YAMAHA
ROBOT
CATALOG 2024

- LCMR200
- RCXiVY2+
- XY-X
- GX
- Robonity
- YP-X
- YHX
- PHASER
- CLEAN
- LCM100
- FLIP-X
- CONTROLLER
- YK-X
- TRANSERVO
- YRG

FULL LINEUP

LINEAR CONVEYOR MODULES

LCMR200   P.8

LCMR200
(Linear module)

SINGLE-AXIS ROBOTS

GX Series   P.20

GX05/GX05L/GX07/GX10/
GX12/GX16/GX20

ROBOTS CONTROLLER

YHX Series   P.22

LCMR200, GX
YHX controller

LINEAR CONVEYOR MODULES

LCM100   P.28

LCM100-4M/3M/2MT
(Linear module)

LCM100-4B/3B
(Belt module)

Controller LCC140 for
Linear module

CLOSED LOOP STEPPING MOTOR SINGLE-AXIS ROBOTS

TRANSERVO Series   P.88

SS Type (Slider type)
SS05H-S   SS05H-R(L)
SS05-S   SS05-R(L)
SS04-S   SS04-R(L)

SG Type (Slider type)
SG07

SR Type (Rod type)
SR05-S   SR05-R(L)
SR04-S   SR04-R(L)
SR03-S   SR03-R(L)

SR Type (Rod type with support guide)
SRD05-S   SRD05-U
SRD04-S   SRD04-U
SRD03-S   SRD03-U

**STH Type
(Slide table type)**
STH04-S   STH04-R(L)
STH06-S   STH06-R(L)

**RF Type
(Rotary type)**
RF02
RF03
RF04

**BD Type
(Belt type)**
BD04
BD05
BD07

SCARA ROBOTS

YK-XG Series / YK-XE Series / YK-XGS / YK-XGP   P.34

Low cost high performance model [YK-XE]
Arm length: 400mm to 710mm
Maximum payload: 4kg to 10kg

YK400XE-4
YK510XE-10
YK610XE-10
YK710XE-10

YK400XE-4

Extra small type [YK-XG]
Arm length: 120mm to 220mm
Maximum payload: 1kg

YK120XG
YK150XG
YK180XG
YK180X
YK220X

YK180XG

Small type [YK-XG]
Arm length: 250mm to 400mm
Maximum payload: 5kg

YK250XG
YK350XG
YK400XG

YK400XG

Medium type [YK-XG]
Arm length: 500mm to 600mm
Maximum payload: 5kg to 20kg

YK500XGL/XG
YK600XGL/XG/XGH

YK500XGL

Large type [YK-XG/YK-X]
Arm length: 700mm to 1200mm
Maximum payload: 20kg to 50kg

YK700XG/XGL
YK800XG
YK900XG
YK1000XG
YK1200X

YK1200X

Wall mount / inverse type [YK-XGS]
Arm length: 300mm to 1000mm
Maximum payload: 20kg

YK300XGS   YK700XGS
YK400XGS   YK800XGS
YK500XGS   YK900XGS
YK600XGS   YK1000XGS

YK500XGS

Dust-proof & drip-proof type [YK-XGP]
Arm length: 250mm to 1000mm
Maximum payload: 20kg

YK250XGP   YK700XGP
YK350XGP   YK800XGP
YK400XGP   YK900XGP
YK500XGLP/ YK1000XGP
YK500XGP
YK600XGLP/
YK600XGP/
YK600XGHP

YK250XGP

Orbit type [YK-TW]
Arm length: 350mm/500mm
Maximum payload: 5kg

YK350TW
YK500TW

YK500TW

SINGLE-AXIS ROBOTS / MOTOR-LESS SINGLE AXIS ACTUATOR

Robonity Series   P.62

**Basic model
Slider type**
ABAS04
ABAS05
ABAS08
ABAS12

**Basic model
Slider type**
LBAS04
LBAS05
LBAS08
LBAS12

**Advanced model
Slider type**
AGXS05/AGXS05L
AGXS07
AGXS10
AGXS12
AGXS16
AGXS20

**Advanced model
Slider type**
LGXS05/LGXS05L
LGXS07
LGXS10
LGXS12
LGXS16
LGXS20

**Basic model
Rod type**
ABAR04
ABAR05
ABAR08

**Basic model
Rod type**
LBAR04
LBAR05
LBAR08

ROBOT VISION   Robot with image processing functions

RCXiVY2+ System   P.44

A robot-integrated vision system

RCX340 + RCXiVY2+

Tracking board   RCXiVY2+ unit

SINGLE-AXIS ROBOTS

FLIP-X Series   P.78

T type Frame-less structure model

T4L/T4LH
T5L/T5LH
T6L
T9/T9H

T4L

F type / GF type
High rigidity frame model

F8/F8L/F8LH/F10/F10H/F14/F14H/
F17/F17L/F20/F20N
GF14XL/GF17XL

F8   GF14XL

N type Nut rotation type model

N15/N15D
N18/N18D

N15

R type Rotation axis type model

R5
R10
R20

R5

B type Timing belt drive model

B10
B14/B14H

B10

LINEAR MOTOR SINGLE-AXIS ROBOTS

PHASER Series   P.72

MF Type Long stroke & high-power using flat motor with core

■ Double Carriges Standard on all Modules

MF7/7D
MF15/15D
MF20/20D
MF30/30D
MF75/75D
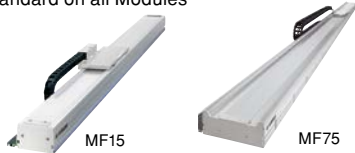
MF15   MF75

CARTESIAN ROBOTS

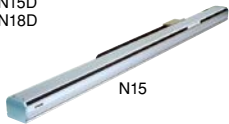### XY-X Series   P.96

PXYx   FXYx   FXYBx

SXYx   SXYBx   MXYx

NXY   NXY-W

HXYx   HXYLx

ELECTRIC GRIPPER

YRG Series   P.132

YRG-4225S   YRG-2810W   YRG-2840FS   YRG-2820T

PICK & PLACE ROBOTS

YP-X Series   P.100

2 axes type	3 axes type	4 axes type
YP220X YP320X	YP220BXR YP320XR YP330X	YP340X

CLEAN ROBOTS

CLEAN Type   P.102

Single-axis robots	Cartesian robots	SCARA robots
SSC04/05/05H C4L/C4LH/ C5L/C5LH/C6L C8/C8L/C8LH C10/C14/C14H C17/C17L/C20	SXYxC SXYxC (ZSC12) SXYxC (ZSC6) SXYxC (ZRSC12) SXYxC (ZRSC6)	YX180XC/ YK700XC/ YK220XC/ YK800XC/ YK250XGC YK1000XC YK350XGC/ YK400XGC/ YK500XGLC/ YK500XC/ YK600XGLC/ YK600XC/

C14   SXYxC

YK250XGC

ROBOTS CONTROLLER

Controllers   P.108

Single axis Robot positioner

EP-01

Single axis Robot positioner

TS-S2   TS-X
TS-SH   TS-P

Single axis Robot driver

<pulse train input only>

TS-SD   RDV-X
RDV-P

Single axis Robot controller

<small servo 24V · 30W>

ERCD

Single axis Robot controller

SR1-X
SR1-P

1 to 2 axis Robot controller

RCX320

1 to 4 axis Robot controller

RCX340

YAMAHA ROBOT
History and approach

45 years of proven reliability.

YAMAHA's robot development started as it was introduced in our motorcycle production line more than 45 years ago. Since then, YAMAHA's industrial robots have supported production equipment in a wide variety of industries, such as assembly of electronic products, transfer of in-vehicle components, and manufacture of large-scale LCD panels.

Over the years YAMAHA has striven to develop and improve the market and this is a testament to YAMAHA's reliability.

Technical development based on the originally developed technologies and focusing on the needs of the market

"Motor control technology" absolutely necessary for precise and high-speed operation "Controller development technology" is based on the highest evaluation standards and Signal processing technology allowing stable operation even under extreme environmental conditions.

Rigidity, durability, and operability are features of YAMAHA's products base on "Coretechnologies*" .

*Control boards, linear motors, and linear scales (position detectors), etc.

Evaluation system provides high reliability

YAMAHA continues to evaluate technology to assure product reliability.

In the product development phase, the evaluation test at "anechoic chamber"* (YAMAHA's equipment) was developed to ensure the high reliability and quality.

*Anechoic chamber: This equipment is intended to synthetically develop the EMC (Electro-Magnetic Compatibility) technologies for YAMAHA Group products and to share the developed technologies. This equipment can evaluate the compliance with each country's regulation in conformity with the international standards.

YAMAHA quality ensuring safety

The products have passed the strict evaluation standards unique to YAMAHA, a manufacturer of transportation equipment that protects human lives.

We design our products for long-term use so that you can use them safely for a long time.

Manufacturing, sales, and technology integrated system is utilized at its maximum level to establish a system that consistently performs a series of processes: inspection → manufacture → assembly → inspection → shipping. This can provide the customers with high quality, low price, and short delivery time.

Key components are manufactured through in-house processing and machining. YAMAHA as a robot manufacturer builds the components to the highest quality level.

Furthermore, the quality control based on the severe standards achieves the craftsmanship with high quality.

YAMAHA
General Small

Only YAMAHA can unify
We provide the best

Pick & place robots
YP-X
Pick and place work
Optimal for high-speed pick & place of small components.

Orbit type robots
YK-TW
High-speed transfer processing
Ideal for narrow or limited space

Integrated robot vision
RCXiVY2+ SYSTEM
Code recognition process
Unified control with only the robot program

BEST ROBOT SOLUTION

Robot System Supplier

manufacturers from small actuators to linear conveyor modules.
solution for a wide range of automation.

Scara robots
YK-XE Series

Sealing work

Both the high operation performance
and low-price are provided.
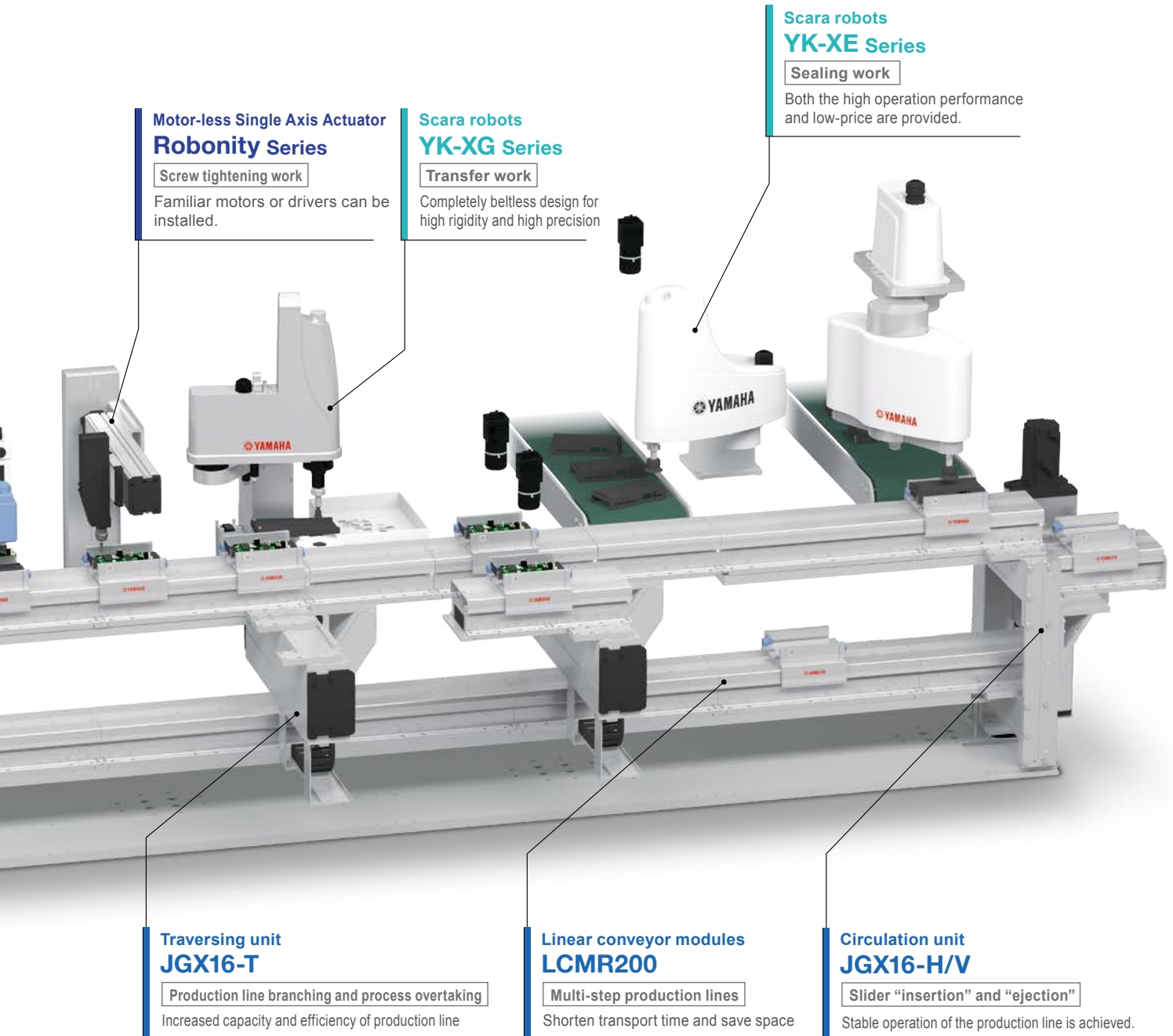
Motor-less Single Axis Actuator
Robonity Series

Screw tightening work

Familiar motors or drivers can be
installed.

Scara robots
YK-XG Series

Transfer work

Completely beltless design for
high rigidity and high precision

Traversing unit
JGX16-T

Production line branching and process overtaking

Increased capacity and efficiency of production line

Linear conveyor modules
LCMR200

Multi-step production lines

Shorten transport time and save space

Circulation unit
JGX16-H/V

Slider "insertion" and "ejection"

Stable operation of the production line is achieved.

Single-axis robots
GX Series

Ideal model for use with LCMR200

Closed loop stepping motor
single-axis robots
TRANSERVO Series

Low-cost positioning equipment

Single-axis AC servo motor robot
FLIP-X Series

A wide range of general-purpose
robots

Linear motor single-axis robots
PHASER Series

For long-distance or high-mass transport

Cartesian robots (2-axis to 6-axis)
XY-X Series

High-rigidity guide ensures long life

Electric gripper
YRG Series

Abundant variations

5

YAMAHA
WEB

ROBOT

Maintenance

Selection

Starting

Plan

YAMAHA ROBOT

WEB MEMBER SITE

YAMAHA Robot Member Site provides information
you can utilize in the model selection or design phase
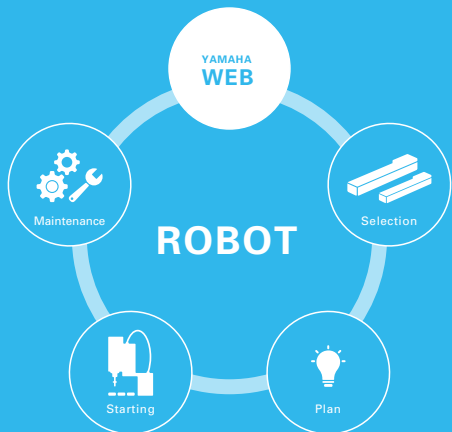when introducing industrial robots.
Additionally, the contents necessary for the start-up
or maintenance work are also prepared.

Selection

Before

Plan

Selection

Plan

Cycle time simulation calculation

Use this when selecting models or calculating cycle time.

Input simple
parameters

Automatic calculation

- Total movement time
- Acceleration/ deceleration time
- Acceleration/ deceleration distance
- Constant speed time
- Constant speed distance

2D/3D CAD data download

Use this for production line design and device design, and to check the layout and operating range.

You can download 2D/3D CAD data for Yamaha robots and controllers.

■ Download 2D CAD data

■ Download 3D CAD data

Robot life calculation

Use this when selecting models or calculating payload shape.

Input simple parameters

Enter the robot model, installation direction, operating stroke, speed setting, payload mass, eccentricity, etc.

Automatic calculation

- Guide lifetime distance
- Ball screw movement distance
- Total movement time
- Acceleration/ deceleration time
- Constant speed time
- Constant speed distance

Connection with other companies' units is also supported.

Plug-in information is also available.

- Asycube plug-in (including the instruction manual)
- RCX3 Suzuno Seisakusho's vision picking feeder operation manual
- RCX3 high-speed pick and place function setup program (including the instruction manual)
- KEYENCE's image sensor connection plug-in (including the instruction manual)
- Cognex's image sensor connection plug-in (including the instruction manual)

Accepting registrations from website

Useful contents from model selections to design, start-up, and maintenance work are provided.

To register as a new member

Go to New Registration screen from the top page
https://global.yamaha-motor.com/business/robot/

Go to New Registration screen from here

After
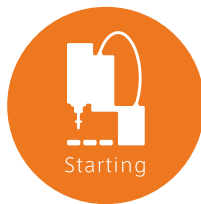
Starting

Maintenance

Starting

Maintenance

Manual download

| User's Manual | Installation Manual | Maintenance Manual |

Since this describes not only operating methods and setting methods but also robot placement and examples of external wiring for the controller, it will be helpful for pre-setup work. Since component replacement methods are also described, this also is useful for maintenance in conjunction with the parts list.
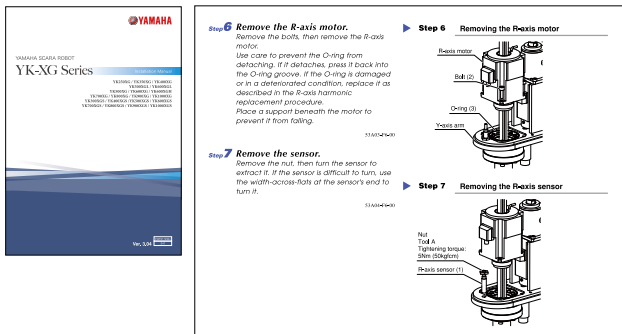
Various software download

- TS-Manager
- EP-Manager
- RCX-Studio 2020
- RCXiVY2+ Studio / RCXiVY2+ PCVison
- iVY2+Studio
- YHX Controller related
  - ・YHX Studio for Standard Profile
  - ・YHX Driver Firmware
  - ・YHX Project Project Standard Profile
  - ・YHX Device file
- Data for PBX updating
- Communication cable USB driver
- VIP+

Parts List and Exploded View

You can view parts lists, and request quotations.

Part lists for Yamaha robots are available.
For some parts, this shows associated parts for which replacement is required or recommended; this is helpful for maintenance activity.

Parts are shown in detail ▶ **Very convenient for repair work**
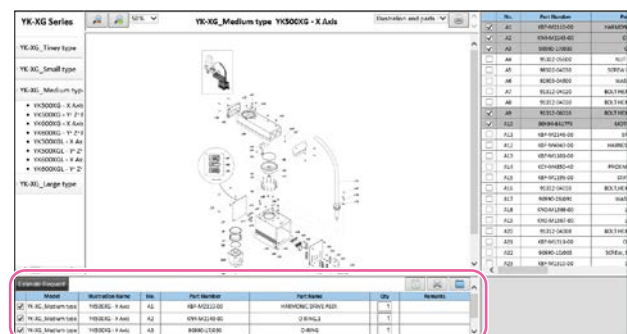
You can also request a price estimate for the selected part.

reddot winner 2021

iF DESIGN AWARD 2021

LINEAR CONVEYOR MODULES

Dedicated for LCMR 200	
Single-axis robot GX series	P.20
Controller YHX	P.22

Efficiency of time and space in production

Yamaha's answer to Next Generation of Production Line design
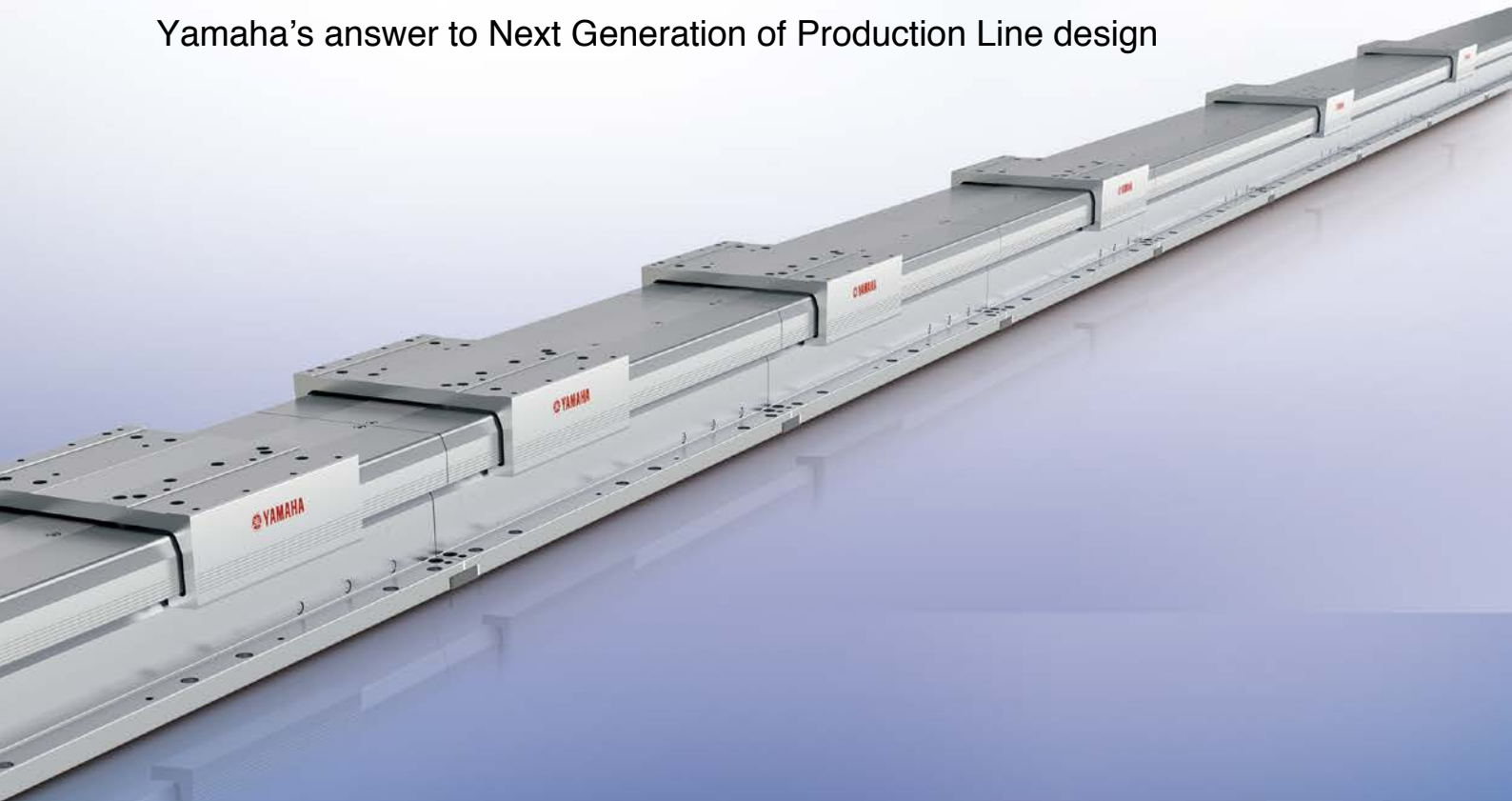
Linear conveyor module LCMR200

Note. As the figure shown above illustrates CG images, they are different from the actual product.

Adding productivity to the transportation process

Convert transfer processes into "value-added" assembly processes.

Production line using
LCMR200

- Improve productivity.
- Cost reduction
- Reduce transport time.
- Save space.

Direct positioning

Operation directly on slider

Smooth acceleration and deceleration

Bi-directional move

Capable of circulating / cycling motion

Accurate stop

Branching and overtaking are possible.

Module structure

YHX controller
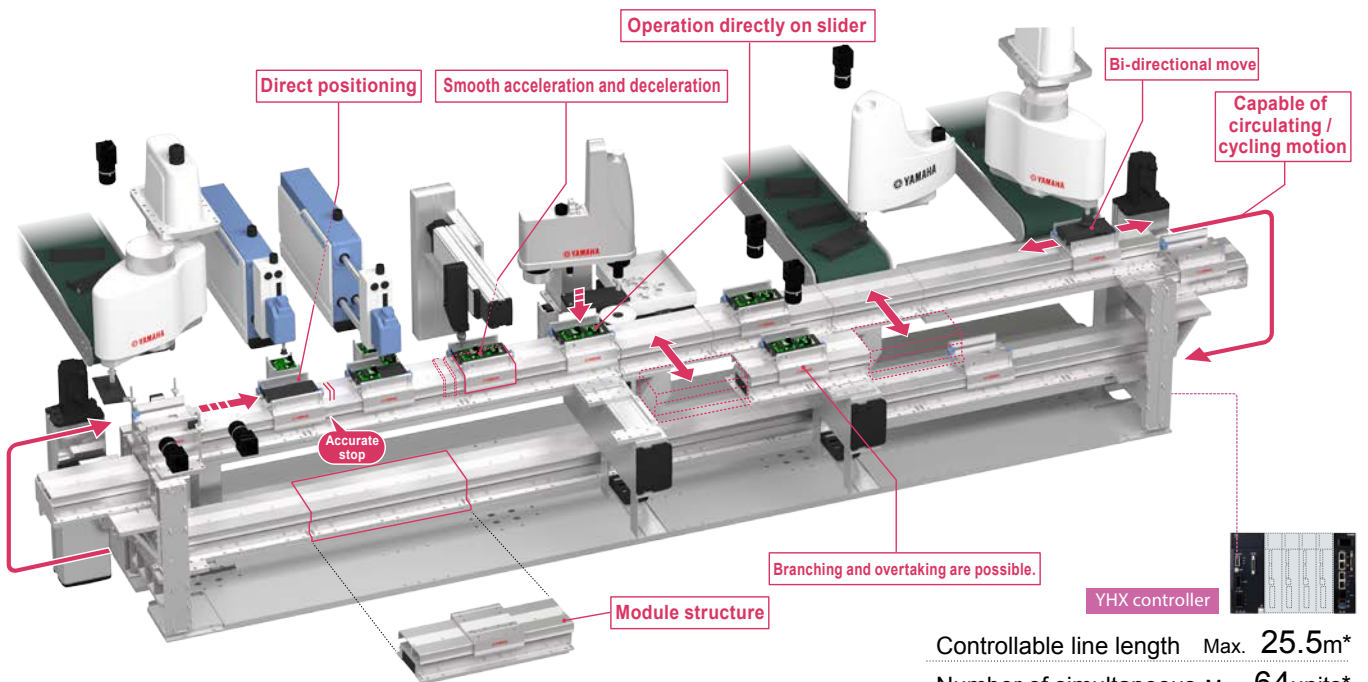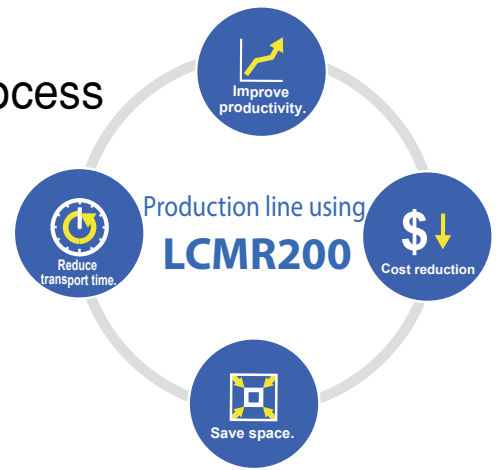
Controllable line length   Max. **25.5**m*

Number of simultaneous   Max. **64**units*
controllable sliders

* It may differ depending on the system configuration.

Advanced linear conveyor module with high speed transport.

- Able to perform narrow pitch and high speed transport.
- Individual ID recognition.
- Complete absolute position system. No origin process needed.
- Built-in driver and reduced wiring.
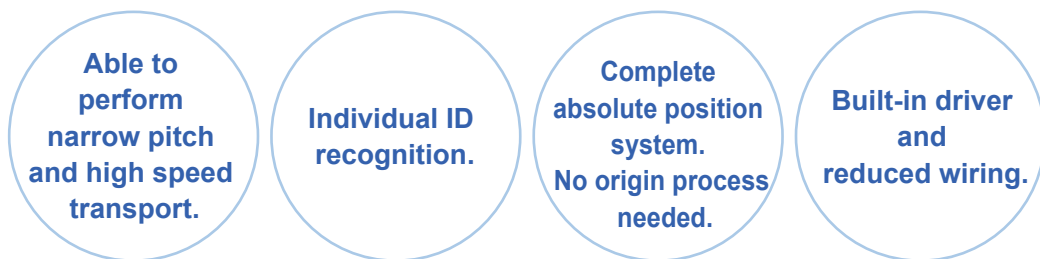
▶ **Reduction of Tact Time in transportation**	▶ **Improved Productivity**
▶ **Flexibility in line design**	▶ **Reduces line design time**
▶ **Easy maintenance**	▶ **Space saving design**
▶ **Low operation cost**	▶ **Durability**

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

From ordinary "passive flow" to "active position transport". By converting conveyor flow into active production process improves profitability.

Mechanical tolerance between robot sliders
+/-30 µm

Repeatability (Single)
+/-5 µm

Maximum payload
30 kg

Maximum speed
2500 mm/sec*

*Speed will be reduced to 2,000 mm/sec if dynamic load is over 10 kg.

Maximum acceleration
1.3 G (At dynamic load of 1 kg)
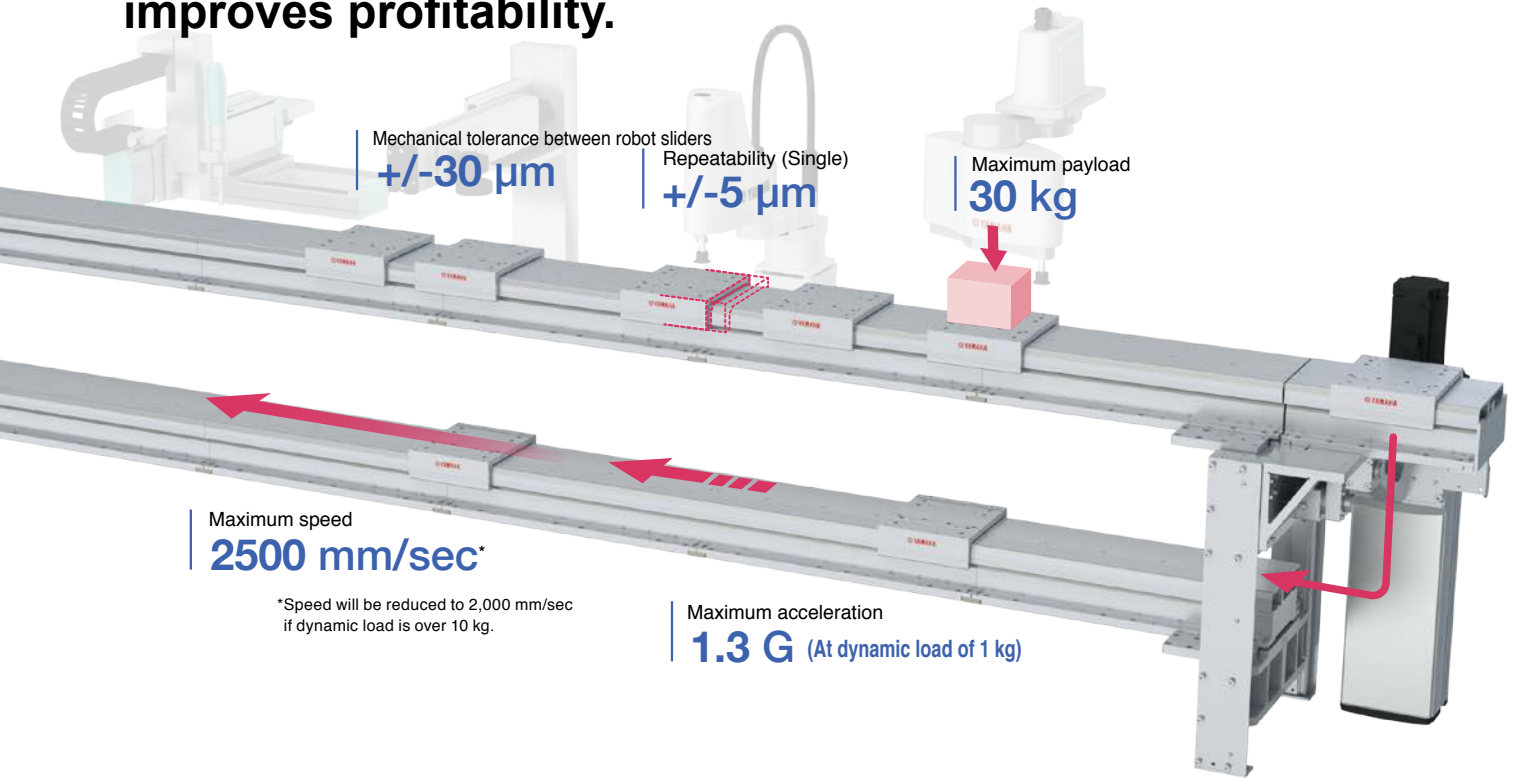
Thorough comparison of LCMR200 and conventional conveyor
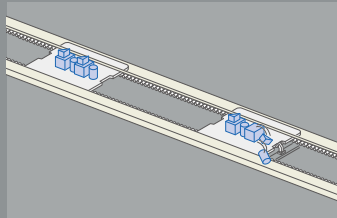
Conventional type conveyors

- Mechanical stoppers or sensors are required at each stop position.
- Complicated control due to various conveyor components.
- Stopper adjustments are required each time the stop position is changed.
- Fixed productivity rate.
- Various adjustments required
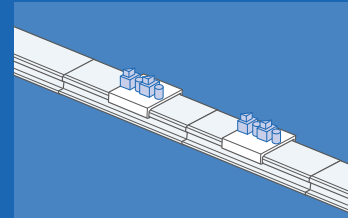
LCMR200

- Direct driving of the slider.
- Stop positions are controlled with position data in program.
- No mechanical stoppers or external sensors required.
- Maximum speed of 2.5 m/sec for better transfer time.
- Adjustable transfer speed for total line flow coordination.
- Actual task times can be easily monitored.

	Conventional type conveyors		LCMR200	
Speed control	△	Same speed required on entire conveyor	◎	Able to specify the speed and acceleration speed individually
Operation control	×	One (fixed) direction	◎	Bi-directional and distance can be set individually for each carriage
Travel / Stops	×	Physical impact at mechanical stop	◎	Smooth servo-controlled acceleration, deceleration, and incremental move
Number of system components	×	Stopper or sensor required at each stop position	◎	No mechanical components required for stop position
Accuracy	△	Additional support is required to increase accuracy	◎	Mechanical tolerance between sliders (between total sliders) +/- 30 µm
Rigidity	△	Additional support is required to ensure rigidity	○	Assembly work can be performed directly on carriage supported by high-rigidity guides
Line flow changes	×	Requires stopper adjustments at each line flow change	◎	Simple modification of line layout by modular design. Stop position can be changed in program
Footprint	△	Certain space is required	◎	Space saving design

Superior performance that improves the transfer environment.

POINT 1

Transfer time is shortened to increase the production volume.

● Comparison between LCMR200 and a conventional conveyor

Increased yield by approx. 80 %

LCMR200

Conventional conveyor

(Yield per min.)

* Subject to user's operation setup.

Transfer time is reduced from 6 to 3 seconds.

50 % reduction in tact time

LCMR200

Transfer	Stop	Work	Transfer
High-speed movement	Direct positioning / Accurate stop	Work on the slider is possible	High-speed movement
Linear motor drive for high-speed transfer	Optimum acceleration/deceleration ensures a smooth deceleration and stop	Slider is supported directly by a highly rigid guide	

Finished

Conventional conveyor

Transfer	Deceleration	Stop	Retraction	Work	Returning	Transfer
Slow transport due to frictional resistance	Requires some distance for deceleration	Collides. All stop positions require a sensor and stopper	Workpiece retraction is required because the system does not have rigidity		Returned back to the line	

Finished

Note. May vary depending on conditions

POINT 2

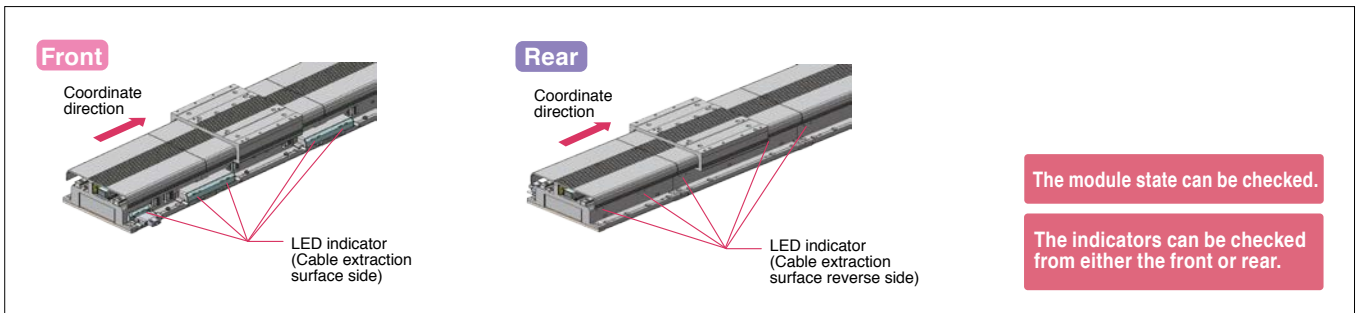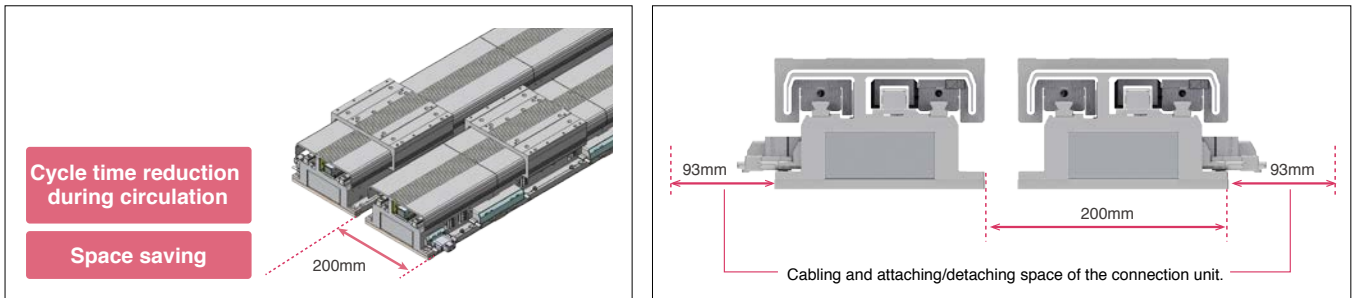### Easy modular connection with Connecting Plate and Connecting Unit

Mechanical connection by Connecting Plate and signal communicating by Connecting Unit. Simple yet, secured connecting method of modular system.

End plate

Connection plate

Connection unit

End unit

Connection plate

Connection unit

End plate

End unit

11
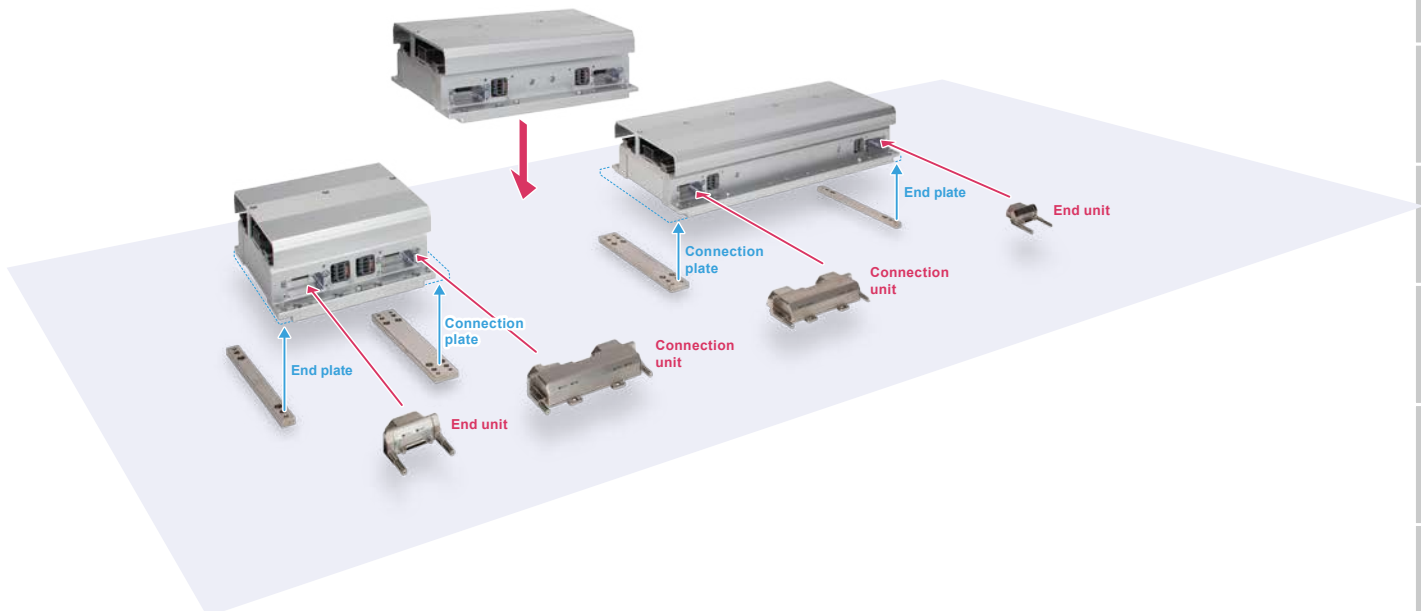
POINT 3

Saves space through proximity installation of forward and returning modules
<Cable extraction direction can be selected Front Rear >

Since the cable extraction direction of a module can be selected, the degree of freedom in electrical wiring is improved when installed on the equipment. In particular, when the cable extraction direction is reversed on the forward and returning modules in the horizontal circulation layout, the module pitch can be made close to the shortest level of 200 mm. This can shorten the cycle time and reduce the installation space during circulation. In addition, the LED indicators that show the module state can be visually checked from both the front and rear sides of the module.

Cycle time reduction during circulation

Space saving

200mm

93mm   200mm   93mm

Cabling and attaching/detaching space of the connection unit.

Front
Coordinate direction
LED indicator (Cable extraction surface side)

Rear
Coordinate direction
LED indicator (Cable extraction surface reverse side)

The module state can be checked.

The indicators can be checked from either the front or rear.

POINT 4

All the sliders can be operated / programmed independently.

Speed and acceleration can be programmed by each move. All carriages can be controlled individually.

POINT 5

Top enclosure design for protection.

Top enclosure was designed to protect the internal mechanism from any fallen object during line setup process.

Top enclosure
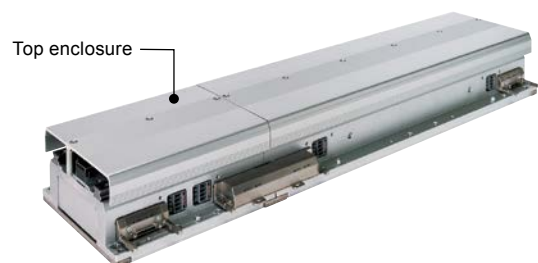
POINT 6

Mechanical tolerance between sliders +/-30 μm (Dowel hole standard)

Due to tis machined accuracy, each carriage has own tolerance at one stopping point, however, LCMR200 can limit the slide machine difference to +/-30 μm, and is suitable for high precision process. As RFID, etc. is not necessary, cost reduction is possible.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

POINT 7

No origin process needed

Newly developed high-precision full-range absolute server eliminates the need for return-to-origin. The operation can be started and stopped easily, so there is no time loss even when starting or restarting.

High acceleration rate

High speed motion between an extremely short distance is possible even in a high density process or pitch feed.

Recognize slider's individual IDs

All sliders can be identified when the power is applied.
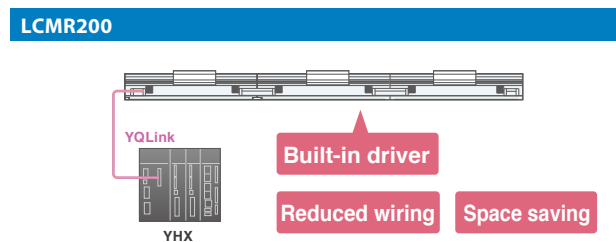
POINT 8

Low profile structure

By adopting a newly developed linear motor, the module height is approx. 30 % down compared to LCM100. The space under the frame can be effectively utilized.

LCM100 / LCMR200

101
155
136.5

About 30% reduction

175
175
109
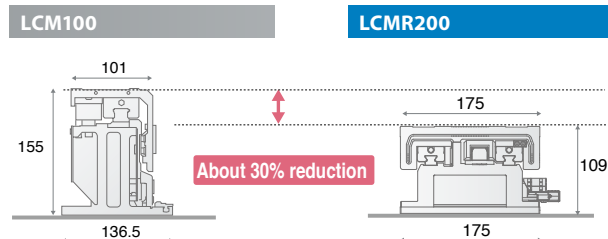
POINT 9

Built-in driver saves electrical wiring

Motor driver is incorporated inside module and entire LCMR200 is controlled by YHX controller through YQLink cable. It also contributes to space saving inside the control panel.

LCM100

Robot cable

LCC140   LCC140   LCC140

LINK cable

LCMR200

YQLink

Built-in driver

Reduced wiring   Space saving

YHX
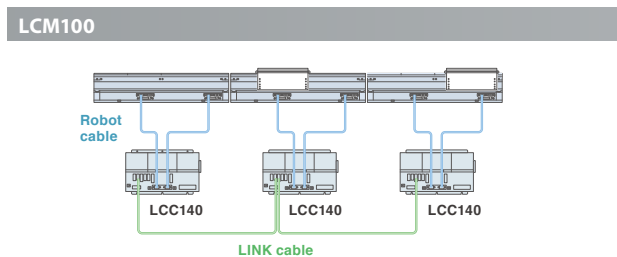
POINT 10

Concentrated control by the YHX controller

Including the operation environment, all sliders and single-axis robots on the transfer process can be controlled.

POINT 11

Simple control with the standard profile

According to the commands from the host PLC, it adopts a simple control method that operates the sliders and single-axis robots as positioners

Features of YHX standard profile

● **Eliminates writing ladder logic codes.**
● **Adding operation through a pendant.**
● **Perform simple direct value operation and specific point-to-point move.**
● **Servo ON of any slider individually.**
● **Obtain alarm information through the host PLC.**

Versatile and value added transport between work process.

Improve cycle time and reduce line floor space.
Increase productivity and cost performance.

Reduce transport time. | Improve productivity. | Cost reduction | Save space.

POINT 12   Direct drive | Slider backward travel $↓

Process sharing

● Carriage is bi-directional and one work station can perform more than one task. Saving total line cost and floor space.

● High speed bi-directional move and simultaneous independent operation of multiple carriages.

Conventional method

Requires two duplicated work stations in one line

<Process flow>
A ➡ B ➡ A ➡ C

Duplicated tasks

A
B
A
C

LCMR200   Eliminating duplicated work station

Duplicated process

A
A
B
C

<Process flow>
A ➡ B
A ➡ C

Bi-directional feature reduces total line cost = assembly cost

---
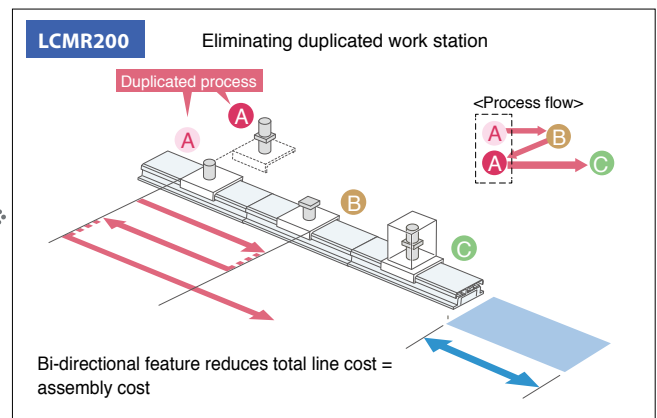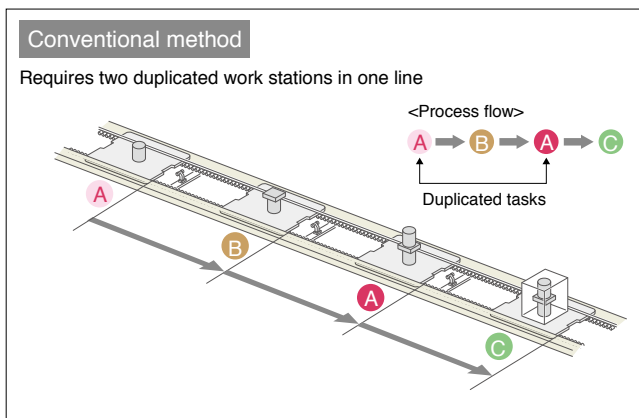
POINT 13   Direct drive | Narrow pitch operation

Variable speed control between work stations.

● Servo controlled direct drive eliminates mechanical stoppers and position sensors.

● Simple position setting by entering point data in a program.

● Flexibility in setup for production lot change

● Saving flow time by narrow pitch incremental move and high speed move.

LCMR200

Narrow pitch movement

High-speed movement

Narrow pitch movement

Linear conveyor modules · LCMR200 · Single-axis robots · GX · Controller · YHX · Linear conveyor modules · LCM100 · SCARA robots · YK-X · Robot Vision · RCX iVY2+ · Single-axis robots · Robonity · Linear motor single-axis robots · PHASER · Single-axis robots · FLIP-X · Compact single-a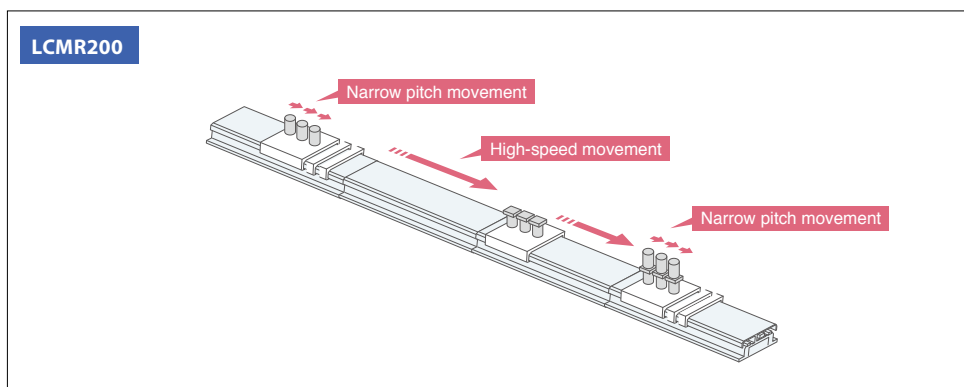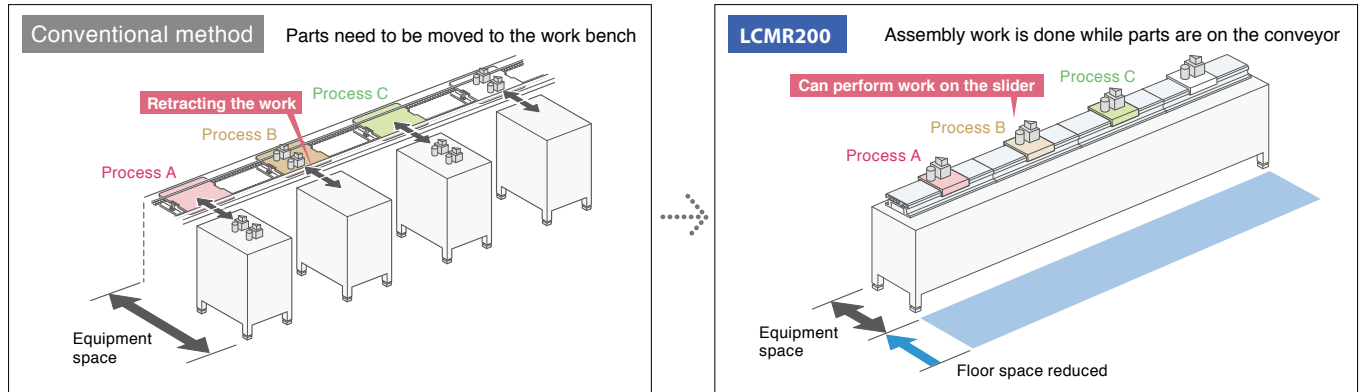xis robots · TRANSERVO · Cartesian robots · XY-X · Pick & place robots · YP-X · CLEAN · CONTROLLER · Electric Gripper · YRG · APPLICATION · SERVICE PERIOD

POINT 14

Highly rigid guide

Assembly can be done while parts are on the conveyor.

● The highly rigid guide enables assembly and processing on the transport line.

● No need to reposition parts to/from conveyor. Floor line space is reduced substantially.

Conventional method — Parts need to be moved to the work bench

Retracting the work
Process C
Process B
Process A
Equipment space

LCMR200 — Assembly work is done while parts are on the conveyor

Can perform work on the slider
Process C
Process B
Process A
Equipment space
Floor space reduced

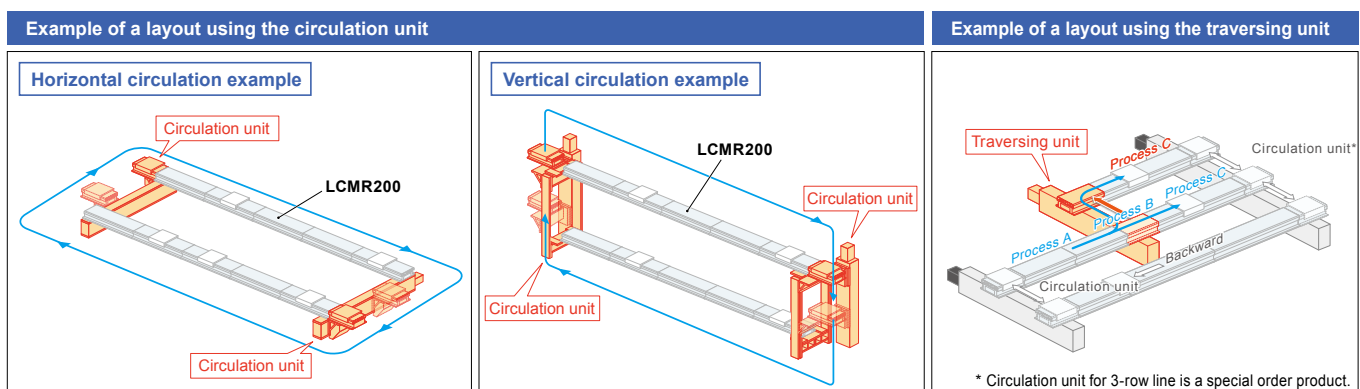## POINT 15

Easily serviceability = Easy troubleshooting

● Covered structure of module keeps internal mechanism free from foreign objects.

● The environment-resistant magnetic sensor is resilient to contamination.

● Easy positioning with no precision setting.

● Non-contact motor and linear scale design eliminates mechanical wearing.

● Low particle generation (only mechanical contact is guide rail)

● Standardized components reduce spare parts SKU.

● Parts can be replaced easily.

● Operation can be restored just by replacing the slider or linear module, and the manufacturing line down time can be kept to a minimum.

Sleek and simple configuration.
Simplified line design process with flexibility and efficiency by a modular concept.

All carriages and peripheral linear robots can be controlled by the PLC through one YHX controller.

POINT 16

● Layout example with a combination of the module and circulation unit.

Example of a layout using the circulation unit

Horizontal circulation example

Circulation unit
LCMR200
Circulation unit
Circulation unit

Vertical circulation example

Circulation unit
LCMR200
Circulation unit
Circulation unit

Example of a layout using the traversing unit

Traversing unit
Process C
Process B
Process C
Process A
Circulation unit*
Backward
Circulation unit

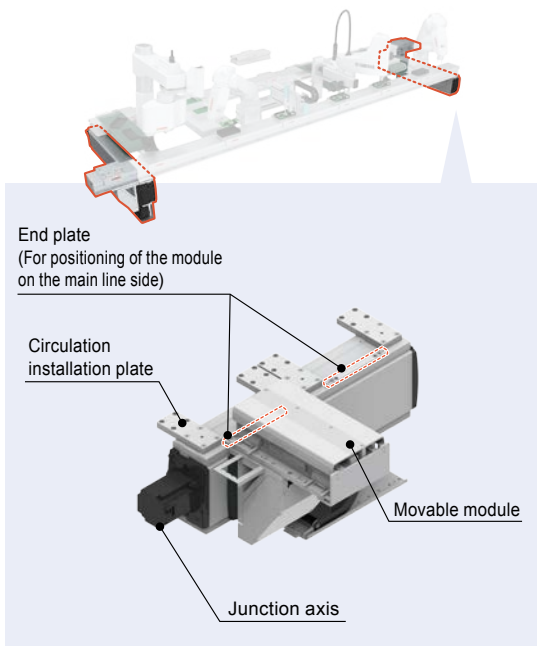* Circulation unit for 3-row line is a special order product.

15

Circulation unit

Circulation units are available as standard.

Because the circulation units are manufacturer's standard products, the stable operation of the production line is achieved without worrying about module "deviation". Furthermore, you can also save time and effort in design.
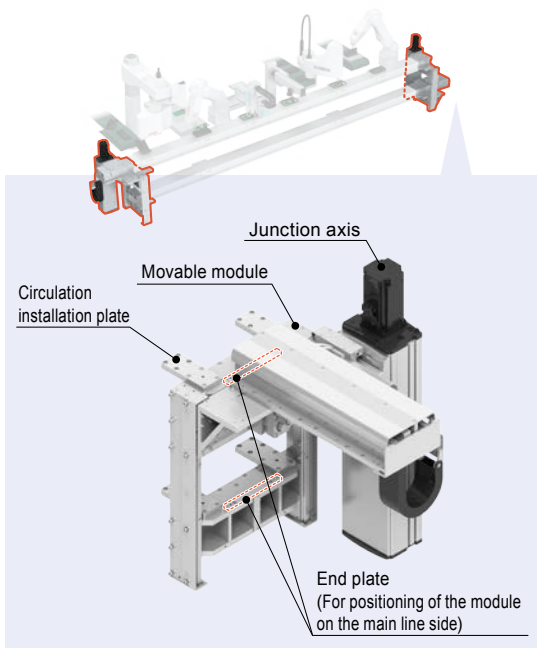
YAMAHA genuine circulation unit

YAMAHA genuine circulation units achieve the stable operation of the production line.

Horizontal circulation unit   JGX16-H

End plate
(For positioning of the module on the main line side)

Circulation installation plate

Movable module

Junction axis

Vertical circulation unit   JGX16-V

Junction axis

Movable module

Circulation installation plate

End plate
(For positioning of the module on the main line side)

Traversing unit

This unit can branch the production line or pass the process. Improvement and high efficiency of the production line capacity can be achieved.

Traversing unit

- **Bottleneck process is resolved to improve the throughput.**
- **Sampling inspection and workpiece correction can be performed without stopping the line.**

Traversing unit   JGX16-T

Branching specifications

Traversing unit

Process C

Process C

Process B

Process A

Backward

Circulation unit*
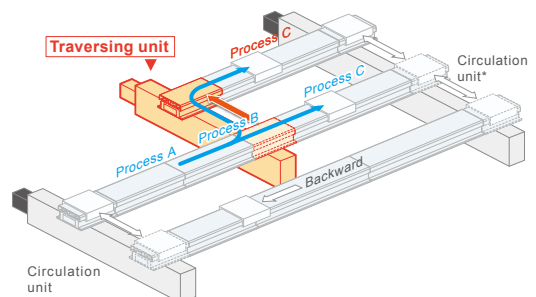
Circulation unit

* Circulation unit for 3-row line is a special order product.

Retracting specifications

Traversing unit 2

Traversing unit 1

Process B2

Process B1

Process C

Process A

Backward

Circulation unit

Circulation unit

Support unit

LCMR200

Junction axis

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
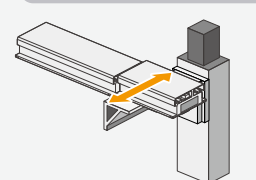SERVICE PERIOD

POINT 1

Measures against "deviation" necessary to maintain the accuracy are taken thoroughly.

Maintaining the accuracy is very important for transfer sections, but is not easy since a "deviation" may occur.

Use of YAMAHA genuine circulation units makes it possible to eliminate such "deviation" and maintain the accuracy.
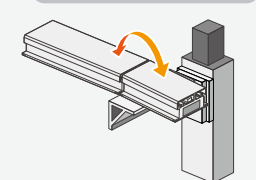
Concerns about "deviation" due to temperature or motor heat, etc.
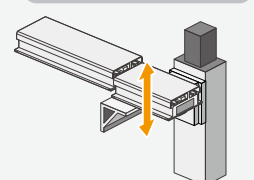
Horizontal deviation

Torsion deviation
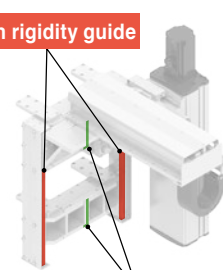
Vertical deviation

YAMAHA genuine circulation unit
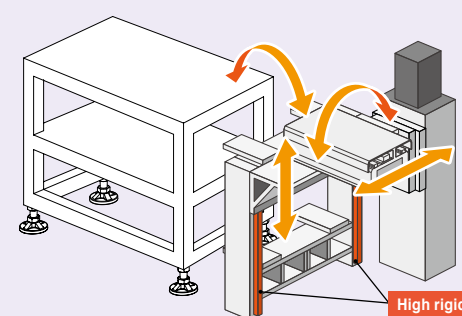
High rigidity guide
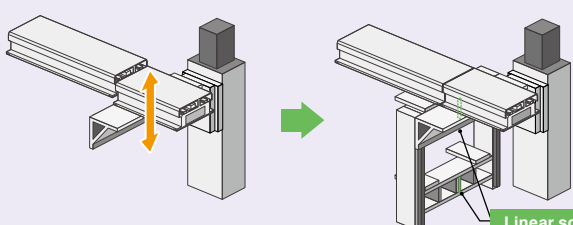
Linear scale

Restricted by two high rigidity guides. **Torsion deviation and horizontal deviation are eliminated.**

■ Circulation module moves along the guide.

■ Torsion deviation or horizontal deviation of the transfer section is restricted by two guides.

High rigidity guide

Corrected by the linear scale. **Vertical deviation is eliminated.**
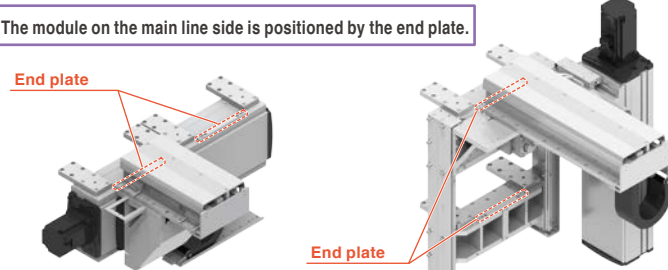
■ Positioning is performed by the full closed loop system using the linear scale arranged near the transfer section to correct effects due to thermal elongation of the ball screw, etc.

Linear scale

POINT 2

Easy adjustment

The adjustment has been performed before shipment from the factory. After the product has arrived, the adjustment is completed in a short time by simply attaching the module to the equipment based on the end plate and performing the teaching.

The module on the main line side is positioned by the end plate.

End plate

End plate

17

POINT 3

About Traversing unit

Circulation unit

- **One module moves.**
- **The slider can access from only one side of the module.**

This figure shows that the slider can access from only the right side.
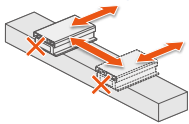
The slider cannot access from the left side of the module.

Traversing unit

Accessible from both sides of the module
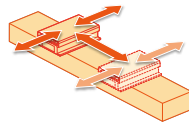
Module moves.

Basic movement pattern

OUT ← → I/O
IN ← →

The lower side is only IN. The upper side is IN/OUT and OUT (IN: 2/OUT: 2).

OUT → OUT
IN → OUT

Pattern with different left and OUT positions (IN: 1/OUT: 2).
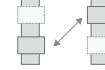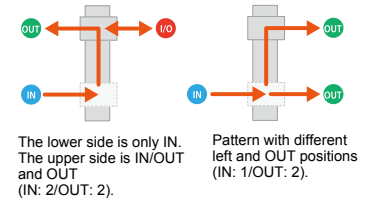
Two modules can also be installed.

set | set

Two modules move.

set | set

Basic movement pattern

Working after retracting

IN → OUT
set

Another slider can move.
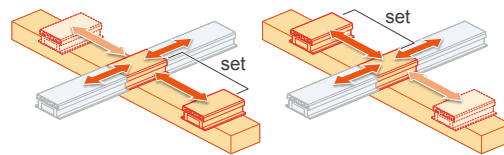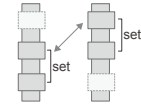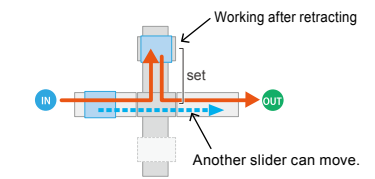
Usage example

Bottleneck is resolved. The production volume is improved by parallelizing processes that inevitably take time.

■ Bottleneck is resolved./Multiple models are supported.

"Improvement of specific process capacity" and "Distribution of line by model" are achieved by branching.

Example of bottleneck resolution

Process C is parallelized to resolve the bottleneck.
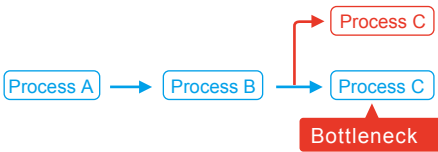
Process A → Process B → Process C
                          Process C
                        Bottleneck

Example of bottleneck resolution

Process C
Process C
Process B
Process A
Traversing unit
Backward
Circulation unit*
Circulation unit
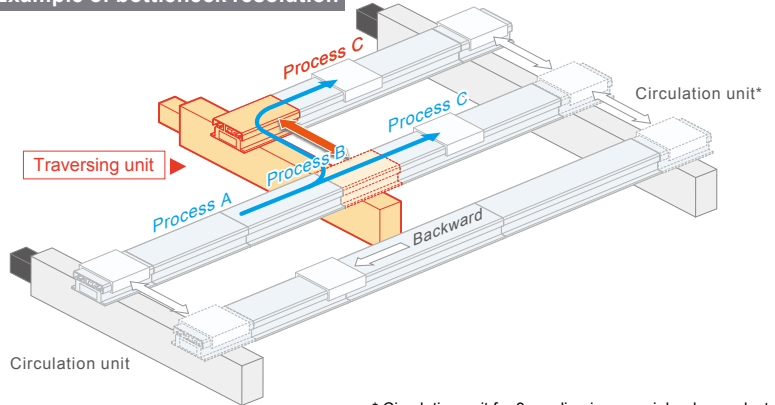
* Circulation unit for 3-row line is a special order product.

■ Bottleneck is resolved.

Passing the slider resolves the bottleneck.

Arranging multiple processes B and passing the working slider resolve the bottleneck.

Process B1 | Process B2
Process A → Process B → Process C
              Bottleneck

Traversing unit **2**
Traversing unit **1**
Process B2
Process B1
Process C
Process A
Backward
Circulation unit
Circulation unit

Linear conveyor modules

LCMR200

Single-axis robots
GX

Controller
YHX

Linear conveyor modules
LCM100

SCARA robots
YK-X

Robot Vision
RCX iVY2+

Single-axis robots
Robonity

Linear motor single-axis robots
PHASER

Single-axis robots
FLIP-X

Compact single-axis robots
TRANSERVO

Cartesian robots
XY-X

Pick & place robots
YP-X

CLEAN

CONTROLLER

Electric Gripper
YRG

APPLICATION

SERVICE PERIOD

Sampling inspection/correction   The production volume can be maintained while reducing losses.

■ Correction

NG product delivery ⇒ Correction ⇒ Inspection.
"Production line without waste" is achieved.

OK product

Process A → Inspection → Process B

Correction

Correction
Process A → Inspection → Process B

• Workpiece is retracted to the correction area according to the inspection results.
• Workpiece is returned to before the inspection process again after completion of the correction.
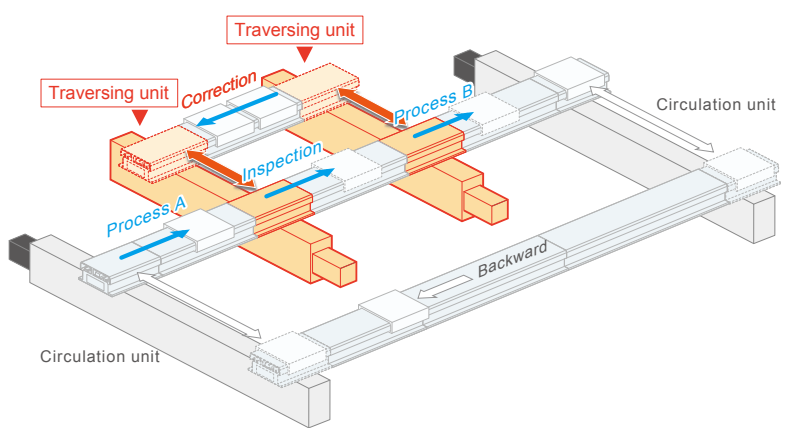
■ Sampling inspection/correction   <Workpiece to be sampled needs to be extracted onto an extension of the line.>

When the jig pallet may be defective, it can be delivered and replaced immediately. Production line that continuously manufactures OK products is achieved.

Process A → Process B → Process C
↓
Workpiece stock area
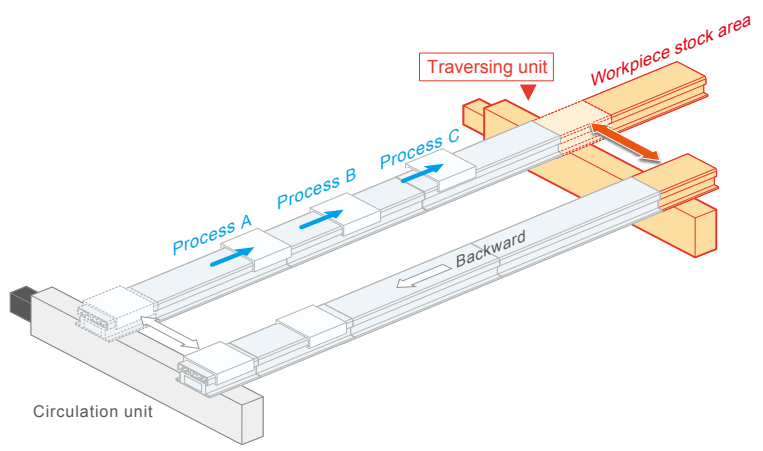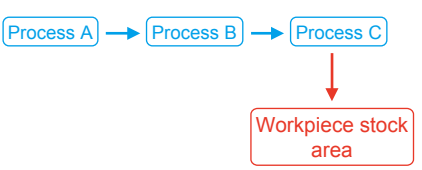
■ Sampling inspection/correction

Workpieces can be delivered to the workpiece stock area for sampling and correction.
Line that can be handled at a convenient timing on site is achieved.

OK product

Process A → Inspection → Process B

Correction

Process A → Inspection → Correction/inspection

• Workpiece is retracted to the correction area according to the inspection results.
• Workpiece to be used for the sampling inspection is pulled out by the traversing unit.

19
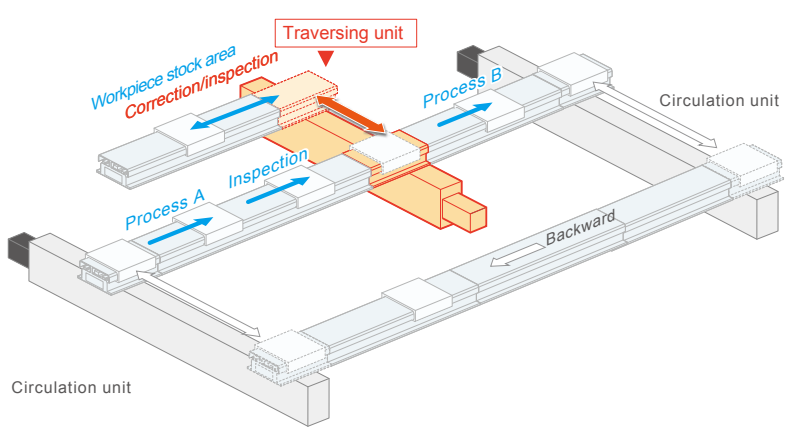
Dedicated for LCMR 200* Single-axis robot GX series

Highly efficient, highly accurate ground ball screws are now a standard feature for all types and models.
The high precision models with reliability and durability.

Supported controller: YHX P.22

* The base structure of the robot is the same as the Robonity series. When you use a single-axis robot alone, consider Robonity series on P.62. (GX series and Robonity series have different control methods and controllers.)

+/-5 μm positioning repeatability ensured for all models
Made to the clean specification as a standard feature

POINT 1   Reliability

High precision, high rigidity, high durability

All product models employ highly efficient, highly accurate ground ball screws as the standard features. The lead accuracy complies with JIS accuracy class C5 that brings about the positioning accuracy repeatability of +/-5 μm.

The accuracy is about two times higher than the previous models. These new features contributes improving yield. In addition, noise level is reduced and structural life is extended serv.

LM guide
Ball retainers
Ground ball screws
Accuracy to JIS C5
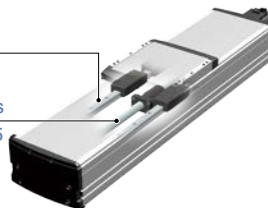
POINT 2   Save space

Shortest overall length in the industry

The industry's shortest class is achieved for the total length in relation to the operation stroke.
This significantly contributes to saving production facility footprints.
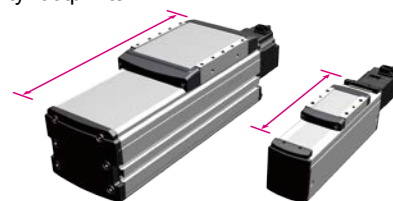
POINT 3   Usability   Save space

All models can be mounted (fixed) from the top surface or bottom surface

The main unit can be fixed from ether the bottom face or top face to respond to the system's densification and space saving.

Mount and fix from the top of the main unit

Mount and fix from the bottom of the main unit
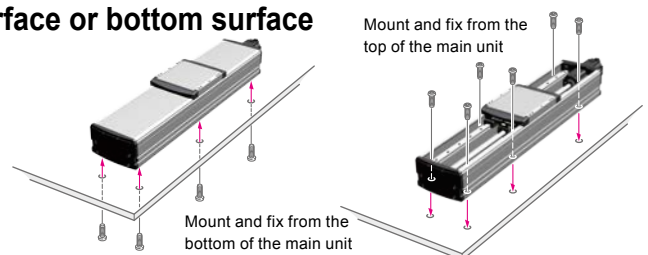
POINT 4   Environment resistance

Clean specification as a standard feature

Dust-proof structure…Upper surface of main frame of all models is protected with durable stainless steel dust shield.
This structure helps reducing foreign particle contamination from outside. By applying negative air pressure from suction port it can be used in a clean environment.

Stainless steel sheet, standard feature

Slider with rollers

Port as standard feature

Motor: IP67

■ Simply install suction joint

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 5

Battery-less absolute system / No origin process needed

The complete absolute method is adopted so there is no need to perform return-to-origin when restart and initial start up process.
The battery-less absolute is also supported.

POINT 6

Easy to alter specifications

Options available for retrofit

Converting cable outlet orientation

With conversion adapter on a standard motor orientation of cable outlet can be changed.
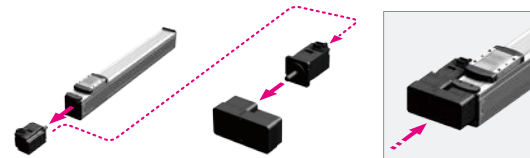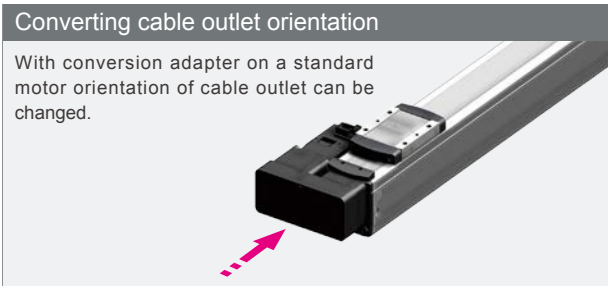
Standard model + Conversion adapter ▶ Motor folded type

Simply remove the motor from the robot body, set it onto the conversion adapter, and then mount onto the body again.

Changing the location of robot cable outlet

The direction of cable outlet can be converted to customer's preference.

Downward direction

Side direction

Unscrew motor fixing bolts   Reposition the motor

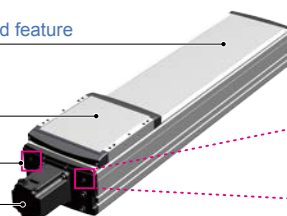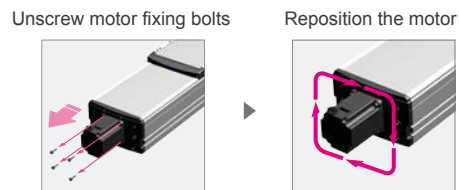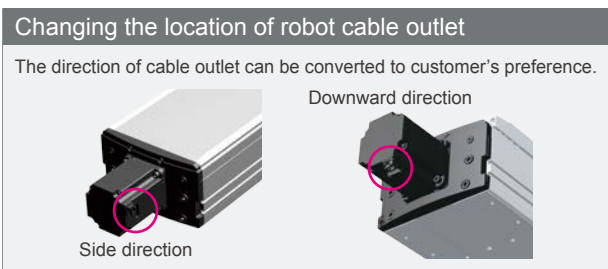| Type Model		Motor output AC (W)	Repeat-ability (mm)	Ballscrew diameter [Class C5]	Size (mm) Note 1	Overall length (mm)		Lead (mm)	Maximum payload (kg)		Rated thrust (N)	Maximum speed (mm/sec) Note 2	Stroke (mm) [50 increment]
						Horizontal	Vertical		Horizontal	Vertical			
Small type	GX05	50		φ12	W48 × H65	ST +188	ST +228.5	20	5	2	41	1333	50 to 800
								10	8	4	69	665	
								5	13	8	138	333	
	GX05L	100		φ12	W48 × H65	ST +230	ST +270.5	20	12	3	84	1333	
								10	24	6	169	666	
								5	32	12	339	333	
	GX07	100		φ15	W70 × H76.5	ST +270.5	ST +311	30	10	2	56	1800	50 to 1100
								20	25	4	84	1200	
								10	45	8	169	600	
								5	85	16	339	300	
Medium type	GX10	200	+/-0.005	φ15	W100 × H99.5	ST +245	ST +285.5	30	25	4	113	1800	100 to 1250
								20	40	8	170	1200	
								10	80	20	341	600	
								5	100	30	683	300	
	GX12	400			W125 × H101	ST +297	ST +337.5	30	35	8	225	1800	100 to 1250
								20	50	15	339	1200	
								10	95	25	678	600	
								5	115	45	1360	300	
Large type	GX16	750		φ20	W160 × H130	ST +339.5	ST +386.5	40	45	12	320	2400	100 to 1450
								20	95	28	640	1200	
								10	130	55	1280	600	
	GX20				W200 × H140	ST +385.5	ST +432.5	40	65	15	415	2400	100 to 1450
								20	130	35	640	1200	
								10	160	65	1280	600	

Note 1. The size shows approximate maximum cross sectional size.

Note 2. The maximum speed will vary according to the stroke length. Refer to the descriptions of each model for details.

21

Controller dedicated for LCMR200 / GX
YHX Controller

Reduces production line configuration time

Supported product: LCMR200 P.8 **/ GXseries** P.20

Controller for the linear conveyor module LCMR200 and single-axis robot GX series. Advanced production line can be constructed in a short period.

Stacking modular structure

No wiring between modules needed.

Incorporation a control power supply, motor drive power supply, high speed network communication, safety circuit into a stacking modular structure.
Eliminates wiring between units, reducing conventional wiring cost and wiring man-hour to 30% to 50%.
The stacking structure including host, power and driver is the very first in the industry.

Power unit **Driver unit** **Host controller unit**
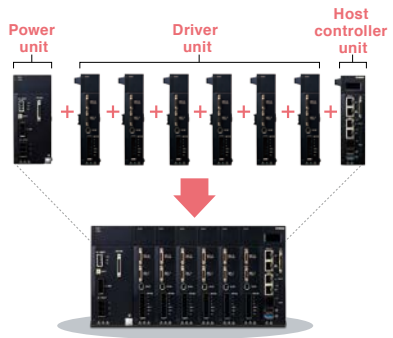
Typical photo image of stacking structure

Driver unit
up to **16** units
Stackable

Configuration example

Driver power unit **Host controller unit** Programming pad   Computer   Host PLC

Safety circuit

Brake unit

Regenerative unit

LCMR200 series

GX series

Two axes are used as the circulation unit.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN |
CONTROLLER |
YRG | Electric Gripper
APPLICATION |
SERVICE PERIOD |

System configuration diagram

Configuration example

One way 2000 mm, vertical circulation transport line
* 200 mm linear model and single-axis robot are used for circulation section

Icon	Name	Description
Linear module (green)	**Linear module**	Size of modules selected here is for reference only. The cable extraction direction can be selected in units of cluster (multiple linear modules are connected to configure one line). A linear module used in the circulation part is also common.
XBOT	**Robot slider**	A slider that operates on the linear module.
EP	**End plate**	Position a linear module on both ends of a cluster.
CP	**Connection plate**	The adjacent modules are positioned and connected.
AP	**Adjuster plate**	This adjuster plate is used to adjust the return line length to match the reference line.
EU	**End unit**	Connect with the YQLink cable or YQLink terminal end unit on both ends of a cluster.
CU	**Connection unit**	Between module communication of adjacent modules is connected.
(connector)	**Control power source connector**	A connector to supply control power source from 48 VDC power source to the linear module.
(jumper)	**Control power source jumper**	A jumper cable to supply control power source to adjacent modules.
(connector)	**Motor power source connector**	A connector to supply motor power source from 48 VDC power source to the linear module.
(jumper)	**Motor power source jumper**	A jumper cable to supply motor power source to adjacent modules.
(jumper)	**Motor power source jumper (for 1000 mm module relay)**	A jumper cable to relay motor power source in 1000 mm module. When 3 to 4 robot sliders stop in 1000 mm module, remove this motor power source jumper, and connect the power source device for additional motor with the motor power source connector.
(cable)	**YQLink cable**	A communication cable between each linear module cluster and the controller. As shown in the above figure, connect from left to right with one line. Connect the YQLink end connector to the terminal of the end cluster.
48 VDC power supply	**48 VDC power supply**	General-purpose 48 VDC power source device that can be applied to both control and motor operations. With one power source device, 10 m module control power source can be supplied. Also, one power source device can supply motor power source of two robot sliders. Prepare power source devices for each control power source and motor power source.
(line)	**Flexible power cable for movable module**	Flexible cable to supply power source to the module that performs reciprocal operation mainly in the circulation part.

23

Implementing a task is simple and easy

Project file　YHX Standard Profile

This standard profile is a project file for the LCMR200 that operates the single-axis robot or LCMR200 as a positioner from the host PLC via the field network.

Features of YHX standard profile

- Eliminates writing ladder logic codes.
- Adding operation through a pendant.
- Perform simple direct value operation and specific point-to-point move.
- Servo ON of any slider individually.
- Obtain alarm information through the host PLC.

Significant reduction of launching man-hour.	Significant reduction of startup time and process.	Controlled by program creation of the host PLC.	Numbers of improvements in line design and operation.

POINT 1

LCMR200 can be operated using your familiar PLC.

Use of YHX standard profile makes it possible to operate the LCMR200 from the host unit such as PLC via the I/O interface of each field network.

PLC　YHX

Remote command is converted by the YHX standard profile.

Manufacture line using the LCMR200

Remote command is issued.
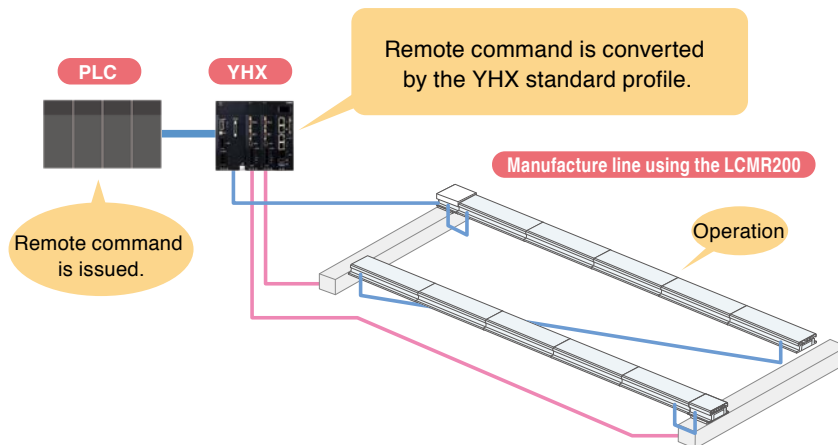
Operation

POINT 2

Creation of YHX ladder by the customer is not needed.

Dedicated input and output signals are already assigned to the word and bit area of the field network.
Operations necessary for the robot motion such as servo ON or JOG movement can be performed without creating programs.

What you can do with the YHX standard profile

- Slider or single-axis servo ON
- Brake of the vertical axis is released.
- Alarm type and occurrence location are checked.
- JOG movement
- Inching

LCMR200 | Linear conveyor modules

GX | Single-axis robots

YHX | Controller

LCM100 | Linear conveyor modules

YK-X | SCARA robots

RCX iVY2+ | Robot Vision

Robonity | Single-axis robots

PHASER | Linear motor single-axis robots

FLIP-X | Single-axis robots

TRANSERVO | Compact single-axis robots

XY-X | Cartesian robots

YP-X | Pick & place robots

CLEAN

CONTROLLER

YRG | Electric Gripper

APPLICATION

SERVICE PERIOD

POINT 3

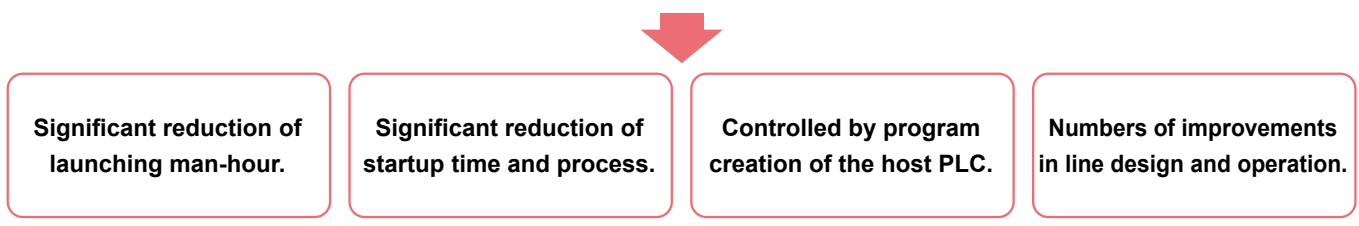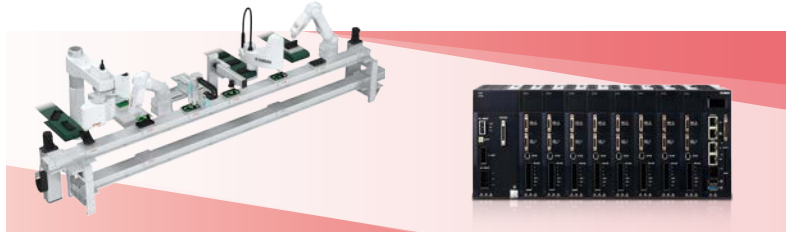### Control using "movement file"

Control is performed using the point data "movement file" necessary to register the target position.

"Movement file" plays a role similar to point data.

For TS-SH

Point data

Movement based on the point data.

For YHX

Movement file

Movement based on the data of the movement file.
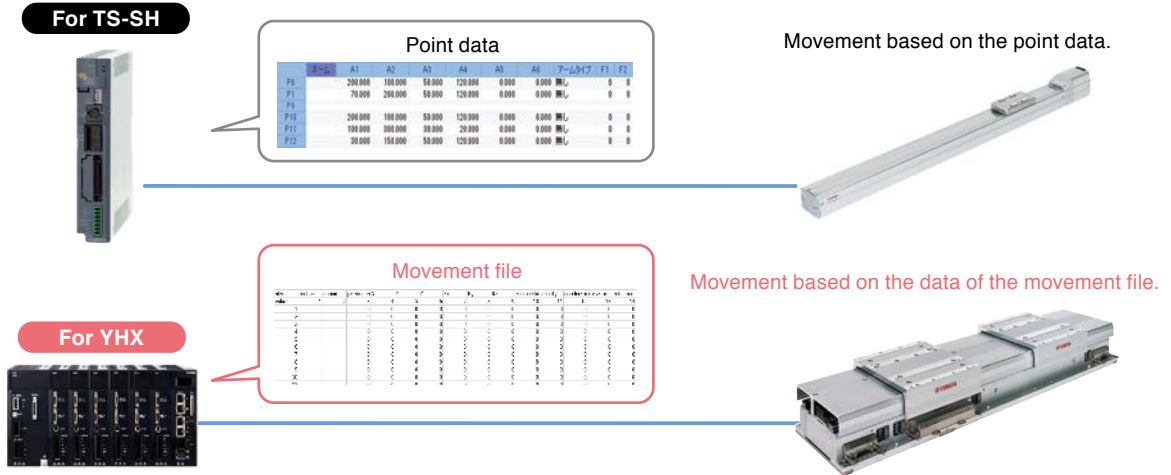
POINT 4

JOG or inching operation can be performed from the pendant even when no PLC is connected.

Even in a status where no PLC is connected, the axis can be operated using the JOG or inching operation from the programming pad.
When the LCMR200 is used for the circulation layout, the necessary adjustment work can be performed immediately.

POINT 5

Prevention of operation leading to damage to the circulation section is supported.

Registering the pallet size to the parameter determines the slider operable area.
Even when a pallet or workpiece is larger than the overall length of the slider, a circulation operation failure can be detected.
This avoids any slider transfer accident of the circulation unit and allows for safer software design.
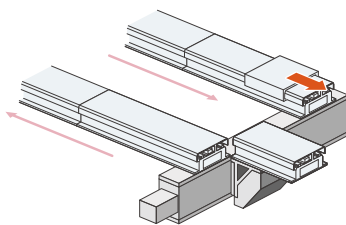
Slider is ejected in a state where there is no circulation unit.
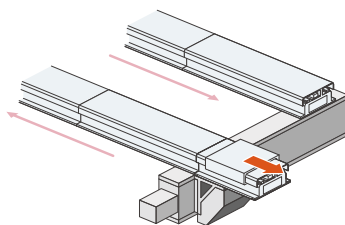
Slider is ejected in the opposite direction.
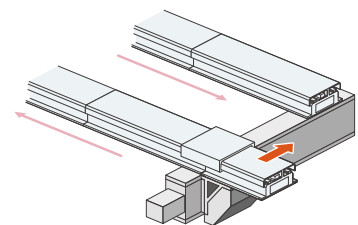
Circulation unit is moved during transfer.
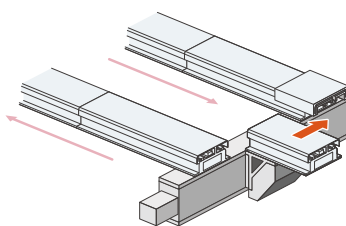
Circulation unit is moved with the slider protruded.
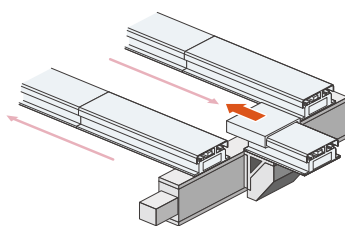
Circulation unit is moved with the slider protruded.
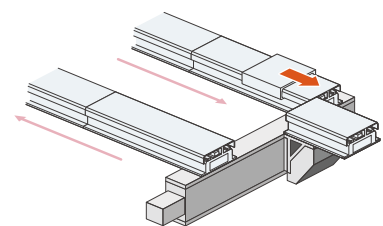
Slider is ejected with the circulation unit deviated.

25

POINT 6

Simple direct value operation and point designation movement can be performed.

About point designation

· The operation pattern for up to 65,535 points in total can be designated.
· The coordinate value, speed, acceleration, deceleration, and tolerance are specified for each point.

Designation image

Point	Coordinate value (mm)	Speed	Acceleration	Deceleration	Tolerance (mm)
1	100.000	1	0.5	1	0.01
2	823.500	0.5	1	1	0.05
3	472.000	1	1	1	0.02
4	1834.410	0.5	1	1	0.01
5	2755.350	1	1	1	0.01

Overview of remote command

Input
1. Command
2. Point designation
3. Direct value position designation

Output
1. Axis status
2. Point output
3. Current position output

1. Servo ON, return-to-origin, movement, JOG, inching, etc.
2. Point number to be used.
3. When the direct value is designated, the speed and acceleration use the values stated in 2 and only.

1. Servo status, during movement, or movement completion, etc.
2. Point number during movement
3. Current position is always output.

PLC   YHX

P1   P3   P2   P4   P5

0   500   1000   1500   2000   2500   3000
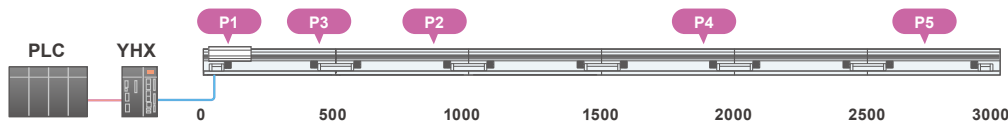
Point designation operation

· Next the movement point number for each slider is designated.
· This operation is valid when each slider needs to be circulated to the predetermined stop position.

Point	Coordinate value (mm)	Speed	Acceleration	Deceleration	Tolerance (mm)
10	500.0	1	0.5	1	0.01
11	1250.0	0.5	1	1	0.05
12	2000.0	1	1	1	0.02
13	2750.0	0.2	1	1	0.01

The operation conditions such as coordinate, speed, and acceleration are entered into the point.

| Step	Slider		
	#01	#02	#03
1	P10	-	-
2	P11	P10	-
3	P12	P11	P10
4	P13	P12	P11

Point number is assigned to the slider.

PLC   YHX

P10   P11   P12   P13

0   500   1000   1500   2000   2500   3000
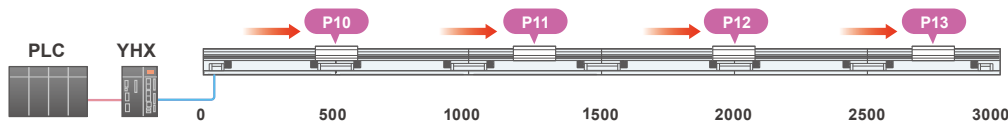
Direct value operation

· The operation conditions such as speed are specified by the points and the target coordinates are directly specified by the numeric values.
· This operation is valid when each slider position is managed by the PLC or when the stop position needs to be changed as required.

Point	Coordinate value (mm)	Speed	Acceleration	Deceleration	Tolerance (mm)
10		1	0.5	1	0.01
11	Specified separately	0.5	1	1	0.05
12		1	1	1	0.02
13		0.2	1	1	0.01

The operation conditions are registered for the points and the target coordinates are specified separately.

Step	Slider #01		Slider #02		Slider #03	
	Point	Coordinate value (mm)	Point	Coordinate value (mm)	Point	Coordinate value (mm)
1	P10	500.0	-	-	-	-
2	P11	1250.0	P10	510.0	-	-
3	P12	2000.0	P11	1260.0	P10	500.0
4	P13	2750.0	P12	2010.0	P11	1250.0

Operation conditions: Registered point is referred to.
+ Target position: Directly specified by the numeric values.

The coordinate values are managed by the PLC.

PLC   YHX

500   1250   2000   2750

0   500   1000   1500   2000   2500   3000

Process

Preparation such as hardware connection.
▼
Registration of robots and sliders, and parameter settings.
▼
Registration of circulation part configuration.
▼
Setting of each stop position.
▼
Program creation of the host PLC
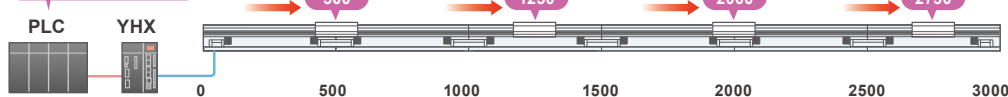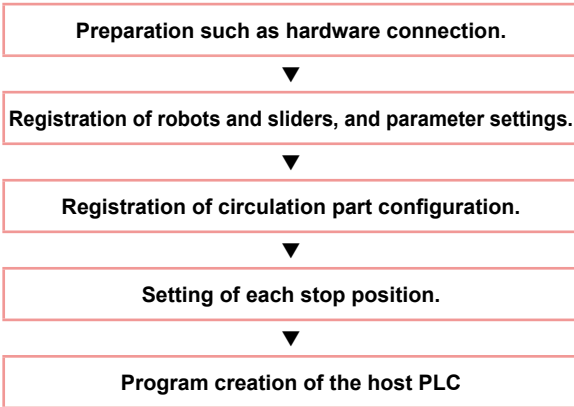
Standard profile specification

Applicable controller		YHX-HCU
Operation method		Point trace point No. specified positioning and direct value coordinate specified positioning.
Comparative robot		LCMR200, LCM-X and GX series (LCMR200 and LCM-X cannot be controlled together).
Interface		YHX Studio, YHX-PP, and field network communication
Operation type		Absolute position moving
Maximum number of points that can be registered.		65535
No. of control axes (Total of sliders and single-axis robots, however, up to 16 axes for single-axis robot)	EtherCAT	64
	EtherNet/IP™	64
	PROFINET	64
	CC-Link	22
Main input and output See the manual for other functions.	All axes target input	Servo ON/OFF switch/Interlock/Alarm reset
	All axes target output	Servo State/Interlock State/Alarm State/Heart beat/Emergency stop State
	Individual axis target input	Servo ON/OFF switch/Return to Origin/Positioning moving inside the control range (including LCM relay operation)/Slider insertion preparation from outside the control range/Slider discharge to outside the control range/Jog movement, inching movement/Movement Stop
	Individual axis target output	Servo State/Return to origin State/Output specified point No. for various execution state display/Current position/Axis alarm State
Main remote command See the manual for other remote commands.		Writing/reading of setting data
		Alarm check
		Writing and reading of integrated running distance and No of transits.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

LINEAR CONVEYOR MODULES

From "flow" to "move"
Efficient transfer processes for increased profitability
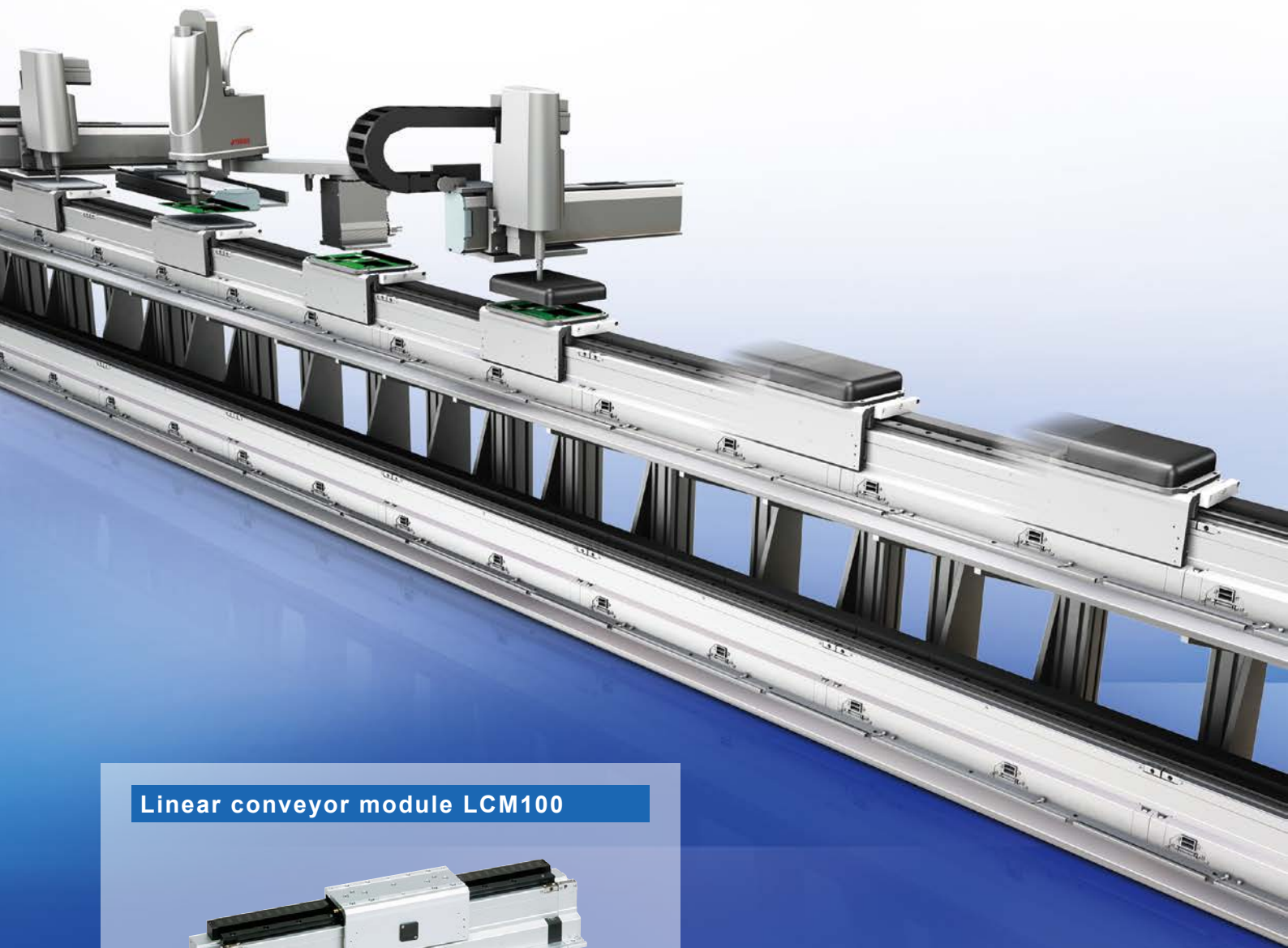
Linear conveyor module LCM100

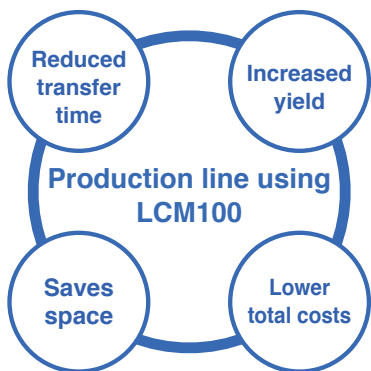Note. As the figure shown above illustrates CG images, they are different from the actual product.

Linear Conveyor Module LCM100
Constructing high-speed throughput lines.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

High-speed movement

Round travel is possible

Smooth deceleration and stop

Direct positioning

Work on the slider is possible

Removable slider

Production line using **LCM100**
- Reduced transfer time
- Increased yield
- Saves space
- Lower total costs

High-speed and high-accuracy transfer

- Max. speed: **3000mm/sec**
- Max. acceleration: **2G**
- Max. load mass: **15kg**
- Repeated positioning accuracy: **+/-0.015mm (standalone slider)** Note

Note. This is the repeated positioning accuracy for a standalone slider when positioning from one direction (single-side approach).
Note. The positioning accuracy for the single-side approach after correction by RFID is 0.1 mm including the mutual difference between sliders.

POINT

Increase productivity by shortening transport time

- Comparison between LCM100 and a conventional conveyor
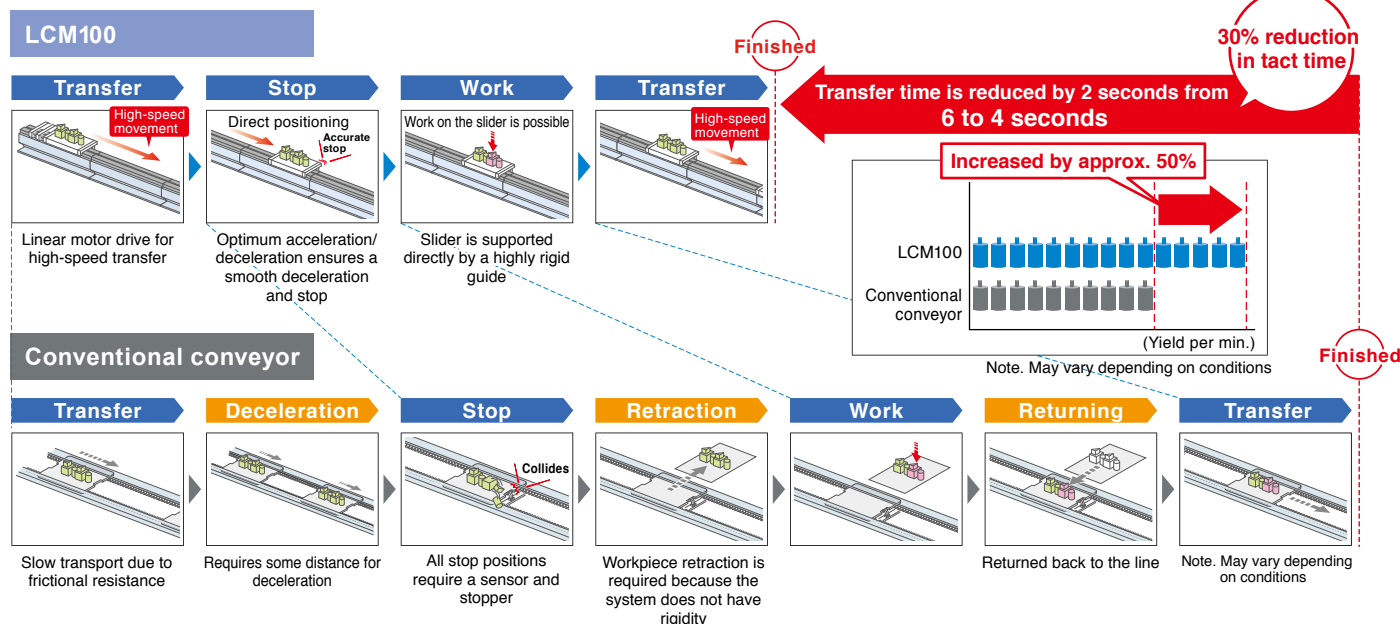
LCM100

Transfer	Stop	Work	Transfer
High-speed movement	Direct positioning Accurate stop	Work on the slider is possible	High-speed movement
Linear motor drive for high-speed transfer	Optimum acceleration/ deceleration ensures a smooth deceleration and stop	Slider is supported directly by a highly rigid guide	

Finished

30% reduction in tact time

Transfer time is reduced by 2 seconds from **6 to 4 seconds**

Increased by approx. 50%

LCM100
Conventional conveyor
(Yield per min.)
Note. May vary depending on conditions

Conventional conveyor

Transfer	Deceleration	Stop	Retraction	Work	Returning	Transfer
		Collides				
Slow transport due to frictional resistance	Requires some distance for deceleration	All stop positions require a sensor and stopper	Workpiece retraction is required because the system does not have rigidity		Returned back to the line	Note. May vary depending on conditions

Finished

29

The length of the transfer line can be adjusted freely by adding modules.

Save equipment space.

● Since the movement direction can be changed, the same processes are made common. This makes the equipment compact and results in cost reduction.

● Forward and backward movement at a high speed can be set freely.

● Flexible actions such as moving only some sliders backward is possible.
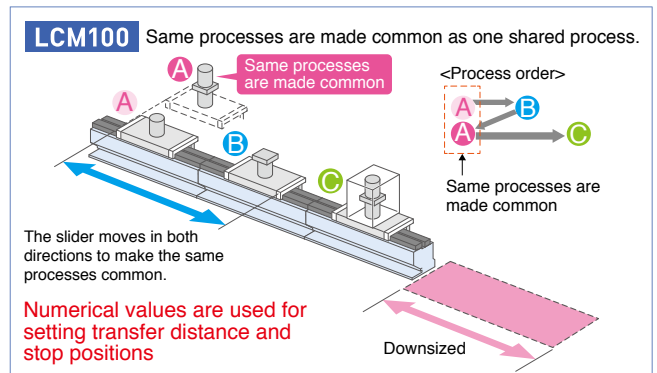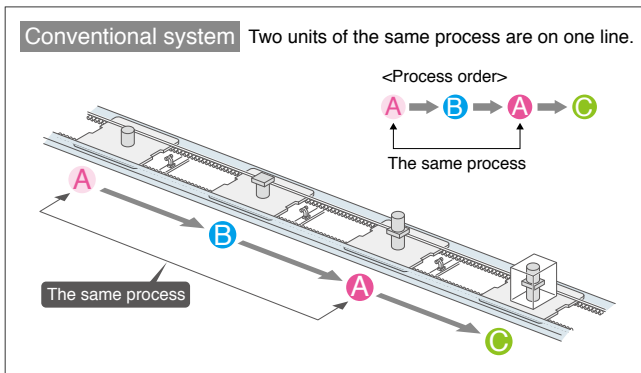
Can be moved efficiently between processes with different tacts

● Narrow pitch movement is possible.

● Movement time can be reduced by combining the use of different movements, such as using pitch-feed for the same processes in short-time processes while transferring three workpieces at the same time at a high speed in long-time processes.
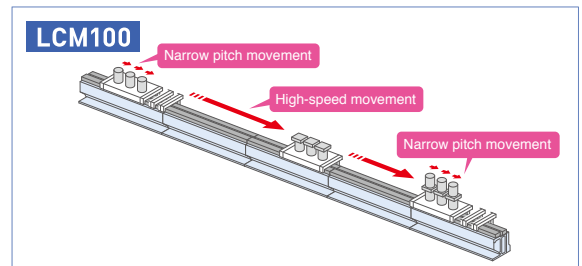
Workpieces do not need to be retracted

● As the work moves down, you can assemble and process them on the transfer line.

● Eliminates having to retract the work from the pallet to the work table.

● Reduces costs.

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

POINT

Significant reduction of start-up time

- Just connect modules for easy construction of a transfer line.
- Lifting cylinders, sensors, stoppers, and other complex parts are not necessary.
- Operations can be performed by using only the LCC140 Controller.
- Economical as excess modules can be used for other lines or stored for maintenance.

Stored for maintenance Module is added

Transfer line is shortened Transfer line is made longer.
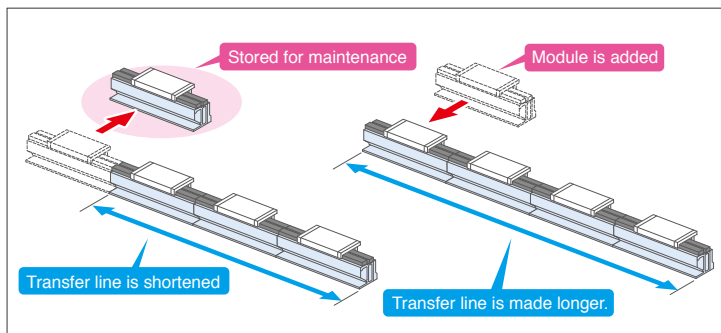
POINT

Construct branching lines, joint lines, and other lines in flexible configurations.

- Layout examples by combining modules with circulation mechanisms

Example of horizontal circulation

Horizontal circulation mechanism

Linear conveyor

Example of horizontal branching

Branching mechanism

Linear conveyor

Joint mechanism

Example of vertical circulation

Linear conveyor

Vertical circulation mechanism

Belt conveyor
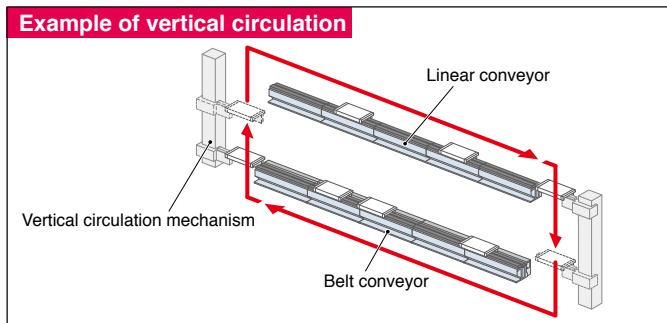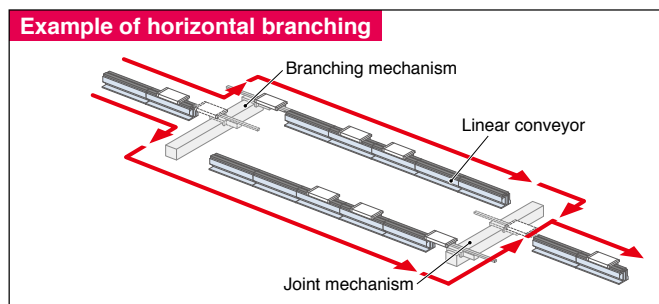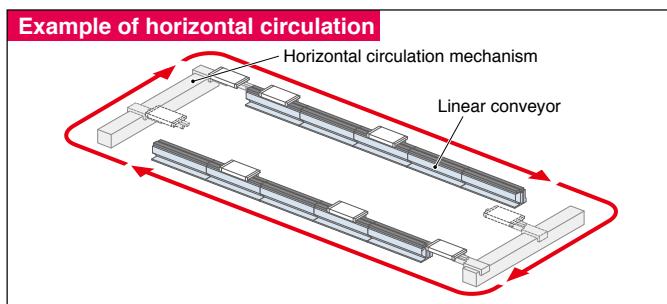
Note. The customer needs to prepare the return unit and the circulation mechanism.
Note. Modules convenient for the circulation are configured.

POINT

Optimal for small batch production of various product types

- No need for mechanical stoppers or sensors. Change layout easily.
- Reconstruction can be finished quickly by just changing the program to set a stop position.
- Frequent unit changes for different models can be handled flexibly.

Conventional system Requires stopper position adjustment

Stopper

Stopper

LCM100 Stop positions can be set just by changing the program settings.

Narrow pitch movement

Stop position can be changed just by changing the numeric value.

1780

2013
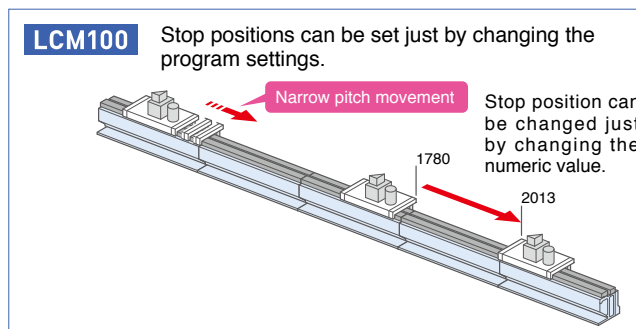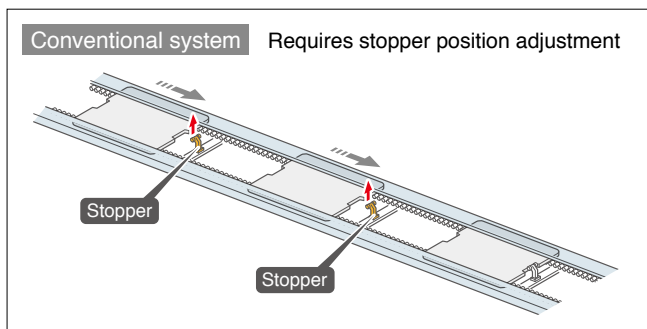
Flexible set-up of the slider's acceleration/deceleration, forward/backward movement, positioning, and other actions. The variety of possible line structures has been greatly expanded to supersede conventional models.

Simpler design and fewer processing steps

- LCM100-2MT, a module for circulation, is available to insert or eject a slider into or out of a line.
- Also can be used for a return mechanism.

We welcome consultations on proposals for customized design, design drawing presentation, etc., to create return units best fitting your request. For details, contact our sales representatives.

Linear module

Optimum line length design

Stroke variation [640 mm/480 mm] The optimum design can be achieved by combining multiple modules to reduce line length.

Belt module

Circulation modules are also available
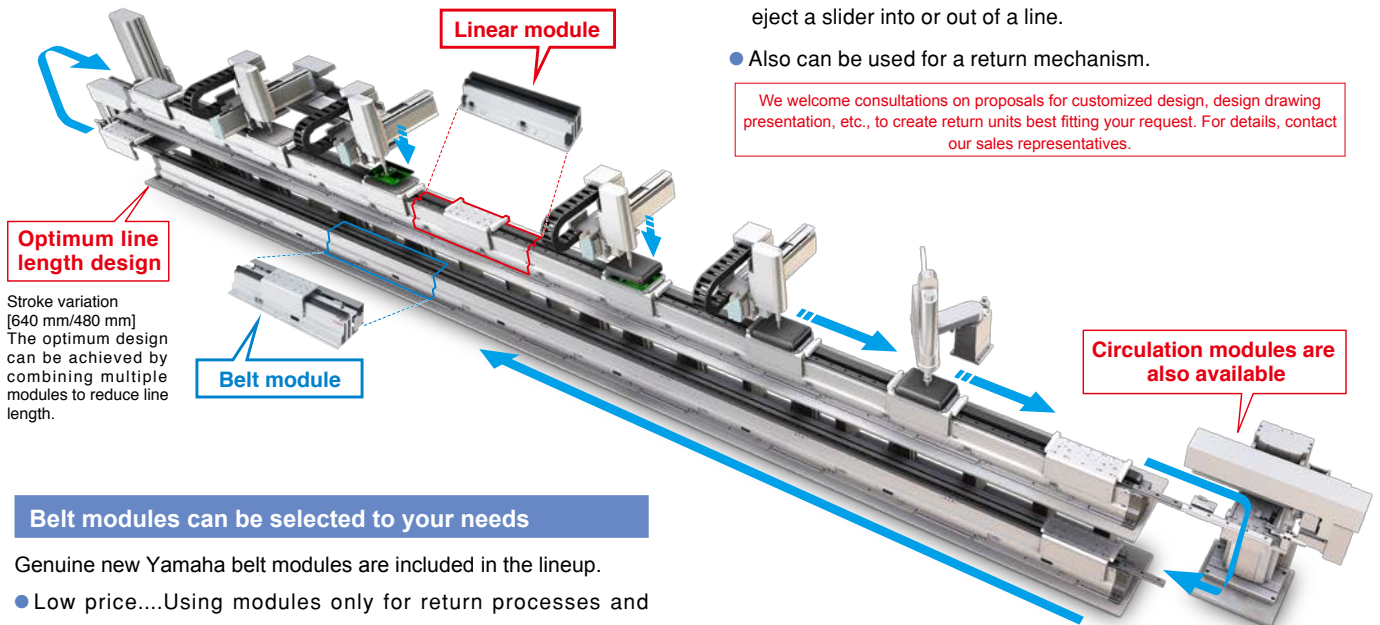
Belt modules can be selected to your needs

Genuine new Yamaha belt modules are included in the lineup.

- Low price....Using modules only for return processes and interprocess transfer will help reduce the facility cost.
- Easy control without controllers and no need to create robot programs

POINT

Quick recovery by replacing the slider when machine trouble occurs

- Parts can be replaced easily.
- Parts can be kept for maintenance as they are standardized.
- Possible to minimize the downtime of a production line.

LCM100 module

Slider

POINT

Easy maintenance

- Motors and scales do not make contact and are free from abrasion.
- As only the rails are sliding parts, dust generation is low.
- There are only a few consumable parts, which mean a long service life.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

System configuration diagram (when 3 sliders are connected)

The module is standardized and can also be stored for maintenance.

If a short line is used and modules are in excess, they can be diverted to another line or stored for maintenance.

Standardized slider

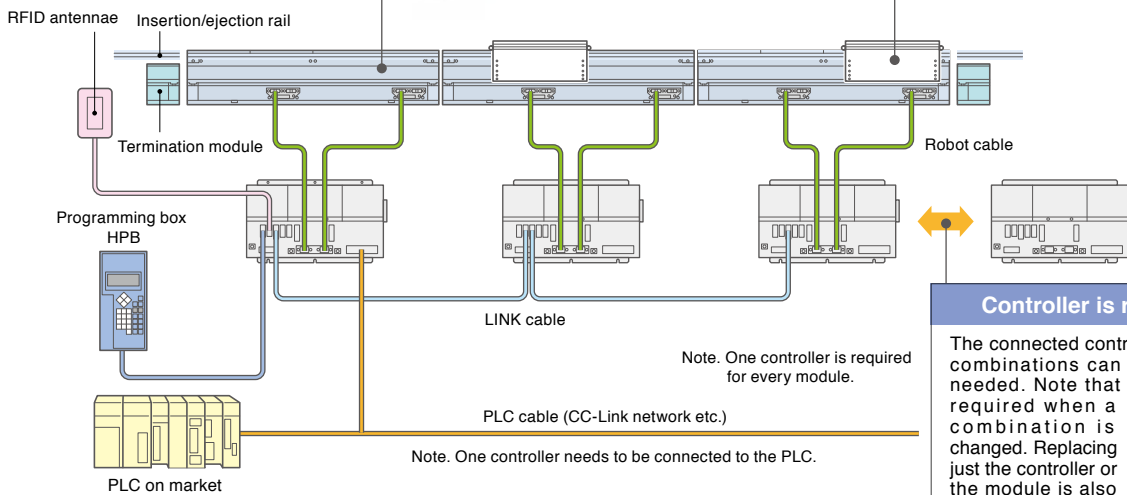The slider is standardized and can be used for any line. It is also possible to share the slider on multiple lines. Production can be restored immediately by replacing a failed slider if trouble occurs.

RFID antennae

Insertion/ejection rail

Termination module

Robot cable

Programming box HPB

LINK cable

Note. One controller is required for every module.

PLC cable (CC-Link network etc.)

Note. One controller needs to be connected to the PLC.

PLC on market

Controller is replaceable

The connected controller and module combinations can be changed as needed. Note that initial setting is required when a combination is changed. Replacing just the controller or the module is also possible.

Belt module

Power cable

PLC cable (parallel I/O)

PLC on market
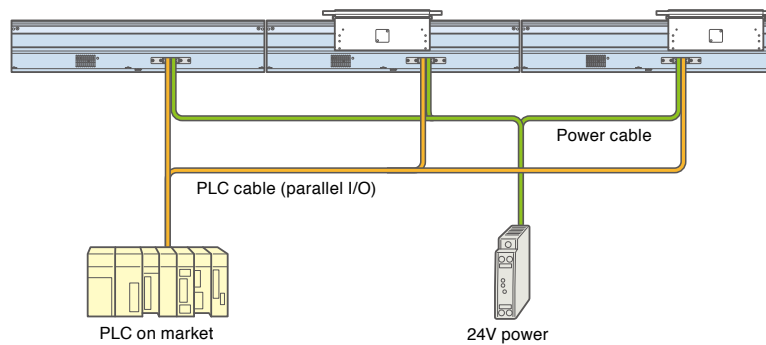
24V power

This interface allows the customer to supply 24V power and select just the necessary signals to use.[Note]

Note. The customer will need to prepare the wiring on the user side.

Linear module controller LCC140

Program operation

The LCC140 controller can perform operations using registered programs and operations using remote commands from the PLC.

In addition to the control of input/output signals such as movement or positioning, processes related to the insertion/ejection of sliders can be performed.

SR1 controller base operation system

The same user interface as the SR1 controller is incorporated, and specifications and functions specific to the linear conveyor module have been added based on this user interface. A very user friendly operation system is provided.[Note 1]

Controller-linking function

You can use the link cables dedicated to LCC140 controllers to connect the controllers when two or more modules are connected. You can handle multiple controllers as if they were one controller.

Position correction function using RFID

When multiple sliders are each stopped at a position of your choice, actual stop positions has an error width (machine difference) of 500 μm. This is because each slider has a different stopping accuracy. Link the RFID unit and LCC140 controller to suppress the machine difference of individual sliders to an error width of approximately 100 μm.[Note 2]

Note 1. Please note that some Yamaha single-axis controller SR1 functions are not available with the linear conveyor controller.

Note 2. All sliders stop within the width of 100μm that includes a teaching point.

YK-TW   Orbit type
YK-XG/YK-X   Completely beltless model [Note]
YK-XE   Low cost high performance model
YK-XGS   Wall mount/inverse model
YK-XGP   Dust-proof & drip-proof model

Note. Except for YK1200X

SCARA ROBOTS

Arm length of 120 mm to 1200 mm, full-selection of the lineup is top in the world.

Low cost high performance model
YK400XE-4

History of 45 years

The first YAMAHA robots were SCARA robots. Since the first SCARA robot called "CAME" was produced in 1979, some 45 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

■ Arm length 350 mm / 500 mm
■ Maximum payload 5 kg

YK500TW

Extra small type

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

YK120XG/YK150XG/YK180XG　　**YK180X/YK220X**

Small type

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

YK250XG/YK350XG/YK400XG

Medium type

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

YK500XGL　　**YK500XG**

YK600XGL　　**YK600XG/XGH**

Low cost high performance model

■ Arm length 400 mm to 710 mm
■ Maximum payload 4 kg to 10 kg

YK400XE-4　　**YK510XE-10**
YK610XE-10
YK710XE-10
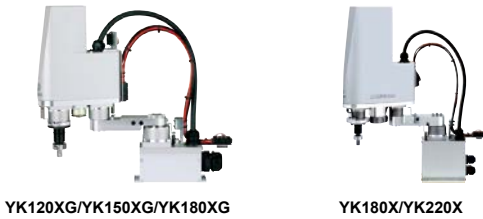
Large type

■ Arm length 700 mm to 1200 mm
■ Maximum payload 10 kg to 50 kg

YK700XG　　**YK900XG**

YK1000XG　　**YK1200X**

Wall mount/inverse model

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

YK250XGP/YK350XGP/YK400XGP　　**YK500XGP to YK1000XGP**
YK500XGLP/YK600XGLP

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.

35

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

YK-TW Orbit type

Layout design freedom

User: We want a smaller equipment footprint.

YK-TW can move anywhere through the full φ 1000 mm Note 2 work envelope.

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.

Motion range
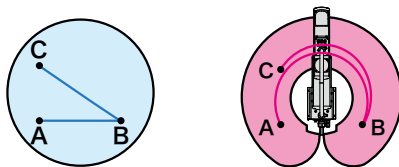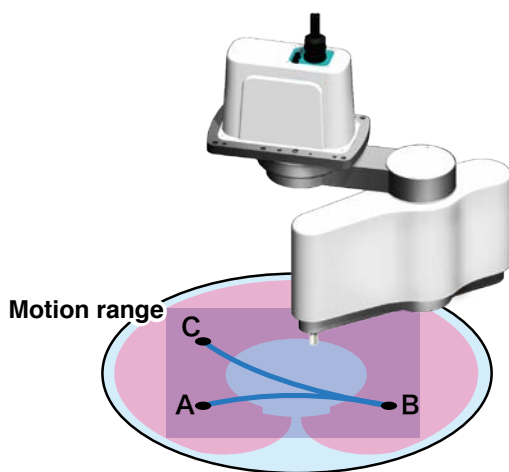
Orbit type SCARA robot   Standard type SCARA robot

Higher productivity

User: We need to reduce cycle time.

Standard cycle time of 0.29 secs. Note 2

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.

YK500TW — Standard cycle time of 0.29 secs. — **Reduced by approx. 36 %**

Previous YAMAHA model
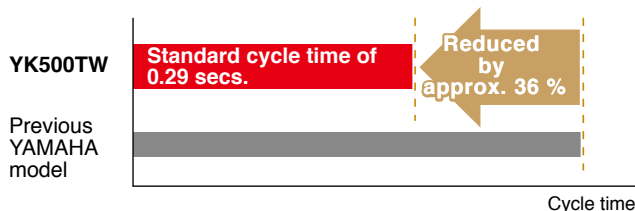
Cycle time

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

High quality

User: We want a high precision assembly system.

YK-TW offers a repeated positioning accuracy of +/-0.01 mm Note 1 (XY axes).

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.

Y-motor
Reduction gear
R-motor
Z-motor
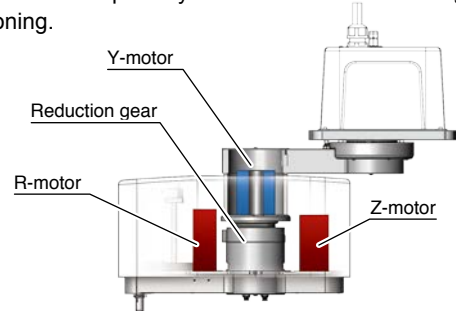
Hollow construction

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

360 ° Rotation.

Optimized rotation center of gravity moment

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.

YK-TW handles payloads up to 5 kg.

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.

YK-TW offers both a lower height and a smaller footprint.

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

Overall height is reduced.

Genuine bracket

844mm
75kg
YD11

392mm
27kg
YK500TW

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

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

YK-TW POINT 6

Easy installation

User: Parallel-link robots require large frames which complicates installation…

▼

YK-TW has a total height of only 392 mm, and weighs only 27 kg.
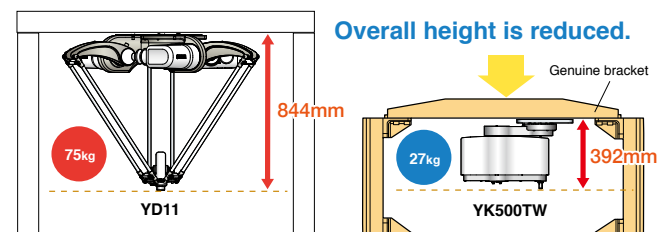
Lower inertia = Lighter frame

| YK500TW | **Weighs only 27 kg** | **Approx. 74 % lighter** |
| YD11 | **75 kg** | |

YK-TW POINT 7

Reduce the number of steps

User: Preparing the frame is extra work.

▼

We can optionally provide a dedicated frame for the YK-TW.

With no need for complex calculations of strength, startup steps can be reduced.

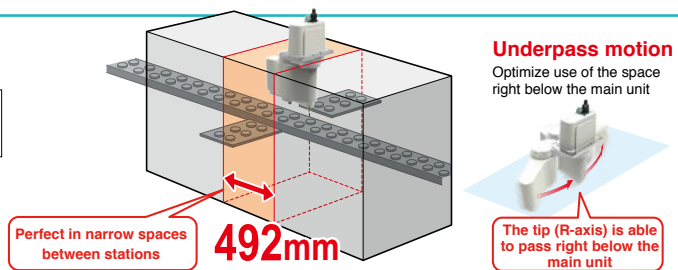Note. For details on dimensions and price, please contact Yamaha.

YK-TW POINT 8

Ideal for narrow space applications

User: We need to install in limited space, such as between equipment.

▼

Minimum installation width 492mm Note 1

Underpass motion
Optimize use of the space right below the main unit

Perfect in narrow spaces between stations

492mm

The tip (R-axis) is able to pass right below the main unit

YK-XG Completely beltless type

Integral structure designed for optimal operation

Note. The following shows an example of YK500XG.

Highly rigid independent spline shaft

Ball screw directly connected structure passed on from the single axis robot

Built-in user wiring/ user tubing

Specially developed hollow motor

Tip rotation axis also uses the speed reducer direct coupling structure to ensure the high rigidity and high accuracy.

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).

Conventional model

Vertical axis motor

Rotation axis motor

Drive by pulley and timing belt

● Rigidity and accuracy are determined by belt.
● Secular change, such as belt elongation occurs.

YK-XG series

Vertical axis ball screw

Rotation axis hollow motor

Vertical shaft motor (direct coupling)

Rotation axis hollow speed reducer

● High rigidity and high accuracy
● No worry about belt elongation and breakage
● Maintenance free

37

YK-XG POINT 2

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	Resolver
● 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.	● Magnetic type ● Simple structure only with iron core and winding has less potential failure factors. ● Immune to shock and electric noise.
▼	▼
Detection failure	**High reliability**

YK-XG POINT 3

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 speed reducer needs many steps to disassemble the gear and may cause positional deviation. However, since the speed reducer of the YAMAHA SCARA robot uses long-life grease, the grease replacement is not needed.

NEW

A grease supply hole is provided in the back of the cover. Even when greasing is required, the cover does not need to be removed for easy maintenance.

* The covers of the products shipped before March 2020 do not have grease supply holes, but can be replaced with covers that have grease supply holes. (Installation compatible. Please order a cover with grease supply hole separately.)

Target product: YK600XGH, YK700XG, YK800XG, YK900XG, YK1000X

NEW
Grease supply hole

Ball screw:
Grease can be applied from outside.

XG is belt-less, so no belt maintenance is required.

Harness:
Replaceable on site.

Speed reduction gear:
No grease-up required.

Spline: Direct grease-up is possible.
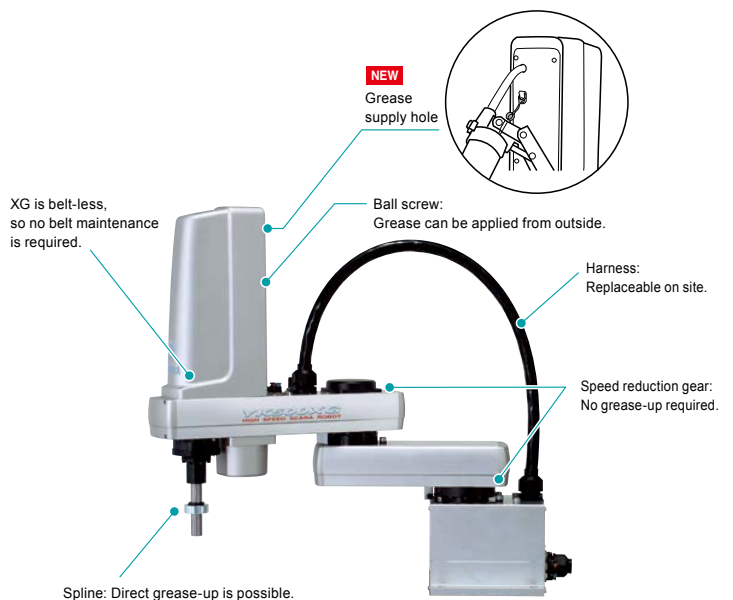
YK-XG POINT 4

User can replace the motor and ball screw, etc.

In the case of other companies' SCARA robots, replacing motors and ball screws is time-consuming and in some cases difficult for customers to replace.
In this respect, YAMAHA SCARA robots are easy to replace these parts, so they can be replaced by the customer.

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

YK-XG POINT 5

High-speed transfer is possible even with heavy workpieces and large offsets.

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.

YK180XG
(R-axis tolerable moment of inertia: 0.01 kgfcms^2)

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

1kg   **Approx. 100 mm**

Optimal acceleration and deceleration are set automatically.

The moment of inertia varies depending on the shape of the workpiece and the offset distance from the R-axis tip to the load center of gravity.
When the offset is large even with the same payload, this value increases. So, the acceleration during operation needs to be reduced.
With the RCX340, the optimum acceleration is automatically set by simply setting the moment of inertia value, so there is no need for troublesome settings.

Offset
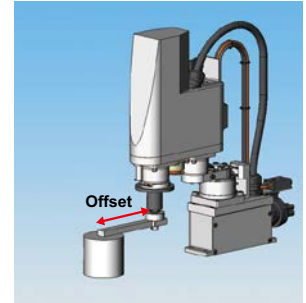
YK-XG POINT 6

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.

675mm

741mm   790mm
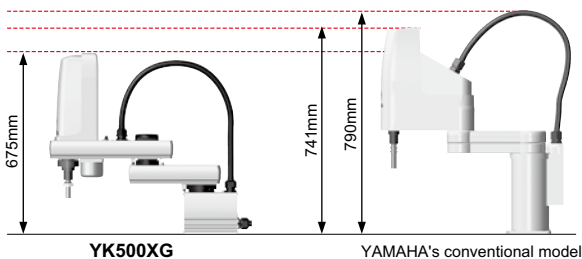
YK500XG   YAMAHA's conventional model

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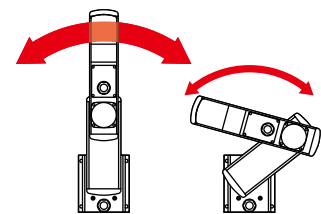
If the motor torque exceeds the peak value
→ **This may adversely affect the controllability and mechanical vibration, etc.**
If the torque exceeds the tolerable peak torque value of the speed reducer
→ **This may cause early breakage or extremely shorten the service life.**

Robot stops at a desired position accurately to ensure long service life.

39

YK-XE Low cost high performance model

YK-XE POINT 1

Both the high operation performance and low-price are provided.

Both the high operation performance and low-price are provided.
Production equipment with high cost performance can be constructed.

YK400XE-4   **YK510XE-10**   **YK610XE-10**   **YK710XE-10**

YK-XE POINT 2

Improved User Interface

Enhanced size and numbers of air tubes and user I/O for end effectors.
Tubes and wires are positioned for easy layout and reduced risk of disconnection.
(YK510XE-10, YK610XE-10, YK710XE-10)

User tubing ϕ**6 x 3 pcs**

User tubing ϕ**6 tube x 3 pcs**

User wiring x 20 cores
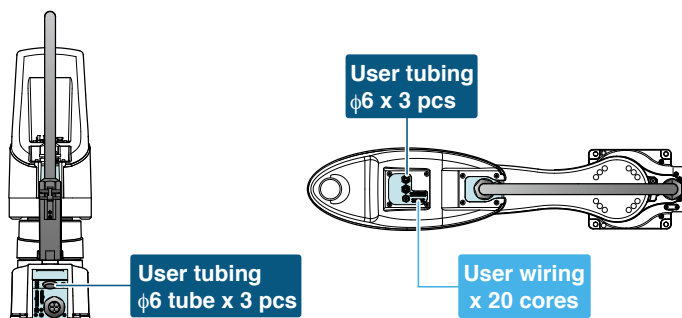
Note. YK400XE-4 provides the user wiring x 10 cores and the User tubing ϕ4 x 3 pcs.

YK-XE POINT 3   Option specifications

Through-shaft and through-cap have been added.

"Through-shaft" or "through-cap" option for wiring and tubing that is convenient to run the air tubing and wiring can be selected. The wiring and tubing routes can be investigated easily without designing and manufacturing a stay for installing the wiring and tubing. In addition, by passing the wiring and tubing through the inside of the main body, worries about wire breakage or disconnection are reduced during operation. (Through-shaft is only available with the YK400XE-4.)

Through-shaft

Through-cap

YK-XE POINT 4   Option specifications

Brake release switch is selectable.

In the emergency stop state, the Z-axis brake is released and the Z-axis can be moved up or down while the brake release switch is held down. Releasing the switch applies the brake to the Z-axis. This improves the convenience during installation adjustment.

Brake release switch

LCMR200 Linear conveyor modules

GX Single-axis robots

YHX Controller

LCM100 Linear conveyor modules

YK-X SCARA robots

RCX iVY2+ Robot Vision

Robonity Single-axis robots

PHASER Linear motor single-axis robots

FLIP-X Single-axis robots

TRANSERVO Compact single-axis robots

XY-X Cartesian robots

YP-X Pick & place robots

CLEAN

CONTROLLER

YRG Electric Gripper

APPLICATION

SERVICE PERIOD

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.

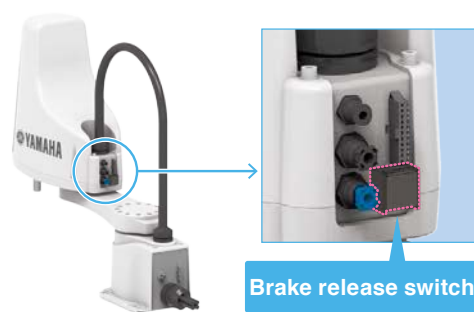The dust-proof and drip-proof type that can be operated even in a work environment where water or particle dust scatters was renewed to a completely beltless structure. The belt does not deteriorate and poor environment resistance is improved. Additionally, an up/down bellows structure is used to improve 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/m², 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)

SCARA robot / Single-axis robot / Cartesian robot / Pick and place robot Various targets

Food grade grease can be used.

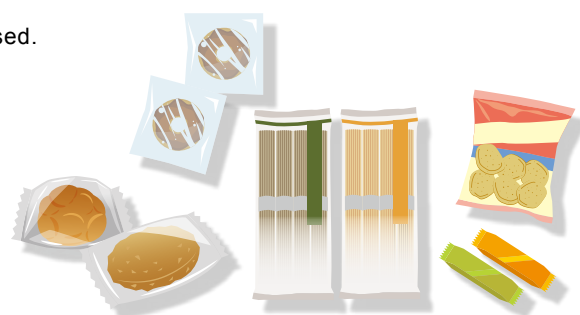The grease used in our robots can be changed to food grade grease.

■ Unless otherwise specified, the grease specified by YAMAHA is used.
■ It is possible to change to grease other than our specified grease.
 (At this time, please supply the grease from the customer.)

For details, contact YAMAHA sales representative.

Bellows can also be added by special order!

* For use outside Japan, please contact YAMAHA.

Model/Type		Model	Arm length (mm)	Z-axis stroke (mm)	Maximum payload (kg)	Standard cycle time (sec.) [Note 1]
Orbit type		YK350TW	350	130	5.0	0.32
		YK500TW	500	130	5.0 (4.0)[Note 3]	0.29
Standard	Extra small type	YK120XG	120	50	1.0	0.33
		YK150XG	150	50	1.0	0.33
		YK180XG	180	50	1.0	0.33
		YK180X	180	100	1.0	0.39
		YK220X	220	100	1.0	0.42
	Small type	YK250XG	250	150	5.0 (4.0)[Note 3]	0.43
		YK350XG	350	150	5.0 (4.0)[Note 3]	0.44
		YK400XE-4	400	150	4.0 (3.0)[Note 3]	0.41
		YK400XG	400	150	5.0 (4.0)[Note 3]	0.45
	Medium type	YK500XGL	500	150	5.0 (4.0)[Note 3]	0.48
		YK500XG	500	200/300	10.0	0.42
		YK510XE-10	510	200	10.0 (9.0)[Note 3]	0.38
		YK600XGL	600	150	5.0 (4.0)[Note 3]	0.54
		YK600XG	600	200/300	10.0	0.43
		YK610XE-10	610	200	10.0 (9.0)[Note 3]	0.39
		YK600XGH	600	200/400	20.0 (19.0)[Note 3]	0.47
	Large type	YK700XGL	700	200/300	10.0 (9.0)[Note 3]	0.50
		YK710XE-10	710	200	10.0 (9.0)[Note 3]	0.42
		YK700XG	700	200/400	20.0 (19.0)[Note 3]	0.42
		YK800XG	800	200/400	20.0 (19.0)[Note 3]	0.48
		YK900XG	900	200/400	20.0 (19.0)[Note 3]	0.49
		YK1000XG	1000	200/400	20.0 (19.0)[Note 3]	0.49
		YK1200X	1200	400	50.0	0.91
Wall mount/inverse model		YK300XGS[Note 2]	300	150	5.0 (4.0)[Note 3]	0.49
		YK400XGS[Note 2]	400	150	5.0 (4.0)[Note 3]	0.49
		YK500XGS	500	200/300	10.0	0.45
		YK600XGS	600	200/300	10.0	0.46
		YK700XGS	700	200/400	20.0	0.42
		YK800XGS	800	200/400	20.0	0.48
		YK900XGS	900	200/400	20.0	0.49
		YK1000XGS	1000	200/400	20.0	0.49
Dust-proof & drip-proof model		YK250XGP	250	150	4.0	0.50
		YK350XGP	350	150	4.0	0.52
		YK400XGP	400	150	4.0	0.50
		YK500XGLP	500	150	4.0	0.66
		YK500XGP	500	200/300	10.0	0.55
		YK600XGLP	600	150	4.0	0.71
		YK600XGP	600	200/300	10.0	0.56
		YK600XGHP	600	200/400	18.0	0.57
		YK700XGP	700	200/400	20.0	0.52
		YK800XGP	800	200/400	20.0	0.58
		YK900XGP	900	200/400	20.0	0.59
		YK1000XGP	1000	200/400	20.0	0.59
Clean model		See P.103				

Note 1. The standard cycle time is measured under the following conditions.
    • During back and forth movement 25mm vertically and 100mm horizontally (extra small type)
    • During back and forth movement 25mm vertically and 300mm horizontally (small type / medium type / large type)
Note 2 The YK300XGS and YK400XGS are custom-order products. For details about the delivery time, please contact YAMAHA.

Note 3. For the option specifications (tool flange mount type and user wiring/tubing through spline type), the maximum payload becomes the value in ( ).

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

ROBOT VISION RCXiVY2+

RCX320/340

Robot integrated vision system realized only by YAMAHA.

Blob search function optimal for tracking of irregular workpieces is built-in.

Simplicity

Setup is completed as little as eight minutes after power-on.
Auto-calibration makes setup easy.

Sophistication

With up to five million pixels, a variety of workpieces can be supported.
Improve throughput to 100 CPM with conveyor tracking.

Assurance

Comprehensive support covers everything from camera image acquisition to the operation of the gripper and robot. With support that only the robot manufacturer can provide, you can relax.

For customers who consider to replace "iVY2" with "RCXiVY2+"

Workpieces that have been able to be recognized by the iVY2 system can also be detected by the RCXiVY2+ system under the same conditions without changing the installation position.
Therefore, it is not necessary to evaluate the workpieces again.
However, the exposure time and aperture may need to be adjusted.
In addition, since the installation hole positions of the camera are changed, the plate of the installation section needs to be changed.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

Camera	Parts registration	Search time reduced by	Maximum cable length	Monitoring
400,000 to **5** million pixels	**254** types	Approximately **50** % less	**15** m	Monitor output is provided

* Time depends on the workpiece.

Solutions RCXiVY2+ can provide:

■ Reducing teaching process time

Robot teaching work requires a lot of labor and time. The RCX-iVY2+ system acts as "robot eye". The final fine positioning can be automated and greatly reduce the teaching time that was required for the conventional models.

■ Simplified positioning process

Reducing positioning process time in frequent lot change in small lot production.
Cost in preparation, control, and switching positioning jigs can be reduced.

■ Random workpieces need to be handled.

With position detection function of RCXiVY2+, pick & place operation of random shaped parts from parts feeder or pallet can be simplified.

■ Conveyor tracking

With a feedback from encoder of a conveyor RCXiVY2+ can do pick & place following conveyor move.

■ Yamaha's comprehensive support of Robot and Vision

Yamaha's integrated robot vision system. It means Yamaha supports both robot and vision system seamlessly.
If you have any questions and don't know if it is robot or vision related? Simply contact a Yamaha representative. We have answers.

RCXiVY2+ features:

- ● **Adjusting parts orientation on the fly**
- ● **Conveyor follower**
- ● **Searching randomly placed parts**
- ● **Top/bottom judgement**
- ● **OK/NG judgement**

POINT 1

High speed positioning of irregular shaped parts (foods or clothes)

Blob search function

Suitable for pick & place or detection of parts with wide tolerance in shape and size, or high speed counting.
Detection speed is 2 to 10 times faster that edge detection.

POINT 2

Suitable for parts detection and high volume parts count

Application examples

- ■ Detection of electronics components on PC board
- ■ Detection of accessories in package
- ■ Counting of the number of bottles in pallet
- ■ Detection of food labels
- ■ Detection of screws and washers that secure parts
- ■ Checking drilled holes
- ■ Counting of electronics components

*Subject to application and conditions.

POINT 3

Overlap can be eliminated.

Overlapped workpieces are recognized and they can be excluded from the search target.
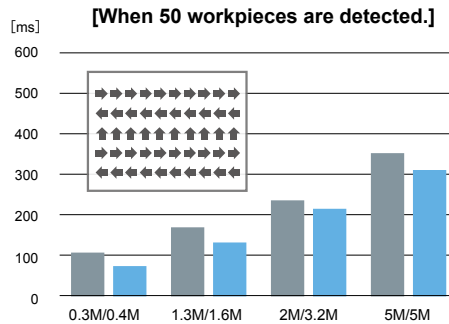
45

POINT 4

Detection time is shortened up to 45%.

By adopting a high-performance camera and improving the camera frame rate and CPU capability, detection time is reduced 8 to 45% while the resolution is improved.

CMOS camera

Improved camera pixels

Improved camera frame rate

Improved CPU

Comparison of search time

[When one workpiece is detected.]

[ms]
600
500
400
300
200
100
0

0.3M/0.4M   1.3M/1.6M   2M/3.2M   5M/5M

[When 50 workpieces are detected.]

[ms]
600
500
400
300
200
100
0

0.3M/0.4M   1.3M/1.6M   2M/3.2M   5M/5M
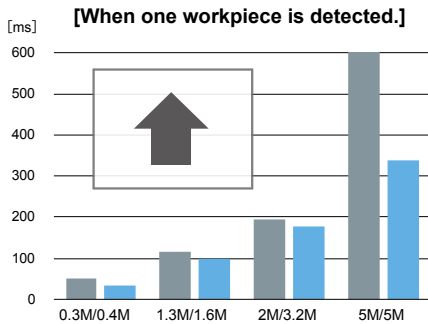
Time
Up to **45%** is shortened.

■ Conventional iVY2
■ RCXiVY2+

POINT 5

Detection with Speed

Comparing with edge search, blob search speed is 2 to 10 times faster.

Search speed
Up to **10** times faster

Comparison of edge search and blob search

* Only doughnut shape workpieces are detected.

Edge search

Blob search

[Comparison of search speed]

[ms]
600
400
200
0

579   162
Edge search   Blob search
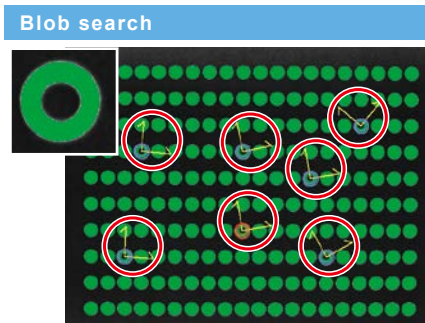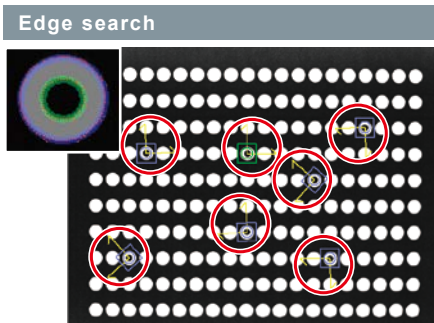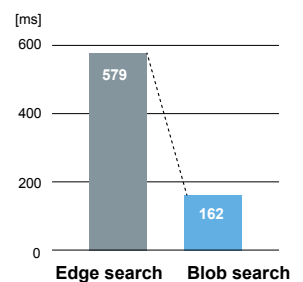
POINT 6

Code recognition function

Codes such as QR codes, data matrix codes, and barcodes can be recognized.
This code recognition function is optimal for applications that change the operation corresponding to the code contents such as traceability management, workpiece sorting, and tracking change of sealing.
It is not necessary to separately purchase a handy terminal or code reader. Troublesome communication control is also not needed.

[Supported codes]
• QR code
• Data matrix code
• Barcode (JAN/EAN-13 JAN/EAN-8 ITF NW7 CODE39 CODE128)
* Up to 255 characters can be read. Only alphanumeric characters and symbols are supported. (2-byte characters such as HIRAGANA and KANJI characters cannot be read.)

QR code

Automatic image save function/History image function

Automatic image save function

Images are automatically saved to a USB memory when search is executed.
This function is very useful when you want to go back in time to check captured images during operation or debugging or when you want to save images for traceability purposes.
A USB connectable SSD or HDD can also be used.

[Parameter]

Image save mode	All images / NG images / Disabled
Image size	Full size / Reduced size (320 x 240 pix.)
Overwrite save	Disabled / Enabled (The images are deleted from the oldest image when enabled.)

[Number of images that can be saved]

Number of images that can be saved when the memory size is 128 GB.

Number of camera pixels	Image size	Number of images that can be saved
0.4 million pixels	0.4MB	327,680
1.6 million pixels	1.6MB	81,920
3.2 million pixels	3.2MB	40,960
5 million pixels	5.0MB	26,214
Reduced size	0.08MB	1,638,400

Connector for USB memory

A connector that connects a USB memory to save images.
This connector is used for the automatic image save function.

USB connector for mouse

A USB connector that connects a mouse to operate an external monitor. This connector is used for the history image function.

Monitor output connector

A connector that outputs images captured by the camera to a monitor.

Number of images that can be saved = Memory size / Image size
81920 images can be saved by 1.6 million pixels camera when 128 GB memory is used.
When the cycle time is 3 seconds, images for 68 hours can be saved.

History image function

Images can be displayed on an external monitor during searching. The images and search results can be checked retrospectively with a USB mouse connected.

Past search images and results are checked.
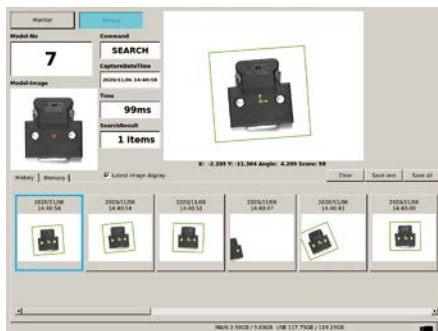
Images in the memories (No. 0 to 15) are checked.
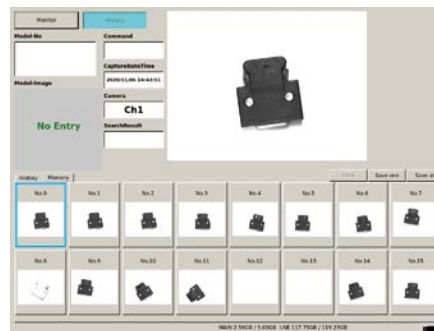
[Number of images that can be saved]

Number of camera pixels	Image size	Number of images that can be saved
0.4 million pixels	0.4MB	1250
1.6 million pixels	1.6MB	312
3.2 million pixels	3.2MB	156
5 million pixels	5.0MB	100

Area for history images 500 MB
Number of images that can be recorded to the history = 500 MB / Image size

Connection of multiple cameras

By controlling multiple cameras with one controller, multiple processes such as component supply, position correction, and mounting can be performed by one robot and controller.
This makes it possible to dramatically improve the setup man-hours prepared for each component type and contributes to improvement of production efficiency.

Workpiece is searched for.

Place position is corrected.

Positioning and angle are corrected.

[Application using three cameras]

① Workpiece supply position is corrected using the downward camera.
② Workpiece positioning or angle is corrected using the upward camera.
③ Place position is corrected using the downward camera.

POINT 9

Robot controller integrated type

Monitor

RCXiVY2+

Camera

Lighting

Up to 8 cameras

Controller integrated type

Encoder

Two separated operations of lighting and encoder.

RCX340 or RCX320

Typical Robot Vision setup

PLC

Image processing unit

Power supply for lighting
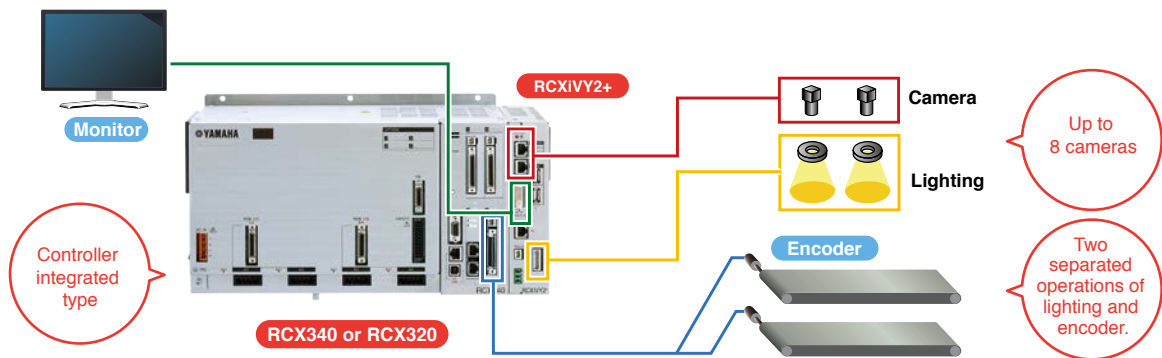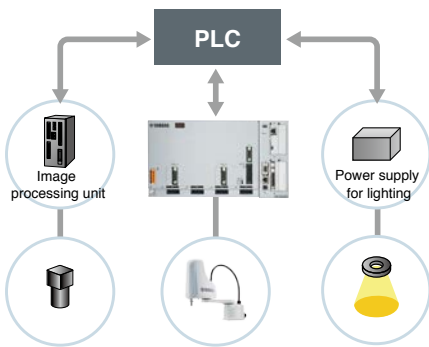
1 Time consuming robot coordinates alignment.
2 Need to calculate compensation for moving camera setup.
3 Operation deviation between the camera and robot due to communication time.
4 Adjustment of communication format is needed.

✕

• Handling not easy
• Installation and setup costs are high.
• Robot issue or vision issue? Who to call?

RCXiVY2+ system

PLC
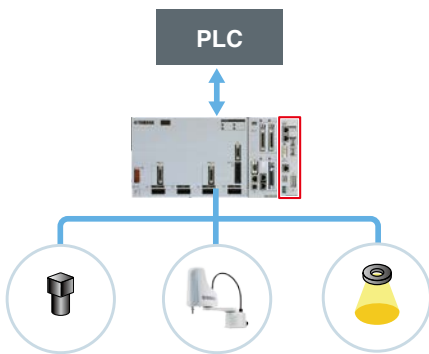
1 Simple calibration function is incorporated.
2 Coordinates are corrected automatically even when the camera moves.
3 High-speed connections through dedicated bus line.
4 Controller is incorporated to provide the central operation.
5 Applicable to all models of YAMAHA robot lineup.

◯

• Easy to use
• Various applications are supported using easy operation.
• Cost reduction by reducing work steps.
• Robot and vision supported by Yamaha

Typical Robot Vision setup

```
MOVE P, P9
OFF LINE
SEND (* *) TO CMU       Communication with
SEND CMU TO P10         image processing unit
ON LINE
MOVE P, P10
```

⇅ RS-232C

Program of image processing unit ⟷ Program of host PLC

Camera and robot have separate programs

RCXiVY2+ system

```
MOVE P, P9
VSEARCH 1,2,0  ——————  Searches for workpiece.
P10=VGETPOS(0)  —————  Reads the point.
MOVE P, P10  —————————  Moves to this point.
```

POINT
● No communication time lag
● Needs only few command lines.
● Simple and easy to understand

Centralized control using only the robot program

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

Examples of program commands

VSEARCH   ・・・ Detect parts with designated camera

Camera and component type to be used for detection and the calibration data to be used can be switched with one command.

VSEARCH 1, 2, 1

· Camera: 1
· Component type number: 2
· Calibration data: 1

Component type number: 2

#01

#02
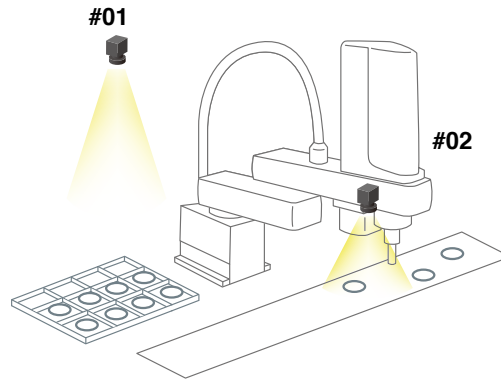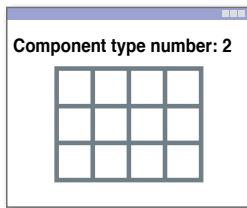
VSEARCH 2, 3, 2

· Camera: 2
· Component type number: 3
· Calibration data: 2

Component type number: 3
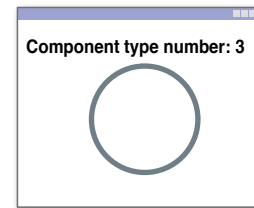
VGETPOS   ・・・ Acquires the coordinates of the detected workpieces.

The search results can be substituted into the point coordinates directly.

VSEARCH 1, 2, 1	・・・ Detects the workpieces.
N = VGETCNT	・・・ Substitutes the number of detected workpieces.
FOR J = 0 TO N-1	
P[J] = VGETPOS (J)	・・・ Acquires the workpiece coordinates.
NEXT J	
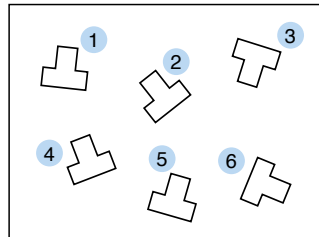
VGETPOS (0) → Coordinates of ①
VGETPOS (1) → Coordinates of ②
VGETPOS (2) → Coordinates of ③
VGETPOS (3) → Coordinates of ④
VGETPOS (4) → Coordinates of ⑤
VGETPOS (5) → Coordinates of ⑥

* The order to substitute into VGETPOS can be selected from the following.
  1) Score order, 2) X coordinate, and 3) Y coordinate

LVOLUME   ・・・ Intensity of light is adjustable from 0 to 100% range

In detection mode intensity of light can be adjusted with one command. Detection can be repeated with adjusted intensity.

With a robot program of RCXiVY2+, retry detection with adjusted light intensity can be easily performed

· Light 1 is set to 10%.   · Light 1 is set to 100%.
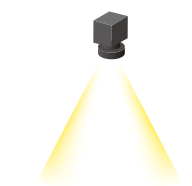
LVOLUME(1)=10   LVOLUME(1)=100

LVOLUME(1)=80
↓
VSEARCH → OK
↓ NG
LVOLUME(1)=100
↓
VSEARCH → OK
↓ NG
LVOLUME(1)=60
↓
VSEARCH → OK
↓ NG
Error process

To next process

49
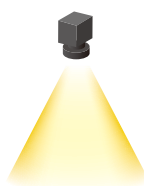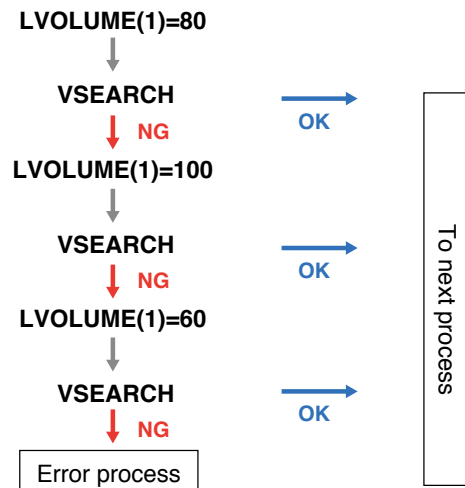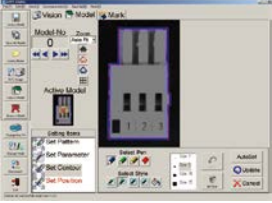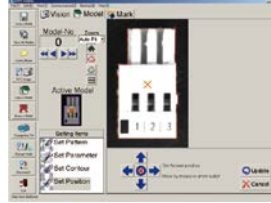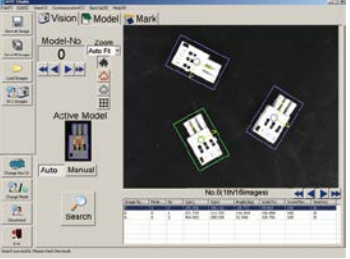
3 easy steps for parts registration
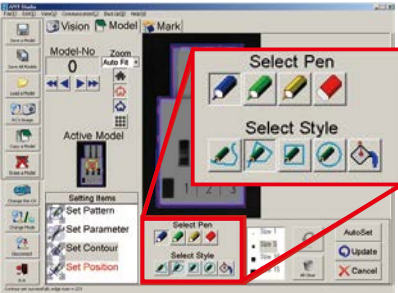
From image acquisition, registration takes just three steps.

Requires as little as 3 minutes

STEP. 1	STEP. 2	STEP. 3	Search results
Capture images.	**Set the contour.**	**Register the detection position.**	
Put the workpiece within the camera field-of-view and specify an image capturing range.	Contour is automatically extracted. Paint the necessary contour with a pen tool.	Specify the detection position with the mouse. Desired positions can be set.	

Simple parts judgement process

Contour setting pen
Paints the areas to be used from among the automatically detected edges.

Priority area pen
Paints the areas to be used as priority areas during search from among the edges.

Reduction area pen
Paints the areas where there should not be an edge during search.

[Usage example]

· Workpiece top or bottom judgement

ABC   **A C**
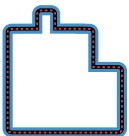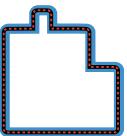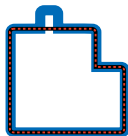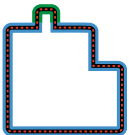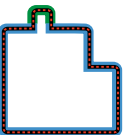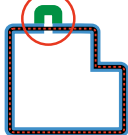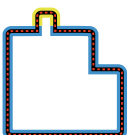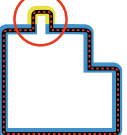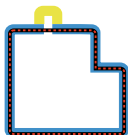
· Simple OK or NG judgement

· Usage example of contour setting pen

When a workpiece with a partially different shape needs to be distinguished and recognized or when the top or bottom needs to be judged, the detection can be performed by painting the contours in different colors by combining the contour setting pen with the priority area pen and reduction area pen.

Detection results

Blue : Normal contour setting

All contours are handled equivalently.

OK   OK

The score may slightly vary depending on the presence status of the protrusion. However, both are detected.

Green : Priority area setting

In addition to the blue area search, areas painted in green are used as priority areas to perform the judgement.

OK   NG

When no edge is detected in the area set as priority area, this is judged as NG and the workpiece is not detected.

Yellow : Reduction area settin

When there is an edge in the unnecessary area painted in yellow, the score is reduced.

NG   OK

When an edge is detected in the area set as unnecessary area, the score is reduced and the workpiece is not detected.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 12

Simple calibration

Conventional equipment combining "image processing unit + robot" requires many steps in "calibration" that aligns the camera coordinates with the robot coordinates. With the RCXiVY2+ system, following the wizard to perform the operation will complete the calibration easily within a short time. In addition, even when the setting position deviates, the calibration is executed and restored immediately.

Requires as little as 5 minutes

STEP. 1

Register the desired fiducial mark

STEP. 2

Select the camera mounting method

Mounted on robot

Can be mounted on moving part

Camera

Camera

Fixed upward

Camera

Camera

STEP. 3

Align fiducial mark position

If camera is movable, move the robot

Camera

If camera is fixed, attach fiducial mark to robot, and move it

Camera

Execute auto-calibration

Fiducial mark

POINT 13

Calibration is automated with the dedicated jig.

By automating the calibration using the advanced calibration function, highly accurate calibration can be achieved easily without depending on the operator's skill.
The hand data can also be created automatically and the time necessary for the calibration is reduced greatly.
Since the dedicated jig is the standard part (option part), the jig does not need to be designed and manufactured and can be used immediately.
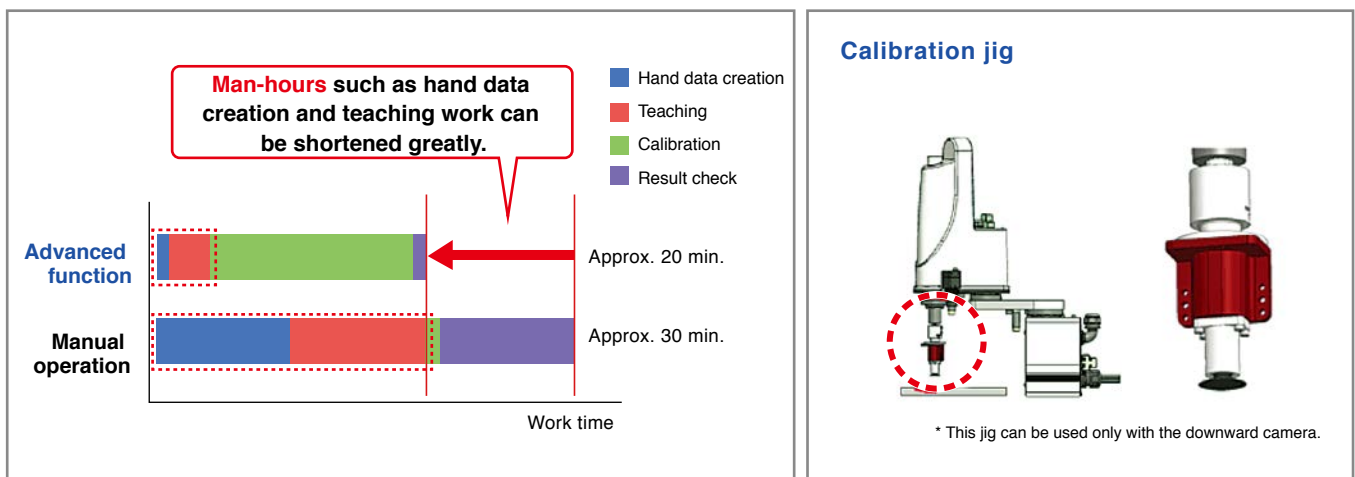
Man-hours such as hand data creation and teaching work can be shortened greatly.

- Hand data creation
- Teaching
- Calibration
- Result check

Advanced function — Approx. 20 min.

Manual operation — Approx. 30 min.

Work time

Calibration jig

* This jig can be used only with the downward camera.

51

POINT 14

Setup time reduced greatly

When using third-party vision, a coordinate conversion program needs to be created in the robot controller since the robot coordinate data differs from the vision format.

In RCXiVY2+, vision system is incorporated in robot controller the robot coordinate data can be stored into the robot point data using single process. This ensures very simple operation. Additionally, the unified control of the camera control and light control can be performed using the robot program. Start-up process will be greatly simplified.

Comparison of setup time

RCXiVY2+ system

General-purpose vision

← Setup time is shortened greatly

Setup time

Setup time reduced by up to **80**%

- ▮ Installation
- ▮ Calibration
- ▮ Pattern registration
- ▮ Parameter setting
- ▮ Communication setting
- ▮ Program setting
- ▮ Debug

POINT 15

Easy link with peripheral equipment

One controller provides unified control of robot, gripper, and lighting.

Robot vision: RCXiVY2+ System

Camera Light

Electric gripper: YRG series
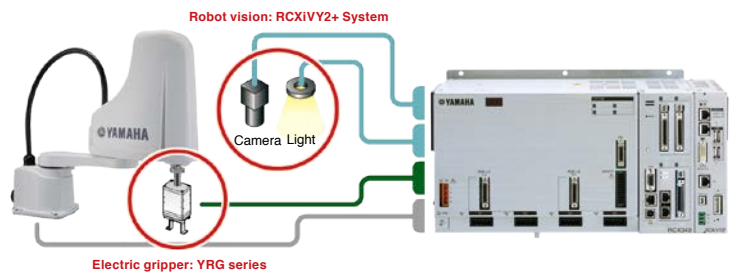
POINT 16

System configuration illustration

* Shows a system configuration example of the RCXiVY2+ unit (with light control board option).
* To the STD.DIO, ACIN, and SAFETY connectors not shown.

Programming box PBX

Monitor

RCXiVY2+ unit

Software RCXiVY2+ Studio

DC12 V/24 V power supply
(The power supply depends on the light specifications.)

24VDC power supply

Camera

Lighting

Photoelectric or proximity sensor, etc.

Robot

Encoder

Tracking board
(when installed in option slot 4)

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 17

Conveyor tracking

Ideal for high-speed packaging arrangement high-speed transport of multiple types of items such as pharmaceuticals, cosmetics, and food products.

The vision camera detects the position and orientation of parts moving on the conveyor, and the robot picks them up.

CMOS camera

Palletizing robot

Supply conveyor   Pallet   Collection conveyor

Example program

❶ **New CTMOVE** CTMOVE (1),Z=0.0,CTZ=10.0

Can be executed with a single command

Unify the move up command, follow workpiece command, move down command

Seamless movement from move up to move down

❶ **Predict workpiece location and move directly**

Tracking start position

Conveyor direction

Workpiece pickup location

Reduce movement distance

Workpiece position when tracking begins

Operating conditions: YK500XG / payload 1 kg (total of workpiece and tool) / horizontal movement 250 mm / vertical movement 1 mm / conveyor speed 100 mm/sec

POINT 18

Improving productivity by controlling multiple robot systems

RCX340＋RCXiVY2+

RCX340

YC-Link/E

Tracking board

Connect up to four units

100 CPM/unit x 4 units
(maximum 400 CPM)

Shortened cycle time

Improve throughput

Parts sorting by program contributes productivity

Control two robots to let downstream robot handle missed items

Information from a single camera can be shared by multiple robots

Conveyor direction

53

POINT 19

Up to 254 types of parts registration

Setup changes require only that part numbers be changed. Setup changes are easy.

254 types (0–253) can be registered

POINT 20

Monitor output

Monitor the operating status

Monitor the search status while making calibration settings or during automatic operation.

Contents of output
· Selected type / Captured image
· Search result (position, score, scale)
· Executed command
· Time required by command

Output method
· DVI-I (supports digital monitor or analog monitor)

POINT 21

High-precision search even under low light

Edge search engine is built-in

Supports a variety of applications while being minimally affected by the external environment.
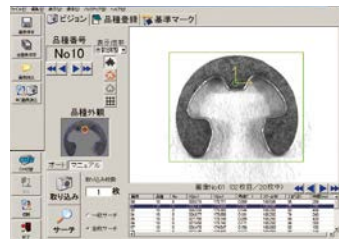
When lighting is sufficient
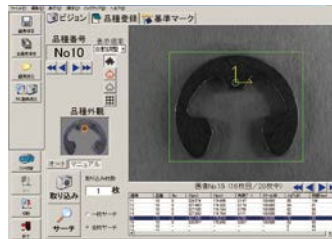
Accurate search even if lighting is insufficient

POINT 22

Lens distortion and camera inclination correction function

Mounting accuracy is improved   Camera is installed in the inclined status*

The lens distortion and camera inclination when the angle of visibility is wide or when the camera is installed in the inclined status can be corrected.

When the distortion and inclination correction function is enabled during calibration, the calibration data for the distortion and inclination correction is created. When images are captured using this calibration data, captured images are corrected and output.

* Up to approx. 15 degrees
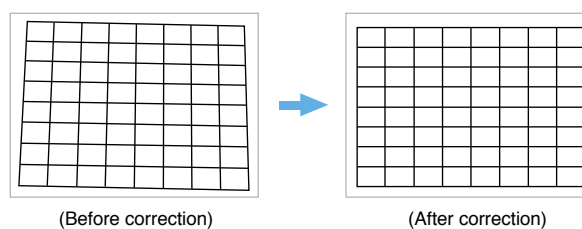
(Before correction)

(After correction)

54

POINT 23

Also supports moving camera

Even if the camera is mounted on the robot, coordinates are automatically converted according to the robot's movement.

Fixed camera | **Fixed downward.** | **Fixed upward.**

Movable camera | **SCARA robots** | **Cartesian robots**
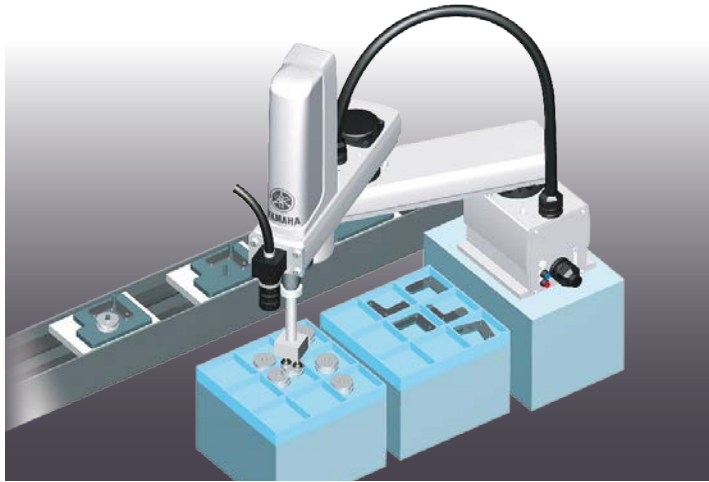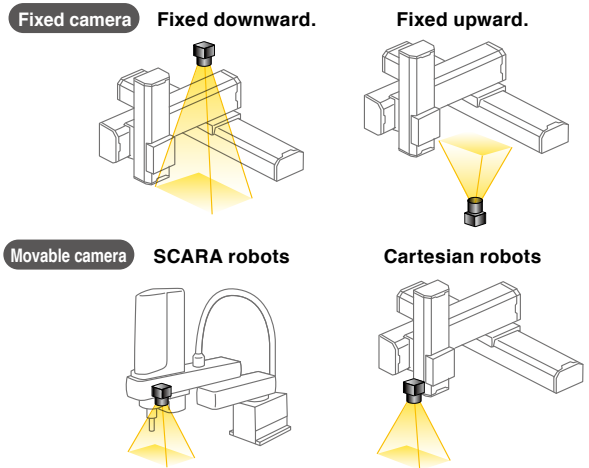
Even when the camera is moved, the coordinates are corrected automatically.

POINT 24

Easy-to-use programming software RCXiVY2+ Studio

With programming software "RCXiVY2+ Studio", all vision related operations such as registration of fiducial marks and workpieces used for calibration (contour settings, various parameter settings, and read range settings), backup, restore operation, and operation monitor can be performed.

- Search trial-run, part type registration
- Reference mark registration (for calibration)
- Up to 254 workpiece types can be registered.
- Workpiece can also be added easily.
- Up to 100 workpieces can be detected at once.
- Data backup
- This software functions as a monitor during program operation.

RCXiVY2+ Studio

Download from website (member site)

POINT 25

Easy programming

Constructing the most suitable robot vision system for an application.

RCX-Studio 2020 program template function

◆ Program is created automatically simply following step-by-step operating process

RCX3 series programming software RCX-Studio 2020 also has following five templates for vision system:
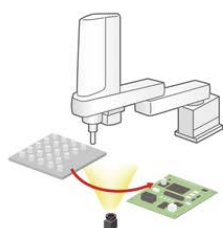
- Pallet picking using the vision
- Dispensing work using the vision
- Gripping deviation correction using the vision
- Gripping deviation and mounting position correction using the vision
- Gripping deviation and mounting position correction using the vision (without using any master)
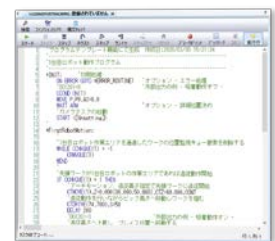
LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
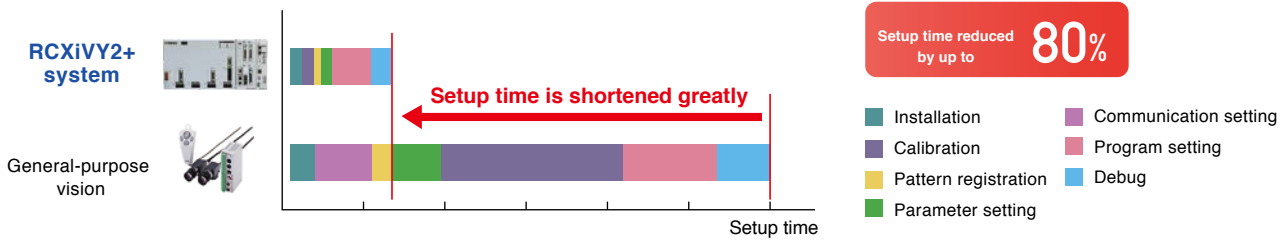YRG Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 26

A wide variety of robot systems to choose from the most suitable and economical solution for the robot vision system

XY-X Cartesian robots   **YK-XG/XE SCARA robots**   **YK-TW orbit type robots**   **FLIP-X single-axis robots**
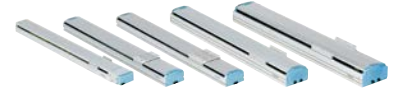
POINT 27

Verifying application prior to purchase

User's application is verified using actual sample parts before making a purchase decision.
Based on the evaluation result, recommendation will be made for most suitable and economical solution.

Application review

Sample parts review

Actual Simulation

Actual machine test

Recommendation with evaluation report

Robot training

Follow-up after delivery

Preliminary evaluation

Starting evaluation with actual sample piece

■ Evaluation conditions (example)

Lens: 8 mm
Lighting
Lighting height: 375 mm
WD: 400 mm
Workpiece
Background: black

Actual machine test

Evaluation of application with robot and vision setup

Recommendation

Based on the results of preliminary evaluation necessary recommendation is made
Recommendation on vision system setup

Advice regarding camera, lens, and lighting settings

Robot training

Training is available upon request

Lot application examples

● Random flow of parts on conveyor

The workpiece positions are recognized by the camera and the labels are adhered to the determined positions on workpieces. The adhesion position can also be specified for each part type.

❸ The camera recognizes the position.

❷ The positions, orientations, and clearances are not aligned.

❹ The label is adhered to the determined position.

❶ Workpieces are flown.
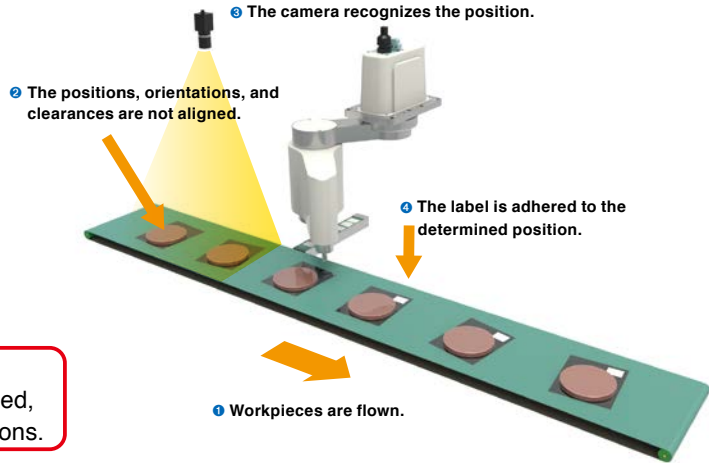
POINT Even when the positions or orientations of workpieces that are flown are not aligned, the labels are adhered to the same positions.

● Automatically adjusting sealing points

Position of workpiece is correctly recognized by its shape.
Changing setup or jig between production lot can be eliminated.

❷ The camera recognizes the workpiece position.

❶ The workpiece is placed within the specified area.

❸ The sealing is applied correctly.
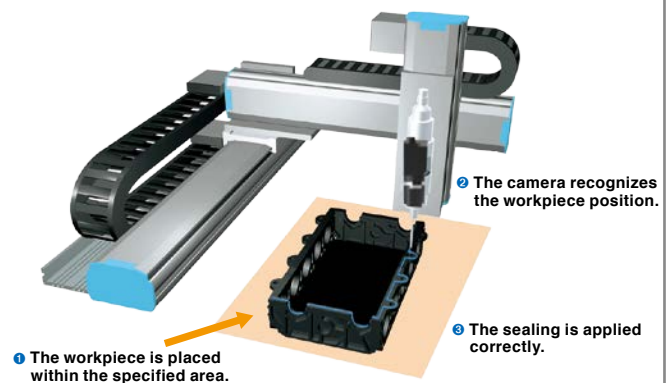
POINT The workpiece shape is recognized by the camera and the sealing is applied to the correct position.

● Adjusting screw fastening position

Vision camera recognizes actual hole position with wide tolerance and adjust fastening position.

❷ Camera recognizes tolerance

❶ Wide tolerance of hole position even after parts are positioned
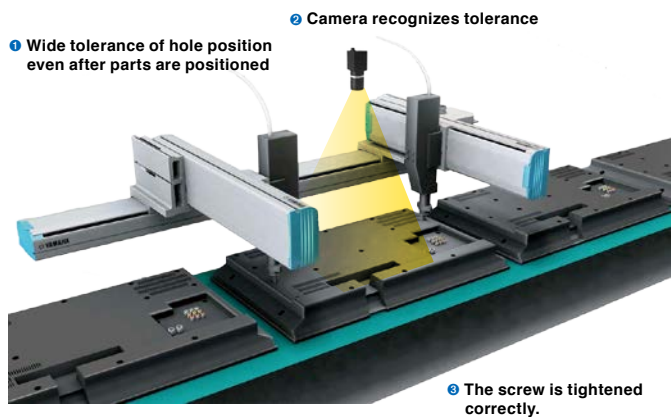
POINT Even when there are variations in product accuracy such as resin mold product, the products can be assembled correctly.

❸ The screw is tightened correctly.

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

>> Application examples continued.

● **"Pick-and-Assemble" in one motion**

Pick up parts from a tray, adjust position on the fly and install directly.

❸ Workpiece is assembled at the correct position.

❷ Camera corrects the workpiece position during transfer.

❶ Workpieces are positioned roughly in the tray.
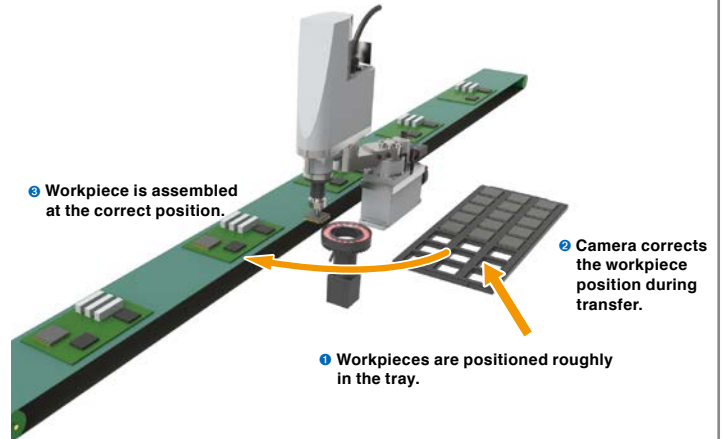
POINT Use of the upward camera makes it possible to correct the position during transfer.

● **Conveyor tracking**

Pick-and-pace operation of randomly positioned parts on the conveyor by a SCARA robot. Position and orientation of parts are recognized by a vision camera.
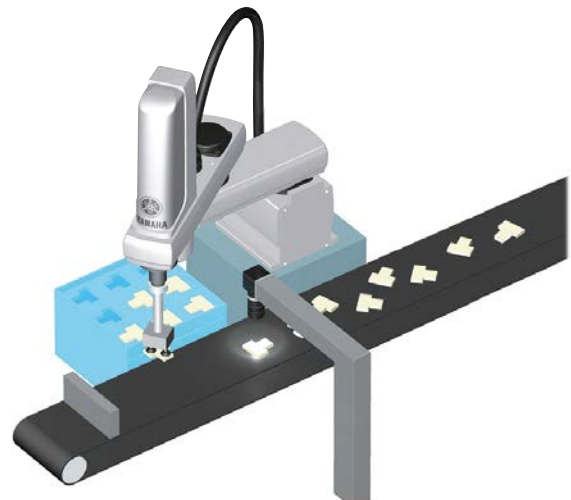
POINT Handling process is reduced without teaching

● **Irregular shape workpieces such as foods and clothes**

Pick-and-place with conveyor tracking for parts with wide tolerance like foods and clothes.
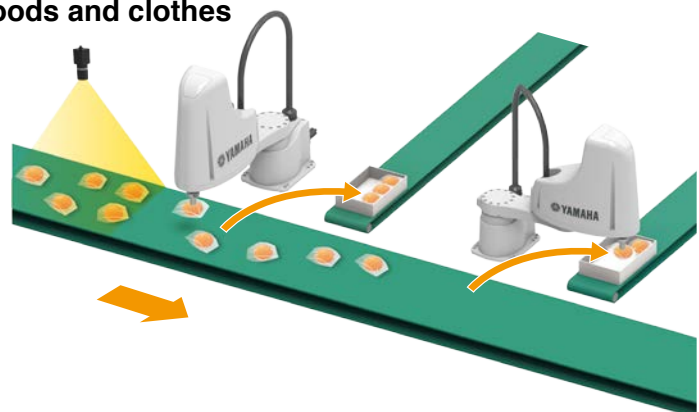
POINT Increasing productivity with two robots

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

PC-based Machine Vision
RCXiVY2+ PCVision

PCVision provides the same ease of use use and affinity with robots as the RCXiVY2+ system.

"Robot+ vision" allows you to perform the simulation.

If you have a PC and camera, you can perform the recognition test of workpieces.

High-pixel camera up to 25 megapixels is supported.
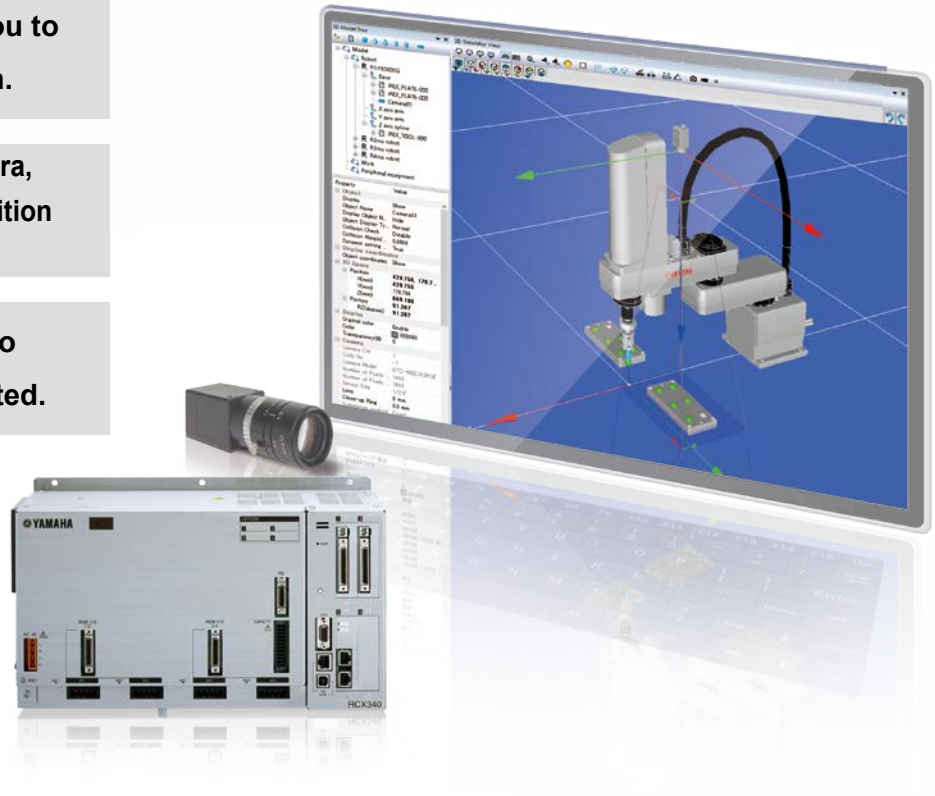
What is "RCXiVY2+ PCVision"?

Apps working as RCXiVY2+ on Windows.

By connecting the PC into which this software has been installed to the RCX controller, a PC vision system that is equivalent to the "RCXiVY2+ System" can be constructed.

RCXiVY2+ PCVision

PoE HUB

RCX3 series controller

Camera
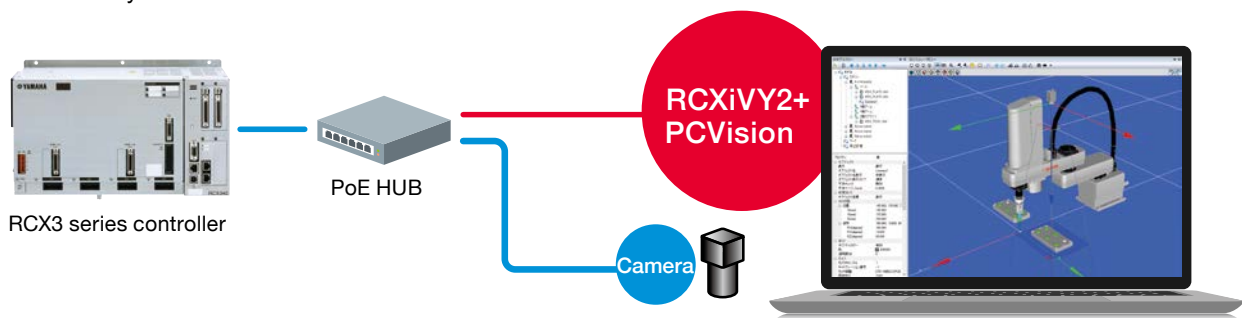
Free DL **RCXiVY2+ PCVision** Download from the web site (member site).

RCXIVY2+ PCVision

To connect the RCX3 series controller to RCXiVY2+ PCVision and use it as a robot vision system, a license for RCXiVY2+ PCVision needs to be purchased.

59

When using the "RCXiVY2+ PCVision" without building it into the equipment

POINT 1

The system can be used for pre-evaluation.

Simply install the "RCXiVY2+ PCVision" software and connect the camera to check the vision system even without an RCX controller. It is possible to register the component type of the target workpiece, check the detection status, and adjust parameters from the camera connected to the PC or the images stored in the PC.

License is required for connection to the "RCXiVY2+ PCVision".

Free of charge

Software can be downloaded from the website free of charge.

RCXiVY2+ PCVision

PoE HUB

Camera

RCX3 series controller

Workpieces can be evaluated even without a controller.
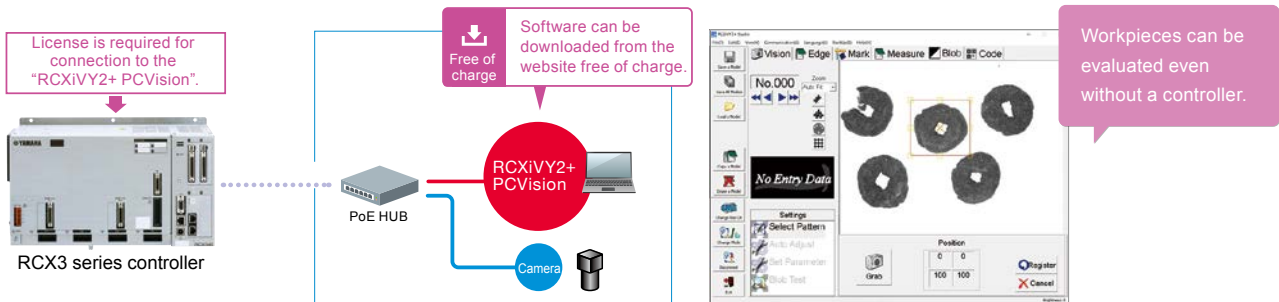
POINT 2

Dummy camera can be set.

By setting a dummy camera, images can be loaded from the specified folder at the time of the image capture command.

☑ **Workpiece can be evaluated with images in the PC.**

☑ **Images of different sizes are automatically corrected to the image size of the dummy camera.**

☑ **Color images are also automatically corrected to monochrome images.**

Images from a digital camera or smartphone are also acceptable.

Dummy camera can be added from the Camera window of the PCVision.

Camera

Status	X	Y	Ch
o	1440	1080	2
o	1280	966	1

Add Dummy Camera

Model Name   DummyCam03

Pixel Size   1440   1080   ∨   1.6M

Image Folder   C:\Users\0470891\Pictures\dummy\16

OK   Cancel

Add Dummy Camera

RCXiVY2+ PCVision — Real camera

— Dummy camera

One image per image capture is loaded in alphabetical descending order. Folder can be specified for each camera.

Image00.bmp
Image01.bmp
Image02.bmp
Image03.bmp
Image04.bmp
...

POINT 3

From camera layout examination to operation verification can be performed on the 3D emulator.

☑ **Simple equipment layout with RCX-Studio 2020**

Camera can be installed in the 3D simulator. Maximum and minimum WD (work distance), and field of view range are displayed depending on the camera and lens combinations. Pre-verification of optimal combination and installation position can be performed.

☑ **Program simulation with RCX-Studio 2020**

Test execution of programs containing vision commands can be performed. Program debugging and cycle time measurement can be performed without an actual machine.

Addition of camera object

The maximum and minimum WD can be displayed when the parameters are set. So, the camera installation position can be checked easily.

Camera view

Camera

Minimum WD and field of view size.

Specified WD and field of view size.

When the camera is moved using the 3D emulator, the image in the camera view changes accordingly, so the actual field of view range can be checked.

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

When using the "RCXiVY2+ PCVision" with building it into the equipment

POINT 1

Machine Vision on the PC of your production machinery.

In the conventional "RCXiVY2+ System", the dedicated vision unit needs to be built into the robot controller.
In the "RCXiVY2+ PCVision", your PC can be utilized for the equipment instead of the dedicated vision unit.
The equipment can be designed at lower cost, and the degree of freedom in designing equipment and systems that utilize PCs is expanded.
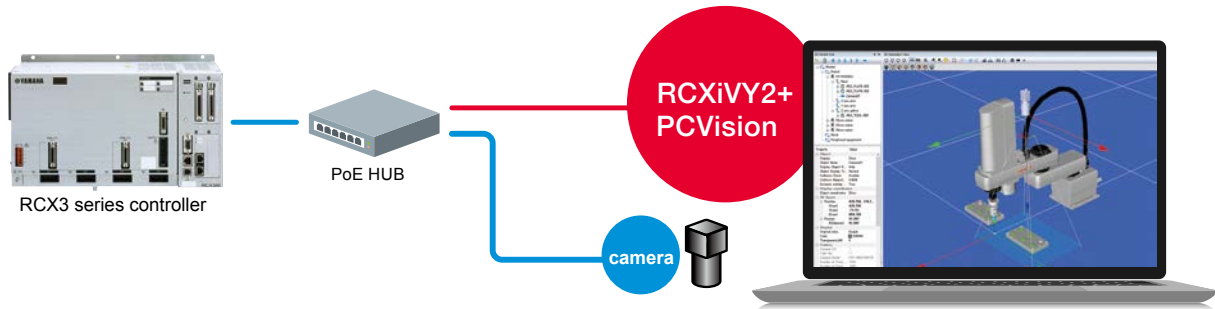
POINT 2

Various cameras are supported.

GigE and USB cameras compatible with the GenICam standards can be used. In addition, a camera with 5 megapixels or more can also supported.
Use of a high-resolution camera makes it possible to perform more accurate detection and expand the field of view.

	RCXiVY2+ unit	RCXiVY2+PCVision
Usable camera	OMRON SENTECH	OMRON SENTECH HIKROBOT BASLER Other camera manufacturers (* Camera needs to be compliant with the GeniCam standards.)
Number of camera pixels	5 megapixels or less	25 megapixels or less

Compatibility with the "RCXiVY2+ system".

There is a compatibility with the conventional built-in type "RCXiVY2+ system".
Robot commands, component type data, and calibration are common to the "RCXiVY2+ system".
The "RCXiVY2+ PCVision" can be controlled by conventional robot commands.

[Comparison of "RCXiVY2+ PCVision" and "RCXiVY2+ unit"]
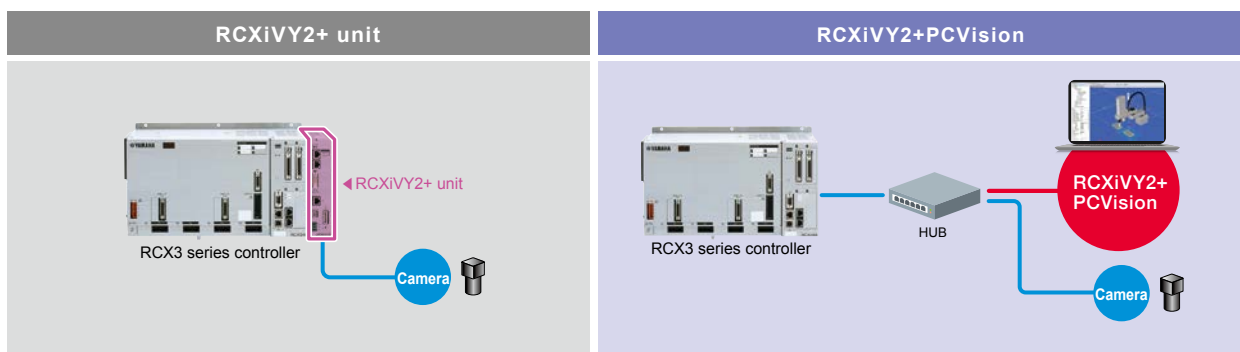
MOTOR-LESS SINGLE AXIS ACTUATOR

| LBAS | LGXS | LBAR |

SINGLE-AXIS ROBOTS

| ABAS | AGXS | ABAR |

With or without motor, 2 types can be selected.
There are abundant lead variations and specifications
suitable for the customer's needs can be selected.

Products have passed strict evaluation criteria unique
to "YAMAHA", a vehicle equipment manufacturer, that
protects peoples lives.   Yamaha designs products
with high longevity so that people are able to use
them for a long time.

Intuitive / Durability / Economy
Robonity series

Single-axis robots

Single-axis robots "Robonity series" have been developed as more affordable single-axis robots by revising the controller design for a more affordable system with reliability.

Motor-less actuator

Wide range of selection for transfer and positioning applications
Wide variety of ball screw lead and stroke length to choose from

---

Slider type

Basic model [P.64]

Integrated guide rail and frame design. High moment rigidity in a compact design.

ABAS

ABAS04
ABAS05
ABAS08
LBAS12

LBAS

LBAS04
LBAS05
LBAS08
LBAS12

Advanced model [P.65]

Ground ball screw is standard. High precision model with high reliability and durability.

AGXS

AGXS05   AGXS12
AGXS05L AGXS16
AGXS07   AGXS20
AGXS10

LGXS

LGXS05   LGXS12
LGXS05L LGXS16
LGXS07   LGXS20
LGXS10

Rod type [P.66]

High rigidity structure that follows the slider type. Compatible with a long stroke of up to 800 mm.

ABAR

ABAR04
ABAR05
ABAR08

LBAR

LBAR04
LBAR05
LBAR08

Robot positioner

EP-01 series

EP-01-A10   EP-01-A30

- Same price as parallel I/O and industrial Ethernet
- Absolute battery function
- Support software is provided free of charge.
- Industry-leading compactness

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

Slider type

Basic model

Motor-less single axis actuator
LBAS

Single-axis robots
ABAS

Maximum payload — Up to 115 kg
Maximum speed — 300 to 1,800 mm/sec
Stroke — 50 to 1,250 mm

High Rigidity | **Compact** | **Low Cost**

POINT 1

Compact and high rigidity

Even though the product is more compact than the conventional product, it achieves a higher rigidity.

	Conventional product T6L	LBAS05/ABAS05
MY	35	59
MP	40	63
MR	50	103

(N · m)

	Conventional product T9H	LBAS08/ABAS08
MY	86	221
MP	133	309
MR	117	343

(N · m)
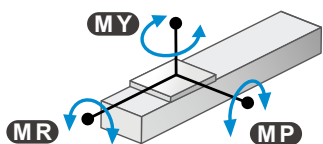
POINT 2

Overall length can be shortened by motor bending specifications.

Motor bending specifications can also be selected, expanding the range of design.

Straight type — **Bending type**
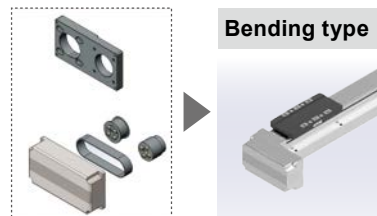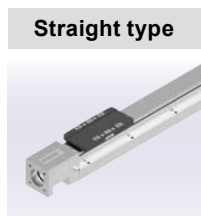
POINT 3

First-class usability even at a low cost.

Reference surfaces are provided on the sides of the main body and knock holes are provided on the bottom to reduce design and assembly man-hours.

Upper fixing — Lower fixing

Standard surface

54
26.7±0.03   27
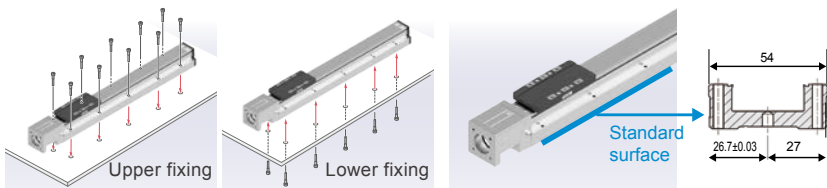
Installation is possible from either the top or bottom without removing any exterior parts.

POINT 4

Easy Maintenance

Greasing work that tends to be troublesome,such as opening the covers, can be performed easily.
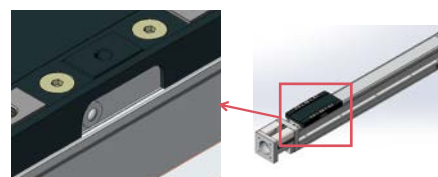
Grease nipple on the slider side surface

POINT 5

Suitable for the X-axis of Cartesian robots! Slim type "LBAS12/ABAS12" is added to the lineup.

The slim type structure achieves a low center of gravity, making it suitable for the X-axis of Cartesian robots.

The overall height can be suppressed, contributing to equipment downsizing.

LBAS12/ABAS12 — **Conventional product F14H** — **Conventional product F17**

76 — 83 — 100
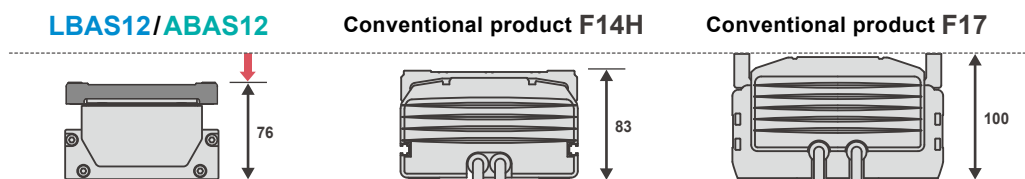
With the same frame width, the product can be used for both 200W and 400W motors, making it suitable for a wide range of situations.

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

Advanced model

Motor-less single axis actuator
LGXS

Single-axis robots
AGXS

Maximum payload	Up to 160 kg
Maximum speed	300 to 2,400 mm/sec
Stroke	50 to 1,450 mm

High Precision Accuracy Class C5

High Durability

Clean room specification as a standard feature

POINT 1

High quality model with high accuracy.

Adopted ground ball screws

Ball screw : Accuracy class C5

Positioning repeatability: +/-5 μm

LM guide

Ball retainers

Ground ball screws

Accuracy to JIS C5
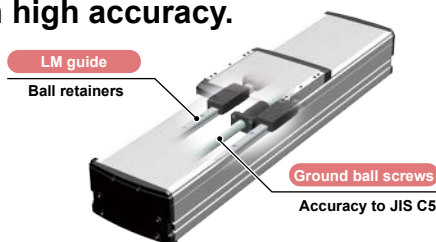
POINT 2

Overall length for effective stroke is the shortest class in the industry.

Overall length for the effective stroke is the shortest in class for the industry.
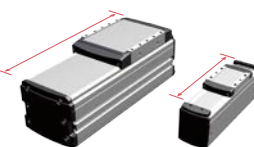
POINT 3

This product can used in a wide range of situations.

Dust-proof stainless steel sheet is used on the top surface of the main body.

Products can be used in a clean environment by attaching a pipe joint and suctioning.

Air purging can also be used as anti-contamination measures.

Of course, the product can be used as it is without attaching any joint.

Stainless steel dust shield

Cleanroom roller mechanism

Vacuum ports

Motor: IP67

■ **Simply attach vacuum fitting**
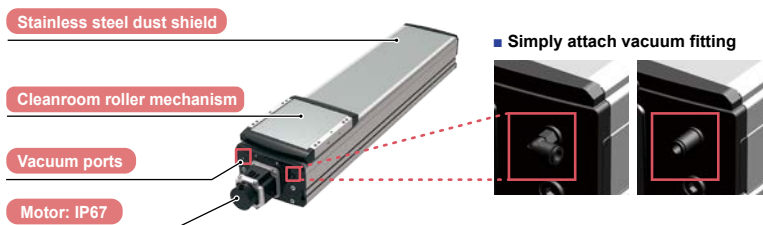
One standard product can be used in a wide range of applications.

POINT 4

High acceleration/deceleration models are added to the lineup.

With the recent improvements in KAIZEN awareness, we have received many requests from manufacturing sites.
"We need a faster single-axis robot to further improve productivity! Of course, we want to use this robot for an extended period of time with confidence."
To respond to such a request, "High agility mode" has been added to the Advanced model lineup of the Robonity series.

1. The robot operation time can be shortened.
2. Therefore, the product manufacturing time can be shortened.
3. That is, the daily production quantity can be increased and more production can be performed in the same time.

» **Large difference! Effect of acceleration/deceleration!**

Comparison of movement time when the payload is 1kg.

For LGXS10-20-100 **Comparison of high acceleration/deceleration operation tact time**

LGXS10-20-100 Acceleration 2G

General actuator Acceleration 0.5G

Maximum speed(mm/sec): 1400, 1200, 1000, 800, 600, 400, 200, 0

Operation time(s): 0, 0.05, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35

Shortened 0.13 sec.

Production volume is increased only by increasing the acceleration/deceleration of the single-axis robot!

Rod type

Motor-less single axis actuator
LBAR
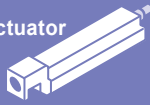
Single-axis robots
ABAR

Maximum payload	Up to 80 kg
Maximum speed	Up to 1200 mm/sec
Stroke	50 to 800 mm

High Rigidity   **Compact**   **Long stroke**

Linear guide built-in rod type compatible with radial load. LBAR/ABAR

Radial load   **Linear guide**

The integrated structure with built-in linear guide does not impair linearity even when radial load is applied.
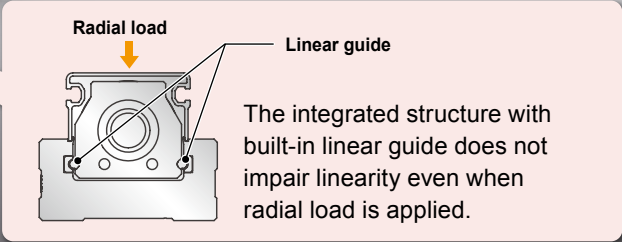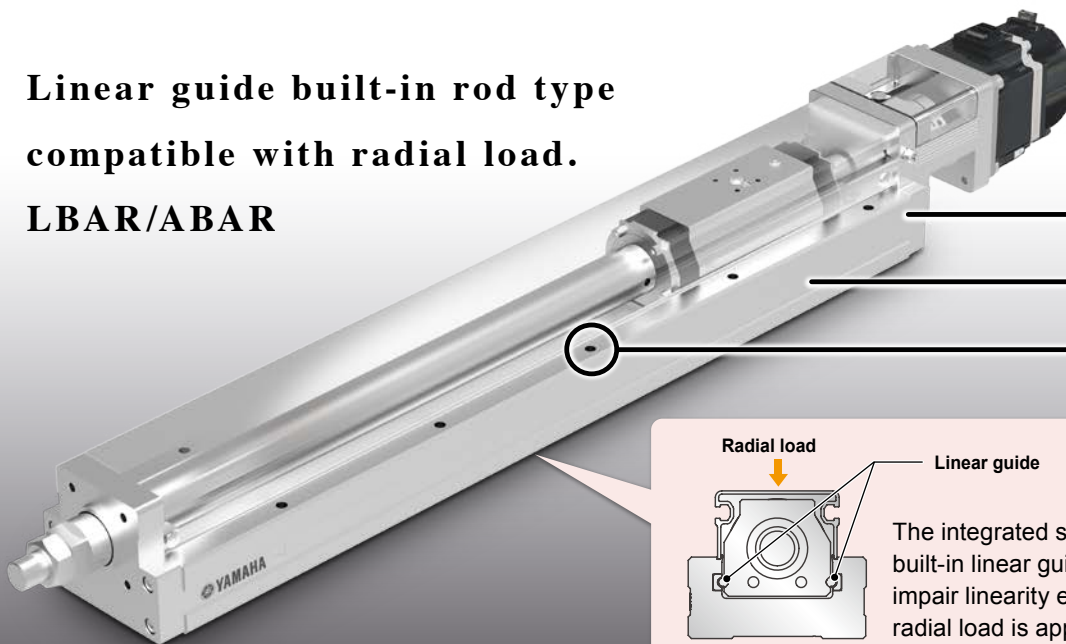
POINT 1

No external guide is needed.

External guide is not needed since the linear guide is built-in.
* An external guide may be recommended when a certain stroke is exceeded.

Conventional product
TRANSERVO series
SRD05   External guide is needed.

157

55

External guide
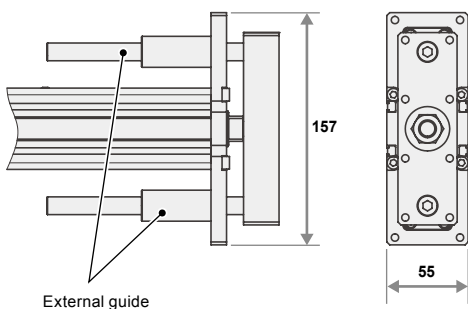
Robonity series
LBAR05/ABAR05   Linear guide is built-in.

53.8

54
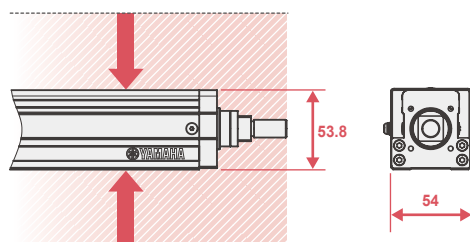
Width size
Reduced approx.
65%
when compared to conventional products.

Contributes to equipment downsizing!

POINT 2

Rod non-rotation accuracy ±0°

The built-in linear guide suppresses rattling in the rotation direction.

The working accuracy of the tool attached to the tip of the rod is maintained.

Conventional product SRD05	LBAR05/ABAR05
±0.05°	**±0°**

θ
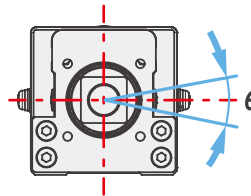
POINT 3

Compatible with a long stroke.

Compatible with a long stroke of up to 800 mm.

The corresponding stroke has doubled when compared to the conventional product with the same size.

This product can be used in a wide range of situations.

Conventional product SRD05	LBAR04/ABAR04	LBAR05/ABAR05	LBAR08/ABAR08
Max. **300**St	Max. **500**St	Max. **600**St	Max. **800**St

Conventional product   Max. stroke
LBAR04/ABAR04
LBAR05/ABAR05
LBAR08/ABAR08

2.7 times as much as conventional

100 200 300 400 500 600 700 800   St
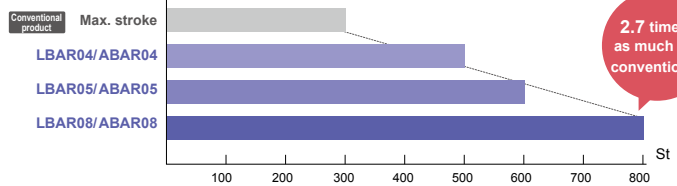
POINT 4

Easy installation and specification change

Upper fixing

Lower fixing

Standard surface

82
40.7±0.03   41

Straight type

Motor bending type
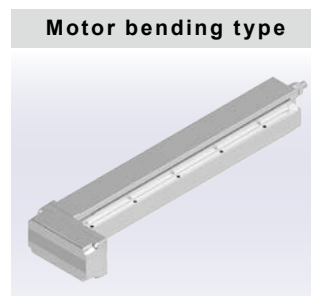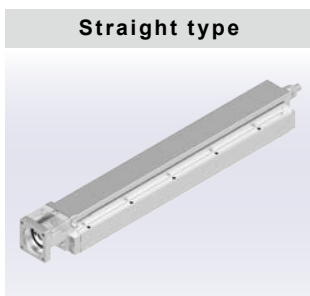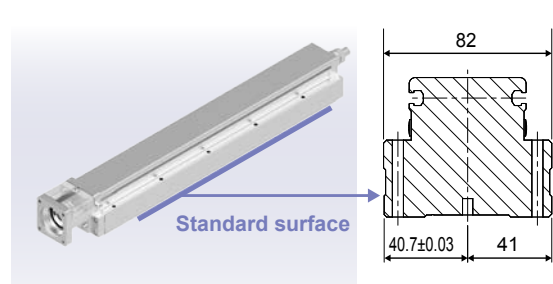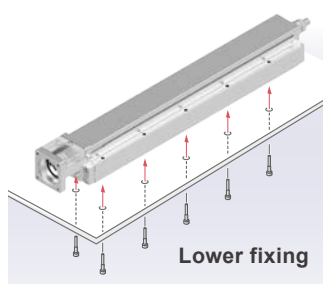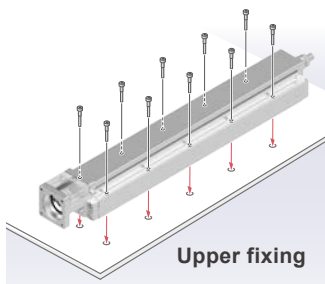
Ease of use is also inherited from the slider type!

Robonity Single-axis robots Features

POINT 1

Low cost high performance line-up

▶ **Easy operation and aordable system with Industrial Ethernet**

Robot positioner "EP-01" is a newly designed positioner for a better Ethernet platform and the cost performance. As a result the price of Ethernet is now offered at the same price level as parallel I/O (NPN). While achieving a lower cost design, "EP-01" positioner has expanded features such as standard Ethernet, feedback pulse output, direct value control function, and real-time output.

Robot positioner

EP-01 series

EP-01-A10   EP-01-A30

[Supported field networks]

EtherNet/IP™   PROFI NET®

EtherCAT®

Parallel I/O and industrial Ethernet are the same price!

POINT 2

User friendly setup

▶ **The hassle of startup is reduced.**

Ethernet port is standard on a controller and dedicated PC programming cable is no longer required. Startup procedure is reduced and simplified.

Dedicated cable is not needed.
Easy connection with LAN cable

LAN cable   HUB

PC
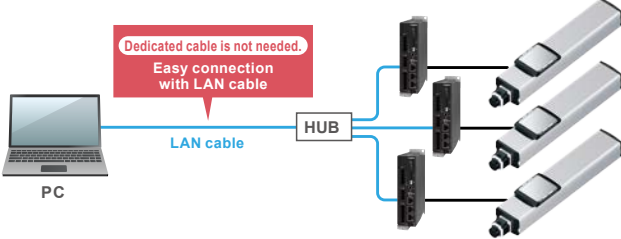
POINT 3

Easy model selection

▶ **Simple cycle time and service life calculation.**

The service life and cycle time can be calculated at the same time by simply entering the required information at the website.
The result can be conveniently saved as PDF file.

| Entry screen | Results | PDF |

Easy to save

POINT 4

For stable and constant operation

▶ **Contribution to early recovery from line stop**

The cause that took a long time to recover can be solved.

Battery-less absolute method	**Calendar function**	**Absolute battery is installed on the cable section.**
Because the single-axis controller supports the battery-less absolute method, the battery replacement is not needed.	The controller has clock function internally and histories like alarm are recorded chronologically. Such information is retained for over one year without power and no need for resetting at system startup after long holidays.	Position data will be retained even when replacing a absolute controller.

LCMR200 | Linear conveyor modules

GX | Single-axis robots

YHX | Controller

LCM100 | Linear conveyor modules

YK-X | SCARA robots

RCX iVY2+ | Robot Vision

Robonity | Single-axis robots

PHASER | Linear motor single-axis robots

FLIP-X | Single-axis robots

TRANSERVO | Compact single-axis robots

XY-X | Cartesian robots

YP-X | Pick & place robots

CLEAN

CONTROLLER

YRG | Electric Gripper

APPLICATION

SERVICE PERIOD

POINT 5

Space efficient compact design.

▶ Industry-leading compact design

Compact design for machine size reduction.

Basic model（ABAS）

Conventional model
T6L

ABAS05

65

54
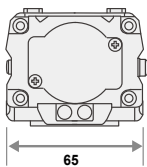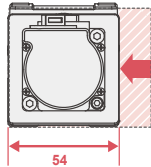
Width
Reduced approx. 17% compared to the conventional model.

Robot positioner EP-01

Conventional model
TS-X

EP-01

167

150

40

124

58
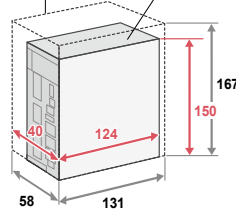
131

Capacity
Reduced approx. 37% compared to the conventional model.

POINT 6

To meet a wide range of needs

▶ Used for a wider range of applications with expanded functions and new functions.

Acceleration and deceleration designation type was added to the positioning operation command from the PLC.

Direct value position designation	Position data	Speed	Acceleration	Deceleration
Data designation type 1	○			
Data designation type 2	○	○		
Data designation type 3	○	○	○	○

When the custom setting is selected, the speed and acceleration can be designated to (mm/s) and (m/s^2) from the PLC!

Feedback pulse function has been added to enable use in conjunction with external devices.

Feedback pulse output

Conventional

Controller
Field network
PLC

EP-01

Controller
Field network
PLC
Feedback pulse output
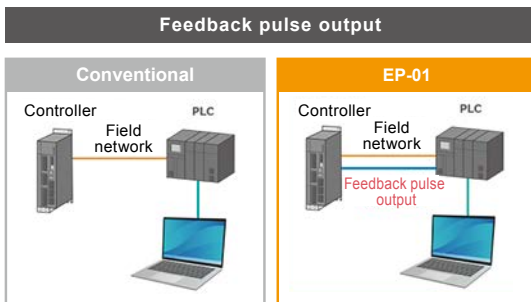
Exact current location is understood without communication delay

Usage example of feedback pulse output

Sensor

Single-axis robots

Controller
Field network
PLC
Feedback pulse output
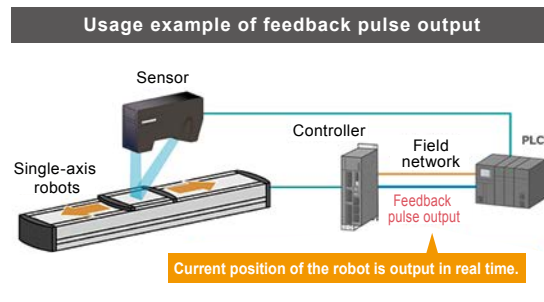
Current position of the robot is output in real time.

Speed ripple can be corrected.

New vibration suppression function has been added to achieve vibration suppression!

Normal operation
There is vibration.

With vibration suppression function
Vibration is reduced.

Normal operation
There is vibration.

With vibration suppression function
Vibration is reduced.

Vibration

Normal operation

With vibration suppression function

Time
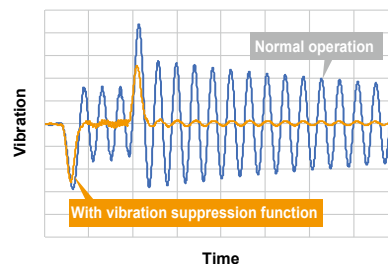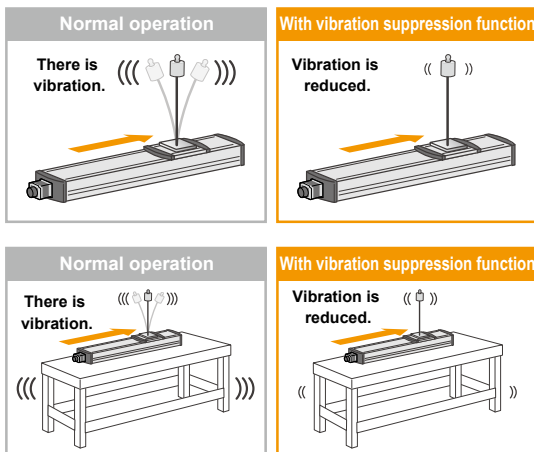
It can be adjusted according to the number of vibrations that need to be suppressed, such as tool vibrations and installation base vibrations!

Robonity Motor-less single axis actuator Features

Wide range of selection for transfer and positioning application
Wide variety of ball screw lead and stroke length to choose from

POINT 1

Supports major brands and standards ▶ Build a system with motor/driver of your choice

In addition to the conventional servomotors, stepping motors are also newly supported and actuators can be used in accordance with customers' needs.

LBAS Supported motor manufacturers

[Servo motor]

Yasukawa Electric	Mitsubishi Electric	KEYENCE
OMRON	SANYO DENKI	TAMAGAWA SEIKI
DELTA ELECTRONICS	Panasonic	FANUC
Siemens AG	Rockwell Automation, Inc.	
Schneider Electric SA	KINGSERVO Hoof automation CO., LTD.	
Beckhoff Automation GmbH & Co. KG		

[Stepping motor]	**[NEMA standards]**
Oriental Motor	NEMA17 NEMA23

LGXS Supported motor manufacturers

[Servo motor]

Yasukawa Electric
Mitsubishi Electric
KEYENCE
OMRON
Panasonic

POINT 2

Easy selection ▶ Easy simulation of cycle time and service life of motorless single axis actuator.

Simulator on web site will provide cycle time and service life of ball screw or guide.
Selection of most suitable model with confidence.

Just enter simple parameters ...

Easy Automatic calculation

- Acceleration/deceleration time
- Uniform velocity time
- Total movement time
- Uniform velocity distance
- Life distance of guide
- Life distance of ball screw

Access the website below.

https://robot.yamaha-motor.co.jp/robot/member/motorless_eng/motorless.php

* These contents are not available on smartphones.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 3

Most suitable specification from wide range of selection.

Many selection of leads, stroke length, and size to choose from.

POINT 4

Long stroke

Strong length from 50 mm to 1450 mm to choose from.

POINT 5

Compact

Space efficient compact design (20% less than current model).

Existing product
T6L

LBAS05

65   **54**

71

LINEAR MOTOR SINGLE-AXIS ROBOTS

No limit on critical speed even when using a long stroke of 4 m.
"PHASER" series delivers superb performance
during long distance transfer.

Critical speed is not restricted and high-speed long-stroke transfer is possible.

MF type

High-power and long-stroke using flat motor with core

- Maximum stroke: 4050mm
- Maximum speed: 2500mm/s
- Repeated positioning accuracy: ±5µm
- Maximum payload: 7 to 160kg

MF7D

MF15

MF20

MF30D

MF75

Moving coil

Flat type magnet

Magnetic head

Magnetic scale
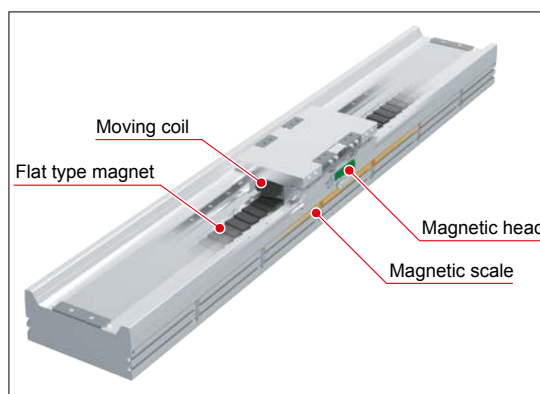
Type	Size (mm) Note 1	Model	Carrier	Maximum payload (kg)	Maximum speed (mm/sec.)	Stroke (mm)
MF type Flat type with core Linear motor specifications	W85 × H80	MF7	Single	10 (7)Note 2	2500	100 to 4000
		MF7D	Double			100 to 3800
	W100 × H80	MF15	Single	30 (15)Note 2		100 to 4000
		MF15D	Double			100 to 3800
	W150 × H80	MF20	Single	40 (20)Note 2		150 to 4050
		MF20D	Double			150 to 3850
		MF30	Single	60 (30)Note 2		100 to 4000
		MF30D	Double			150 to 3750
	W210 × H100	MF75	Single	160 (75)Note 2		1000 to 4000
		MF75D	Double			680 to 3680

Note 1. The size shows approximate maximum cross sectional size.
Note 2. When using at the maximum speed, the maximum payload becomes the value in ( ).

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

POINT 1

No critical speed like ball screw!

The main attraction of the linear motor single-axis robot is that it has no critical speed like ball screw. The maximum speed does not decrease even during long distance transfer. In addition, the maximum stroke is 4 m. The cycle time is reduced significantly in the long-distance transfer process. Also, unlike the ball-screw single-axis robot, there are few sliding parts and rotating parts, ensuring excellent quietness. Furthermore, the coil and magnet are non-contact and are not worn out, ensuring long-term use.

Comparison between stroke and maximum speed
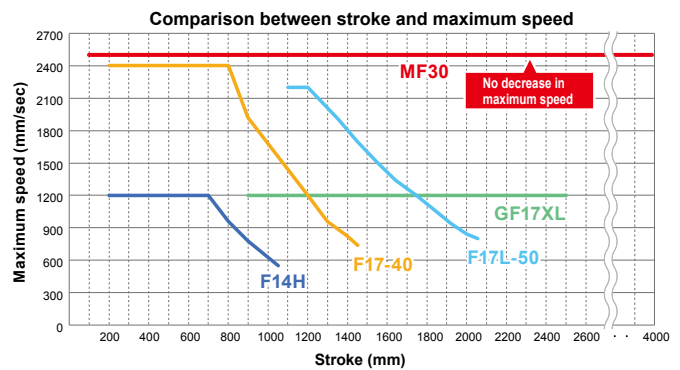
POINT 2

In-house manufacturing of major parts achieves low costs.

Magnetic scales are developed and manufactured at YAMAHA. In-house manufacturing of other major parts achieves large cost reduction. Nowadays, the linear motor is not a special mechanism. The customer can select the linear motor or ball screw in the similar way according to the customer's needs. In particular, when performing a high-speed and long-distance transfer of a light workpiece, selecting linear motor robots may reduce the cost.
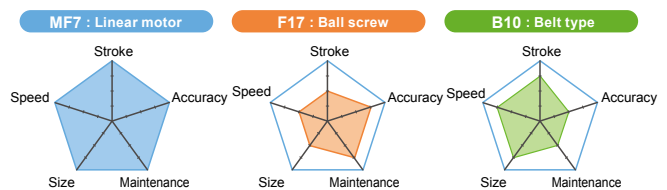
■ **Comparison of single-axis robot models**

Model name	Main body price [Note 1]	Maximum speed (mm/sec.)	Maximum payload (kg)	Repeated positioning accuracy (μm)	Maximum stroke (mm)	Maximum cross-sectional dimension [Note 2] (mm)
MF7-1500		**2500**	10(7) [Note 3]	**±5**	**4000**	W85×H80
F17-40-1450		720 [Note 4]	40	±10	1450	W168×H100
B10-1450		1850	10	±40	2550	W100×H81

Note 1: The prices are compared with the strokes shown above.

Note 2: Cable carriers are not included.

Note 3: The payload is 7 kg when the maximum speed is 2500 mm/s. (10 kg-payload: 2100 mm/s)

Note 4: This value is obtained by considering the critical speed with a stroke of 1450 mm.

POINT 3

Double-carrier available as standard

Double-carrier specifications that operate two carriers on one robot are available as standard. High effects, such as space saving, cost reduction, and tact improvement are obtained when compared to two single-axis robots. Furthermore, no axis alignment is needed and tools are commonly used to shorten the setup time. (When using the RCX series controller, an anti-collision function can be used.)

■ Layout using two ball screw single-axis robots

■ Space saving using double-carrier
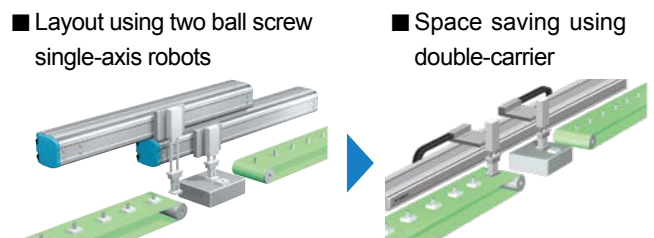
POINT 4

Suitable for heavy object transfer.
Maximum payload 160 kg

The maximum payload is 160 kg. The robot can transfer a heavy object, such as large LCD panel at a high speed with high accuracy. (In the payload range of some MF types, the maximum speed may be restricted.)

In the case of dual drive (2-axis synchronous control), the maximum payload is 320 kg.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

POINT 5

Both long stroke transfer and downsizing are achieved.

When transferring a workpiece over a long distance while maintaining the tact, a structure in which multiple single-axis robots are used to deliver the workpiece can be considered. (Illustration "Before") However, in this case, not only is the installation width required for the number of single-axis robots, but there is also the risk of mistakes that occur during workpiece delivery. In the case of PHASER, the tact can be maintained even with long strokes, and since no workpiece is delivered to another robot, it is possible to reduce the installation width while suppressing transfer errors. (Illustration "After")

Example of actual introduction

Before

Positions of processes A and B (center line) may deviate.

Process A
Process B

F14H-30-500 (ball screw)

Movement distance	500mm × 2 operations × 2 units
Movement time Each	510 msec × 4 + delivery time
→ Total time	2,040msec + delivery time

❌ **Installation space becomes large.**

After

Y-axis can also be shortened.
Positions of processes A and B (center line) can be made the same.
Delivery can be performed at the same position.
Operable at high speed.

Process A
Process B

Installation width is downsized.

MF30D-1000 (linear/double carrier)

Movement distance	500mm × 2 operations × 2 carriers
Movement time Each	440msec × 4 + delivery time
→ Total time	1,760msec + delivery time

⏺ **Downsizing and tact time reduction**

POINT 6

Linear scale developed by YAMAHA

YAMAHA originally developed a new linear scale based on its excellent magnetic signal detection technology.

Magnetic scale provides high environment resistance.

YAMAHA's magnetic scale is resistant to dirt and can be used in an environment where grease or cutting fluid sometimes splashes.

High resolution 1 μm

Magnetic signals recorded in the magnetic scale are detected and interpolated to achieve a highly accurate resolution of 1 μm.

Semi-absolute specifications

The current position is obtained by reading the signal recorded in the linear scale. So, it is not necessary to perform a large return-to-origin movement before starting the operation after turning on the power (the slider moves up to 76 mm when reading the signals).

Repeated positioning accuracy: +/-5 μm

A fully-closed control that always feeds back the table position provides high accuracy steadily.
Additionally, there are no mechanical backlashes, such as ball screws or timing belts.

Cost reduction

In-house linear scale development and manufacturing achieves large cost reduction.

POINT 7

Silence and long service life

Unlike ball screw type robots, there are few sliding and rotating parts. So, the operation is very quiet. Moreover, as the coil is not in contact with the magnet, they are not worn out and can be used for an extended period of time.

POINT 8

Dust-proof structure

All YAMAHA's linear motor robots use a stainless steel shutter. This prevents entry of foreign objects. Additionally, these shutters are made of tough stainless steel with an extremely high fatigue strength to support high-speed and long-stroke operation.

75

POINT 9

Flat type without cable carrier protrusion

For the MF7, as the main body is made compact, a flat type that the cable carrier becomes flat on the top surface of the table is prepared as standard. Please select this type according to the tool or workpiece shape, or installation method.

Standard type
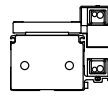
Flat type
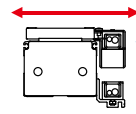
As the cable carrier does not protrude from the table upper surface in the flat type, a large tool can be installed easily.
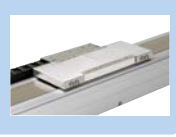
Applicable to multi-carrier operation

The PHASER series also supports "multi-carrier" operation that allows using three or more carriers on one robot.

This "multi-carrier" operation drastically extends applications due to its high effect in improving tact time and saving space.

Supported by special order. So, contact YAMAHA.
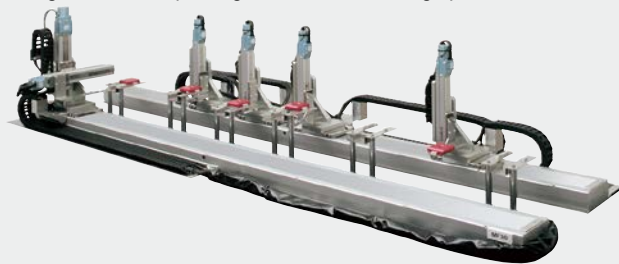
Applicable to dual-drive

As a dual-drive that simultaneously drives two axes, high-speed transfer and heavy object transfer are possible in a wide area.

YAMAHA can propose an optimal control method according to the robot linkage rigidity.

MEMO

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

SINGLE-AXIS ROBOTS

General-purpose single-axis robots can be used for various applications, such as assembly and inspection work.
6 types and 28 models ranging from compact size to long-stroke robots are available.

| Various custom specifications are also supported.

Various custom specifications, such as double-slider and wide slider are also supported.
For details, please consult YAMAHA.

Six types with high reliability and durability

T type Frame-less structure model

T4L/T4LH   **T5L/T5LH**   **T6L**   **T9/T9H**

■ Double appeal of compact body and low price.
■ Ideal in applications as an actuator directly installed on an installation base.

R type Rotation axis model

R20   **R10**   **R5**

■ Repeated positioning accuracy +/- 30 sec. (0.0083 °)
■ The robot can be used as the rotation axis when combined with other robots or utilized for a wide variety of applications, such as index tables.
■ High rigidity and high accuracy by harmonic drive.

N type Nut rotation type model

■ Repeated positioning accuracy +/- 0.01 mm
■ Maximum payload 80 kg
■ Double-carrier available as a standard

N18   **N15**

Comparison of stroke vs. maximum speed

N15
F14H
Competitor's model
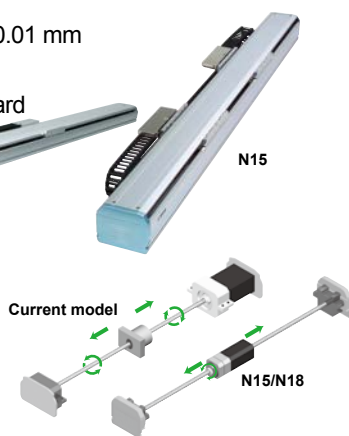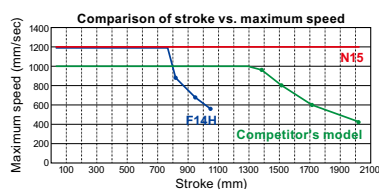
Critical speed is not restricted and high-speed transfer is possible.
Stroke: 2500 mm
Maximum speed: 1200 mm/sec.

Current model

N15/N18

In this structure, the hollow motor is connected to the nut of the ball screw and the nut is rotated with the screw shaft secured to perform the movement.

Layout using two conventional single-axis robots

Layout using two conventional cartesian robots

Process 1
Process 2

Space saving using double-carrier of N15/N18

Space saving and process integration using double-carrier of N15/N18

F type Model with high rigidity frame

F8   **F10**   **F14**   **F14H**   **F17**   **F20**

F20N

F17L
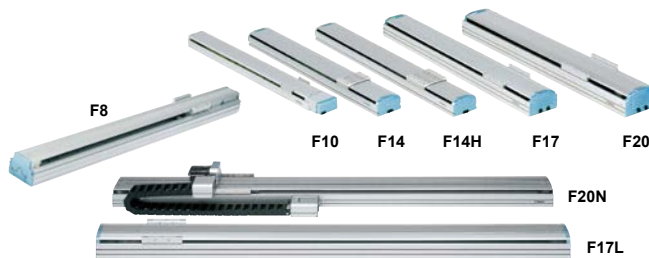
■ Tolerable load moment is large and highly resistant to the offset load.
■ Suitable for Cartesian robots needing rigid arm or moving arms that move the entire axis.

GF type Long stroke model with high rigidity frame

GF17XL

GF14XL

Optimal support mechanism Note

Effective stroke vs. maximum speed

GF17XL
Competitor's model
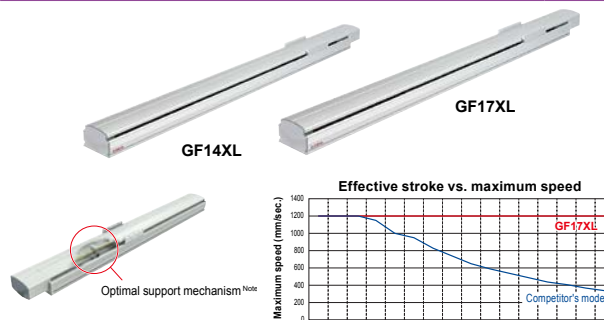
■ Movable at 1200 mm/sec. in the whole area without critical speed.
■ Suitable for long distance transfer.

B type Timing belt drive model

B14H

B14

B10
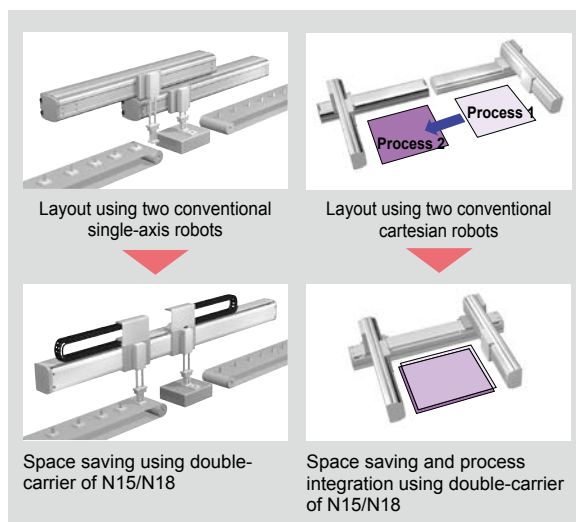
■ Maximum stroke is 3050 mm. Long-distance transfer between the processes is possible.

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 1

### 4-row circular arc groove type 2-point contact guide that is resistant to large moment load is adopted.[Note 1]

4-row circular arc groove type 2-point contact guide with less differential slip is used for the linear guide. This guide has less ball differential slip due to its structure when compared to the 2-row Gothic arch type 4-point contact guide and maintains a satisfactory rolling movement even if a large moment load is applied or the installation surface precision is poor. The guide has characteristics that are difficult to malfunction, such as unusual wear and provides excellent reliability.

Note 1. Except for T4L/T4LH and T5L/T5LH

2-row gothic arch groove type 4-point contact guide

Friction resistance is large and differential slip is large.
- Easy to receive adverse effects of installation surface accuracy, friction, and elastic deformation.
- Breakage may occur before expiration of calculation service life.

4-row circular arc groove type 2-point contact guide

Differential slip is small and self-centering function is high.
- Resistant to alignment changes and moment loads.
- Difficult to break.

F/N/B type [Note 2]

For the F type, N type, and B type, two guide frames are laid out on the high rigidity aluminum extruded material frame. Two bearing units per rail, four bearing units in total, support a large load firmly. As a large moment load is mainly converted into vertical force, the moment applied to one bearing unit becomes small to ensure excellent durability.
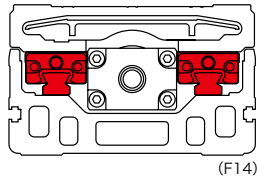
Note 2. Except for F8 series/F10/B10.

(F14)

F8 series

The F8 series uses a newly developed module guide to greatly reduce the cross-sectional area (70 % when compared to F10). The rail is laid out in the full width of the frame to ensure the high rigidity even with compact design. Of course, this series also uses the 4-row circular arc groove type 2-point contact guide.

(F8)
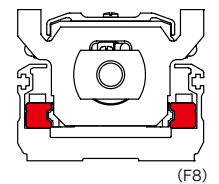
POINT 2

Resolver with excellent environment resistance is used for the position detector.

Slider

Ball screw

Position detector
Device intended to read-out the position or speed.

Linear motion guide

AC servomotor
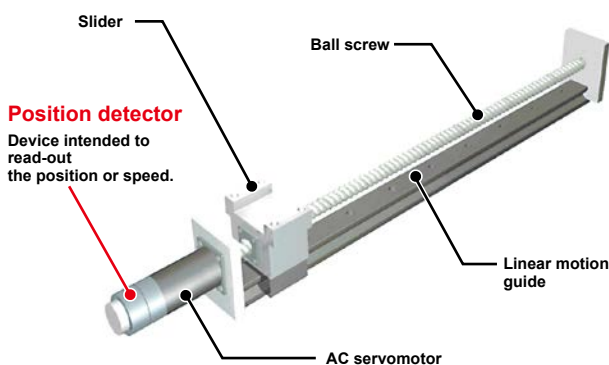
Optical encoder
- Optical type
- Electronic components are required and structure is complicated.
- Damaged easily by electronic component breakdown, dew condensation on or oil sticking to the disk.

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
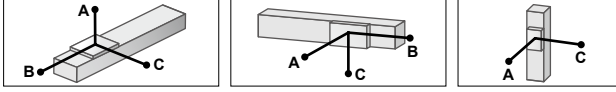
A resolver is used for the position detector. The resolver has a simple and rigid structure without using electronic components and optical elements. Detection problems due to electronic component breakdown, dew condensation on or oil sticking to the disk that may occur in optical encoders do not occur in the resolver. The resolver provides excellent durability. Additionally, as the absolute specifications and incremental specifications use the same mechanical specifications and common controller, desired specifications can be selected 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. Furthermore, the backup circuit has been completely renovated and now has a backup period of one year in the non-energizing state.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

POINT 3

Long service life greatly reduces the maintenance cost.

As the acceleration is determined by the weight parameter, the service life can be assured when the weight and position of center of gravity are known.

■ Allowable overhang Note

Horizontal installation (Unit: mm)

		A	B	C
Lead 30	5kg	864	501	383
	15kg	491	156	140
Lead 20	5kg	1292	505	462
	15kg	572	158	151
	30kg	455	73	75
Lead 10	20kg	617	119	127
	40kg	422	53	59
	55kg	420	36	40
Lead 5	50kg	722	42	47
	60kg	657	33	37
	80kg	577	23	25

Wall installation (Unit: mm)

		A	B	C
Lead 30	5kg	348	384	776
	15kg	87	40	306
Lead 20	5kg	416	388	1186
	15kg	92	42	386
	30kg	0	0	61
Lead 10	10kg	193	132	910
	20kg	53	0	400
	30kg	0	0	109
Lead 5	10kg	197	133	2360
	20kg	54	0	985
	30kg	0	0	427

Vertical installation (Unit: mm)

		A	C
Lead 20	1kg	600	600
	2kg	1098	1098
	4kg	545	545
Lead 10	4kg	594	594
	8kg	280	280
	10kg	217	217
Lead 5	10kg	221	221
	15kg	135	135
	20kg	92	92

Note. Distance from center of slider top to center of gravity of object being carried at a guide service life of 10,000 km.

As YAMAHA's robot uses high rigidity ball screw or guide, it provides excellent durability. This greatly contributes to reduction of the customer's maintenance cost.

Cost reduction by high durability

Other company's robot

Maintenance control cost is reduced

YHAMAHA's robot

Product service life
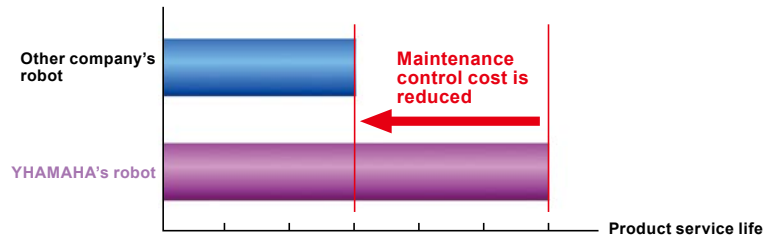
POINT 4

Controllers suitable for applications are prepared.

In addition to the robot program operation and pulse train control, a positioner that is operated by specifying a point number was added to the product lineup. Additionally, multi specifications that control multiple robots using one controller are also supported. You can select an optimal controller suitable for your application.

Program			I/O point trace (Positioner)	Pulse-train control
SR1-X	RCX320	RCX340	TS-X	RDV-X
P.119	P.121	P.121	P.115	P.112
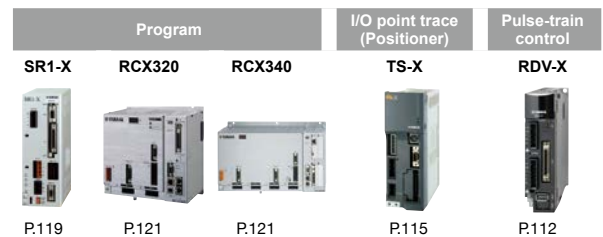
POINT 5

Various custom specifications are supported.

YAMAHA supports custom orders flexibility to meet the customers' various needs.

Addition of free slider	Free slider is added. Various applications, such as rigidity increase or use of two heads are supported.
Wide slider	To increase the slider rigidity, the standard slider is processed to the wide slider.
Specified stroke	A stroke smaller than the minimum stroke may be supported. For details, please consult YAMAHA.
Lead beyond catalog	The lead may be changed to that not stated in the catalog. For details, please consult YAMAHA.
Origin non-motor specifications	Even when not stated in the catalog, the origin may be changed to the non-motor side. For details, please consult YAMAHA.

YAMAHA has a wide variety of custom order results other than those shown above. If you have any requirement or request, please feel free to contact YAMAHA.

Type	Size (mm) Note 1	Model	Lead (mm)	Maximum payload (kg)		Maximum speed (mm/sec.)	Stroke (mm)
				Horizontal	Vertical		
T type Frame-less structure model	W45 × H53	T4L/T4LH	12	4.5	1.2	720	50 to 400
			6	6	2.4	360	
			2	6	7.2	120	
	W55 × H52	T5L/T5LH	20	3	-	1200	50 to 800
			12	5	1.2	800	
			6	9	2.4	400	
	W65 × H56	T6L	20	10	-	1333	50 to 800
			12	12	4	800	
			6	30	8	400	
	W94 × H98	T9 (Standard)	30	15	-	1800	150 to 1050
			20	30	4	1200	
			10	55	10	600	
			5	80	20	300	
		T9H (High thrust)	30	25	-	1800	150 to 1050
			20	40	8	1200	
			10	80	20	600	
			5	100	30	300	
F type Model with high rigidity frame	W80 × H65	F8	20	12	-	1200	150 to 800
			12	20	4	720	
			6	40	8	360	
	W80 × H65	F8L	30	7	-	1800	150 to 1050
			20	20	4	1200	
			10	40	8	600	
			5	50	16	300	
	W80 × H65	F8LH	20	30	-	1200	150 to 1050
			10	60	-	600	
			5	80	-	300	
	W110 × H71	F10 (Standard)	30	15	-	1800	150 to 1050
			20	20	4	1200	
			10	40	10	600	
			5	60	20	300	
		F10H (High thrust)	30	25	-	1800	150 to 1000
			20	40	8	1200	
			10	80	20	600	
			5	100	30	300	
	W136 × H83	F14 (Standard)	30	15	-	1800	150 to 1050
			20	30	4	1200	
			10	55	10	600	
			5	80	20	300	
		F14H (High thrust)	30	25	-	1800	
			20	40	8	1200	
			10	80	20	600	
			5	100	30	300	
	W168 × H100	F17L	50	50	10	2200	1100 to 2050
		F17	40	40	-	2400	200 to 1450
			20	80	15	1200	200 to 1250
			10	120	35	600	
	W202 × H115	F20	40	60	-	2400	200 to 1450
			20	120	25	1200	200 to 1250
			10	-	45	600	
	W202 × H120	F20N	20	80	-	1200	1150 to 2050
GF type	W140 × H91.5	GF14XL	20	45	-	1200	750 to 2000
	W168 × H105.5	GF17XL	20	90	-	1200	850 to 2500
N type Nut rotation type model	W145 × H120	N15 (Single-carrier)	20	50	-	1200	500 to 2000
		N15D (Double-carrier)					250 to 1750
	W180 × H115	N18 (Single-carrier)		80	-		500 to 2500
		N18D (Double-carrier)					250 to 2250
B type Timing belt drive model	W100 × H81	B10	Belt drive	10	-	1875	150 to 2550
	W146 × H94	B14 (Standard)	Belt drive	20	-	1875	150 to 3050
		B14H (High thrust)	Belt drive	30	-	1875	
R type Rotation axis model	-	R5	-	0.12kgm^2	-	360°/sec	360°
		R10		0.36kgm^2	-		
		R20		1.83kgm^2	-		
Clean model	See P.105						

Note 1. The size shows approximate maximum cross sectional size.

Multi-robot MULTI-FLIP/MULTI-PHASER

This robot has multi specifications that control multiple robots using one controller.

Advantages of control with multi-axis controller

● Sequence control is easy. System upgrades are easy at less expensive price.

● Compact and space saving when compared to the operation with multiple single-axis controllers.

● More advanced control is possible.

● RCX320, RCX340 provide mixed control of the FLIP-X series and PHASER series (linear single-axis).

Multi-robot ordering method

MLTX Note 1	–	1st unit Note 2	–	2nd unit Note 2	–	3rd unit Note 2	. . .	Cable length	–	Controller	–	Controller option
Multi-robot model prefix	–	1st unit robot type	–	2nd unit robot type	–	3rd unit robot type		3K: 3.5m / 5K: 5m / 10K: 10m	–	RCX320 / RCX340	–	Controller option

Up to 16 units can be controlled.
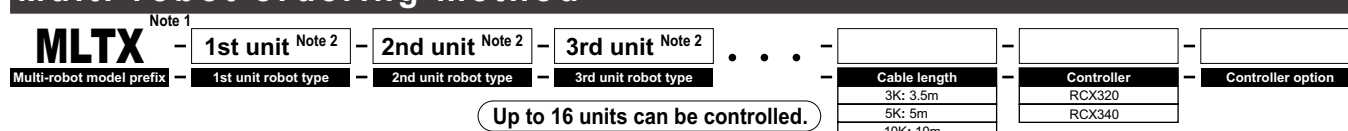
Note 1. When ordering a multi-robot, prefix "MLTX" to the top of the order model.
Note 2. Select either MULTI-FLIP or MULTI-PHASER shown below.
Note 3. For details about the controller and controller option models, please refer to relevant page of each controller.

Robot settings

Multiple-robot setting

Multiple-robot setting and multi-task program allow for asynchronous independent movements. As the auxiliary axis setting is used together-er, more free axis assignment can be made.

Main auxiliary axis setting

This auxiliary axis setting is used when it is inconvenient that two axes move simultaneously by the MOVE command. The axis set for the main auxiliary axis does not operate by the MOVE command and it operates only by the DRIVE command (movement command in axis units). This setting is recommended for the axis that needs to be operated asynchronously from the main robot.

Double-carrier

In robot types that the motor runs separately, such as linear motor single-axis PHASER series or N type (nut rotation type) of FLIP-X series, two motors can be added to one axis.
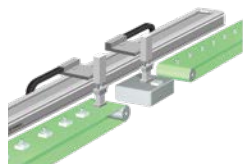
💡 **PHASER is available for 3 or more carriers by special order.**

Dual setting

This setting is used when performing the dual drive (2-axis synchronous control). This setting is used when the gantry type Cartesian robot with a long Y-axis stroke stabilizes the high acceleration/deceleration or when a high load or high thrust is needed.
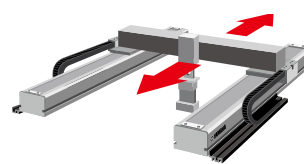
Applicable controllers

Name	1 to 2 axes controller	1 to 4 axes controller
	RCX320	**RCX340**
Appearance	P.121	P.121
Position detection	Incremental/Absolute	
Control model	FLIP-X and PHASER can be mixed.	
Maximum number of programs	100 programs	
Maximum number of points	30,000 points	
Number of input/output points — Standard	Dedicated input 8 points/dedicated output 9 points General-purpose input 16 points/general-purpose output 8 points	
Number of input/output points — Expansion	24 general-purpose inputs and 16 general-purpose outputs (per board. Up to 3 boards can be expanded.)	
Network option	CC-Link, DeviceNet™, EtherNet/IP™, Ethernet, PROFIBUS, PROFINET, EtherCAT	

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

MULTI-FLIP

Type	Model	Lead (mm)	Stroke (mm)
T type Frame-less structure model	T4L/T4LH	12	50 to 400
		6	
		2	
	T5L/T5LH	20	50 to 800
		12	
		6	
	T6L	20	50 to 800
		12	
		6	
	T9 (Standard)	30	150 to 1050
		20	
		10	
		5	
	T9H (High thrust)	30	150 to 1050
		20	
		10	
		5	
F type Model with high rigidity frame	F8	20	150 to 800
		12	
		6	
	F8L	30	150 to 1050
		20	
		10	
		5	
	F8LH	20	150 to 1050
		10	
		5	
	F10 (Standard)	30	150 to 1050
		20	
		10	
		5	
	F10H (High thrust)	30	150 to 1000
		20	
		10	
		5	
	F14 (Standard)	30	150 to 1050
		20	
		10	
		5	
	F14H (High thrust)	30	
		20	
		10	
		5	
	F17L	50	1100 to 2050
	F17	40	200 to 1450
		20	200 to 1250
		10	
	F20	40	200 to 1450
		20	200 to 1250
		10	
	F20N	20	1150 to 2050
GF type	GF14XL	20	750 to 2000
	GF17XL	20	850 to 2500
N type Nut rotation type model	N15 (Single-carrier)	20	500 to 2000
	N15D (Double-carrier)		250 to 1750
	N18 (Single-carrier)		500 to 2500
	N18D (Double-carrier)		250 to 2250
B type Timing belt drive model	B10	Belt drive	150 to 2550
	B14 (Standard)	Belt drive	150 to 3050
	B14H (High thrust)	Belt drive	
R type Rotation axis model	R5	-	360°
	R10		
	R20		

MULTI-PHASER

Type	Model	Carrier	Stroke (mm)
MF type Flat type with core Linear motor specifications	MF7	Single	100 to 4000
	MF7D	Double	100 to 3800
	MF15	Single	300 to 4000
	MF15D	Double	100 to 3800
	MF20	Single	150 to 4050
	MF20D	Double	150 to 3850
	MF30	Single	100 to 4000
	MF30D	Double	150 to 3750
	MF75	Single	1000 to 4000
	MF75D	Double	680 to 3680

Examples of multi-robot ordering methods
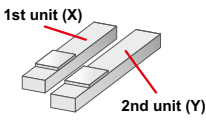
Separate single axes

<Example> F14H and F10 are installed separately.

MLTX - F14H - 20 - U - 500 **1st unit**

‐ F10 - 20 - 300 **2nd unit**

‐ 5K - RCX340 - 2 - N - NS - 2 **Controller**

1st unit (X)

2nd unit (Y)
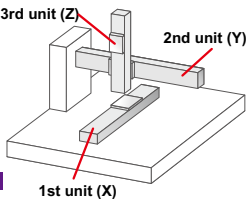
2 axes + 1 axis

<Example> T6 is installed on the base for the 1st axis, C6 is se-
cured to the upper portion for the 2nd axis, and CH4
is secured to the upper portion for the 3rd axis to
assemble the C6 and C4H to the XZ. (Either 2 axes
+ 1 axis or 3 axes simultaneous control can be made
by the setting.)

MLTX - T6L - 6 - 300 **1st unit**

‐ C6L - 6 - 300 **2nd unit**

‐ C4HL - 6 - BK - 100 **3rd unit**

‐ 3K - RCX340 - 3 - N - NS - 3 **Controller**

3rd unit (Z)

2nd unit (Y)

1st unit (X)

Note. When the customer combines each axis, it is recommended to use
the cable terminal (relay cable) for the wiring among axes. For details
about cable terminal, please contact YAMAHA.

Double-carrier/dual drive (2-axis simultaneous control)

Example of 8-axis control

<Example> Two double-carriers of the MF30 are arranged
in parallel and two MF20 installed on the top are
moved by the dual-drive.
T6 is attached to each tip of the MF20 and the
robots are controlled using two controllers.

MLTX - MF30D - H - L - 950 **1st unit**

‐ MF30D - H - L - 950 **2nd unit**
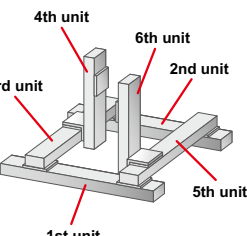
‐ MF20 - H - 1350 **3rd unit**

‐ T6L - 6 - BK - 100 **4th unit**

‐ MF20 - H - 1350 **5th unit**

‐ T6L - 6 - BK - 100 **6th unit**

‐ 3K - RCX340 - 4 - N - YM1 - NS - 0 - RCX340 - 4 - N - YS - 2 **Controller**

4th unit

6th unit

2nd unit

3rd unit

5th unit

1st unit
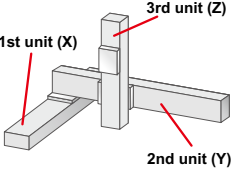
3 axes combination

<Example> C17L, C14H, and C14H are used for the X-axis, Y-
axis, and Z-axis, respectively to form a 3-axis XYZ
combination.

MLTX - C17L - 50 - Z - 1500 **1st unit**

‐ C14H - 20 - 450 **2nd unit**

‐ C14H - 10 - BK - 150 **3rd unit**

‐ 3K - RCX340 - 3 - N - NS - 3 **Controller**

3rd unit (Z)

1st unit (X)

2nd unit (Y)

Double-carrier

Example of 4-axis control
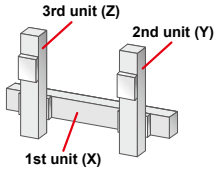
<Example> Two T6 are assembled to the double-carrier of the
MF20A, and they are used as XZ type and con-
trolled using one controller.

MLTX - MF20AD - W - M - 850 **1st unit**

‐ T6 - 12 - BK - 100 **2nd unit**

‐ T6 - 12 - BK - 100 **3rd unit**

‐ 3K - RCX240S - N1 - B **Controller**

3rd unit (Z)

2nd unit (Y)

1st unit (X)

Note. For the double-carrier, since one robot occupies two axes of the con-
troller, the number of robots may differ from the number of controllable
axes.

CAUTION

RCX340 requires no regenerative unit.

Conditions needing regenerative unit on multi-robot

● The total motor capacity exceeds 450 W.

● The total motor capacity of the vertical axis exceeds 240 W.

● The B14H performs the operation at a maximum speed of
more than 1250 mm/s.

● When the vertical axis is 240 W or less, the conditions
shown below are satisfied.

  • There is a 200 W-vertical axis.

  • A 100 W-vertical axis has a stroke of 700 mm or more.

  • There are two 100 W-vertical axes with a 5 mm-lead.

LCMR200 Linear conveyor modules

GX Single-axis robots

YHX Controller

LCM100 Linear conveyor modules

YK-X SCARA robots

RCX iVY2+ Robot Vision

Robonity Single-axis robots

PHASER Linear motor single-axis robots

FLIP-X Single-axis robots

TRANSERVO Compact single-axis robots

XY-X Cartesian robots

YP-X Pick & place robots

CLEAN

CONTROLLER

YRG Electric Gripper

APPLICATION

SERVICE PERIOD

FLIP-X terminology

High lead

This term indicates models supporting ball screw leads that exceed the standard lead (12 mm or 20 mm). (The standard lead of the F17L and C17L is 50.)

Origin on non-motor side

This term indicates models that are applicable to the origin non-motor specifications as standard. The origin on the non-motor side in the standard state is not supported with a lead not stated in the catalog. If special specifications are needed, please consult YAMAHA.

Maximum speed

This term indicates the maximum transfer speed. YAMAHA's single-axis robots can transfer a workpiece at this speed regardless of the transfer weight as long as it is within the maximum payload. However, as the workpiece is heavier, the acceleration/deceleration curve becomes gentle. If the movement distance is short, the speed does not reach the maximum speed stated in the catalog.

> **CAUTION**
>
> When the stroke of the ball screw drive type is long, noise or vibration is produced due to resonance of the ball screw if moved at the maximum speed. If this happens, lower the speed to that stated in the note column. (It is also possible to lower the transfer speed of the entire program using the SPEED setting or make the adjustment for each movement command.)

Maximum payload

This term indicates the maximum weight that can be loaded on the slider and transferred. Select an appropriate model so that the total weight of the customer's tools (air cylinder or chuck) and workpiece is less than this data. When the center of gravity of the tool or workpiece is offset from the center of the slider, the allowable overhang needs to be taken into consideration. Additionally, when entering the total weight of the tool and workpiece for the payload parameter of the controller, optimal acceleration/deceleration and servo parameter are automatically set.

Rated thrust

This term indicates the force to be applied in the slider advancing direction in the slider stationary (hold) state. When using vertically, the weight of the loaded workpiece is subtracted from this value (when the force is applied downward from the top). The slider can move only at a low speed (approximately 10 % of the maximum speed), but this value becomes lower than the specification value. Additionally, the type B of the timing belt drive cannot be used for applications, in which thrust is applied.

Allowable overhang

This term indicates an allowable overhang of an object to be transferred. In the specification data, this indicates the distance from the center of the top face of the slider to the center of gravity of an object to be transferred by the weight. This value is determined according to the service life of the linear guide. Under normal operation conditions[Note] , the 90 %-service life of the linear guide is 10,000 km or more if gravity centers of the workpiece and tool are kept within the allowable overhang. When using with an overhang amount exceeding the specification data, it is necessary to install a separate support guide or restrict operating conditions (speed, acceleration) so that a load is not applied to the linear guide of the single-axis robot. For detail, please consult YAMAHA.
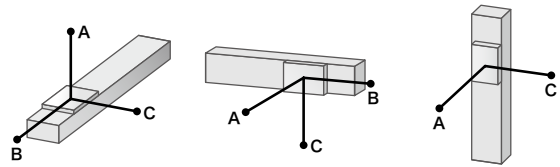
Note. Speed, acceleration 100 % (It is preconditioned that the weight parameters are set correctly.)
There shall be no impact load or excessive vibration during operation. Additionally, the alignment is correct.

Static tolerance moment

This term indicates the load moment applied to the slider in the robot stationary state.
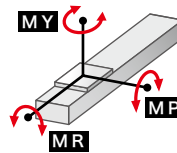
Critical speed

When the stroke of the ball screw drive type is long, noise or vibration is produced due to resonance of the ball screw if moved at the maximum speed. If this happens, lower the speed to that stated in the note column. (It is also possible to lower the transfer speed of the entire program using the SPEED setting or make the adjustment for each movement command.)

MEMO

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

CLOSED LOOP STEPPING MOTOR SINGLE-AXIS ROBOTS

Excellent characteristics of both stepping motor and servomotor were combined.
Stepping motor single-axis robots "TRANSERVO" series breaking through existing conventions.

Robot positioner TS-S2/TS-SH   P.115

This robot positioner is specialized for the I/O point trace input. The positioning or pushing operation can be performed using simple operation, only by specifying a point number from the host control unit and inputting the START signal.

Applicable models:	SS	SG Note	SR	STH
	RF	BD		

Note. SG07 is only applicable to TS-SH.

TS-S2   TS-SH

Robot driver TS-SD   P.114

This robot driver omits the operation with robot languages and is dedicated to the pulse train input. This driver can be made applicable to the open collector method or line driver method using the parameter setting and signal wiring. So, you can match the robot driver to the host unit to be used.

Applicable models:	SS	SR	STH Note	RF Note	BD

Note. Except for STH vertical specifications and RF sensor specifications.

TS-SD

Common features of TRANSRVO Series

POINT 1

New control method combining the advantages of both the servomotor and stepping motor

The stepping motor provides features that its price is less expensive and hunting (minute vibration) does not occur during stopping. However, this motor has disadvantages that the positional deviation due to step-out occurs (in the open loop mode), the torque decreases greatly in the high speed area, and the power consumption is large during stopping. As YAMAHA's TRANSERVO uses the closed loop control, this ensures complete "no step-out". Furthermore, use of a newly developed vector control method ensures less torque decrease in the high speed area, energy saving, and low noise. The function and performance equivalent to the servomotor are achieved at a low cost even using the stepping motor.

Stepping motor	Servomotor
○ • Simple & low cost • No vibration during stopping	○ • Smooth movement • Constant torque at any time • Energy saving
✕ • High-pitched operation noise • Great torque decrease in high speed area • Large power consumption during stopping	✕ • Tiny vibration during stopping • High cost

TRANSERVO combines both merits.
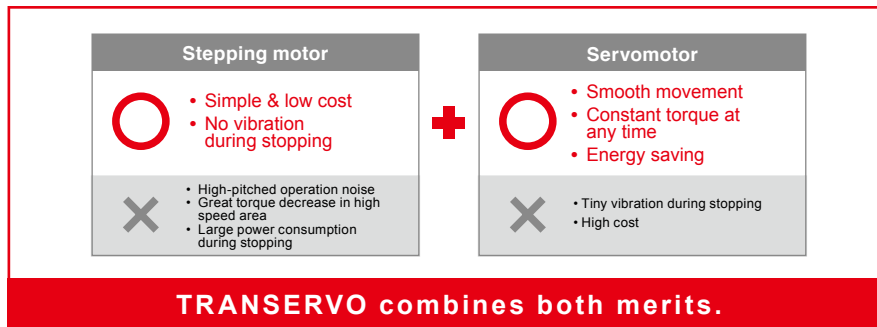
Energy saving

As the basic control is the same as the servomotor, waste power consumption is suppressed. This greatly contributes to the energy saving and CO_2 reduction.

No hunting during stopping

Stop mode without hunting can be set in the same manner as the general stepping motor. So, select this mode as required.

POINT 2

Closed loop control using excellent environment resistant resolver

A resolver with excellent reliability is used to detect the motor position in the same manner as YAMAHA's upper model. The stable position detection can be made even in a poor environment where fine particle dusts or oil mists exist. Additionally, a high resolution of 20480 pulses per revolution is provided.

This 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.

POINT 3

Excellent controllability

Use of a high resolution (4096, 20480 pulse/rev) makes it possible to maintain excellent controllability. Variations in speed are small and settling time during deceleration stop can be shortened.

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

89

SS type (Slider type)

Straight model

SS05H-S

Space-saving model (Side mounted motor model)

SS05H-R (L)

Type	Model	Size (mm) Note 1	Lead (mm)	Maximum payload (kg)Note 2		Maximum speed (mm/sec.) Note 3	Stroke (mm)
				Horizontal	Vertical		
SS type (Slider type) Straight model/ Space-saving model	SS04-S SS04-R (L)	W49 × H59	12	2	1	600	50 to 400
			6	4	2	300	
			2	6	4	100	
	SS05-S SS05-R (L)	W55 × H56	20	4	-	1000	50 to 800
			12	6	1	600	
			6	10	2	300	
	SS05H-S SS05H-R (L)	W55 × H56	20	6	-	1000	50 to 800
			12	8	2	600 (Horizontal) 500 (Vertical)	
			6	12	4	300 (Horizontal) 250 (Vertical)	

Note 1. The size shows approximate maximum cross sectional size.
Note 2. The payload may vary depending on the operation speed.
Note 3. The maximum speed may vary depending on the transfer weight or stroke length.

■ **Allowable ambient temperature for robot installation**
  SS/SR type   0 to 40 °C

POINT

4-row circular arc groove type 2-point contact guide applicable to even large moment load

A newly developed module guide is employed with a 4-row circular arc groove type 2-point contact guide built into a very compact body similar to the conventional model. This guide maintains a satisfactory rolling movement with less ball differential slip due to its structure even if a large moment load is applied or the installation surface precision is poor, and has characteristics that are difficult to malfunction, such as unusual wear.

Conventional model	TRANSERVO (SS type)
■ **2-row gothic arch groove type 4-point contact guide**	■ **4-row circular arc groove type 2-point contact guide**
If a large moment load is applied or the installation surface precision is poor, a large differential slip may occur easily.	Differential slip is small due to its structure and service life is long.
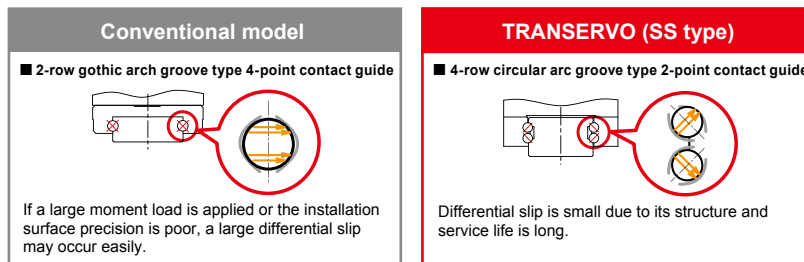
POINT

Tact is shortened by high-speed movement.

As advantages of the vector control method are utilized at maximum level, the TRANSERVO maintains a constant payload even in a high-speed range. This greatly contributes to shortening of the tact time. Additionally, by combining this feature with high-lead ball screws, the TRANSRERVO has achieved a maximum speed of 1 m/sec.Note which is faster than any single-axis servo motor.
Note. SS05-S/SS05H-S with 20 mm-lead specifications

Conventional model	TRANSERVO (SS type)
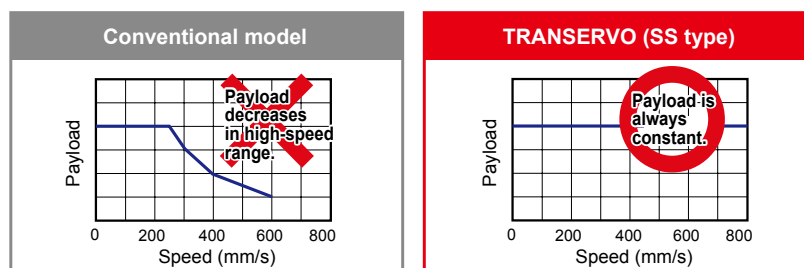
SG type (Slider type)

Straight model

SG07

Type	Model	Size (mm) Note 1	Lead (mm)	Maximum payload (kg)Note 2		Maximum speed (mm/sec.) Note 3	Stroke (mm)
				Horizontal	Vertical		
SG type (Slider type)	SG07	W65 × H64	20	36	4	1200	50 to 800
			12	43	12	800	
			6	46	20	350	

Note 1. The size shows approximate maximum cross sectional size.
Note 2. The payload may vary depending on the operation speed.
Note 3. The maximum speed may vary depending on the transfer weight or stroke length.

POINT

Maximum payload is 46 kg. A maximum payload of 20 kg is supported even with the vertical specifications.

As rigid table slide and 56 ☐ motor are adopted, the payload is increased greatly. A maximum payload of 46 kg is achieved.
Up to 20 kg can be transferred even with the vertical specifications.

SS05H	SG07
Maximum payload	Maximum payload
12kg	46kg

Payload is increased about **4** times.
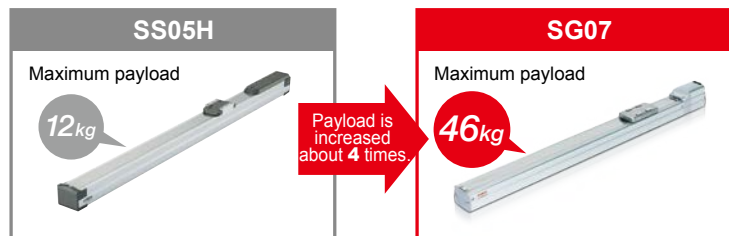
POINT

Maximum speed is 1200 mm/sec.

The maximum speed is made 1.2 times faster than that of the current model SS05H.
The tact-up of the equipment can be achieved.

Current model SS05H: Maximum speed *1000 mm/sec*

SG07: Maximum speed *1200 mm/sec*

Maximum speed of the current model is increased 1.2 times

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

SR type (Rod type standard)

Straight model

SR05-S

SR04-S

SR03-S

Space-saving model (Side mounted motor model)

SR05-R (L)

SR04-R (L)

SR03-R (L)

SR type (Rod type with support guide)

Straight model

SRD05-S

SRD04-S

SRD03-S

Space-saving model (Side mounted motor model)

SRD05-U

SRD04-U

SRD03-U

| Type	Model	Size (mm) Note 1	Lead (mm)	Maximum payload (kg)Note 2		Maximum speed (mm/sec.) Note 3	Stroke (mm)
				Horizontal	Vertical		
SR type (Rod type standard) Straight model/ Space-saving model	SR03-S SR03-R (L) SR03-U	W48 × H56.5	12	10	4	500	50 to 200
			6	20	8	250	
	SR04-S SR04-R (L)	W48 × H58	12	25	5	500	50 to 300
			6	40	12	250	
			2	45	25	80	
	SR05-S SR05-R (L)	W56.4 × H71	12	50	10	300	50 to 300
			6	55	20	150	
			2	60	30	50	
SR type (Rod type with support guide) Straight model/ Space-saving model	SRD03-S SRD03-U	W105 × H56.5	12	10	3.5	500	50 to 200
			6	20	7.5	250	
	SRD04-S SRD04-U	W135 × H58	12	25	4	500	50 to 300
			6	40	11	250	
			2	45	24	80	
	SRD05-S SRD05-U	W157 × H71	12	50	8.5	300	50 to 300
			6	55	18.5	150	
			2	60	28.5	50	

Note 1. The size shows approximate maximum cross sectional size.
Note 2. The payload may vary depending on the operation speed.
Note 3. The maximum speed may vary depending on the transfer weight or stroke length.

■ Allowable ambient temperature for robot installation
SS/SR type   0 to 40 °C

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

POINT

Long-term maintenance free is achieved.

A lubricator used in the ball screw and a contact scraper installed at the rod inlet and outlet provide maintenance-free operation.

Maintenance interval is greatly extended.

Normal grease lubrication on the ball screw loses a very small amount of oil as the ball screw moves.

The SR type has a lubricator that supplies grease lost over long periods to greatly extend the maintenance interval and ensure near maintenance-free operation[Note].

Note. The maintenance-free period is within the running life of the robot.

Environment-friendly lubrication system

The lubrication system is environment-friendly as it uses a high density fiber net and supplies an adequate amount of oil to appropriate locations to eliminate waste lubrication.

Prevention of foreign object entry

The dual-layer scraper is in contact with the front of the rod to ensure excellent fine contaminant particle removal performance. The scraper removes fine contaminant particles sticking to the rod through multi steps to prevent them from entering the inside and troubles caused by foreign objects. Additionally, oleo-synthetic foam rubber with a self-lubricating function ensures low-friction resistance.

Highly reliable resolver is used.
A resolver with excellent environment resistance is used for the position detector. All models can select brake specifications.

Ball screw lubricator
A lubricator with high density fiber net impregnated with grease supplies an adequate amount of oil to appropriate locations.

Laminated type contact scraper
A dual-layer scraper removes fine foreign objects sticking to the rod to prevent them from entering the inside and troubles caused by foreign objects. Rod rattle is suppressed effectively.
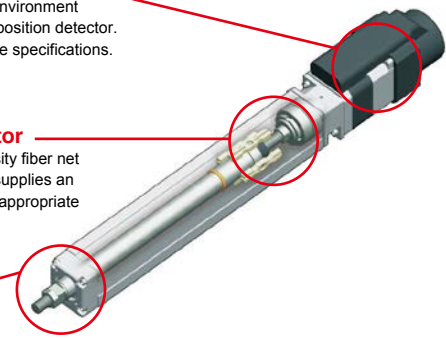
■ **Tip nozzle for grease application**

When applying the grease to the ball screw of the SR type space-saving model SR03-UB or SRD03-UB, use a grease gun with the tip bent.

Model	KCU-M3861-00

Note. YAMAHA's recommended product. This tip nozzle can be attached to a generally available grease gun.

(120) (29) φ5 (PT1/8)
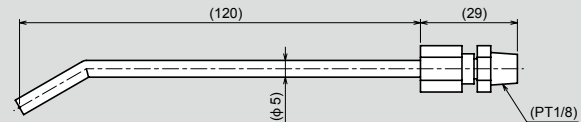
STH type (Slide table type)

Straight model

STH04-S
STH06-S

Space-saving model

STH04-R(L)
STH06-R(L)

Type	Model	Size (mm) [Note 1]	Lead (mm)	Maximum payload (kg)[Note 2]		Maximum speed (mm/sec.) [Note 3]	Stroke (mm)
				Horizontal	Vertical		
STH type (Slide table type)	STH04-S	W45 × H46	5	6	2	200	50 to 100
	STH04-R (L) [Note 4]	W73 × H51	10	4	1	400	
Straight model/ Space-saving model	STH06	W61 × H65	8	9	2	150	50 to 150
	STH06-R(L)	W106 × H70	16	6	4	400	

Note 1. The size shows approximate maximum cross sectional size.
Note 2. The payload may vary depending on the operation speed.
Note 3. The maximum speed may vary depending on the transfer weight or stroke length.

POINT

Use of a circulation type linear guide achieves the high rigidity and high accuracy.

● Guide rail is integrated with the table.
● Table deflection amount is small.
● Use of a circulation type linear guide achieves the high rigidity and high accuracy.
● STH06 provides an allowable overhang exceeding that of FLIP-X series T9.
● Space-saving model with the motor built-into the body is also added to the product lineup.
● Suitable for precision assembly.

Positioning pin hole
Workpiece installation reproducibility is improved.

Body installation through hole
Installation is possible from the top surface.
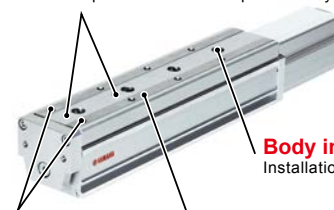
Workpiece installation tap   **Guide rail is integrated with the table.**

93

RF type (Rotary type)

Standard model

High rigidity model

RF02
RF03
RF04

Type	Model	Height (mm)	Torque type	Rotation torque (N • m)	Maximum pushing torque (N • m)	Maximum speed (mm/sec.)^Note 3	Rotation range (°)
RF type (Rotary type) Standard/High rigidity	RF02-N	42 (Standard)	N: Standard	0.22	0.11	420	310(RF02-N)
	RF02-S	49 (High rigidity)	H: High torque	0.32	0.16	280	360(RF02-S)
	RF03-N	53 (Standard)	N: Standard	0.8	0.4	420	320(RF03-N)
	RF03-S	62 (High rigidity)	H: High torque	1.2	0.6	280	360(RF03-S)
	RF04-N	68 (Standard)	N: Standard	6.6	3.3	420	320(RF04-N)
	RF04-S	78 (High rigidity)	H: High torque	10	5	280	360(RF04-S)

POINT

Rotation axis model, first in TRANSERVO series

- ● Rotation axis model, first in TRANSERVO series
- ● Thin and compact
- ● Can be secured from the top or bottom surface.
- ● Hollow hole, through which the tool wiring is passed, is prepared.
- ● Workpiece can be attached easily.
- ● Motor is built-into the body to achieve the space-saving.
- ● Standard model or high rigidity model can be selected.

Use of highly rigid bearing makes it possible to reduce displacement amount in the radial thrust direction of the table.

Standard model   **High rigidity model**

BD type (Belt type)

Straight model

BD04
BD05
BD07

Type	Model	Size (mm) ^Note 1	Lead (mm)	Maximum payload (kg)^Note 2		Maximum speed (mm/sec.) ^Note 3	Stroke (mm)
				Horizontal	Vertical		
BD type (Belt type)	BD04	W40 × H40	48	1	-	1100	300 to 1000
	BD05	W58 × H48	48	5	-	1400	300 to 2000
	BD07	W70 × H60	48	14	-	1500	300 to 2000

Note 1. The size shows approximate maximum cross sectional size.
Note 2. The payload may vary depending on the operation speed.
Note 3. The maximum speed may vary depending on the transfer weight or stroke length.
Note 4. STH04-R (L) with 50-stroke and brake is not supported.

■ **Allowable ambient temperature for robot installation**
  STH/RF/BD type   5 to 40 °C

POINT

Belt type applicable to long stroke

- ● Applicable to up to 2000 mm-stroke.
- ● High speed movement at a speed of up to 1500 mm/sec. can be made.
- ● Maximum payload 14 kg
- ● Main body can be installed without disassembling the robot.
- ● Shutter is provided as standard equipment. This prevents grease scattering or entry of foreign object.
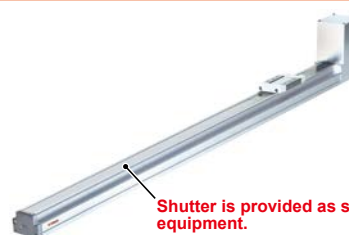
Shutter is provided as standard equipment.
This shutter covers the guide, ball screw, and belt. The shutter prevents grease scattering or entry of external foreign object.

MEMO

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

CARTESIAN ROBOTS

Offering a full lineup of Cartesian robots that come with exact performances and sizes supports a wide variety of applications.

Fulfilling product lineups

Fulfilling product lineups are provided, such as compact and low price PXYx type, HXYLx allowing long-distance transfer with a maximum payload of 50kg, and NXY with hollow servomotor used for the X-axis applicable to double-arm. Fulfilling arm and performance variations support the customers' various requests.

Additionally, various custom-order products other than models stated in the catalog are also supported. For detail, please feel free to consult YAMAHA.

Fulfilling product lineups support a wide variety of applications.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear motor single-axis robots modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN |
CONTROLLER |
YRG | Electric Gripper
APPLICATION |
SERVICE PERIOD |

Various variations

Models with 3 or more axes can be selected from: ■ Z-axis clamped base and moving table type
■ Z-axis clamped table and moving base type

PXYx   **FXYx**   **FXYBx**   **SXYx**   **MXYx**

SXYBx   **NXY**   **NXY-W**   **HXYx**   **HXYLx**
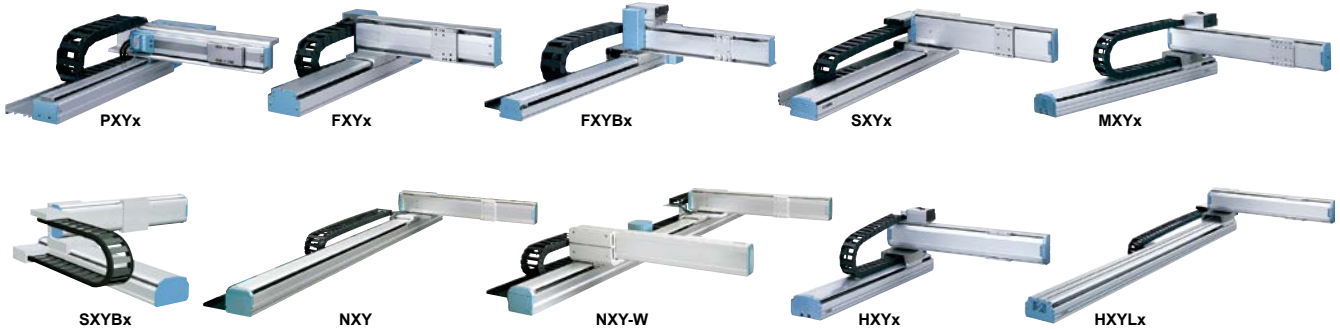
Model	Applicable arm variations					Number of axes	Maximum payload (kg)	Maximum stroke (mm)	
	Arm	Gantry	Moving arm	Pole	XZ			X-axis	Y-axis
PXYx	●	-	-	-	-	2 axes	4.5	150 to 650	50 to 300
FXYx	●	-	-	-	-	2 axes/3 axes	12	150 to 1050	150 to 550
FXYBx	●	-	-	-	-	2 axes	7	150 to 2450	150 to 550
SXYx	●	-	●	●	●	2 axes/3 axes/4 axes	20	150 to 1050	150 to 650
SXYBx	●	-	-	-	●	2 axes/3 axes/4 axes	14	150 to 3050	150 to 550
MXYx	●	●	●	●	●	2 axes/3 axes/4 axes	30	250 to 1250	150 to 650
NXY	●	-	-	-	-	2 axes/3 axes	25	500 to 2000	150 to 650
NXY-W	●	-	-	-	-	4 axes/6 axes	25	250 to 1750	150 to 650
HXYx	●	●	●	●	●	2 axes/3 axes/4 axes	40	250 to 1250	250 to 650
HXYLx	●	●	-	-	-	2 axes	40	1150 to 2050	250 to 650

Note. The maximum payloads and maximum strokes shown above are values when using arm type/cable carrier specifications.

POINT 1

Use of 4-row circular arc groove type 2-point contact achieves high durability.

4-row circular arc groove type 2-point contact guide with less differential slip is adopted. When compared to the 2-row Gothic arch type 4-point contact guide, the robot provides features that it does not stop due to catching or overload and is difficult to malfunction even under poor conditions with low installation surface accuracy or large overhang amount. Guide rail type suitable for Cartesian robots, to which moment is always applied.

2-row gothic arch groove type 4-point contact guide

Large difference in circumferential length

Differential slip is large and friction resistance is large.
● Easy to receive effects of poor installation surface accuracy, friction, and elastic deformation.
● Breakage may occur even within the calculated service life.

4-row circular arc groove type 2-point contact guide

Small difference in circumferential length

Differential slip is small and self-centering function is high.
● Resistant to alignment changes and moment loads.
● Difficult to break.

POINT 2

Highly reliable resolver is used.

A resolver is used for the 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, desired specifications can be selected 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. Furthermore, the backup circuit has been completely renovated and now has a backup period of one year in the non-energizing state.

POINT 3

Easy maintenance

Even when the built-in structure is used, the motor or ball screw can be replaced individually to ensure smooth maintenance work.

97

Low price

It was succeeded to reduce the number of parts while improving the basic performance. So, further cost reduction was achieved. Additionally, the resolver was used to eliminate the existing image "absolute specifications are expensive". Additionally, both the absolute specifications and incremental specifications use exactly same mechanical parts.

Lightweight and compact

The ball screw drive motor is renovated to a couplingless built-in structure to make dead spaces small and contribute to space saving.

Motor rotor
+
Resolver rotor

Motor stator
+
Resolver stator

Ball screw
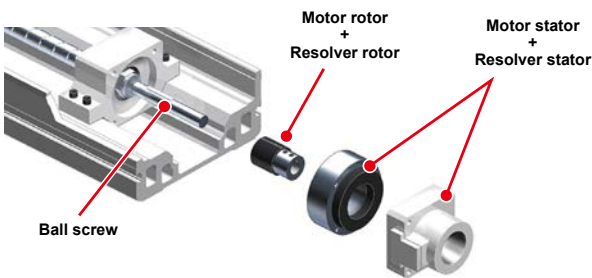
Double Y-axis available as standard

The NXY with nut rotation type structure supports a double Y-axis with two carriers arranged on the same axis. Two Cartesian robots can be made compact to improve the work efficiency at a low cost and ensures the space saving.

■ Layout using two conventional Cartesian robots

Process 1

Process 2

■ Space saving and process integration using NXY-W
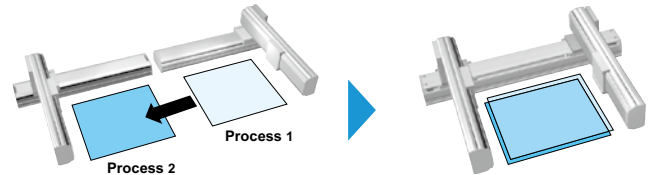
Arm & cable variations

Cable variations

Two kinds of cable specifications, cable carrier and whipover (separate cable), are available. (PXYx uses only the cable carrier.)

● Cable carrier (C)

[User cable is provided as standard equipment.]
When adding cables into a cable carrier, carefully check the space factor (30 % or less), etc.

Note. User cable: 10-core, 0.3 sq
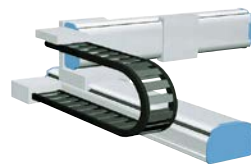
● Whipover (S)

[User cable and air tubing are provided as standard equipment.]
Be aware that sagging or faulty wiring may occur if a load is applied to the whipover.
Additionally, sagging may also occur when using a long-stroke.

Note. User cable: 7-core, 0.2 sq
Note. User tubing: φ4-air tube, 2 pcs.

Arm variations

2 axes combination

● Arm type

Type with Y-axis slider movement

● Moving arm type

Type with entire Y-axis arm movement

● XZ type

Type with combination of X-axis for horizontal movement and Z-axis for vertical movement

Clamped table/moving base

Clamped base/moving table

● Gantry type

Type with support guide attached to the Y-axis tip of the arm type

● Pole type

Type with Y-axis slider vertical movement

● Dual-robot (2 axes)

Type with synchronous drive between two axes

Note. The dual-robot is supported as a custom order.
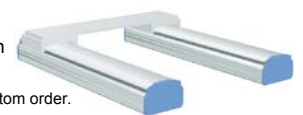
3 axes combinations

● Z-axis clamped base and
moving table type
ZR-axis model: ZT / ZF / ZFL / ZL
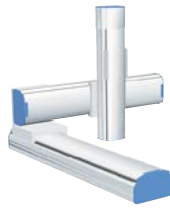
● Z-axis clamped table
and moving base type
ZR-axis model: ZFH / ZH
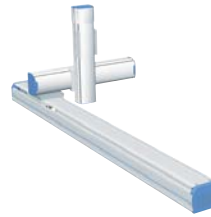
● Shaft up/down type
ZR-axis model: ZS
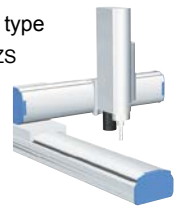
● X-Y Gantry + Z-axis
(Clamped base/moving table)
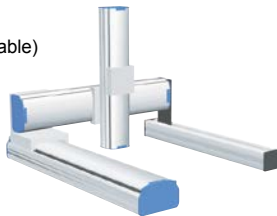
● X-Y Gantry + Z-axis
(Clamped table/moving base)
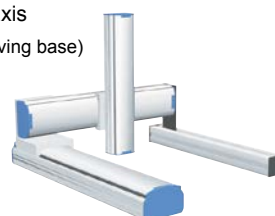
● Dual-robot (3 axes)
Note. The dual-robot is supported as a custom order.

4 axes combinations

● Z-axis clamped base and mov-
ing table type + rotation axis
ZR-axis model: ZRF / ZRFL / ZRL

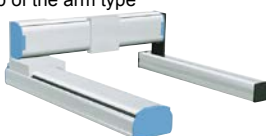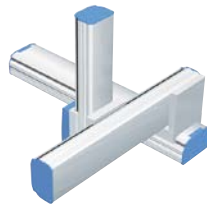● Z-axis clamped table and moving
base type + rotation axis
ZR-axis model: ZRFH / ZRH

● ZR-axis integrated type
ZR-axis model: ZRS
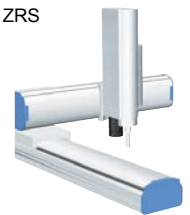
● X-Y Gantry + Z-axis
(Clamped base/moving table) +
rotation axis
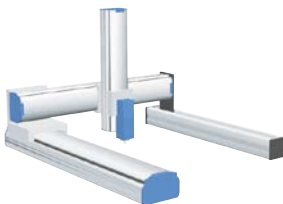
● X-Y Gantry + Z-axis
(Clamped table/moving base) +
rotation axis
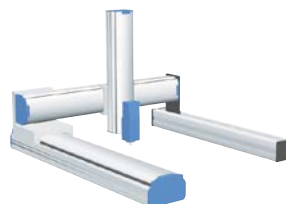
● Dual-robot (4 axes)
Note. The dual-robot is supported as a custom order.
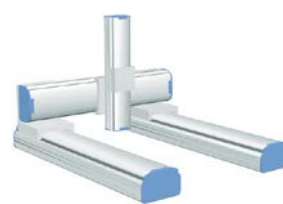
● Double Y-axis specifications
Robot model: NXY-W

6 axes combination

● Double Y-axis specifications/ Z-axis clamped
base and moving table type
Robot model: NXY-W-ZFL
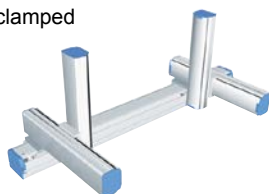
● Double Y-axis specifications/
Z-axis clamped table and moving
base type
Robot model: NXY-W-ZFH
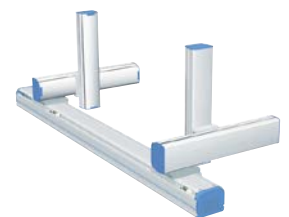
Special orders	YAMAHA supports models with strokes and payloads other than the standards as special orders. For detail, please feel free to consult YAMAHA.
	Contact Us E-mail: robotn@yamaha-motor.co.jp

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

PICK & PLACE ROBOTS

Ideal for small components high-speed pick & place work.
Positioning is made by servo control, so no complex mechanical
adjustments are needed.

Full lineup of 6 models in all from 2 axes to 4 axes

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

2 axes type

YP220BX/YP320X

3 axes type

YP220BXR/YP320XR/YP330X

4 axes type

YP340X

Model	Axis	Structure				Maximum payload (kg)	Cycle time (sec.)
		X-axis	Y-axis	Z-axis	R-axis		
YP220BX	2 axes	Belt	-	Belt	-	3	0.45
YP320X		Ball screw	-	Belt	-	3	0.57
YP220BXR	3 axes	Belt	-	Belt	Rotation axis	1	0.62
YP320XR		Ball screw	-	Belt	Rotation axis	1	0.67
YP330X		Ball screw	Ball screw	Belt	-	3	0.57
YP340X	4 axes	Ball screw	Ball screw	Belt	Rotation axis	1	0.67

POINT 1

High speed

Super high-speed pick & place operation with a standard cycle time of 0.45 sec. (YP220BX with up/down 50 mm, back/forth 150 mm, arch amount 50, load 1 kg) greatly contributes to improvement of the productivity. Since it is possible to output a signal to turn on/off any external equipment from any position while the axis is moving, the actual production cycle time is further improved.

Reciprocation 0.45 sec.

50mm

150mm
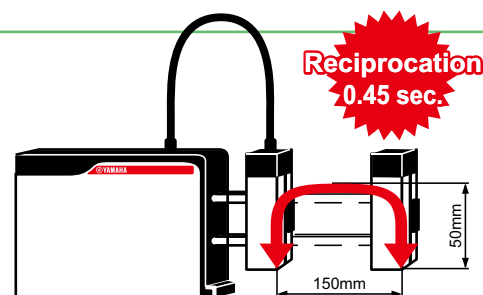
POINT 2

Compact

Use of a compact size with an overall with of 109 mm (YP220BX) makes it possible to make the production line compact and simple. The moving arm structure with less interference with surroundings contributes to space saving.

Reference examples of robot layout comparisons

The compactness can be checked by comparing the occupied spaces when the YP-X series and YAMAHA's Cartesian/ SCARA robots are laid out.

■ Line using YAMAHA's compact Cartesian robot PXYx
X-axis stroke: 250 mm
Y-axis stroke: 250 mm

Approximately **1600mm**
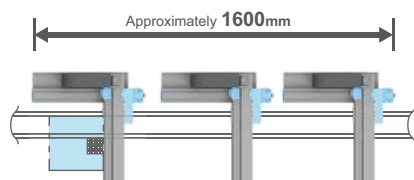
■ Line using YAMAHA's compact SCARA robot YK250XG

Approximately **1150mm**
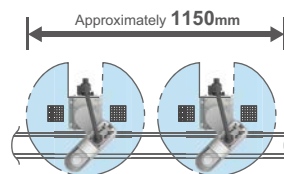
■ Line using pick & place utilizing space saving

Approximately **800mm**

POINT 3

High accuracy

Both extremely high-speed performance and high repeated positioning accuracy of +/- 0.02 mm (YP320X, YP320XR, YP330X, YP340X) are assured.

POINT 4

Complete absolute position system

As the complete absolute position system is used, no return-to-origin operation is needed.

POINT 5

Versatility

Use of YAMAHA's unique servo system makes it possible to freely program the stop point and operation pattern settings. This robot is applicable to production of many models in small quantities that cannot be supported by the cam type robot.

CLEAN ROBOTS

Suitable for electronics component, food, and medical unit related work in clean room.
High sealing structure, dust generation prevention, and improvement of suction efficiency are achieved.
Both the high cleanliness degree and high performance are established.
Clean robots contribute to automation and labor saving of production systems in clean rooms.

Both high cleanliness degree and high performance were achieved. Clean single-axis, Cartesian, and SCARA robots were added to the product lineup.

Clean SCARA robots

YK-XGC/XC type

The Z-axis spline is covered with bellows made of materials with low dust generation and other sliding parts are sealed completely. Harnesses are also incorporated completely and the inside of the robot is sucked from the rear of the base to prevent dust generation.

- **Arm length:** 180 mm to 1000 mm
- **Suction amount:** 30 to 60 Nℓ/min.
- **Cleanliness degree:** ISO CLASS 3 *ISO14644-1
- **Maximum payload:** 20 kg

YK250XGC   **YK400XGC**

POINT 1

Vertical bellows structure improves the reliability of the clean performance.

As a beltless structure is used, no dust generation caused by the belt occurs. Furthermore, as the YK-XGC type was renewed to a structure, in which the bellows are installed on the Z-axis vertically, the reliability of the clean performance was further improved.

Note. Except for YK500XC to YK1000XC

POINT 2

High durability

As a beltless structure is used, the robot can be operated without worry about belt elongation and secular change Note. Additionally, the bellows installed on the Z-axis use material with high durability to ensure the durability performance.

Note. Except for YK500XC to YK1000XC

POINT 3

Completely beltless structure improves the rigidity.

A completely beltless structure was achieved using a ZR-axis direct coupling structure. As a speed reducer is coupled to the tip rotation axis, the R-axis tolerable moment of inertia is very high and the high-speed movement is possible even with a heavy workpiece or largely offset workpiece.

Note. Except for YK500XC to YK1000XC

Conventional model

- Vertical axis motor
- Rotation axis motor
- Drive by pulley and timing belt
- ● Rigidity and accuracy are determined by belt.
- ● Secular change, such as belt elongation occurs.

YK-XGC/XC type
(Including YK180XC/YK220XC)

- Vertical axis Ball screw
- Rotation axis Hollow motor
- Vertical axis motor (direct coupling)
- Rotation axis hollow speed reducer
- ● High rigidity and high accuracy
- ● No worry about belt elongation and breakage
- ● Maintenance free

Type	Model	Arm length (mm)	Maximum payload (kg)	Standard cycle time (sec.)	Beltless structure
Extra small type	YK180XC	180	1.0	0.42	○
	YK220XC	220		0.45	○
Small type	YK250XGC	250	4.0	0.50	○
	YK350XGC	350		0.52	○
	YK400XGC	400		0.50	○
Medium type	YK500XC	500	10.0	0.53	–
	YK500XGLC	500	4.0	0.66	○
	YK600XC	600	10.0	0.56	–
	YK600XGLC	600	4.0	0.71	○
Large type	YK700XC	700	20.0	0.57	–
	YK800XC	800			–
	YK1000XC	1000		0.60	–

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

Clean single-axis robot / Clean motor-less single-axis actuator

Robonity series (Advanced model)

Clean room specifications of the single-axis robot/motor-less single-axis actuator "Robonity series". The slider type advanced models have clean room specifications as standard. Our wide lineup of products can be used for various applications such as production processes for food, medical products, and cosmetics.

- ■ Stroke: 50 to 1450 mm
- ■ Suction amount: 30 to 115 Nℓ/min
- ■ Cleanliness degree: ISO CLASS 3 *ISO14644-1
- ■ Maximum payload: 160kg (when installed horizontally)

POINT

Careful design

1. Dust-proof stainless steel sheet: Prevents grease scattering and entry of foreign objects from outside.
2. Roller specifications of slider section: Prevents dust generation due to friction.
3. Suction port: Prevents dust generation by suction and entry of foreign objects by purging.

Stainless steel sheet as standard

Slider section:
Roller specification that does not easily generate wear particles.

Suction port as standard

Motor: IP67

■ Supported only by installing the suction air joint

Model Model A: Single-axis robot Model L: Motor-less single-axis actuator	Size (mm) Note 1	Lead (mm)	Maximum payload (kg)		Maximum speed (mm/sec.)	Stroke (mm)
			Horizontal	Vertical		
AGXS05/LGXS05	W48×H65	20	5	2	1333	50 to 800
		10	8	4	666	
		5	13	8	333	
AGXS05L/LGXS05L	W48×H65	20	12	3	1333	50 to 800
		10	24	6	666	
		5	32	12	333	
AGXS07/LGXS07	W70×H76.5	30	10	2	1800	50 to 1100
		20	25	4	1200	
		10	45	8	600	
		5	85	16	300	
AGXS10/LGXS10	W100×H99.5	30	25	4	1800	100 to 1250
		20	40	8	1200	
		10	80	20	600	
		5	100	30	300	
AGXS12/LGXS12	W125×H101	30	35	8	1800	100 to 1250
		20	50	15	1200	
		10	95	25	600	
		5	115	45	300	
AGXS12/LGXS12	W125×H101	30	35	8	1800	100 to 1250
		20	50	15	1200	
		10	95	25	600	
		5	115	45	300	
AGXS16/LGXS16	W160×H130	40	45	12	2400	100 to 1450
		20	95	28	1200	
		10	130	55	600	
AGXS20/LGXS20	W200×H140	40	65	15	2400	100 to 1450
		20	130	35	1200	
		10	160	65	600	

Note 1. The size shows approximate maximum cross sectional size.

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

Clean single-axis robots

FLIP-XC type

The FLIP-XC type robots are single-axis robots "FLIP-X series" with clean room specifications. According to the applications, an optimal robot can be selected from 14 models from a lightweight and compact model to a large model with a maximum payload of 120 kg. As an air joint for suction is provided as standard equipment, grease with low dust generative characteristics is used, and stainless sheets with an excellent durability are used for the slide table surface, high cleanliness degree is achieved.
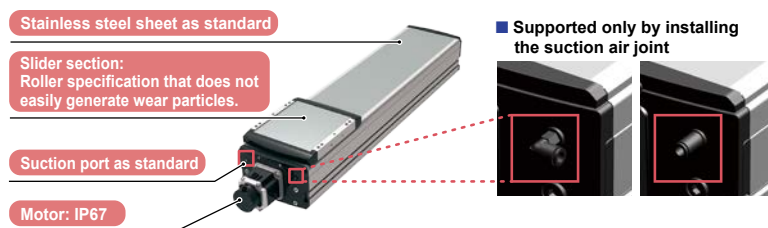
- ■ Stroke: 50 to 2050 mm
- ■ Suction amount: 15 to 90 Nℓ/min.
- ■ Cleanliness degree: ISO CLASS 3 *ISO14644-1
- ■ Maximum payload: 120 kg (When installed horizontally)

C6L   C5L   C4L
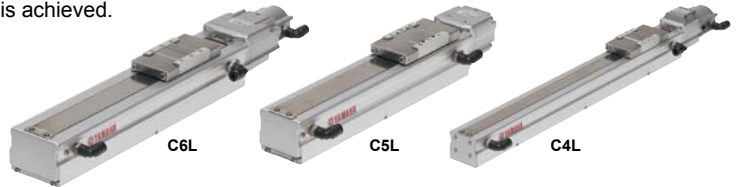
POINT

Excellent maintenance ability

For C4L to C6L models, removing the screws from the side panel of the slider will allow replacement of the inner roller without detaching the tool. For C8 to C20 models, even when the direct coupling structure is used, the motor or ball screw can be replaced individually.

As the table top can be slid horizontally by removing the screws, this ensures easy maintenance work.

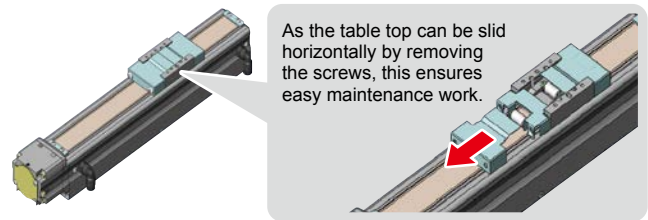| Model	Size (mm) Note 1	Lead (mm)	Maximum payload (kg)		Maximum speed (mm/sec.)	Stroke (mm)
			Horizontal	Vertical		
C4L C4LH	W45 × H55	12	4.5	1.2	720	50 to 400
		6	6	2.4	360	
		2	6	7.2	120	
C5L C5LH	W55 × H65	20	3	-	1000	50 to 800
		12	5	1.2	800	
		6	9	2.4	400	
C6L	W65 × H65	20	10	-	1000	50 to 800
		12	12	4	800	
		6	30	8	400	
C8	W80 × H75	20	12	-	1000	150 to 800
		12	20	4	720	
		6	40	8	360	
C8L	W80 × H75	20	20	4	1000	150 to 1050
		10	40	8	600	
		5	50	16	300	
C8LH	W80 × H75	20	30	-	1000	150 to 1050
		10	60	-	600	
		5	80	-	300	
C10	W104 × H85	20	20	4	1000	150 to 1050
		10	40	10	500	
		5	60	20	250	
C14	W136 × H96	20	30	4	1000	150 to 1050
		10	55	10	500	
		5	80	20	250	
C14H	W136 × H96	20	40	8	1000	150 to 1050
		10	80	20	500	
		5	100	30	250	
C17	W168 × H114	20	80	15	1000	250 to 1250
		10	120	35	600	
C17L	W168 × H114	50	50	10	1000	1150 to 2050
C20	W202 × H117	20	120	25	1000	250 to 1250
		10	-	45	500	

Note 1. The size shows approximate maximum cross sectional size.

Clean single-axis robots

SSC type (TRANSERVO)

The SSC type robots are stepping motor single-axis robots "TRANSERVO series" with clean room specifications. Use of a newly developed vector control method achieves the function and performance equivalent to the servomotor at a low cost even using the stepping motor. As an air joint for suction is provided as standard equipment, grease with low dust generative characteristics is used and stainless sheets with an excellent durability are used for the slide table surface, the high cleanliness degree is achieved.

■ Stroke: 50 to 800 mm
■ Suction amount: 15 to 80 Nℓ/min.
■ Cleanliness degree: ISO CLASS 3 *ISO14644-1
■ Maximum payload: 12 kg (When installed horizontally)

SSC04   SSC05   SSC05H

Model	Size (mm) Note 1	Lead (mm)	Maximum payload (kg)		Maximum speed (mm/sec.)	Stroke (mm)
			Horizontal	Vertical		
SSC04	W49 × H59	12	2	1	600	50 to 400
		6	4	2	300	
		2	6	4	100	
SSC05	W55 × H56	20	4	-	1000	50 to 800
		12	6	1	600	
		6	10	2	300	
SSC05H	W55 × H56	20	6	-	1000	50 to 800
		12	8	2	600 (horizontal) / 500 (vertical)	
		6	12	4	300 (horizontal) / 250 (vertical)	

Note 1. The size shows approximate maximum cross sectional size.

Clean Cartesian robots

XY-XC type

This Cartesian robot XY-XC type is applicable to clean rooms. As stainless sheets with excellent durability are used, the opening can be designed to be its minimum level and the robots area applicable to CLASS10 with less suction amount. Furthermore, as the ZR-axis of the SXYxC uses a super high speed unit of the SCARA robot, this achieves great reduction of the cycle time.

■ Suction amount: 60 to 90 Nℓ/min.
■ Cleanliness degree: ISO CLASS 3 *ISO14644-1
■ Maximum payload: 20 kg
■ Maximum speed: 1000 mm/sec.

SXYxC

Note. User wiring: D-Sub 25-pin connector (Numbers 1 to 24 are already wired and number 25 is frame ground.)
Note. User tubing: φ6-air tube, 3 pcs.

Type	Model	Axis	Movement range	Maximum speed (mm/sec.)	Maximum payload (kg)
2 axes	SXYxC	X	150 to 1050mm	1000	20
		Y	150 to 650mm	1000	
3 axes	SXYxC (ZSC12)	X	150 to 1050mm	1000	3
		Y	150 to 650mm	1000	
		Z	150mm	1000	
	SXYxC (ZSC6)	X	150 to 1050mm	1000	5
		Y	150 to 650mm	1000	
		Z	150mm	500	
4 axes	SXYxC (ZRSC12)	X	150 to 1050mm	1000	3
		Y	150 to 650mm	1000	
		Z	150mm	1000	
		R	360°	1020°/sec	
	SXYxC (ZRSC6)	X	150 to 1050mm	1000	5
		Y	150 to 650mm	1000	
		Z	150mm	500	
		R	360°	1020°/sec	

MEMO

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

CONTROLLERS

An optimal controller can be selected from various command input formats.
As servo parameters and deceleration patterns suitable for robots are pre-registered, robots can be operated quickly without complex settings.

High performance controllers supporting YAMAHA robots

		TRANSERVO	Robonity	FLIP-X		PHASER
		Stepping motor	[ABAS/ABAR/AGXS] General-purpose servomotor	[T4L/T5L] Small type servomotor (24 V·30 W)	General-purpose servomotor (30 to 600W)	Linear motor
1 axis	• I/O point trace • Remote command • Online command	**P** TS-S2 P.115 **P** TS-SH P.115	**P** EP-01 P.113		**P** TS-X P.115	**P** TS-P P.115
	• Pulse train	**D** TS-SD P.114			**D** RDV-X P.112	**D** RDV-P P.112
	• Program (YAMAHA SRC language) • I/O point trace • Remote command • Online command			**C** ERCD P.119	**C** SR1-X P.119	**C** SR1-P P.119
2 axis	• Program (YAMAHA BASIC 2 language) • I/O command • Remote command • Online command				**C** RCX320 P.121	
3, 4 axes	• Program (YAMAHA BASIC 2 language) • Remote command • Online command				**C** RCX340 P.121	

Five or more axes can also be supported

RCX320   RCX340

YC-Link/E

Up to four RCX320, RCX340 controllers
(up to 16 controllable axes) can be connected.

The RCX340 controller and
RCX320 controller can be connected.

up to 16 axes

All programs and settings are managed using the master.

Connectable using LAN cable. YC-Link/E

Controllers without program settings

PLC
Master — Slave — Slave — Slave

Master — Slave   YC-Link/E

P : Robot positioner   **D** : Robot driver   **C** : Robot controller

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 1

Selectable from various control methods

Program input

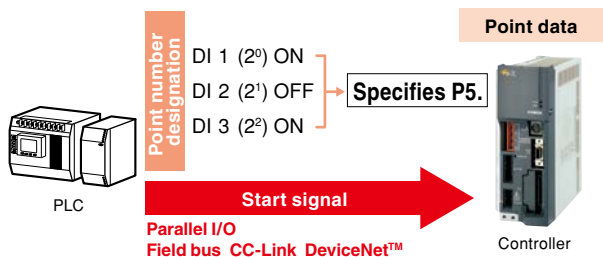#### ▌ A variety of operation settings, calculations, and conditional branching is possible

The single-axis robot controllers use the YAMAHA SRC language [Note] which is simple yet contains all required functions, such as I/O outputs and conditional branching, etc. The multi-axis controller RCX series uses the YAMAHA BASIC 2 language capable of more sophisticated programming and includes all types of arithmetic operations, flexible variable settings, and various conditional branching, etc. Both are easy to use robot language conforming to the BASIC. These languages support various needs from simple operations to expert user's sophisticated work.

Single-axis robot controller	YAMAHA SRC language <Example>	MOVA 1 , 100	Moves to point number 1 at 100 %-speed.
		DO 1 , 1	Turns on general-purpose output number 1.
		WAIT 2 , 1	Waits until general-purpose input number 2 turns on.

Multi-axis robot controller	YAMAHA BASIC 2 language <Example>	IF DO(10)=1 THEN * END	Jumps to *END if general-purpose input number 10 turns on. Otherwise, moves to the next line.
		MOVE P, P2, STOPON DI(1) =1	Moves to point number 2. Stops when general-purpose input number 1 turns on during movement.
		WAIT ARM	Waits until the robot arm operation ends.
		P3=WHERE	Writes the current position into point number 3.
		* END:	Defines the label named "END".
		HOLD	Pauses the program.

I/O point trace

▌ Program-less means easy

The host unit specifies a point number in binary format and the robot moves to the specified point when the start signal is input. The controller can operate only by teaching the point data without programs.
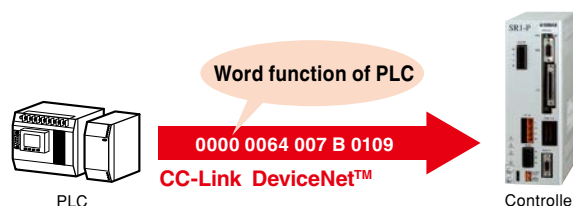

Point number designation

DI 1 (2^0) ON
DI 2 (2^1) OFF
DI 3 (2^2) ON

Specifies P5.

Point data

Start signal

Parallel I/O
Field bus CC-Link DeviceNet™

PLC

Controller

Pulse train

▌ Acceleration/deceleration curves can be created freely

The robot is controlled using pulse trains sent from the positioning unit. The controller does not need to have programs or point data. This pulse train is convenient when the control is centralized to the host unit.

Pulse train

Positioning unit

Controller

Remote command

▌ Ideal for unified data management

The word function of the CC-Link or DeviceNet™ is used to issue various commands or data to the robot. The expandability of the word function from simple operation instructions to point data writing is fully utilized to freely use the robot controller functions from the host unit.
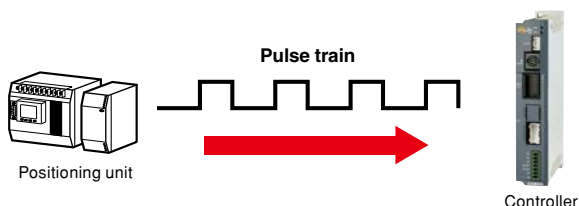
Note. This function is enabled when selecting an option network board.

Word function of PLC

PLC

0000 0064 007 B 0109
CC-Link DeviceNet™

Controller

Online command

▌ Execute everything from a PC

The PC can issue various commands or data to the controller or receive the data or status through the RS-232C or Ethernet [Note]. All executable operations from the teaching pendant can be executed from the PC.

Note. Ethernet is enabled when selecting an option network board.
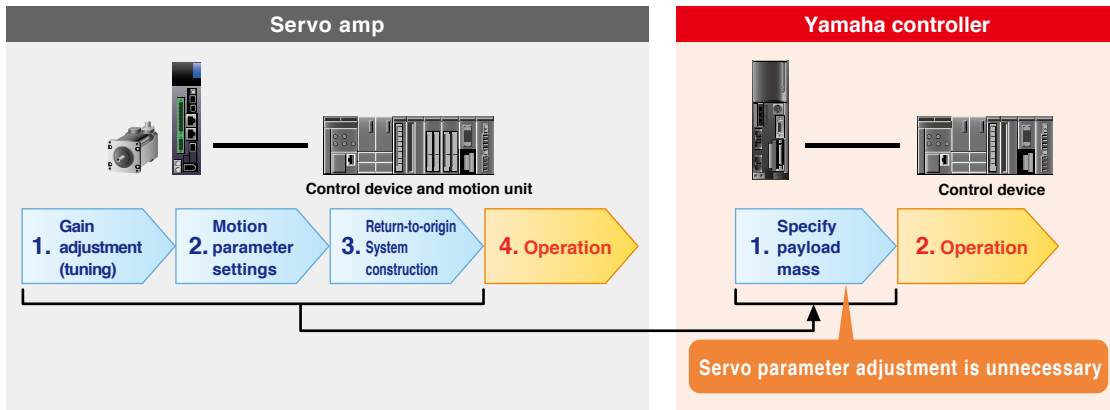(For the RCX320 and RCX340, Ethernet is provided as standard function.)

@MOVA1,100 c/r I/f

PC

Controller

110

Linear conveyor modules | LCMR200
Single-axis robots | GX
Controller | YHX
Linear conveyor modules | LCM100
SCARA robots | YK-X
Robot Vision | RCX iVY2+
Single-axis robots | Robonity
Linear motor single-axis robots | PHASER
Single-axis robots | FLIP-X
Compact single-axis robots | TRANSERVO
Cartesian robots | XY-X
Pick & place robots | YP-X
CLEAN
CONTROLLER
Electric Gripper | YRG
APPLICATION
SERVICE PERIOD

POINT 2

Easy optimal setup
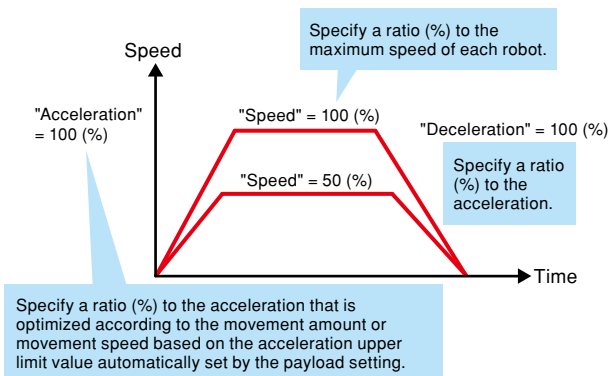
▋ Complicated parameter settings are unnecessary

Robot controllers are specially designed for YAMAHA robots. Optimal values for servo parameters required for robot operation, such as gain are already registered beforehand. Start operating immediately without any need for complicated settings or tuning, even if you don't have knowledge or experience about control.

Servo amp	Yamaha controller

Control device and motion unit

Control device

1. Gain adjustment (tuning)
2. Motion parameter settings
3. Return-to-origin System construction
4. Operation

1. Specify payload mass
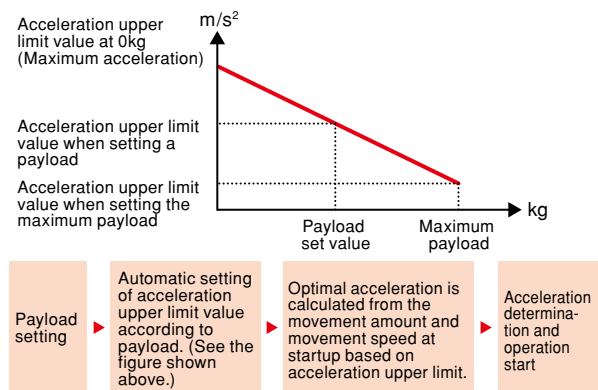2. Operation

Servo parameter adjustment is unnecessary

▋ Easy acceleration/deceleration settings

The acceleration/deceleration is an important factor that affects the service life of the machine. If too high acceleration is set, this may cause the service life of the machine to shorten. If the acceleration is too low, the motor power cannot be used effectively, causing the tact time to lower. The acceleration/deceleration setting of YAMAHA robot controller is determined finely by load weight. Setting only payload parameters will automatically set optimal acceleration/deceleration by taking the service life of the machine and motor capability into consideration. Detailed robot knowledge from YAMAHA is what makes this possible. (Note: For the pulse train input, the customer may need to set the acceleration/deceleration.)

▋ Concept of speed and acceleration

Speed

Specify a ratio (%) to the maximum speed of each robot.

"Acceleration" = 100 (%)

"Speed" = 100 (%)

"Deceleration" = 100 (%)

"Speed" = 50 (%)

Specify a ratio (%) to the acceleration.

Time

Specify a ratio (%) to the acceleration that is optimized according to the movement amount or movement speed based on the acceleration upper limit value automatically set by the payload setting.

▋ Acceleration calculation algorithm

m/s^2

Acceleration upper limit value at 0kg (Maximum acceleration)

Acceleration upper limit value when setting a payload

Acceleration upper limit value when setting the maximum payload

Payload set value

Maximum payload

kg

Payload setting ▶ Automatic setting of acceleration upper limit value according to payload. (See the figure shown above.) ▶ Optimal acceleration is calculated from the movement amount and movement speed at startup based on acceleration upper limit. ▶ Acceleration determination and operation start

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

The SCARA robot also incorporates a zone control function that always operates the robot at its maximum performance level by considering changes in inertia due to the arm posture. 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 to bring out the full power of the motor and keep the high acceleration / deceleration.

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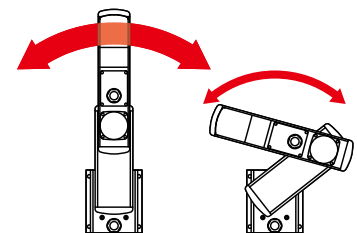
This may greatly affect the service life, vibration during operation, and controllability.

f 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.**

111

POINT 3

Multi-function and expandability

■ Multi-axis controllers support up to 30,000 points while single-axis controllers support up to 1,000 points. Up to 100 programs can be created on each controller.

■ Various field networks, CC-Link, DeviceNet™, PROFIBUS, and EtherNet/IP™ are supported.
   Note. Some models do not support all networks.

■ The TS series, RD series, SR1 series, and RCX series use a dual-power supply system with separate control power supply and power supply.

■ As the controllers conform to the CE marking that is safety standards in EU (Europe), they can be used safely even overseas.
   The TS series (except for TS-S), SR1 series, and RCX series conform to up to safety category 4.

Name	Type	Number of points	Number of programs	Applicable network						Industrial Ethernet	Compliance with CE
				CC-Link	DeviceNet™	EtherNet/IP™	PROFIBUS	PROFINET	EtherCAT		
TS-S2/TS-SH	1 axis robot positioner	255	–	○	○	○	–	○	–	–	○
TS-X/TS-P		255	–	○	○	○	–	○	–	–	○
EP-01		255	–	○	–	○	–	○	○	○	○
TS-SD	1 axis robot driver	–	–	–	–	–	–	–	–	–	○
RDV-X/RDV-P		–	–	–	–	–	–	–	–	–	○
ERCD	1 axis robot controller	1,000	100	–	–	–	–	–	–	–	–
SR1-X/SR1-P		1,000	100	○	○	–	○	–	–	–	○
RCX320	1 to 2 axes controller	30,000	100	○	○	○	○	○	○	○	○
RCX340	1 to 4 axes controller	30,000	100	○	○	○	○	○	○	○	○

RDV-X/RDV-P   FLIP-X   PHASER

[Robot driver]

RDV-X   RDV-P

Operation method	Pulse train
Input power	Main power Single-phase/3-phase AC 200 V to 230 V Control power Single-phase AC 200 V to 230 V
Origin search method	Incremental

▌ Dedicated pulse train control

The dedicated pulse train control has achieved a compact body and a low price.

▌ Position setting time reduced by 40%

The response frequency is enhanced about two times in comparison with former models. The position setting time of uniaxial robots is reduced by about 40%.[Note 1]

▌ Large cost reduction possible

It is easy to assemble them in automated machinery. You can save much labor in designing, parts selection, setting and more. A large cost reduction is possible.

▌ Contributing to saving space for the whole control board

The compact design has reduced the width up to a maximum of 38% in comparison with former models. In addition, the improvement of radiation efficiency makes it possible to arrange the devices with less space in between. Multiple units can be installed side by side in a neat arrangement.

▌ Easy replacement

The parameter settings and fastening-hole pitches are the same as those of former models. It is easy to replace the software and the hardware as well.

▌ Command input: Line driver (2 Mpps)

▌ Command output: ABZ-phase output (with a divider function)

▌ Real-time operation status monitoring

You can have analog outputs for speed, amperage, and more information to know the operation status in real time. RDV-Manager, the dedicated support software, is also available for a graphical view of the status.

▌ Main power: Single and three phases supported (200V)

The full-specification operation is available with a single-phase power supply.

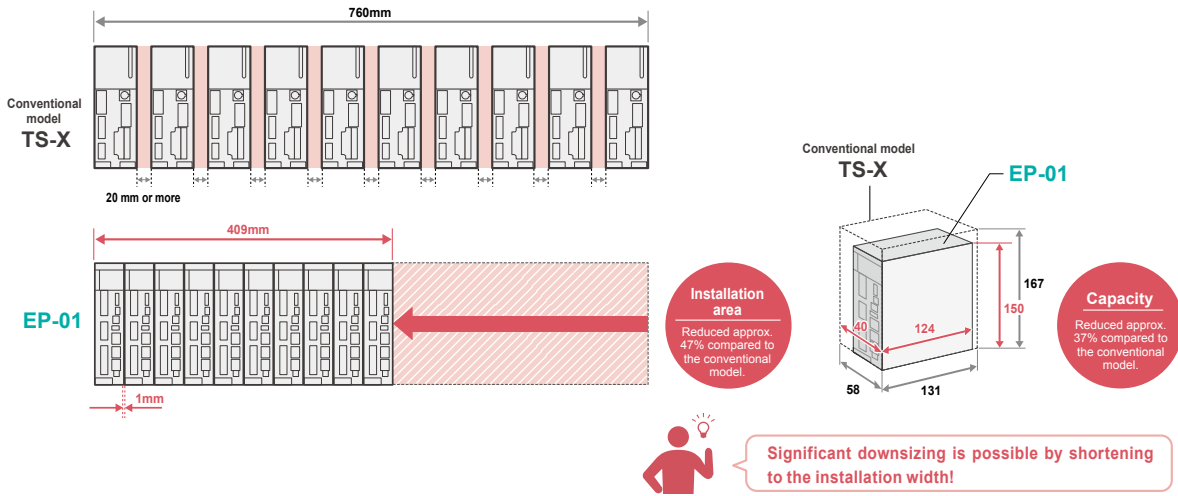Note 1. With a 400W servomotor, 20mm ball screw lead, and portability of 40kg.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

EP-01   P.68   Robonity ABAS/AGXS/ABAR

[Robot positioner]

EP-01-A10   EP-01-A30

Operation method		Point trace (positioning operation by specifying the point number) / remote command
Input power	Main power	Single-phase 200 to 230 V AC ± 10%, 50/60 Hz
	Control power	Single-phase 200 to 230 V AC ± 10%, 50/60 Hz
Return-to-origin method		Absolute

Ideal for space saving

The controllers can be installed by narrowing the distance between them.

760mm

Conventional model **TS-X**

20 mm or more

409mm

EP-01

1mm

Conventional model **TS-X**   **EP-01**

167
150
40   124
58   131

Installation area
Reduced approx. 47% compared to the conventional model.

Capacity
Reduced approx. 37% compared to the conventional model.

Significant downsizing is possible by shortening to the installation width!

Support software "EP-Manager"

Free download available

Support software "EP-Manager" that allows you to perform "Setting" → "Pre-check" → "Debug" → "Maintenance" in a single step is provided free of charge.
Easy edit for robot operation, positioning, timing, or monitoring motor load.

Free

EP-Manager

Download from the web site (member site).

What you can do with EP-Manager.

| Parameter setting | Point setting | Debug (real-time trace) | Robot operation | Operation simulation | Maintenance (alarm history check) |
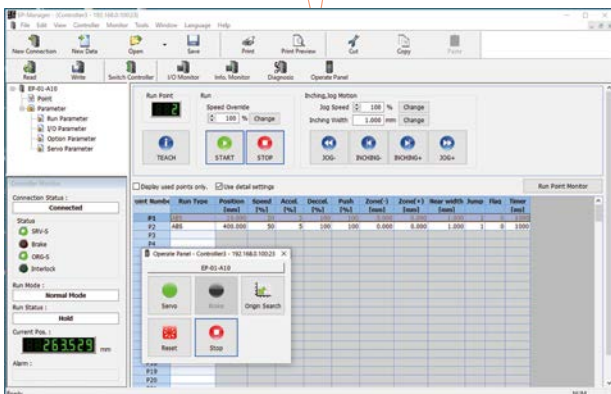
Main window

Extensive functions from pre-check to maintenance

Pre-check

Operation simulator

Operation simulator function is included to enable of-fline simulation.

Debug

Real-time trace

This function traces the current position, speed, load percentage, current, and voltage at real-time. Additionally,once trigger conditions are set, data can be automatically obtained when these conditions are met. Furthermore, by specifying a zone from the monitor results, the maximum value, minimum value, and average value can be calculated. These values are handy for trouble shooting.

Maintenance

Alarm history check

In addition to the position, speed, operation status, current value, and voltage value in case of an alarm, the I/O status of the input/output is displayed.
This contributes to analysis of the status.

113

TS Series Common features

Torque decrease in high-speed area is suppressed

As a vector control method is used, the torque decrease in high-speed area is small and high-speed operation even with high payload can be performed. This greatly contributes to shortening of the tact time.

TS-Manager: Real-time trace function

The current position, speed, load factor, current value, and voltage value, etc. can be traced at real-time. Additionally, as trigger conditions are set, the data when the conditions are satisfied can be automatically acquired. Furthermore, as a range is specified from the monitor results, the maximum value, minimum value, and average value can be calculated. So, this is useful for the analysis if a trouble occurs.

Real-time traceable items (up to four items)		
• Voltage type	• Command position	• Current position
• Command speed	• Current speed	• Internal temperature
• Command current value	• Current current value	• Motor load factor
• Input/output I/O state	• Input pulse count Note 1	• Movement pulse count Note 1
• Word input/output state Note 2		

Note. 1: TS-SD only   Note. 2: TS controller only

Excellent silence Note

High-pitched operation sounds unique to the stepping motor are suppressed to achieve silent operation sounds similar to the AC servo.

Daisy chain function

As multiple TS series controllers and drivers are connected in a daisy chain, the data of a desired unit can be edited from the personal computer (up to 16 units).

Up to 16 units
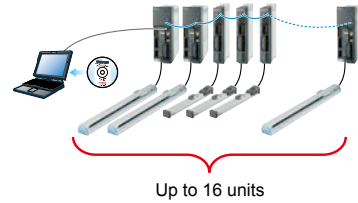
Note. TRANSERVO series

POINT

Usable for all TRANSERVO series models

TS-S2   TS-SH   TS-SD Note 1

SS type
Slider type

SG type Note 2
Slider type

SR type
Rod type

STH type
Slide table type

RF type
Rotary type

BD type
Belt type
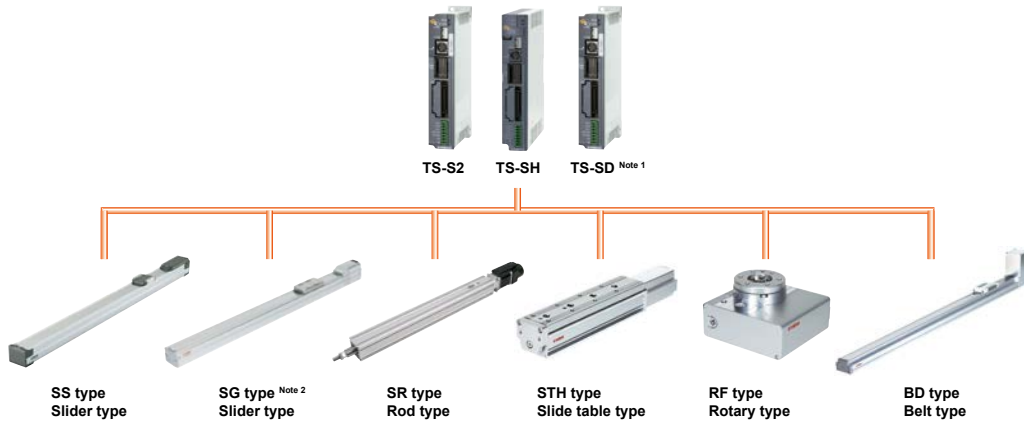
Note 1. The STH type vertical specifications and RF type sensor specifications do not support the TS-SD.
Note 2. SG07 is only applicable to TS-SH.

TS-SD   TRANSERVO

[Robot driver]

TS-SD

Operation method	Pulse train	
Input power	Main power	DC 24 V +/- 10 %
	Control power	DC 24 V +/- 10 %
Origin search method	Incremental	

Pulse train input driver dedicated to "TRANSERVO"

A robot driver dedicated to the pulse train input for "TRANSERVO".

Easy operation with support software TS-Manager

In the same manner as the robot positioner TS series, the operation can be performed with the TS-Manager (Ver.1.3.0 or later) having various convenient functions, such as robot parameter setting, backup, and real-time trace (The handy terminal "HT1" cannot use this TS Manager).

Applicable to a wide variety of pulse train command inputs

This robot driver can be made applicable to the open collector method or line driver method using the parameter setting and signal wiring. In the open collector method, a wide voltage range from 5 V to 24 V is supported. So, the robot driver can be matched to the specifications of the host unit to be used.

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

TS-S2/TS-SH   `TRANSERVO`   # TS-X/TS-P   `FLIP-X` `PHASER`

[Robot positioner]

Operation method	Point trace Remote command Online command
Number of points	255 points
Input power	Main power DC 24 V +/- 10 % Control power DC 24 V +/- 10 %
Origin search method	TS-S2 Incremental TS-SH Absolute Incremental

TS-S2   TS-SH

Operation method	Point trace Remote command Online command
Number of points	255 points
Input power	AC 100 V / AC 200 V

Origin search method	TS-X Absolute
	          Incremental
	TS-P Incremental
	          Semi-absolute

TS-X   TS-P

Design that allows a clean installation

▌ Unified installation sizes

Height and installation pitch are unified throughout the series. Units can be installed neatly within the control board.

Status indication lamps
(PWR,ERR)

Communication connectors
(COM1,COM2)

Robot I/O connector
(ROB I/O)

Motor connector
(MOTOR)

I/O connector

Regenerative unit connector
(RGEN)

Power supply connector

TS-P   TS-X   TS-S2   TS-SH

Absolute battery is neatly accommodated

The absolute battery is stored inside the unit. Replacement can be performed easily from the front side. (TS-X and TS-SH supported)

TS-X

DIN rail installation

On-board installation is made easy by the DIN rail installation mechanism that is standard on the TS-SH.
(Optionally installable on other models)

Selectable I/O interfaces

▌ Two RS-232C ports provided

● **Connect support tools**

Intuitive operation supports controller design and maintenance.

● **Daisy-chaining**

Two ports can be used to daisy-chain up to 16 units.

● **Communication commands**

Easily understood ASCII text strings can be used to perform robot operations.

▌ Selectable 100V/200V

- The TS-X/P let you select AC100/200V as the power input.
  (The 20A model is 200V only.)
- The TS-S2/SH is DC24V input.

▌ A variety of I/O interfaces

In addition to NPN and PNP, you can choose CC-Link, DeviceNet™, EtherNet/IP™, and PROFINET field networks.

CC-Link   DeviceNet   EtherNet/IP   PROFINET

● **Positioner interface**

Functionality has been condensed into an I/O interface with 16 inputs and 16 outputs. In addition to easy positioning, this also includes functionality that enhances interoperability with the control device.

● **Remote commands**

Numerical data can be directly manipulated by using the four-word input and four-word output areas. You can add new direct positioning commands to further unify the data at the control device.
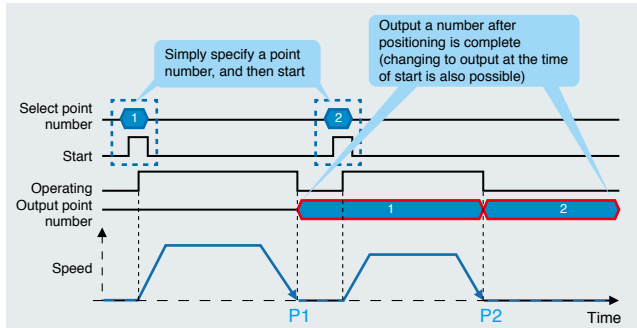
● **Gateway function**

New types of connection are provided to reduce network costs. (CC-Link, EtherNet/IP™, and PROFINET are supported.)

115

Positional interface
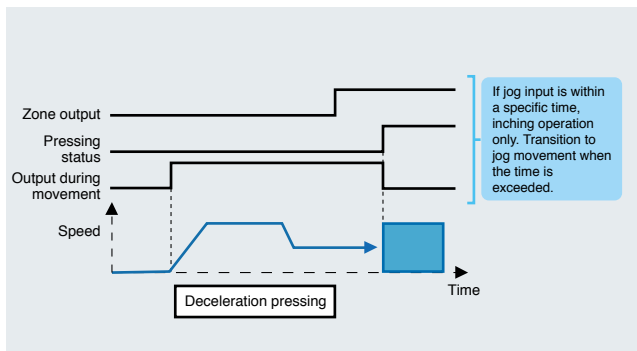
"Positioner function" for easy positioning

You can easily perform positioning operations by specifying the number of a point that is registered in the data, and entering a start command.

Simply specify a point number, and then start

Output a number after positioning is complete (changing to output at the time of start is also possible)

Number	Operation type	Position (mm)	Speed (%)	Acceleration (%)	Deceleration (%)	Branch	Timer (ms)
P1	ABS	100.00	100	100	100	0	0
P2	ABS	200.00	80	100	100	0	0

A variety of output functions

The TS controller provides a variety of status outputs that are linked with positioning operations. By selecting and using an output appropriate for the scene, this can contribute to cost-saving measures such as making the steps of the control device's program more efficient or by reducing the peripheral equipment.

If jog input is within a specific time, inching operation only. Transition to jog movement when the time is exceeded.

Deceleration pressing

List of outputs

• Zone output ....Output ON when between the two specified points
• Near position output ....Output ON when entering the specified region from the goal position
• In movement output ....Output ON when above the specified speed
• Pressing status...............Output ON when specified pressing strength is reached
   Also provided are return-to-origin completed status, manual mode status, warning output, and alarm number output, etc.

Consecutive operation, linked operation

By specifying a branch destination, it is possible to execute positioning operations consecutively. Additionally, by specifying linked operation, operation with the branch destination can be executed while changing the speed without positioning stops; this allows control programming to be simplified and takt to be shortened.
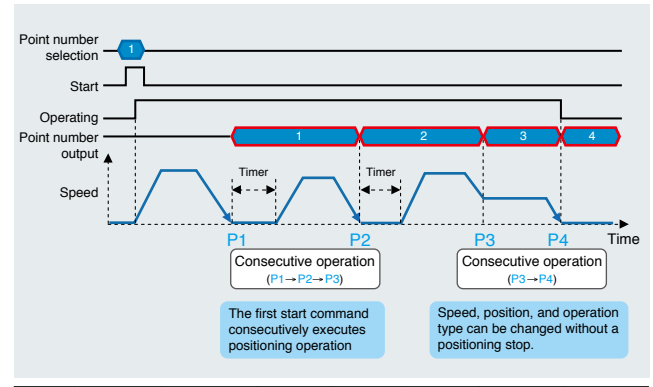
Consecutive operation (P1→P2→P3)

The first start command consecutively executes positioning operation

Consecutive operation (P3→P4)

Speed, position, and operation type can be changed without a positioning stop.

Number	Operation type	Position (mm)	Speed (%)	Acceleration (%)	Deceleration (%)	Branch	Timer (ms)
P1	ABS	100.00	100	100	100	2	500
P2	ABS	200.00	80	100	100	3	800
P3	ABS linked	300.00	100	100	100	4	0
P4	ABS	350.00	30	100	100	0	0

Jog and point teaching functions are provided as standard

Jog movement and point teaching functions are provided as standard for input signals. By linking these with buttons of a touch panel etc., a simple teaching system can be constructed.

Construct a simple teaching system
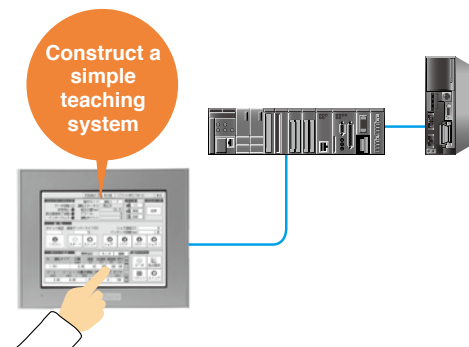
Remote commands

Ideal for unifying data management

Remote commands are functions by which the control device can directly handle data such as points and parameters using the word area of the field network.

Numerical data can be operated directly by using the word area. This promotes unification of data management.

WIN0	WIN1	WIN2	WIN3
Command	Speed data	Position data	

WOUT0	WOUT1	WOUT2	WOUT3
Status	—	Query data	

Data can be managed on the control device

Position and speed data settings and positioning commands transmitted together.

Query data output in real time every 5 ms.

Query data list
- Current position
- Current
- Internal temperature
- Point number being executed
- Current speed
- Voltage
- Load ratio

New function Direct positioning commands that directly specify position and speed data

As remote commands, "direct positioning commands" are provided, allowing the position and speed data to be specified directly and then positioning operations to be performed. In addition to unifying the positioning data on the control device, this allows it to be done with a single command, simplifying programming of the control device.

Consecutive queries for realtime update of various status information

Normally, remote commands only update data when responding, but if a consecutive query is issued, the data continues to be updated at a fixed interval until permission is given to stop. This is useful in various cases such as when it is desirable to obtain positioning data during operation for interoperation with peripheral devices, or to obtain current values in order to monitor the status of a robot.

Parallel processing of "positioner interface" and "remote commands"

Since positioner interface and remote commands operate independently of each other, parallel processing is possible.

< Usage examples >
- Obtain the current position during positioning operation
- Obtain the current position during jog movement
- Change the target position during linked operation

Parallel processing is possible

Positioner interface — Remote command

		Positioner interface		Remote command
		Positioning operation	Jog movement	Positioning operation
Remote commands	Data write	○	○	—
	Data read	○	○	—
	Consecutive query	○	○	○

○ : Parallel processing possible

"Gateway function" — a new way to connect **New function**

Decrease network cost

One controller equipped with a field network board can provide unified management of up to four I/O interfaces via a daisy-chain connection. This allows network cost to be decreased while enabling the same type of I/O control as when one board is installed for each unit. (CC-Link and EtherNet/IP™ are supported)

Previous method

A network board is required for each controller

Four CC-Link boards required

Host unit

Network board

Gateway unit

Gateway unit is separately required

Host unit

Gateway unit

NEW

Only one network board for up to four units.
Gateway unit is not required

Host unit (field network compatible)

Field network

Daisy-chain connection Note

Cost reduction from four to one CC-Link board

Note. Daisy chain connection cable is required.

Daisy chain connection

No need to connect or disconnect cables during operation (up to 16 units)

From a single PC, handy terminal, or touch-panel display, it is possible to specify point data and parameters, perform operations, and monitor the status for up to 16 axes on daisy-chained controllers. For everything from design to maintenance, a connection to only the first controller is sufficient; any desired controller can be accessed simply by switching the station number, without having to connect or disconnect cables.

HT1

Pro-face touch-panel

Connect up to 16 units
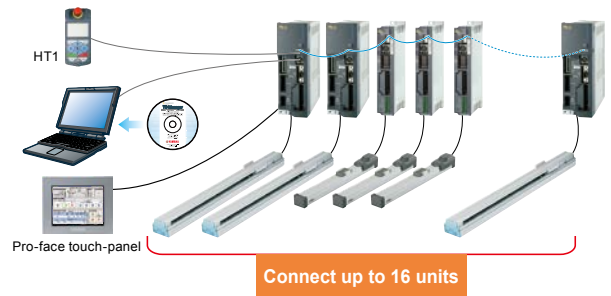
Communication commands

An easily handled command protocol using ASCII text strings supports a wide range of needs from data editing to operation and status monitoring. By daisy-chaining multiple devices, simple multi-axis control can be performed.

START

OK
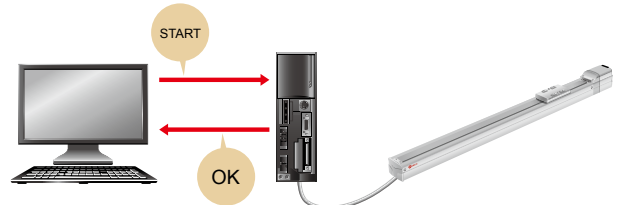
"KEYENCE PROTOCOL STUDIO Lite" serial communication settings software

By loading a TS settings file into PROTOCOL STUDIO Lite, communication settings and main communication commands can be registered automatically. Ladder-less data editing and daisy-chaining can be easily accomplished.

Contact for questions regarding PROTOCOL STUDIO Lite

Keyence Corporation, www.keyence.co.jp/red/kv01/

Daisy-chain connections (up to 16 axes)

Communication with the KV-L21V uses a Yamaha-made communication cable (D-sub type). By using daisy-chain connections, up to 16 axes can be managed together.

RS-232C

KV-L21V

Connect up to 16 units
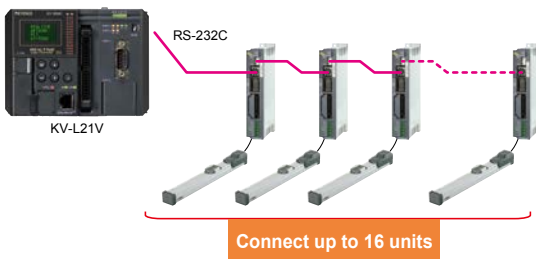
Automatic device assignment for each communication command

If the communication type is specified as cyclic, the desired information to be obtained is automatically stored in data memory.

Touch operator interface "Pro-Face" GP4000 Series

Connecting GP4000 Series made by Pro-face to Robot Positioner, TS-S2, TS-SH, TS-X, TS-P enables you to use a lot of functions as well as basic operations on Touch Operator Interface.

Free download of the program file from the Pro-face home page
http://www.proface.com

Can easily check a state and change settings.

- Check the status (the current position, speed etc)
- Basic operations such as Jog operation, inching operation, return to origin, error reset etc.
- Set, edit, or back up point data and parameters
- Check triggered alarms and detailed descriptions of alarm history

Supports 3 languages

- Supports Japanese, English, and Chinese (simplified, traditional)

Without opening the control panel, you can check the status and change the settings on Touch Operator Interface alone.

Pro-face GP4000 Series

Server

LAN

RS-422

RS-232C

Up to 16 single-axis robot positioners can be connected.

Control Device

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

SR1-X/SR1-P   FLIP-X   PHASER

[Single-axis robot controller]

SR1-X   **SR1-P**

Operation method	Program Point trace Remote command Online command	
Number of points	1000 points	
Input power	Control power	Single phase 100 to 115/200 to 230V AC +/-10% maximum

	Main power	SR1-X05/SR1-X10
		  Single phase 100 to 115/200 to 230V AC
		  +/-10% maximum
		SR1-X20
		  Single phase 200 to 230V AC +/-10%
		  maximum
		SR1-P05/SR1-P10
		  Single phase 100 to 115/200 to 230V AC
		  +/-10% maximum
		SR1-P20
		  Single phase 200 to 230V AC +/-10%
		  maximum

Origin search method	SR1-X Absolute, Incremental SR1-P Incremental, Semi-absolute	

Various command methods

An optimal method can be selected from various command methods, such as program, point trace, remote command, and online command. The program uses the YAMAHA SRC language that is similar to the BASIC. Various operations, such as I/O output and conditional branching, etc. can be executed using simple operations.

Applicable to complete absolute position system

The SR1-X is applicable to complete absolute position system. No return-to-origin is needed. (The backup period is one year in the non-energizing state.)

I/O assignment function

As the I/O assignment is changed, the point trace operation, point teaching, and trace operation by specifying coordinate values can be selected in addition to the normal program operation. Since the JOG movement through the I/O is possible in the point teaching mode, the point teaching can be performed from the host unit without the HPB.

Current position output function

The position data is output as feedback pulse or binary data. This allows the host unit to understand the current robot position at re-al-time. Furthermore, functions, zone output or point zone output to output near point number are incorporated.

Torque limiting

As this function limits the maximum torque command value at desired timing, it is effective in operations such as pushing and work-piece gripping operations. Furthermore, in addition to the torque limiting by the parameter data value, the torque limiting by the analog input voltage can be performed.

ERCD   T4L/T5L

[Single-axis robot controller]

ERCD

Operation method	Program Point trace Online command Pulse train
Number of points	1000 points
Input power	DC 24 V +/-10% maximum
Origin search method	Incremental

Four command formats

A desired command format can be selected from four command formats, program operation using various commands, point trace operation only by instructing a point number, online command, and pulse train input.

Compact design

Compact box size of W 44 × H 142 × D 117mm is achieved with the functions improved.
The installation space can be reduced greatly.

Various input/output functions

As a feedback pulse output function is provided, the host control unit can easily manage the current position. Additionally, as the movement point number can be output in binary format during point trace, the operation can be checked easily. As a teaching function using the I/O is added, the flexibility and usability of the system configuration are further improved.
This output is enabled in the program or point trace operation and the number of outputs can be changed to a desired level using the division setting.

Various monitor functions

The controller status can be checked using the input/output status monitor, duty monitor, and LED status display.

Error history and alarm history

The error or alarm history that occurred in the past can be displayed and checked on the HPB or personal computer screen.

Robot number management

As the controller is initialized by the robot number of the robot to be controlled, parameters suitable for each robot model are automatically registered and no complicated servo adjustment is needed.

Torque limiting control

The torque limiting control can be performed using the program command. The axis can be stopped with the torque applied. This torque limiting control can be used for continuous positioning of workpieces with different sizes, press-fitting work, and workpiece holding operation.
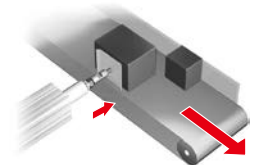
Zone output function

The general-purpose output on/off setting between desired points can be performed using the parameter setting. The positive logic/negative logic setting can be made and the axis position can be easily judged by an external unit. Up to four patterns can be set.
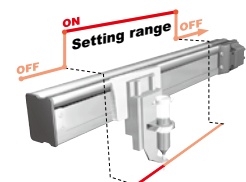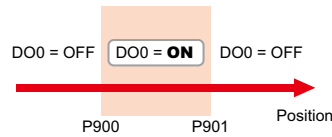
119

SR1-X/SR1-P/ERCD Various functions

Position data output function

Zone output

Outputs whether or not the robot position is within the specified range.

DO0 = OFF | DO0 = **ON** | DO0 = OFF

P900　P901　Position

It is possible to reverse the output logic.

Point zone output

Outputs the point number near the robot position in binary format.

DO (7)　(0)
0000 0011

DO (7)　(0)
0111 1111

P3　P127　Position
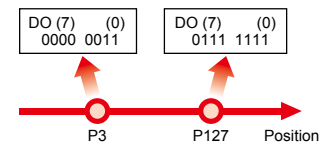
It is also possible to limit to only the moving point.

Binary output

Outputs the current robot position in 16-bit binary format. (This function is available only in the SR1.)

DO (15)　(0)
0011 1111 1100 0000

163.20 [mm]　Position
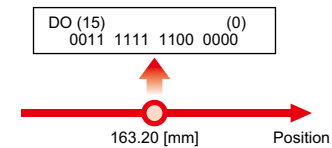
It is possible to adjust the unit of the output position data to be output using parameters.

Feedback pulse output

Outputs the current position counter value of the robot through the A/B-phase line driver.

A-phase
B-phase

Host unit (Counter)
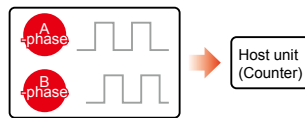
**It is possible to perform the monitoring by host unit at real-time.
A frequency division function is built-in.**

Point teaching

The JOG movement of the robot and the point reaching can be performed from the host unit.

■ Concept

- The robot is moved to the teaching position using the JOG+/JOG- command.
- The current position is registered into the point number specified by the PSET input.

JOG-　JOG+

0　Position

PSET

0　Current position　Position
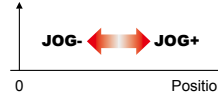
Torque limiting function

As the torque limiting is performed during operation, the operation, such as pushing and workpiece gripping can be performed.

■ Concept

CW

TLM

Torque limiting value 1

Electric current

Torque limiting value 2

CCW
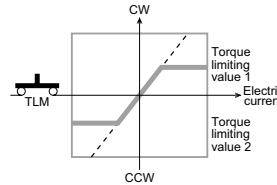
■ Features

SR1
- Host unit manages the limiting time using the TLM input.
- Limiting status is understood using the torque limiting status output (TLON).
- Torque limit value is changed (up to 4 patterns) using the input.
- Torque can be limited using the program command.
- Torque can be limited using the analog input (0 to +10 V / 12 bit).

ERCD
- Torque can be limited using the T program command.

Movement data change function

The movement speed or target position can be changed during movement. (This function is available only in the SR1.)

■ Concept

Inputs 1　Inputs 2　Inputs 3

Speed

Position
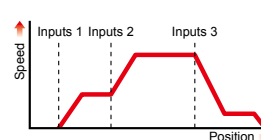
■ Features

- Host unit manages the limiting time using the movement command input.
- Movement command is ABS-PT (absolute movement command) or ABS-BN (binary specified movement command).
- Change speed can be specified in a range of 1 to 100 % (up to 4 patterns).
- Changing is disabled in the deceleration zone.

YAMAHA SRC language convenient functions

Multi-task function

This function can execute multi tasks, such as robot peripheral units in parallel at the same time. Up to four tasks can be executed. With the multi-task function combined with JMPP command, the I/O signals can be output when the robot passes through the specified point during movement.

ON
Setting range　OFF
OFF
P0　P1　P2　P3

P2

P1
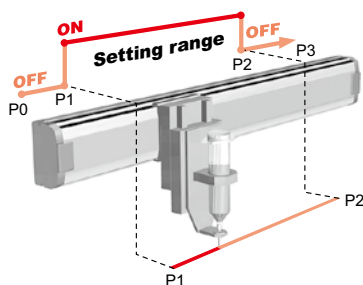
Conditional stop function during movement

The arm can be decelerated and stopped using I/O conditions of the MOVF command while it is moving. This function is useful when searching for the target position with the sensor.

I/O conditions

Stop
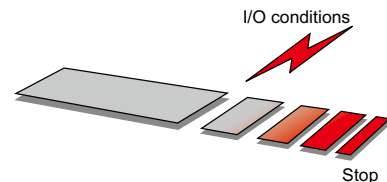
RCX3 series

RCX320 [2 axes]

RCX340 [3 to 4 axes]

[Multi-axis robot controller]

RCX320

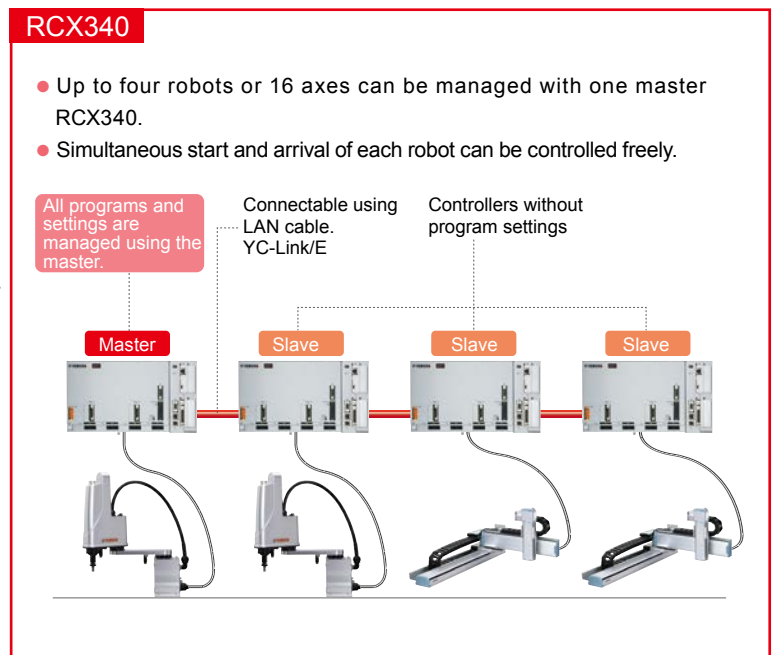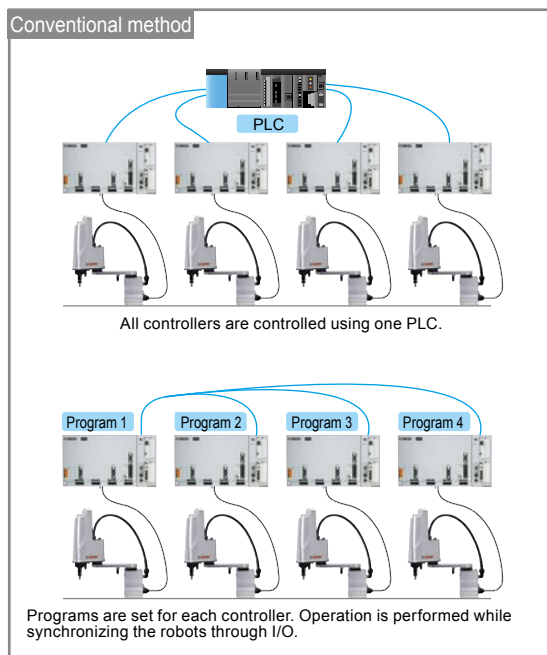| Number of axes		2 axes
Operation method		Program, Remote command, Online command
Number of points		30000 points
Input power	Control power	Single phase 200 to 230V AC +/-10% maximum
	Main power	Single phase 200 to 230V AC +/-10% maximum
Origin search method		Absolute, Incremental Semi-absolute

RCX340

Number of axes		3 to 4 axes
Operation method		Program, Remote command, Online command
Number of points		30000 points
Input power	Control power	Single phase 200 to 230V AC +/-10% maximum
	Main power	Single phase 200 to 230V AC +/-10% maximum
Origin search method		Absolute, Incremental Semi-absolute

Advanced functionality allowing construction of high-level equipment

Multiple robots can be operated synchronously through the high-speed communication. Use of linking among controllers makes it possible to store programs into only one controller. Use of a newly developed algorithm achieves shortening of the positioning time and improvement of the tracking accuracy.

▌The control of multiple robots can be managed using one master controller

The RCX340 controller allows high-speed communication among the controllers. As the operation command can be sent to the controller of each slave from the master controller, the programs or points can be managed only using the host master controller. Additionally, since the controller flexibly supports multitasking, interactions using PLCs can be simplified, making it easier to build systems at lower costs.

Conventional method

PLC

All controllers are controlled using one PLC.

Program 1 | Program 2 | Program 3 | Program 4

Programs are set for each controller. Operation is performed while synchronizing the robots through I/O.

RCX340

- Up to four robots or 16 axes can be managed with one master RCX340.
- Simultaneous start and arrival of each robot can be controlled freely.

All programs and settings are managed using the master.

Connectable using LAN cable. YC-Link/E

Controllers without program settings

Master | Slave | Slave | Slave

▌Motion optimization

The optimization of the motion to meet the operation pattern is further strengthened to bring out the robot performance at its maximum level. Higher quality robot operations, such as shortening of the operation time and suppression of vibrations during stopping are achieved.

■ Optimal acceleration/deceleration motion

Acceleration/deceleration motion is generated that can perform the high-speed operation while suppressing vibrations.

Data table is added.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

Smooth movement is achieved by greatly improving motion functions

As a new servo motion engine is incorporated, various operations can be merged. Use of a newly developed algorithm achieves shortening of the positioning time and improvement of the tracking accuracy.
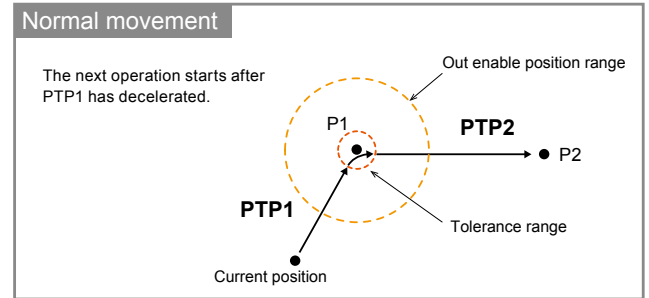
■ Expansion of CONT option function

Different type operations, such as PTP, interpolation operation, and conveyor tracking, etc. are merged to improve the speed.
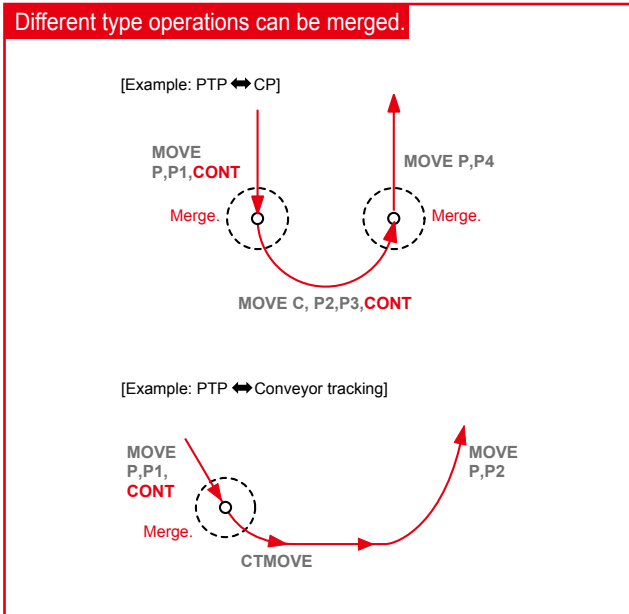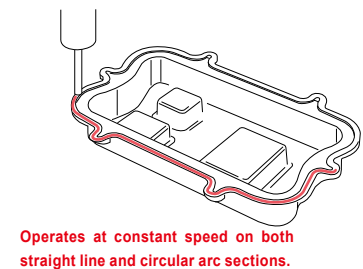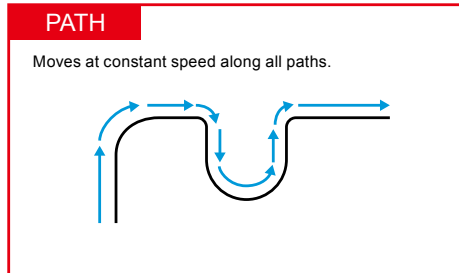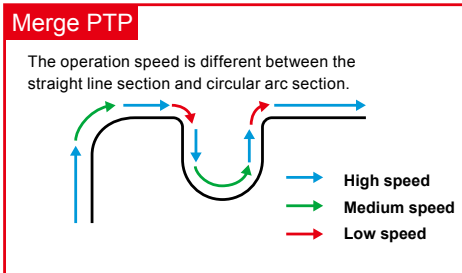
■ Improvement of continuous operation

By using the CONT option, such as when passing through a relay point in the middle of an operation to avoid an obstacle, it is possible to smoothly merge operations without decelerating and stopping for each operation. Regardless of the type of operation (PTP, interpolation operation), operations can be merged.

Different type operations can be merged.

[Example: PTP ◄► CP]

MOVE
P,P1,**CONT**

MOVE P,P4

Merge.

Merge.

MOVE C, P2,P3,**CONT**

[Example: PTP ◄► Conveyor tracking]

MOVE
P,P1,
CONT

MOVE
P,P2

Merge.

CTMOVE

Normal movement

The next operation starts after PTP1 has decelerated.

Out enable position range

P1

PTP2

P2

PTP1

Tolerance range

Current position

CONT option is used.

As the next operation starts in the middle of deceleration, the movement time is reduced.

Out enable position range

P1

PTP2

P2

PTP1

Tolerance range

Current position

■ Proper use according to application [Note]

In merge PTP, priority is given to the movement time, and the movement speed is changed between the straight line section and circular interpolation section. In PATH, by registering paths in advance, it is possible to operate at a constant speed even on complex paths, and tracking accuracy is further improved. This is ideal for applications such as sealing.

Merge PTP

The operation speed is different between the straight line section and circular arc section.

→ High speed
→ Medium speed
→ Low speed

PATH

Moves at constant speed along all paths.

Operates at constant speed on both straight line and circular arc sections.

■ PBX with USB port for backup

Simple and easy operation for adding function or editing work.

Storing backup data is a simple task.

The operation menu supports Japanese, English, and Chinese.

■ Convenient LED Display for Error Status.

The operation status is displayed on the "7-segment LED display" located on the front panel of the controller.

If an error occurs, the relevant error message is displayed. The error status can visibly recognized without connecting the programming box.

ON
OFF

SRV │ ORG │ E-STOP

▲ 7-segment LED display

■ Built-in regenerative unit   RCX340

As the regenerative unit (equivalent to RGU3) is built-in, no additional regenerative unit is needed when connecting to the existing robot.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

PC Programming Software "RCX-Studio 2020"

New functions such as 3D simulator function and program template (program template automatic creation function) are added for ease of user operation.

Evaluation		Design		Installation		Maintenance

3D simulator

Cycle time calculator

Program template
Program edit
Data edit
iVY2 editor

Custom window
Manual operation
Automatic operation
Debugging
IO monitor

Data transfer
Data comparison
Alarm history

Real time trace
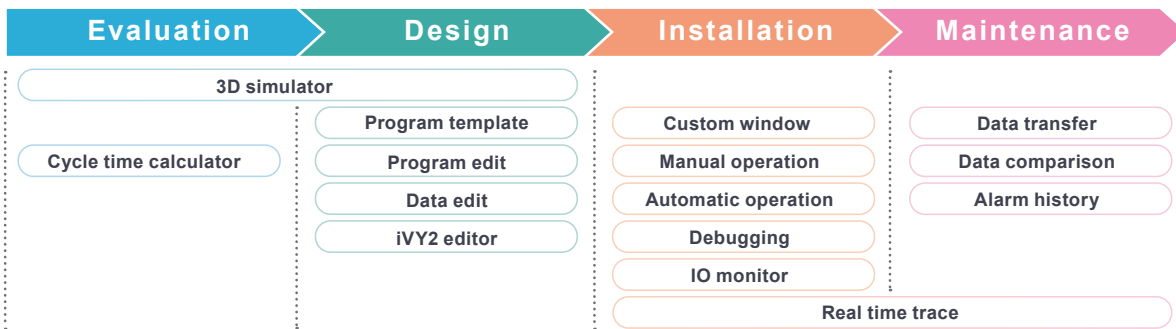
3D simulator

Layout can be verified beforehand without connecting robot.

Robots and peripheral devices are displayed in 3D, and the robot operation is simulated on PC. (This function supports SCARA and Cartesian robots.)

▶ Robot layout, teaching, and debugging can be performed.
▶ Physical interference between the robot and peripheral device can be checked before operation is started.
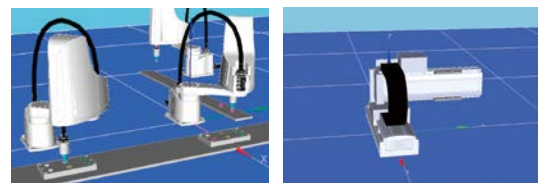
Program template (Program template automatic creation function)

Program creation time can be shortened greatly.

Program templates for 10 types of applications are incorporated. Just following the steps to perform the operation creates a program template automatically.

Supported applications

- Pick & place
- Palletizing
- Dispensing work
- Execution program switching
- Conveyor tracking
- Pallet picking using vision
- Dispensing with vision
- Gripping deviation correction using vision
- Parts orientation adjustment on the fly with vision
- Parts orientation adjustment on the fly with vision (without master)
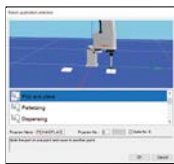
Pick & place

Palletizing
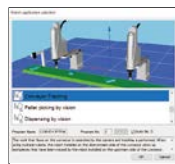
Conveyor tracking
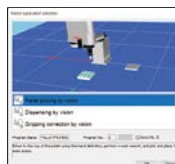
Pallet picking using vision

Parts orientation adjustment on the fly with vision

Switching execution program

Program automatic conversion function

Controller program for RCX240 and earlier is converted to that for RCX3 series.

Other functions
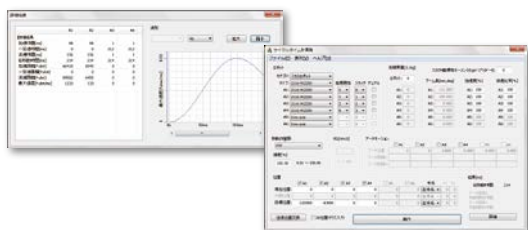
All useful features from RCX-Studio Pro are succeeded to help supporting from startup to maintenance.

Cycle time calculator

Real time trace

Data comparison

Custom window creation function

Enhanced expandability

RS-232C and Ethernet ports are provided as standard equipment. A wide variety of high-speed and large capacity field networks, such as CC-Link, DeviceNet™, EtherNet/IP™, and EtherCAT are supported as options. Connections with general-purpose servo amplifier or other company's VISION are easy. So, the RCX320 and RCX340 is called "connectable controller".

Communication between controllers

YC-Link/E

Up to four RCX320 and RCX340 controllers (up to 16 controllable axes) can be connected.

More flexible robot configuration

Easy programming

Centralized control of multiple robots

Cost reduction

■ Applicable to various field buses/centralized control of robots through connections of up to four controllers

RS-232C and Ethernet ports are provided as standard equipment. Additionally, fulfilling field buses, such as CC-Link, EtherNet/IP™, DeviceNet™, PROFIBUS, PROFINET [Note 1], and EtherCAT can be supported to connect and control a wide variety of devices. For 5 or more axes, use of YC-Link/E makes it possible to connect up to four RCX340 controllers so as to perform the centralized control of multiple robots.

Additionally, when using YC-Link/E [Note 2], multiple robots can be handled as if they are operated using one controller. This ensures very easy robot programming and management.

Therefore, this robot controller contributes to reduction of unseen costs, such as labor cost necessary for the setup work.

Note 1. Supports PROFINET Ver. 2.2
Note 2. When ordering YC-Link/E, please specify what robot is connected to what number controller.

Centralized program control

Standard equipment, Ethernet

Up to four RCX340 controllers (16 axes) can be connected.

YC-Link/E
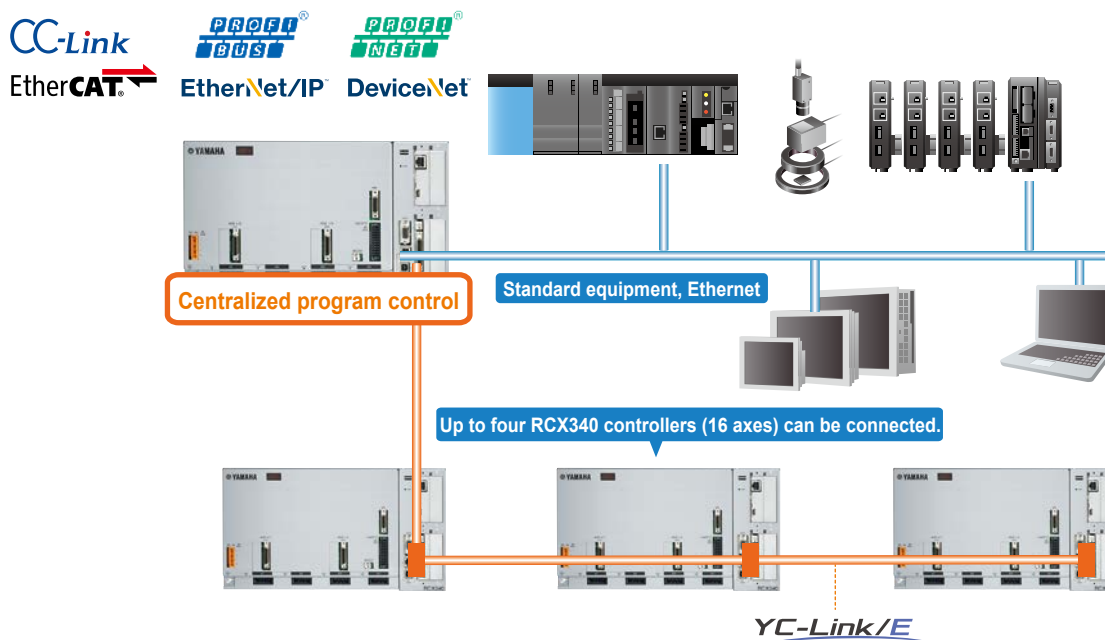
■ Applicable to robot vision and electric gripper

Robot integrated vision "RCXiVY2+" and electric gripper "YRG series" are supported. All control is possible with one robot controller. Data exchanging with the host unit, such as PLC is not needed. The setup or startup is very easy.

Robot vision: RCXiVY2+ System

Camera Light

Electric gripper: YRG series

RCX340
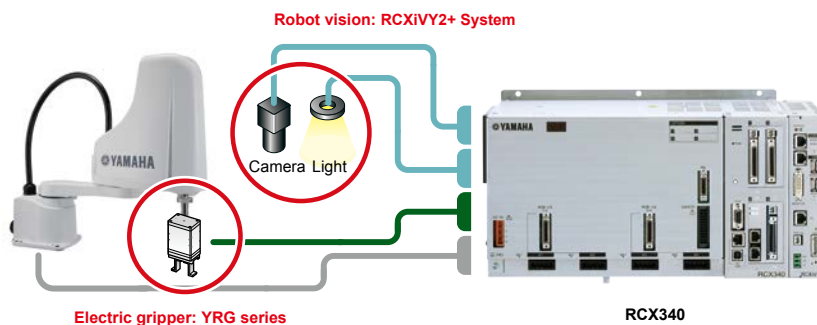
Real-Time output function for Preventive Maintenance.

▌Industrial Ethernet option Real-Time output function

When the industrial Ethernet option (EtherNet/IP, EtherCAT, or Profinet) is selected, the information necessary for the predictive maintenance such as error status, current position, current value, motor load factor, operation hours, and others can be output in real-time to contribute to achievement of the "non-stop production line".

Real-time output function

Error status	Controller temperature	Motor load factor
Current value	Current position	In-position
Operation hours	Speed	I O

Note : The real-time output function is supported.

Real-time output

Predictive maintenance information

RCX340

Centralized program control

Industrial Ethernet option

Up to four RCX320 and RCX340 controllers (16 axes)

RCX340   RCX340   RCX320

YC-Link/E

RCX340 are applicable to all single-axis, Cartesian, SCARA, and P&P robots [Note]

The 4-axis robot controller RCX340 are applicable to all robot models including single-axis, Cartesian, SCARA, and Pick & Place robots.
As the mixed control of the ball screw type FLIP-X series and linear motor type PHASER series can be performed, the robots can be combined freely according to the applications. Additionally, when preparing the robot controllers for the maintenance work of multiple robots, it is enough to prepare only one robot controller. This robot controller can be used for any model only by changing the setting.

Note. Except for 24 V specification models.
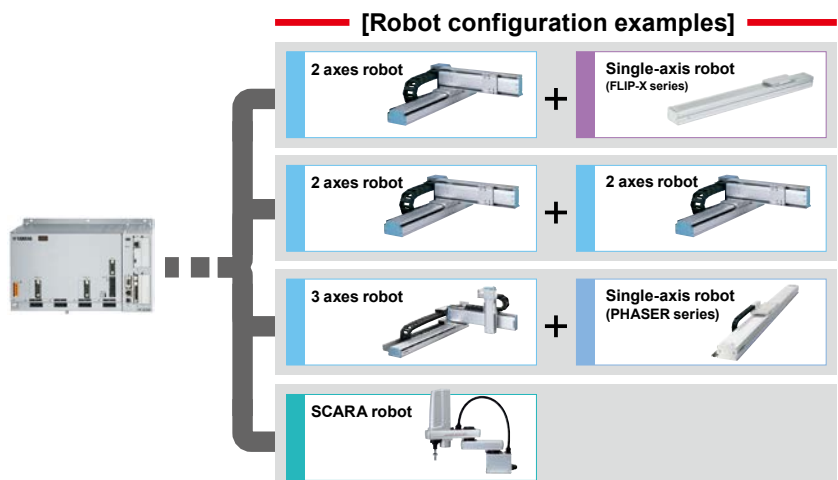
[Robot configuration examples]

2 axes robot	+	Single-axis robot (FLIP-X series)
2 axes robot	+	2 axes robot
3 axes robot	+	Single-axis robot (PHASER series)
SCARA robot		

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

Major features and functions of RCX controller

To palletize.

Function: Palletize

By entering the coordinate values of the four corners on the palette and specifying the number of palettes in the vertical and horizontal directions, the coordinate values of each point are automatically generated. By specifying the coordinate values and the number of palettes in the height direction, a three-dimensional palette is also supported.

The maximum number of pallets that can be defined is 40, but the coordinate values of the four corners and the number of pallets in each direction can be changed by program, so virtually any number of pallets can be supported.
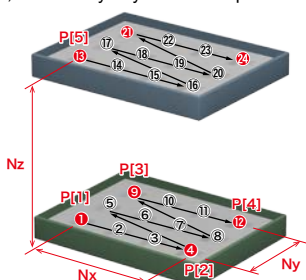
- **Number of pallets that can be used at the same time: 40**
- **2D/3D pallets are supported.**

Sample program
PDEF(1)=3,4,2,P3991 ··· Defines pallet definition 1 to Nx : 4, Ny : 3, and Nz : 2 using P3991 to P3995.
PMOVE(1,16),S=50 ··· Moves the robot to the point at position number 16 of palette number 1 at 50% speed.

To prevent interference with peripheral devices.

Function: Area judgement output

When the robot enters the pre-registered range, a signal is output to the specified port. This function is useful when there are interfering objects in the equipment to limit the robot operation range or when multiple robots are used in a layout where they interfere with each other. This function operates regardless of the automatic or manual operation mode, so it is also effective for jog operation during teaching.

- **Max: 32 areas can be specified.**
- **Effective even during manual operation.**
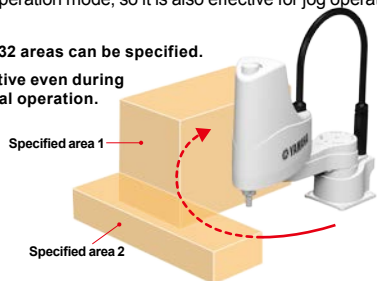
- **Number of areas that can be registered: 32**
- **Functions not only during automatic operation, but also during manual operation.**

To use the tool offset from the tip of the robot.

Function: Hand definition

This function is used to operate the robot based on the coordinates of the off-set tool tip when a tool is attached to the tip axis of the robot in an offset state. This function is especially effective when there are multiple hands or when a SCARA robot or a robot with rotation axis rotates around the tool.
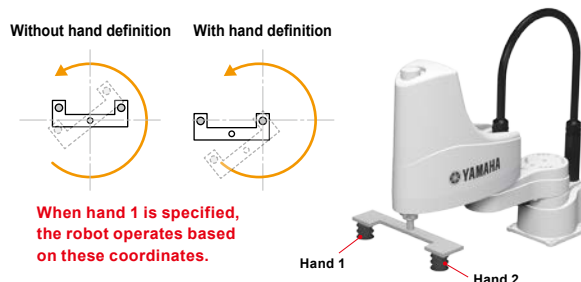
When hand 1 is specified, the robot operates based on these coordinates.

- **Number of hands that can be registered: 32**
- **How to specify when there is R axis:** 1) Angle based on +X direction
  2) Hand length
  3) Z-axis offset amount

Sample program
HAND H1= 0.000 150.000 0.000 R
HAND H2= -90.000 100.000 0.000 R
P1= 150.000 300.000 0.000 0.000 0.000 0.000
CHANGE H1 ··· Changes the hand data of robot 1 to hand 1.
MOVE P,P1 ··· Moves the tip of hand 1 of robot 1 to P1.
CHANGE H2 ··· Changes the hand data of robot 1 to hand 2.
MOVE P,P1 ··· Moves the tip of hand 2 of robot 1 to P1.
HALT

To push the workpiece lightly.

Function: Torque limit (PUSH)

It is possible to operate by limiting the motor torque and movement speed when press-fitting a workpiece. If the movement to the target position is not completed even after the specified pressing time has elapsed, the operation stops.
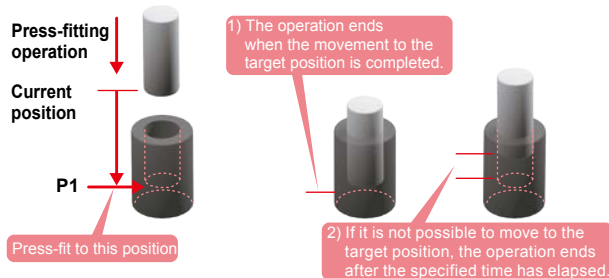
- **Specified by axis.**
- **Pressing force designation: Specified by % to rated thrust.**
- **Pressing time value: 1 to 32767 msec**
- **Pressing speed designation: 1 to 100%**
- **STOPON condition designation: Movement stops when the conditions are met.**

Sample program
PUSH(3,P1),F=20,TIM=5000,S=10
··· Moves the 3rd axis to the position specified by P0 under the following conditions. Pressing force: 20% of rated thrust, Pressing time: 5 sec, Speed: 10% * The command ends when the pressing force reaches 20% for 5 seconds or more.

To move along a specified path.

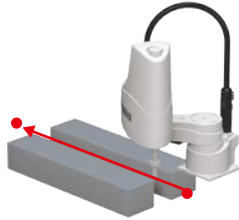### Function: Linear interpolation and circular interpolation (2D/3D)

2D/3D linear and circular interpolation control is possible. This function is effective for sealing work and when you want to specify a path to avoid obstacles.

For PTP movement   **For linear interpolation**
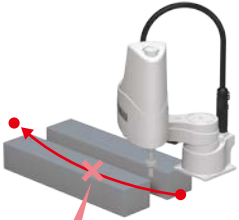
Movement hits an obstacle in PTP.

- Linear interpolation and circular interpolation are supported.
- <Option>
- SPEED: Relative speed designation
- DSPEED: Absolute speed designation
- VEL: Linear speed designation (Specified in mm/s)
- STOPON condition designation: Deceleration stops when the conditions are met.
- CONT designation: Connects with next movement command.
- Acceleration/deceleration designation
- Port output designation: Outputs a signal after moving a specified distance.

Sample program	
MOVE L,P20	··· Linear interpolation movement from the current position to P20
MOVE C,P21,P22,P23,P20	··· Circular interpolation movement consisting of P21, P22, P23, and P20
MOVE L,P24	··· Linear interpolation movement to P24

To perform sealing at constant speed.

Function: PATH statement

Sealing requires the path accuracy and constant movement speed. PATH is a function that moves at a specified speed on a path consisting of straight lines and circular arcs, and is suitable for sealing applications because there is little speed fluctuation during movement.

It is possible to change the speed only for a part of the path or output a signal to a specified port at an arbitrary section during movement.

Operates at the same speed on both straight line and circular arc sections.

Start
End
Circular arc section
Circular arc section
Straight line section
Circular arc section
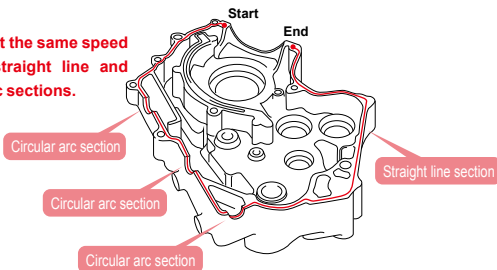
- Moves at a "constant speed" along a specified path.
- After specifying the path in advance with "PATH SET, PATH, PATH END", start the movement with "PATH START".
- Up to 1000 points can be specified.

Sample program	
PATH SET	
PATH L,P1,DO(20)=1@10	··· While moving from the current position to P1 by linear interpolation, set to output "1" to DO(20) at a 10 mm radius position from the start position.
PATH L,P2,DO(21)=1@12.5	··· While moving to P2 by linear interpolation, set to output "1" to DO(21) at a 12.5 mm radius position from P1.
PATH END	
PATH START	

To remove the robot, but not to reteach it.

Function: Shift coordinates

A deviation may occur in the coordinate system when re-installing or replacing the robot during maintenance work. In this case, the coordinate system can be corrected using the shift coordinate function. So, the point data can be used as it is. No re-teaching is needed.

Original coordinates   **Coordinates after reinstallation**   **Correction with shift coordinates**
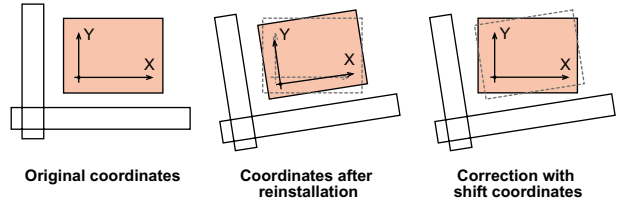
- Number of shifts that can be defined: 40

Sample program	
S0= 0.000 0.000 0.000 0.000	··· Defines the shift coordinates of S0.
S1= 100.000 200.000 50.000 90.000	··· Defines the shift coordinates of S1.
P3= 100.000	··· Defines the point data of P3.
SHIFT S0	··· Changes the shift coordinates to S0.
MOVE P,P3	··· PTP movement to P3.
SHIFT S1	··· Changes the shift coordinates to S1.
MOVE P,P3	··· PTP movement to P3.
HALT	

To output a signal during sealing movement.

Function: Passing point output

For applications such as turning discharge ON/OFF during sealing, general-purpose outputs can be controlled ON/OFF at a specified position without stopping the axis operation during interpolation operation. This function can be used with either the MOVE or PATH command.

OFF
ON
START
Distance1   Distance 2
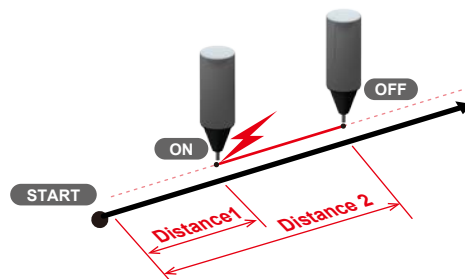
- Up to 3 decimal places can be specified (mm).
- Up to two times can be specified in one MOVE statement.
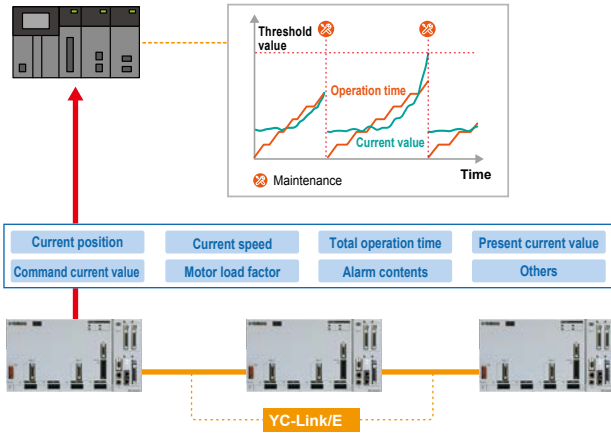
Sample program	
A!=10	
B!=20	
MOVE L,P1,DO(20)=1@A!,DO(20)=0@B!	···After starting to move to P1, DO (20) is turned ON at the timing of 10 mm away and DO (20) is turned OFF at the timing of 20 mm away.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

To output information necessary for predictive maintenance.

Function: Real-time output

Information necessary for predictive maintenance, such as error status, current position, current value, motor load factor, and operation time, can be output in real time.

* Industrial Ethernet options (EtherNet/IP, EtherCAT, Profinet) are supported.

| Current position | Current speed | Total operation time | Present current value |
| Command current value | Motor load factor | Alarm contents | Others |

To control multiple robots with one controller.

Function: YC-Link/E

Multiple RCX controllers can be linked and controlled by one master controller. Single-axis, Cartesian, and SCARA robots can be mixed, and all network boards and vision units are mounted only on the master controller. Therefore, information on one camera can be shared by multiple robots.

• Up to 4 controllers can be connected.
• When the RCX340 is used, up to 16 axes are supported.

To operate two robots efficiently.

Function: Multi-task

Multiple tasks (up to 16 tasks) such as robots and peripheral devices can be executed in parallel at the same time. Each task can be prioritized, and the priority can be changed while the task is running.

This is effective for applications such as simultaneously executing vision and robot operations in different tasks during conveyor tracking, and constantly monitoring the workpiece even during robot operation.
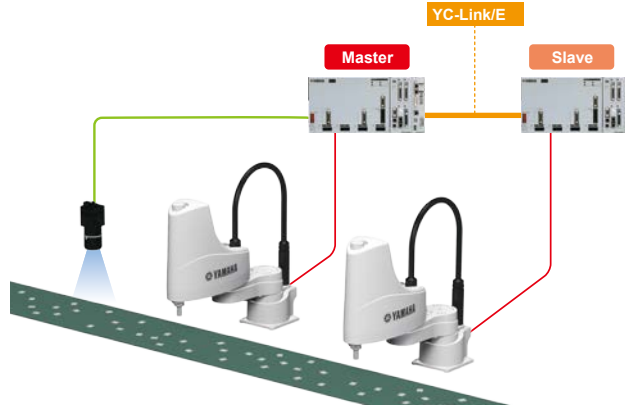
• Number of tasks that can be executed at the same time: 16
• Priority: 1 to 64 (high to low)

Sample program

Program name <TRACK_MAIN>	
START<CONV_SCAN>,T2	⋯Starts the search task.
*CONVEYOR:	
WHILE CCHEKQUE(1)=-1	⋯Repeats until no workpiece passes through the work area.
CRMVQUE(1)	⋯Deletes workpiece elements that have
WEND	passed through the area.
IF CCHKQUE(1)>0 THEN	⋯Starts the work when workpiece enters the work area.
(Robot operation routine)	
ENDIF	
GOTO *CONVEYOR	⋯Repeats the routine.
Program name <CONV_SUB>	
CTVISION ON(1)	⋯Switches to vision use on conveyor 1.
*SCAN:	
VSEARCH 1,2,0	⋯Performs the search.
IF VGENCNT>0 THEN	⋯Process when workpiece is detected.
FOR I%=0 TO VGETCNT-1	⋯Adds search results to the position monitoring array.
CADDQUEV 1,VGETPOS(I%),TG=I%	⋯Adds to the position monitoring queue.
NEXT I	
ENDIF	
GOTO *SCAN	⋯Repeats the search.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

To control multiple robots with one controller.

Function: Multiple-robot setting

Each axis of one controller can be distributed and set to multiple robots.
The RCX320 supports up to 2 axes and the RCX340 supports up to 4 axes.
Furthermore, by connecting multiple controllers via YC-LINK/E, up to 4 robots and 16 axes can be set.

RCX340

Robot 2

Robot 1

Collision prevention
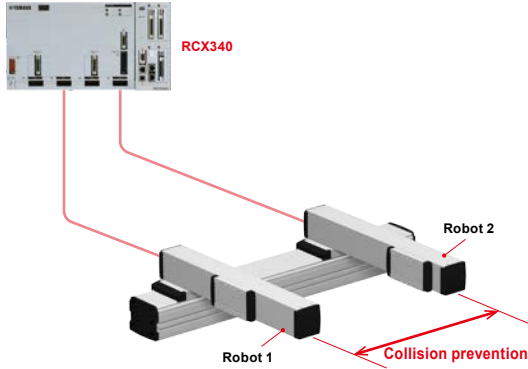
- **Each robot can be operated using MOVE [1] to MOVE [4] commands.**
- **Using multi-task also allows smooth coordination of each robot.**

To prevent pallet interference with the double carrier robot.

Function: Collision prevention function

With the double-carrier robot, collision of both carriers is prevented by control in the controller. No zone control or external sensor installation is required. When a pallet larger than the carrier is mounted, the minimum distance between the carriers can be set using parameters.

Specify the minimum pitch.
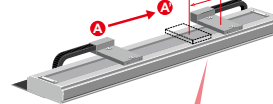
Does not move to a position below the specified pitch.

1. If A moves and collides.

A → B
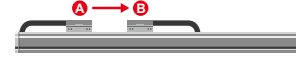
2. If the slider of B moves.

A → B

3. The slider of A starts moving.

A → B
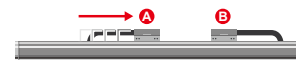
- **Support for operating double-carrier robot with RCX (N15, N18, and PHASER series)**

To lengthen the Y-axis stroke of the Cartesian robot.

Function: Dual drive

This function synchronously controls two robots of the same type. When the main axis is moved, the sub axis follows in accordance with the movement of the main axis.

This function is effective for transferring heavy objects and supporting the long Y-axis stroke of the Cartesian robot. It is also possible to synchronize two sliders with a double-carrier robot such as a linear motor.

For gantry type, positional deviation occurs when the Y-axis is long.

Support guide
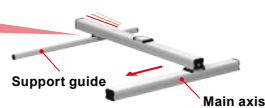
Main axis

High precision movement is possible because the main axis and sub axis are synchronized.
The payload is practically doubled.

Y-axis stroke can be lengthened.
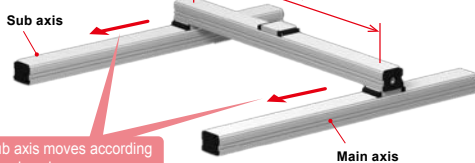
Sub axis

The sub axis moves according to the main axis.

Main axis

- **Rigid dual: The main axis and sub axis are connected with high rigidity.**
- **Flexible dual: The main axis and sub axis do not have any force interference or are not connected.**
- **Tandem dual: Two sliders on the same axis are synchronized.**

To pick up a workpiece while following a moving object.

Function: Conveyor tracking

Picking can be made by following the movement of the workpiece moving on the conveyor.

Straight line and circular arc tracking is supported. Since the follow-up operation is performed based on the encoder input signal, the follow-up operation is possible even when the conveyor speed fluctuates.

This function supports not only workpieces searched by robot vision, but also tracking by sensor signal input.
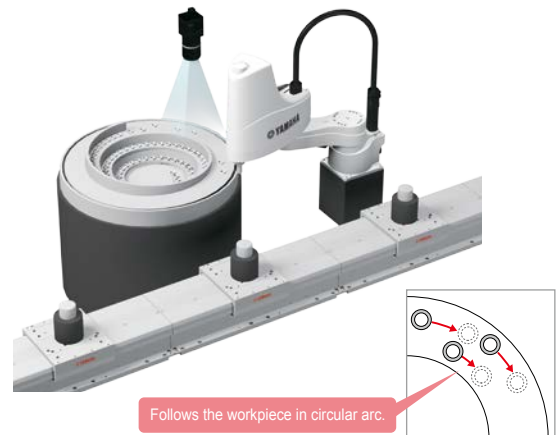
Follows the workpiece in circular arc.

- **Vision tracking and sensor tracking are supported.**
- **Number of encoders connected: 2**
- **Target encoder: Line driver equivalent to 26LS31/26C31**
- **Maximum response frequency: 2 MHz**

129

To increase the tact.

Function: Payload setting, arch motion, out enable position

Arch motion is effective for increasing the tact such as pick and place of workpieces. By specifying the linear movement distance when the Z-axis moves up or down, the operation can be performed with the optimal movement pattern.

In addition, increasing the value of the out enable position speeds up the timing for executing the next operation, which has the effect of reducing operation time.

* The robot is automatically set to the optimum acceleration when the payload is set. (Moment of inertia can also be set for SCARA robots.)

Target position
Tolerance
Out enable position
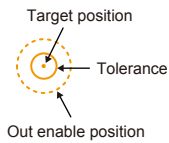
Out enable position:
When the axis tip enters this range, the next operation starts. When passing through relay points to avoid obstacles, etc., the operation time can be shortened by increasing this value.
* The value can be changed using the program.

▶ Normal movement

P2 P3
P1 P4

Normally, P1 to P4 are specified. Each operation starts the next operation when it enters the out enable position range.

MOVE P,P2,CONT	⋯ Moves from the current position to P2.
MOVE P,P3,CONT	⋯ Moves to P3 without stopping when the out enable position is entered.
MOVE P,P4	⋯ Moves to P4 without stopping when the out enable position is entered.

▶ Arch motion is used.

Z0
Z1 Z2
P1 P4
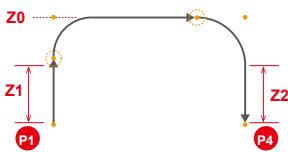
When the arch motion is operated,
• Only P1 and P4 are specified.
• Z-axis height during movement is specified. (Z0)
• The linear movement distances when ascending and descending are specified. (Z1, Z2)

A%=OUTPOS(3)	⋯ Assigns the parameter at the out enable position to A%.
OUTPOS(3)=2000	⋯ Changes the parameter at the out enable position to 2000.
MOVE P,P4,A3=0.00{50.00,70.00}	
	⋯ The A3-axis moves up to 0.00 mm when moving to P4. The A3 axis moves linearly 50.00 mm when ascending and 70.00 mm when descending.
OUTPOS(3)=A	⋯ Returns the parameter at the out enable position to the original value.

To improve the accuracy.

**Function: WAIT ARM, tolerance setting, acceleration setting**

In a normal movement command, the next command is executed when the out enable position is entered. If positioning accuracy during operation is required, use "WAIT ARM" to execute the command after waiting for the position to fall within the tolerance range.

Additionally, since the tolerance range can be changed using the program, it is possible to move with different tolerance for each movement command.

• **WAIT ARM**
Executes the next command after entering the tolerance range.

• **TOLE**
Sets/acquires the tolerance parameter.

▶ Normal movement

Signal is output before entering the tolerance range.

Out enable position range
Tolerance range
P1 : Target position

Signal is output to DO (20).
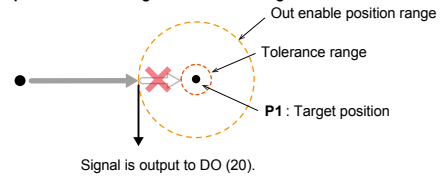
MOVE P,P1	⋯ Moves to P1.
DO(20)=1	⋯ "1" is output to DO20 when the out enable position is entered.

▶ WAIT ARM is used.

Signal is output after entering the tolerance range.

Out enable position range
P1 : Target position
Tolerance range

Signal is output to DO (20).

This range can be changed using the program.
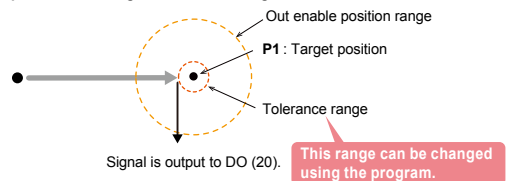
MOVE P,P1	⋯ Moves to P1.
WAIT ARM	⋯ Continues to move until entering the tolerance.
DO(20)=1	⋯ "1" is output to DO20 when entering the tolerance range.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

To operate without stopping at the avoidance point

Function: CONT option

When there is an obstacle on the robot movement path and an escape point is set to avoid it, use the CONT option in the movement command to enable smoother movement.

The normal MOVE command performs the positioning at each point, but when the CONT option is used, each movement is linked so that the movement continues without stopping in the middle.

▶ Normal movement

Starts the next movement after entering the tolerance range.
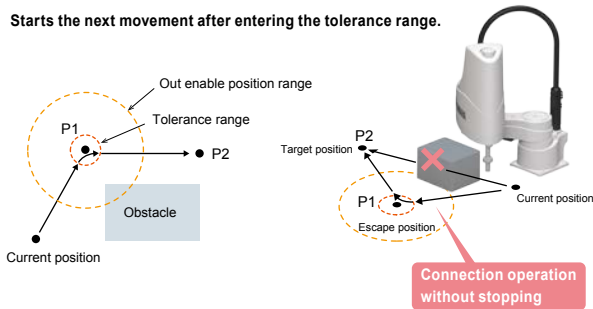
MOVE P,P1	···	Moves to P1. When the movement axis enters the tolerance range,
MOVE P,P2		the movement to P2 starts.

▶ CONT option is used.

Starts the next movement when entering the out enable position range.
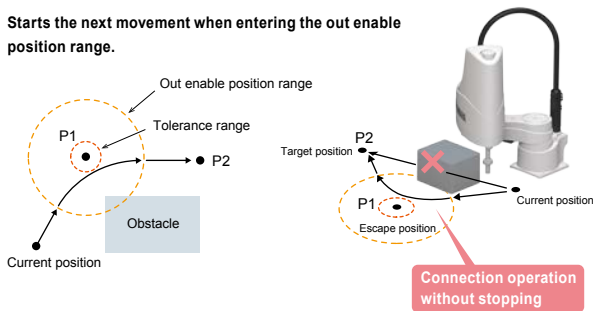
For out enable position

OUTPOS 10000	···	Changes the OUTPOS parameters of all axes to 10000.
MOVE P,P1,CONT	···	Moves to P1. When the movement axis enters the out
MOVE P,P2		enable position range, the movement to P2 starts.

To increase the tact using two robots.

Function: Area judgement output, internal output variable

When two robots are used to transfer a workpiece for tact-up purposes, the area judgment output can be used to ensure that the robots do not interfere with each other. In this case, by using the internal output variables (MI, MO), it is possible to exchange signals at high speed without using the host PLC.

▶ Area judgement output setting
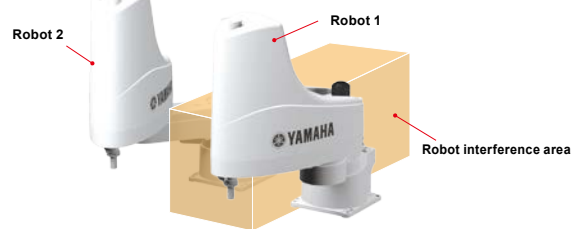
MO(20)	···	ON when robot 1 enters the area.
MO(40)	···	ON when robot 2 enters the area.

▶ Program example

Program name <ROB1_MAIN>

START <ROB2_SUB>,T2	···	Starts the sub task.
MOVE[1] P,P1,A3=0.00	···	Moves to the standby position.
*LOOP1:		
WAIT MO(50,40)=&B10	···	Waits until robot 2 moves out of area.
MO(30)=0	···	Operating flag is OFF.
MOVE[1] P,P3	···	Moves to the place position.
WAIT ARM[1]		
MO(30)=1	···	Operating flag is ON.
MOVE[1] P,P2	···	Moves to the pick position.
WAIT ARM[1]		
GOTO *LOOP1		

Program name <ROB2_SUB>

MOVE[2] P,P11,A3=0.00	···	Moves robot 2 to the standby position.
*LOOP2:		
MO(50)=1	···	Operating flag is ON.
MOVE[2] P,P12	···	Moves to the pick position.
WAIT ARM[2]		
WAIT MO(30,20)=&B10	···	Waits until robot 1 moves out of area.
MO(50)=0	···	Operating flag is OFF.
MOVE[2] P,P13	···	Moves to the place position.
WAIT ARM[2]		
GOTO *LOOP2		

ELECTRIC GRIPPERS

Electric grippers dedicated to the RCX320 and RCX340 controller.
Easy operation is achieved as YAMAHA robot language gives unified control.

Gripping force control

Gripping force can be set in 1 % steps from 30 to 100 %.

Measuring

Workpiece can be measured using position detection function.

Speed control

Speed can be set in 1 % steps from 20 to 100 % and acceleration can be set in 1 % steps from 1 to 100 %.

Multi-point position control

Up to 10,000 positioning points can be set.

Workpiece check function

Workpiece gripping mistake or workpiece drop can be checked by the HOLD output signal without using sensor.

Plenty of lightweight and compact model variations

S type Single cam type

Lightweight, compact, high-speed

Small single cam

YRG-2005SS YRG-2010S YRG-2815S YRG-4225S

Single cam structure
Use of an unique cam structure achieves the simple and compact design. As the self-lock is not activated, the fingers can be operated using an external force.

W type Double cam type

High gripping force

YRG-2005W YRG-2810W YRG-4220W

Double cam structure
Unique double cam structure with gear. Use of a simple structure achieves high gripping force with compact body.

Screw type Straight shape

High accuracy, long stroke

YRG-2020FS/YRG-2840FS

Screw type "T" shape

YRG-2020FT/YRG-2840FT
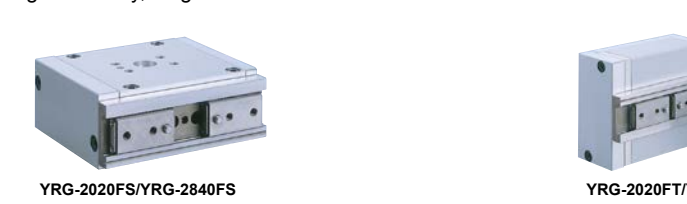
Ball screw structure
As the ground ball screw is driven by the belt, the long stroke with high efficiency and high accuracy is achieved.

Three fingers type

Compact, high rigidity, long stroke

YRG-2004T YRG-2013T YRG-2820T YRG-4230T

Compact ball guide structure
Use of a special cam provides lightweight and compact electric grippers. These electric grippers are suitable for transfer of round workpieces made of glass or similar materials.

Type	Model	Gripping force(N)	Open/close stroke (mm)	Maximum speed (mm/sec.)	Repeated positioning accuracy (mm)	Main body weight (g)
Compact single cam	YRG-2005SS	5	3.2	100	+/- 0.02	90
Single cam	YRG-2010S	6	7.6	100	+/- 0.02	160
	YRG-2815S	22	14.3	100	+/- 0.02	300
	YRG-4225S	40	23.5	100	+/- 0.02	580
Double cam	YRG-2005W	50	5	60	+/- 0.03	200
	YRG-2810W	150	10	60	+/- 0.03	350
	YRG-4220W	250	19.3	45	+/- 0.03	800
Screw type Straight shape	YRG-2020FS	50	19	50	+/- 0.01	420
	YRG-2840FS	150	38	50	+/- 0.01	880
Screw type "T" shape	YRG-2020FT	50	19	50	+/- 0.01	420
	YRG-2840FT	150	38	50	+/- 0.01	890
Three fingers type	YRG-2004T	2.5	3.5	100	+/- 0.03	90
	YRG-2013T	2	13	100	+/- 0.03	190
	YRG-2820T	10	20	100	+/- 0.03	340
	YRG-4230T	20	30	100	+/- 0.03	640

● Gripping force control: 30 to 100 % (1 % steps)   ● Speed control: 20 to 100 % (1 % steps)   ● Acceleration control: 1 to 100 % (1 % steps)
● Multi-point position control: Maximum 10,000 points   ● Workpiece size judgment: 0.01 mm steps (by ZON signal)

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 1

Electric grippers achieve highly accurate gripping force, and position, and speed controls.

The YRG series provides the gripping force control, speed and acceleration controls, multi-point control, and workpiece measurement that were difficult by conventional air-driven devices. The YRG series flexibly supports various applications.
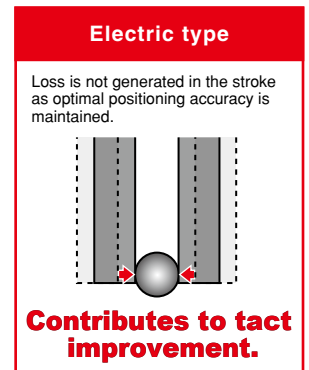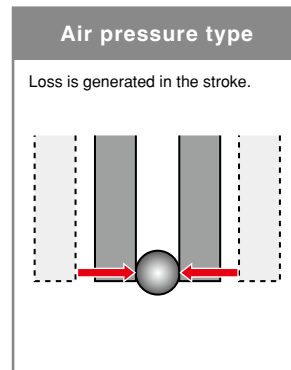
▌ Gripping force control

The gripping force can be set in 1 % steps. Workpieces that are easy to break or deform, such as glass or spring can be gripped. The gripping force is constant even when the finger position changes.

Air pressure type	Electric type
Fine adjustment of the regulator is difficult.	Gripping force can be set in 1 % steps from 30 % to 100 %.

▌ Workpiece presence check function

The electric gripper outputs the HOLD signal. Workpiece gripping mistake or workpiece drop during transfer can be checked. No external sensors are needed.

Air pressure type	Electric type
Workpiece gripping mistake or drop is judged using the sensor or image processing unit.	Workpiece drop can be judged. No external sensor is needed.

▌ Speed control

The speed and acceleration can be set in a range of 20 to 100 mm/sec. in 1 % steps (singe cam and three fingers type). The gripper can gently touch workpieces that are vulnerable to impact, such as lenses or electronic components.

POINT 2

Gripper can be controlled with controller commands.

The gripper controls can be performed with one multi-axis controller RCX320, RCX340. Data exchanging with the host unit, such as PLC is not needed. The setup or startup can be made easily.
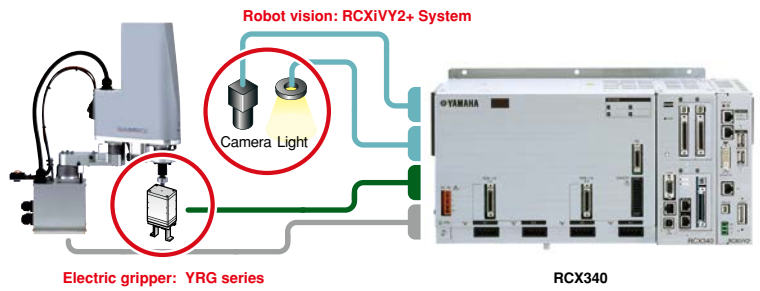
▌ Multi-point position control

The finger can be set to a desired position according to the workpiece size. This contributes to efficiency improvement of lines with different workpiece sizes and materials mixed and lines with many setup steps.

Air pressure type	Electric type
Loss is generated in the stroke.	Loss is not generated in the stroke as optimal positioning accuracy is maintained.
	Contributes to tact improvement.

▌ Measuring function

The gripped workpiece can be measured using the position detection. Use of this function makes it possible to correctly judge what portion of the workpiece is gripped.

▌ Zone range function

Use of this zone range function makes it possible to judge the size OK/NG and check for slant insertion.

■ List of robot languages (example)

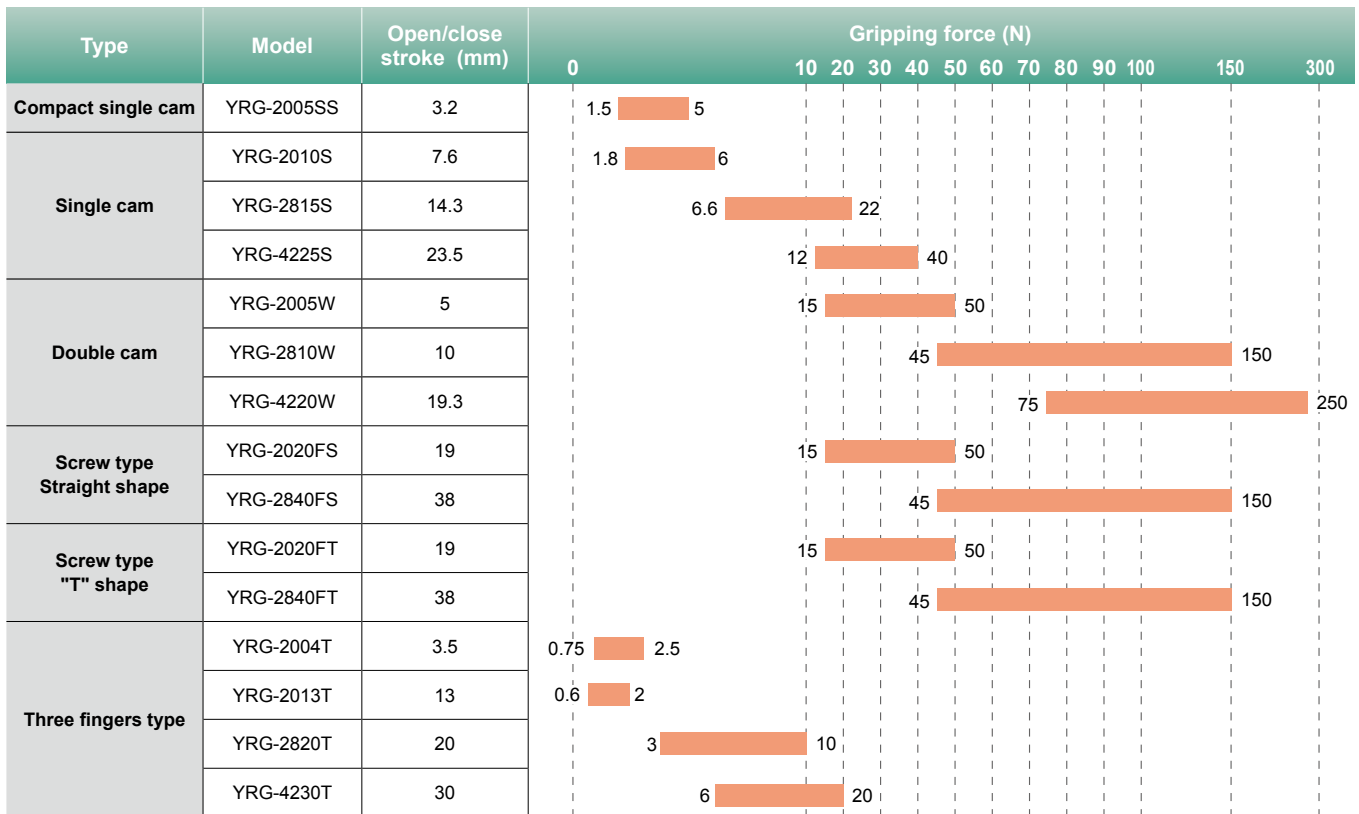| Language name	Function
GDRIVE	Absolute position movement
GDRIVEI	Relative position movement
GHOLD	Absolute position gripping movement
GHOLDI	Relative position gripping movement
GOPEN	Constant speed gripping movement (open)
GCLOSE	Constant speed gripping movement (close)
GORIGIN	Gripper axis return-to-origin
GSTATUS	Status acquisition
ORIGIN	Return-to-origin
WHERE	Main group current position acquisition (joint coordinate: pulse)
WHERE2	Sub group current position acquisition (joint coordinate: pulse)
WHRXY	Main group current position acquisition (Cartesian coordinate: mm, degree)
WHRXY2	Sub group current position acquisition (Cartesian coordinate: mm, degree)

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

POINT 3

Combination with a vision system supports a wide variety of applications.

As the YRG series is combined with controller integrated robot vision "RCXiVY2+ System", the operations from the positioning using the camera to workpiece handling can be controlled in the batch mode using the RCX320, RCX340 controller. Sophisticated systems can be easily configured.

Robot vision: RCXiVY2+ System

Camera Light

Electric gripper: YRG series

RCX340

Gripping force comparison of electric gripper models

Type	Model	Open/close stroke (mm)	Gripping force (N)
Compact single cam	YRG-2005SS	3.2	1.5 – 5
Single cam	YRG-2010S	7.6	1.8 – 6
Single cam	YRG-2815S	14.3	6.6 – 22
Single cam	YRG-4225S	23.5	12 – 40
Double cam	YRG-2005W	5	15 – 50
Double cam	YRG-2810W	10	45 – 150
Double cam	YRG-4220W	19.3	75 – 250
Screw type Straight shape	YRG-2020FS	19	15 – 50
Screw type Straight shape	YRG-2840FS	38	45 – 150
Screw type "T" shape	YRG-2020FT	19	15 – 50
Screw type "T" shape	YRG-2840FT	38	45 – 150
Three fingers type	YRG-2004T	3.5	0.75 – 2.5
Three fingers type	YRG-2013T	13	0.6 – 2
Three fingers type	YRG-2820T	20	3 – 10
Three fingers type	YRG-4230T	30	6 – 20

Gripping force scale (N): 0 10 20 30 40 50 60 70 80 90 100 150 300

Application examples

Deformation prevention transfer of resin rings, etc.
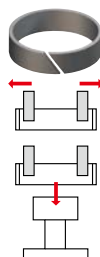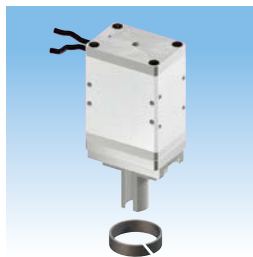
● Measuring function (Maintains workpiece shape.)
● Gripping force control (Maintains workpiece shape and prevents scratches.)
● Speed control (Maintains workpiece shape and prevents scratches.)
● Multi-point position control (Applicable to many part types of workpieces.)

Note. Air unit cannot control the gripping force and speed, causing workpiece to be scratched or tact time not to be shortened.

Chip assembly transfer Deformation prevention and lead protrusion dimension check
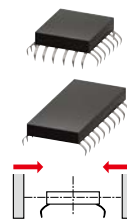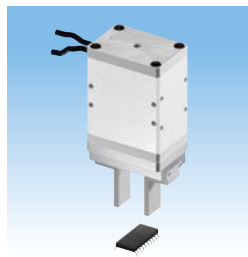
● Measuring function (Checks lead protrusion dimensions.)
● Gripping force control (Maintains workpiece shape and prevents scratches.)
● Speed control (Maintains workpiece shape and prevents scratches.)
● Multi-point position control (Applicable to many part types of workpieces.)

Transfer and dimension check of flexible workpieces with different sizes
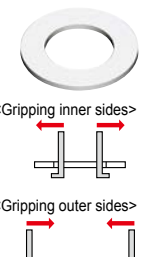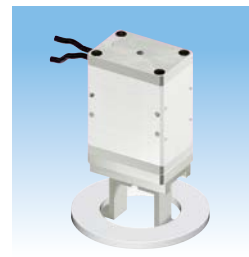
<Gripping inner sides>

<Gripping outer sides>

● Measuring function (Checks lead protrusion dimensions.)
● Gripping force control (Prevents workpiece deformation.)
● Speed control (Prevents scratches.)
● Multi-point position control (Applicable to many part types of workpieces.)
● Reduction of setup work (Improves productivity.)

135

Videos from application videos to operation and setup instructions are now available.

More than 100 robot videos are available!

▶ YouTube

Yamaha Motor Global -Robotics-

Proposals to make productions lines efficient and improve them.

[Promotion video]
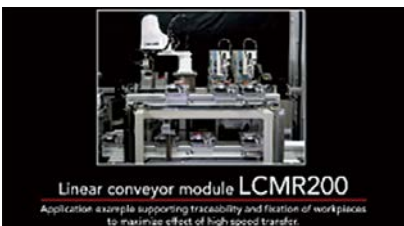**Introduction of YAMAHA products and merits of introducing LCMR200**

Linear conveyor modules LCMR200

[Development secrets]
THE GAME CHANGER

[Horizontal circulation unit]
High-speed transfer/compact equipment is achieved.

[Vertical circulation unit]
Workpiece misalignment during high-speed transfer is resolved and identification of defect causes is made easier.

[Traversing unit]
Bottleneck is resolved, and multiple models and defective products are supported.

[Application]
Bottleneck process is resolved by process parallelization.

136

SCARA × ROBOT VISION

[Automation of bulk parts]
Integrated control of robot × Asycube × vision

[Application]
Machine Vision"RCXiVY2+"× SCARA Robot

Series to learn with videos

[LCMR200]
Easy assembly and installation procedures

【LCMR200】
Software setup

[LCMR200]
Transfer adjustment of horizontal circulation unit

[RCXiVY2+]
Calibration of downward fixed camera

[RCXiVY2+]
"Model registration" edge data
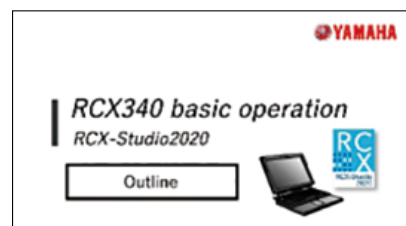
[RCX340]
Basic operation of support software RCX-Studio2020

APPLICATION

APPLICATION

CONTENTS

YAMAHA STEPPING MOTOR SINGLE-AXIS ROBOTS

TRANSERVO
Series

P.88

YAMAHA SINGLE-AXIS ROBOTS

FLIP-X
Series

P.78

Pressing and cutter machines

- Cuts plastic lens material
- Pressing function applications

MOVIE Web site
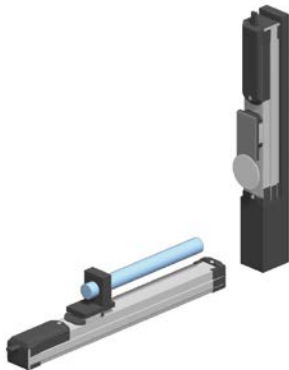
POINT

1. Cutting tasks using the TRANSERVO (TS-S, TS-X, TS-P) pressing function
2. Pressing torque is adjustable, and time-out time and operation after reaching specified torque can be selected as desired (continuous pressing, position hold).
3. Host control can be simplified by setting multiple continuous operation points.

Pressing and pitch feed

- Positioning for bread loaf slicing
- Pressing function and pitch feed applications

MOVIE Web site
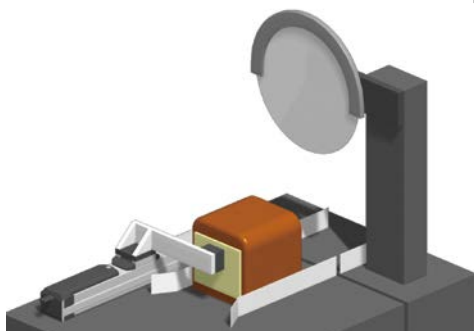
POINT

1. Measures bread thickness with robot and identifies bread type. (TS positioner can send feedback on current position.)
2. Varies the pitch feed quantity to match workpiece type.
3. Pressing torque is adjustable to match the workpiece type.

Clean, dustproof / dripproof, high-speed conveying unit

- Transfer and conveyance in the clean environment.
- Transfer and conveyance in the harsh environment.

Wafer

POINT

1. Belt drive type robot complying with cleanliness requirement.
2. With a large payload, it is optimum for conveying panels.
3. Provided with specifications for cleanliness and applicable to long stroke.
4. With the payload and moment permissible value at high level, it is applicable to the Cartesian combination.
5. Equivalent to B10 (YAMAHA model) .

Contact stopper height change unit

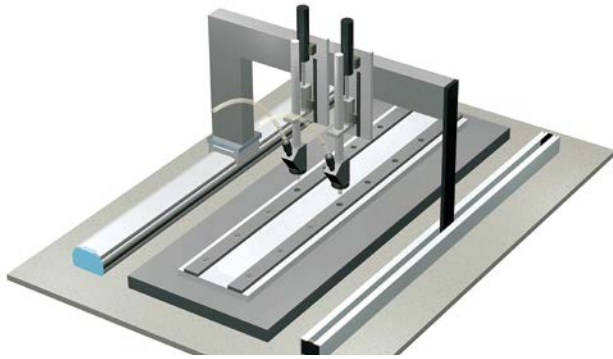- Change of stopper height in multiple number of steps.
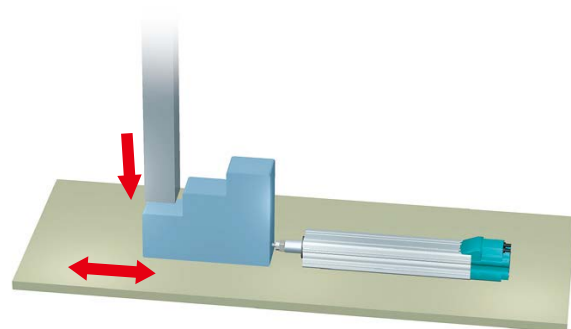
POINT

1. The stop position for the stopper block is positioned by the cylinder type robot.
2. It is possible to make set-up done by single touch operation or automatically.

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

Screw tightening device
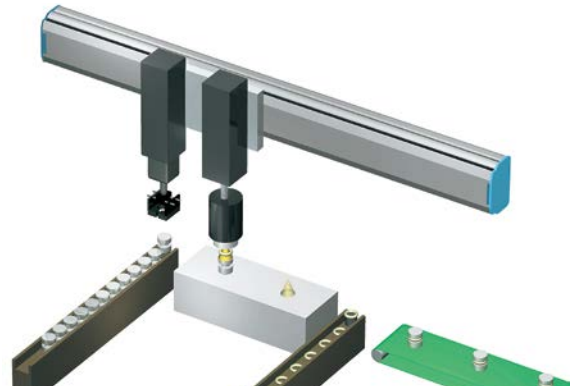
■ Tightening screws arranged on a straight line.

1. High rigidity with a support axis added.
2. Pitch selectable freely in the moving axis direction.

O-ring fitting device

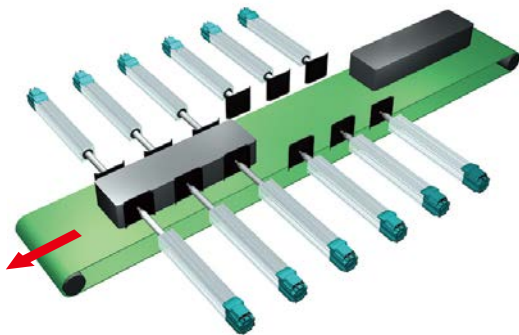■ Handling workpieces to assembly units arranged on a straight line.

1. Assembly jigs arranged on a straight line under the single axis robot.

Device to shift workpiece in width direction

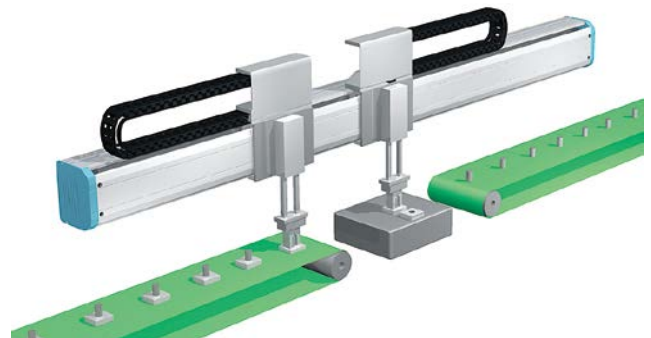■ Positioning of workpieces flowing on the conveyor.

1. Arrangement of multiple number of compact robots.
2. Pulse string control from the upper controller.

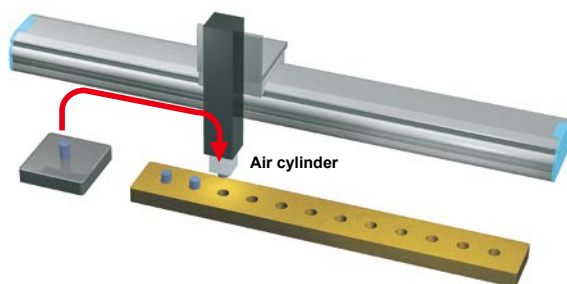## Carrying and transferring equipment

■ Handling parts

1. Space saving layout using double carrier. (N15 / N18)

Press-fitting device

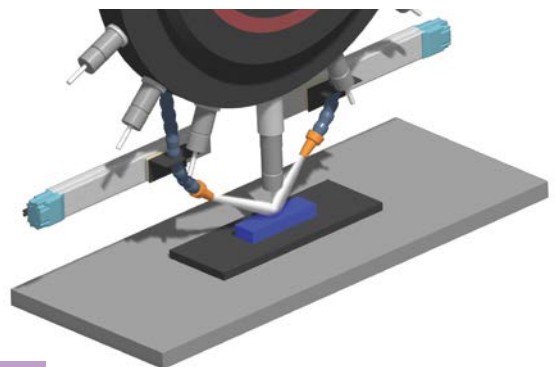■ Workpieces are press-fitted in holes arranged on a straight line.

Air cylinder

1. Highly rigid frame.
2. Applicable to work positions arranged linearly.

Jig and tool positioning mechanism

■ Adjustment of cutting fluid nozzle position of machining center
■ Positioning under harsh working environments

1. The adoption of a magnetic accuracy detection resolver allows use even under adverse conditions.

Painting by combining multiple single-axis robots

■ Interpolation control of multiple single-axis robots is performed for painting work.

MOVIE
Web site

POINT

1. As single-axis robots are controlled with the multi-axis controller, such as RCX240, the linear or circular interpolation operation can be performed with combined coordinates.
2. A layout, such as desktop type that is different from the normal Cartesian robot can be configured.
3. Optimal specifications can be selected from the versatile single-axis robot lineup and they can be combined.

Tape affixing to circular workpieces

■ Interpolation control of multiple single-axis robots is performed for tape affixing to circular workpieces

MOVIE
Web site
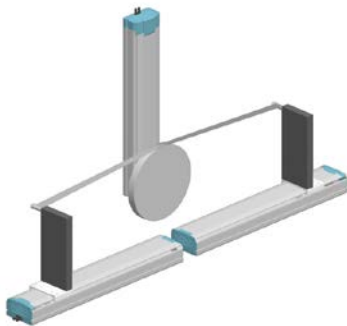
POINT

1. Multiple single-axis robots are controlled with one multi-axis controller (multi-robot).
2. Use of an interpolation function of the multi-axis controller makes it possible to synchronize each axis.
3. As each axis is synchronized, a tension applied to the tape is kept constant to provide tape affixing without elongation or sagging.
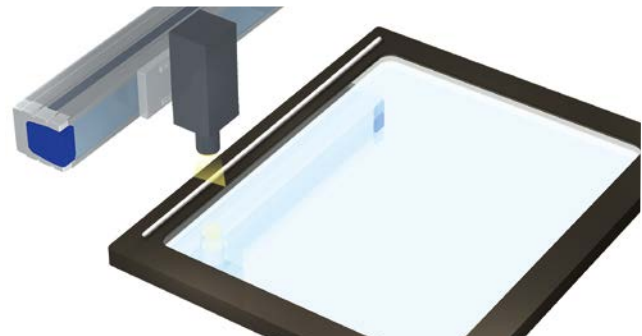

YAMAHA LINEAR MOTOR SINGLE-AXIS ROBOTS

P H A S E R
Series
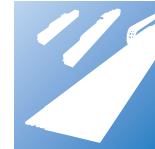
P.72

Check camera moving unit

■ Checking with moving camera.
■ Multi-point check with a camera.
■ Drawing created with line sensor and moving axes.

POINT

1. Allows movement with minimal speed fluctuations.
2. Compact size.

Ink jet printer

■ Ink jet feeding mechanism.

Speed
Movement at uniform speed
Stroke
Ink jet head
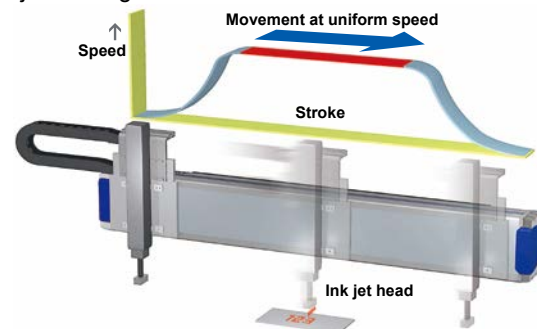
POINT

1. Allows movement with minimal speed fluctuations.
2. Capable of coping with a request for high speed. (Max. 2,500mm/sec)
3. Allows setting long constant-speed sections, with large acceleration.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

141

Chip mounter

- Bonding and chip mounting on circuit board.
- Electronic part mounting process.

Operation ranges are overlapped

Vacuum head

Chips, etc.

Circuit board

Dispenser
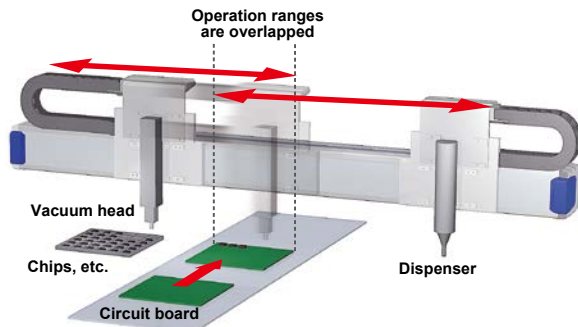
POINT

1. Double carrier structure enabled compact size.
2. Layout designing is easy as different workpieces can be carried onto the same axis.
3. Clean specification requirement can be coped with easily.

Check device

- Handling to multiple number of check devices.

Parts unloaded

Parts loaded

POINT

1. 2 heads can be installed to the same axis compactly.
2. High speed operation.

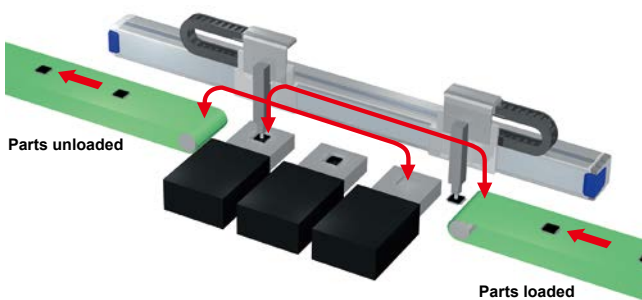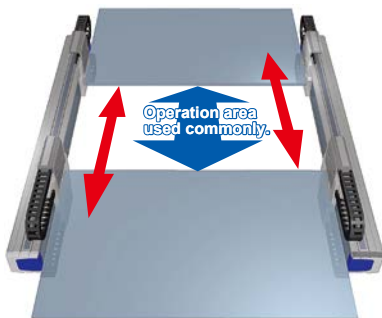## Open / close device

- Wide open/close of shutter.

Operation area used commonly.

POINT

1. It is possible to drive a work with a large width (shutter) using the dual drive method.
2. Various advantages (such as center layout, higher open / close speed, sharing of effective stroke) are available due to adoption of the double carrier mechanism.
3. Drives with the dual drive mechanism with 2 units of double carrier PHASER in parallel and fixing them with sliders respectively.
4. RCX240 can control 4 axes in all.

High-speed screw tightening unit

- Positioning 2 nut runners at the same time for a large work piece.
- 2 screws at opposite locations tightened at the same time.
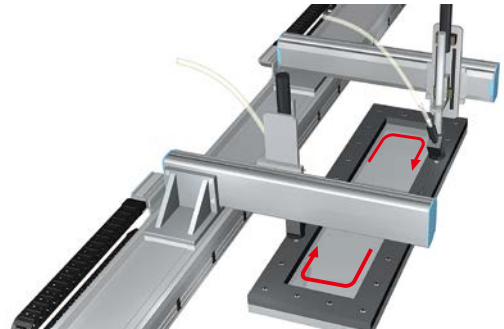
POINT

1. Performs high-speed, high-accuracy screw tightening on large work pieces such as large construction materials.

High-speed applicator (1)

- Application to a large size workpiece such as liquid crystal circuit board and the like.
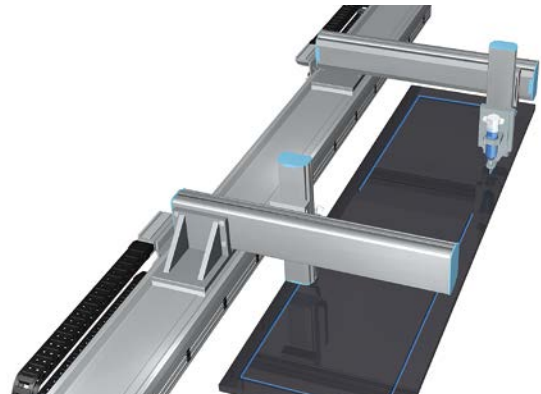
POINT

1. Capable of applying to a large size work such as a flat panel display.

High-speed applicator (2)

- Application to a large size workpiece such as liquid crystal circuit board and the like.
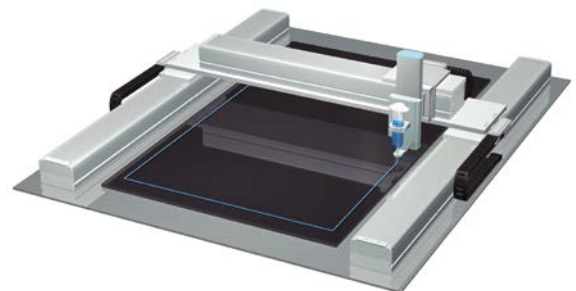
POINT

1. Capable of applying to a large size work such as a flat panel display.
2. It is possible to drive a work with a large width using the dual drive method.

High-speed pick & place unit

■ Pick & place operation from the rack for large size parts.

POINT

1. Capable of carrying over a long distance between processes in various production facilities.

High-speed loading / unloading robot

■ The loading unit and unloading unit are mounted on the same axis.
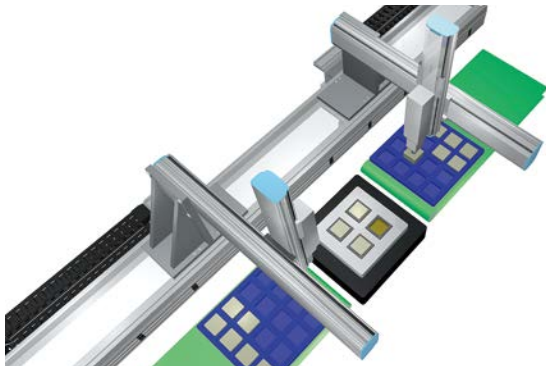
POINT

1. Utilizing double-carriers allows building systems that are highly efficient in saving space.

YAMAHA CARTESIAN ROBOTS

X Y - X
Series

P.96

Conveyor (2 parts simultaneously)

■ Conveyance with high efficiency using double arms.

F10

F10

F17L
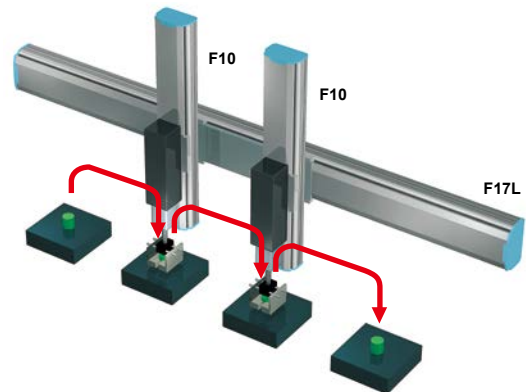
POINT

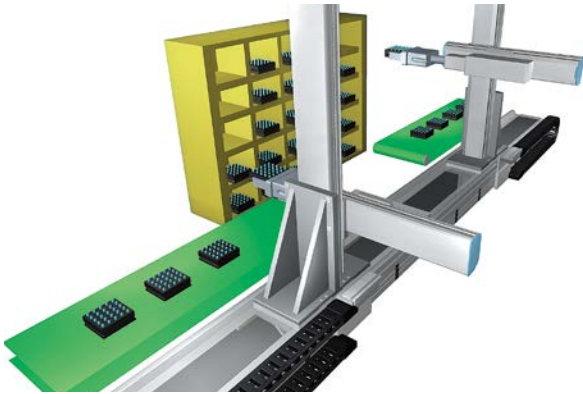1. Setting 2 units on the Z-axis intersecting XZ drastically cuts the total tact time and reduces the required installation space.
2. Customization only possible because a highly rigid frame and guide are used.

Application of adhesive agent

■ Application of adhesive agent within a large size liquid crystal surface processing unit.
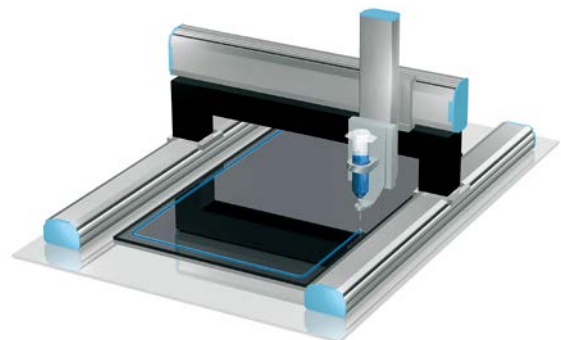
POINT

1. Capable of handling large size workpieces.
2. Also applicable to cutting work with a cutter, surface check with a camera, etc.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

143

IC palletizing within the unit

- ICs are taken out of the pallet and parts are transferred to the specified place by the XYZ Cartesian robot.
- Application as a part of the machine used in the process where a die is attached to the circuit board using thermocompression bonding in the manufacture of semiconductors.

FXYBx

Pallet

Special station
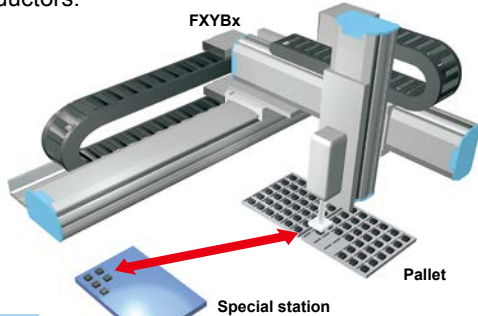
1. By using the RCX controller, it is possible to use the result of the operation based on variables during palletizing.

Tester (2 Cartesian robots controlled simultaneously)

- Use as a tester in the post-process of manufacturing electronic parts.

RCX340
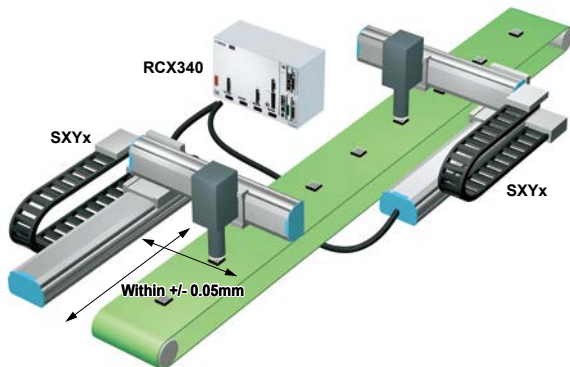
SXYx

SXYx

Within +/- 0.05mm

1. 2 units of SXYx are operated using 1 unit of RCX340 with settings for 2 robots.
2. The vertical traveling accuracy of XY axes of both 2 units of SXYx is within +/- 0.05mm.

Sealing

- Spreading sealant to mating faces of the cases.

SXYx
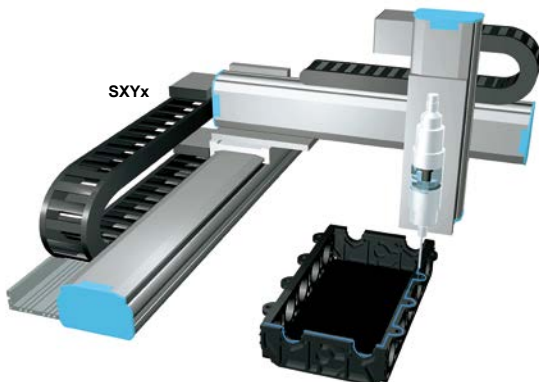
1. Three dimensional application using 3 axes Cartesian robot. Cartesian robot incorporated with special purpose machine.

Transfer and stacking device within the unit

- Used in the sheet metal processing unit.
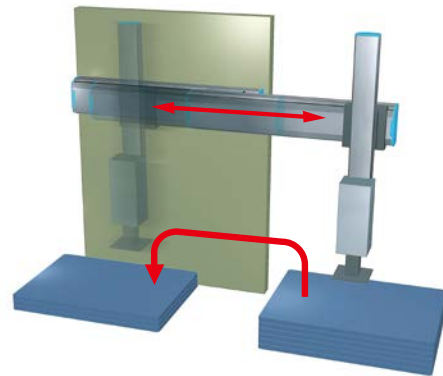
1. X1 and X2 axes are superposed for space efficiency.
2. The unit layout is easy even for the doubled stroke.

Dispenser

- Spreading adhesive agent to drums.

R axis

Z axis

Y axis : Wide moving

X axis
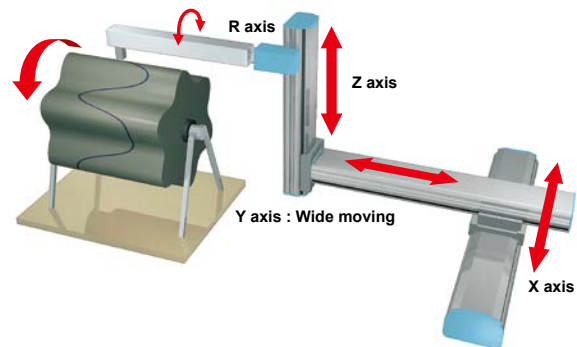
1. Boosting the R axis strength allows 3-dimensional interpolation + R operation.
2. Each axis has high rigidity and so can easily withstand harsh conditions such as on the moving arm (handles 100mm/sec).

Insertion unit
(Tare weight cancellation using moving Z + air balancer)

- Heavy workpiece inserted in the pallet, etc.
- Heavy workpiece before processing set in the processing machine.
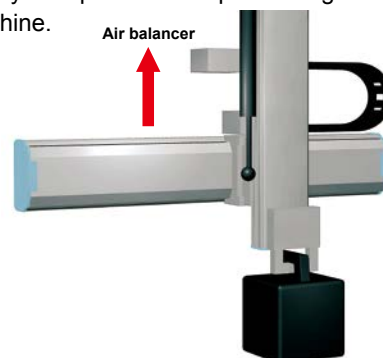
Air balancer

1. Z axis moving type: The heavy workpiece is cancelled by the air balancer and moved up and down.

Assembler & tester base machine
(Simultaneous operation at upper and lower levels)

- Tester (upper and lower probes, camera with lighting) .
- Precision spot welding machine.
- Simultaneous assembly at upper and lower levels (caulking parts, screw tightening) .

POINT

1. Simultaneous control of 2 Cartesian robots.
2. Levelness of upper and lower robots assured (custom specification) .

Part assembly machine

- Automotive clutch assembly
- Efficient alternate assembly of two different parts

MOVIE
Web site
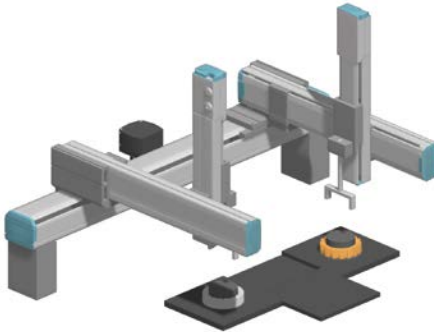
POINT

1. Double-arm ensures a short tact time along with a space-saving footprint.
2. Double-arm specifications selectable as standard feature.
3. Y axis and Z axis strokes are selectable separately for left and right. (Special orders available)
4. Nut rotation type X axis supports long stroke and also maintains maximum speed.

Application example of long-stroke and dual-drive

- Long-stroke axis is combined with Cartesian axis using the dual-drive control.

MOVIE
Web site

POINT

1. As the dual drive (simultaneous 2 axes) control is applied, a Y-axis long-stroke of up to 2m can be supported. This is applicable to long-distance transfer and heavy workpiece transfer specifications.
2. As the vertical axis is combined, this can be applied to the inspection with large LCD glass panels arranged vertically.
3. According to required repeated accuracy, YAMAHA proposes optimal combination mechanism and control method.

Dual-drive transport between processes

- Uses dual-drive to convey large and heavy workpieces

MOVIE
Web site
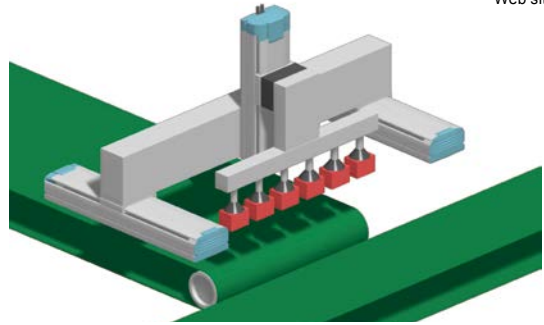
POINT

1. Dual-drive allows synchronized operation of two single-axis robots of the same type.
2. Using dual-drive even allows conveying heavy items or large size parts and products.
3. Enhanced acceleration also helps cut tact time.

Application example of combination with auxiliary single-axis

- Cartesian robot and single-axis robot are controlled with one controller.

MOVIE
Web site
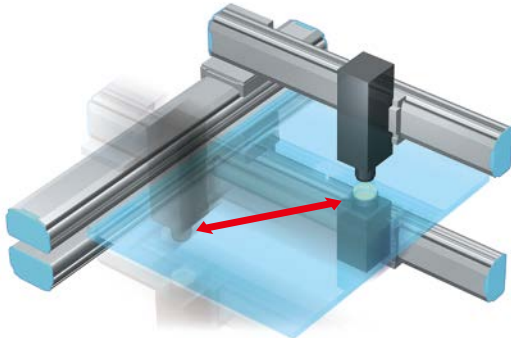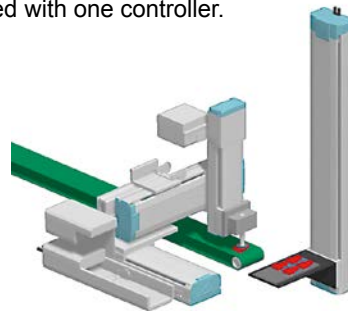
POINT

1. Multiple robots can be controlled simultaneously with one controller. Up to 8 axes of maximum 2 groups can be expanded.
2. As multiple robots are controlled with one controller, the linking can be performed without using the I/O of the PLC or between the controllers. Therefore, there are merits that the number of control program creation steps is reduced to shorten the equipment startup time and reduce the labor cost.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

145

YAMAHA SCARA ROBOT

YK-X
Series

P.34

Finished product inspection, touch-panel type evaluation machine

- Finished product function test.
- Developed software evaluation.
- Push-button type quality check.

Image processor

PDA

YK150XG
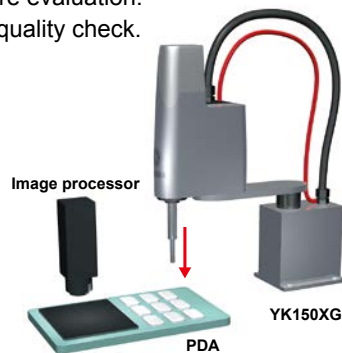
POINT

1. Supports a variety of systems in a product lineup that is top class in its field with arm lengths from 120mm to 1200mm.
2. Space saving.
3. Using SCARA, judgment is made through image processing by pushing each button.

Conveying masks for wafers

- Replacing wafer mask from the stocker.

Discharge　**Discharge**

Wall mounting

Clean environment (Class 10)

Mask　Mask　Mask　Mask

Side view　**Top view**
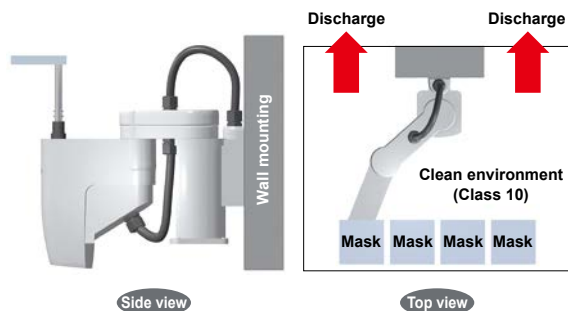
POINT

1. Drive section installed beneath work pieces has clean specs + inverted structure.
2. If the cylindrical coordinate type robot is used, a running axis is necessary for this application. However, if SCARA with the interpolation function is used, the fixed type is usable.

Tall work pieces conveying and stacking machine

- Tall workpieces stacked by utilizing long Z axis.
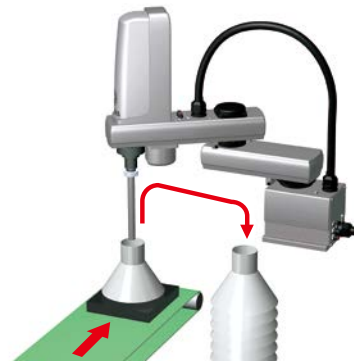
POINT

1. Z-axis long stroke is also accepted as special order.
   If a stroke longer than the standard stroke shown below is needed, consult YAMAHA.
   Standard Z-axis stroke
   [YK120XG to YK180XG] ...... 50mm　　　[YK180X to YK220X]........ 100mm
   [YK250XG to YK600XGL] .... 150mm　　　[YK500XG to YK600XG] .. 200mm/300mm
   [YK600XGH to YK1000XG].. 200mm/400mm　[YK1200X] 400mm
2. SCARA robot is used by utilizing its advantages, such as X/Y-axis speed and space saving installation.

Assembly cell (independent cell)

- Base machine of independent type assembly cell.

Hand change unit　　**Work jig unit**

Part supply unit
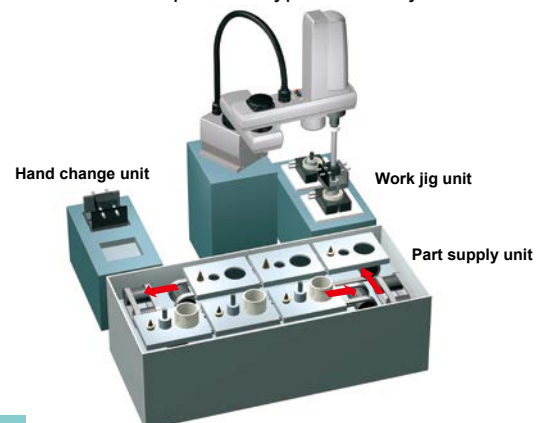
POINT

1. Optimum for multi type variable quantity production.
2. Setting up reception places forms a construction of multiple number of cells.

Assembly cell (line cell)

- Base machine of line type assembly cell.

Part feeder

Assembly pallet

Part supply pallet
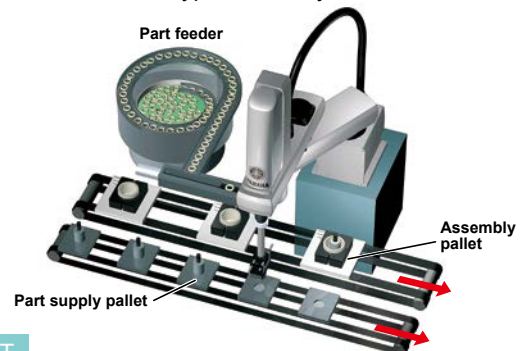
POINT

1. Utilization of advantages of SCARA with a wide operation range.
2. Form a line to any length by coupling these cells together.

146

Assembly cell
(Handling unit for special purpose tester)

■ When placed between 2 turn tables, handling of both tables is possible.

Special purpose tester

Test stage

Assembly stage
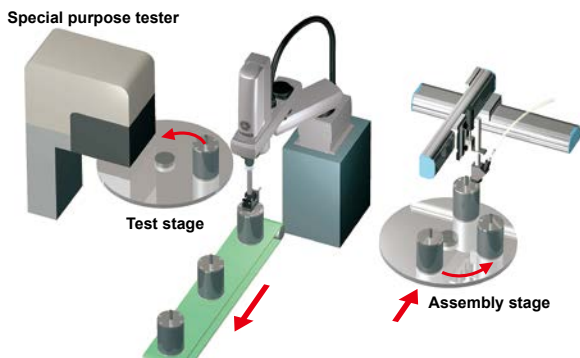
POINT

1. Utilization of advantages of SCARA which has a wide operation range.

Inter-process transport

■ Conveys large and heavy workpieces

MOVIE
Web site
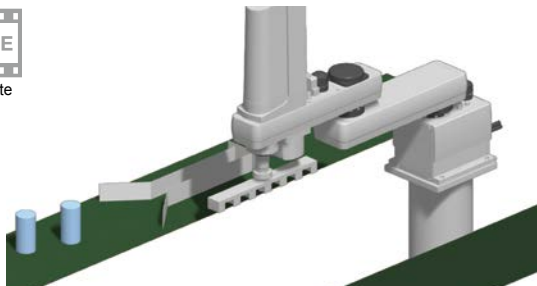
POINT

1. Built-in structure with no timing belt achieves high allowable moment-of-inertia on R axis.
2. High allowable moment-of-inertia on R axis permits using large hand on robot. So more workpieces can be conveyed per one time which makes operation more efficient.
3. R axis can be driven at high acceleration during low moment-of-inertia. This shortens the tact time.

Inter-process transport with inverse specifications applied

■ Workpiece inter-process transport with inverse specifications applied

MOVIE
Web site

POINT

1. As the inverse specifications are applied, the workpieces can be held from the lower portion to prevent foreign objects from dropping onto workpieces being transported.
2. The performance of the robot mechanical section is similar to the standard specifications. The high performance of the YK-XG series can be utilized.
3. YAMAHA SCARA robot can select three installation patterns, standard floor installation, wall-mount, inverse specifications (Note). YAMAHA proposes various ideas about equipment design.

Note. If the robot with the standard specifications, normal ceiling-mount specifications, or wall-mount specifications is installed upside down, this may cause a malfunction. When considering the installation like this, be sure to use the robot with the dedicated inverse specifications (YK-XS-U).

YAMAHA PICK & PLACE ROBOTS

Y P - X
Series

P.100

Precision part assembler (1)

■ Assembly of small size precision parts.
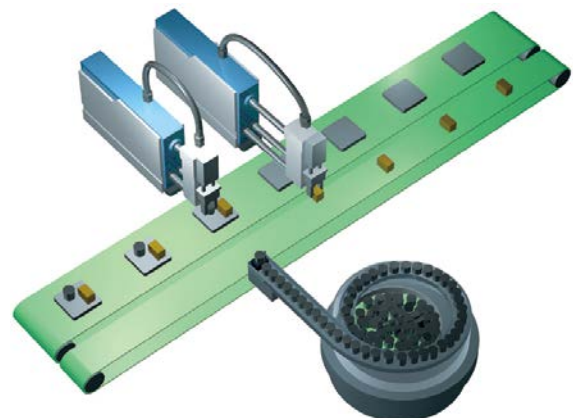
POINT

1. High speed assembly.
2. Narrow machine width, and settable with a tiny pitch.

Precision part assembler (2)

■ Assembly of small size precision parts.
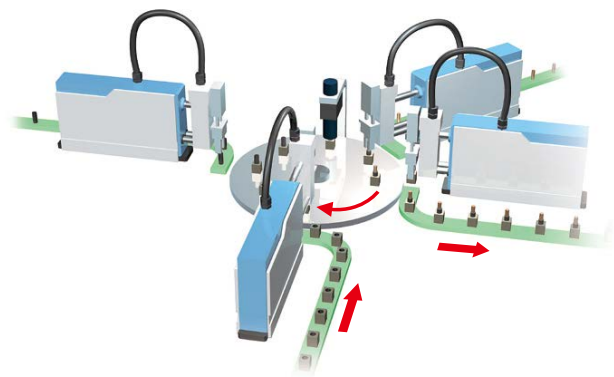
POINT

1. Speed increased even more when used in combination with a rotary table.

Linear conveyor modules LCMR200
Single-axis robots GX
Controller YHX
Linear conveyor modules LCM100
SCARA robots YK-X
Robot Vision RCX iVY2+
Single-axis robots Robonity
Linear motor single-axis robots PHASER
Single-axis robots FLIP-X
Compact single-axis robots TRANSERVO
Cartesian robots XY-X
Pick & place robots YP-X
CLEAN
CONTROLLER
Electric Gripper YRG
APPLICATION
SERVICE PERIOD

YAMAHA ROBOT VISION

RCXiVY2+
System

P.44

Small part palletizing

■ Assemble a sorting pallet for the automated machine in the next process.

CMOS camera
Supply vibrator hopper
Palletizing robot
Supply conveyor
Recovery conveyor
Recovery conveyor
Palettes
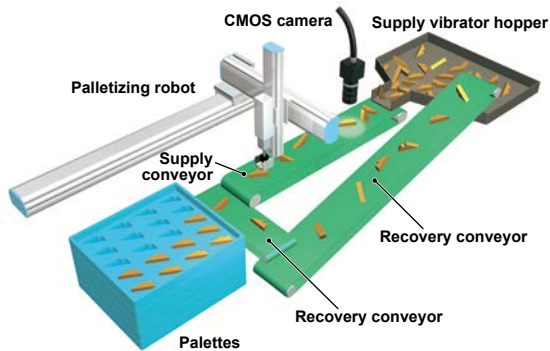
Loading parts into assembler machine

■ Loads unsorted parts or components into automated equipment.

Transfer-Assembly stage
CMOS camera
Screw tightener stage
Supply conveyor
Part 2 supply stage
Assembly turntable
Part 1 supply stage
Finished part extractor conveyor
CMOS camera
Supply conveyor
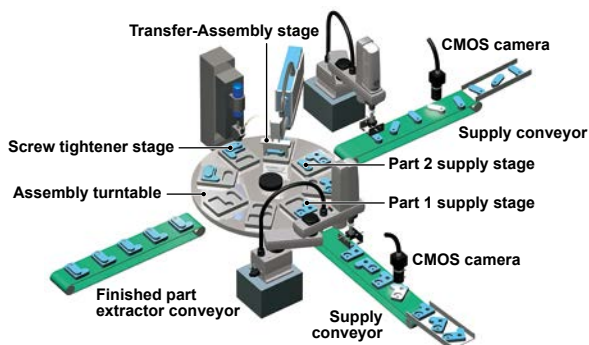
Screw tightening work with SCARA robot

■ Screw tightening work with the SCARA robot is improved using the RCXiVY2+ system.

MOVIE
Web site

POINT

1. As the position detection function using the RCXiVY2+ system is added, the robot is applicable to various conditions.
   For example, if the screw hole position varies, the workpiece position on the conveyor is not constant, or various workpieces are supplied, the robot can be installed easily.
2. Use of RCXiVY2+ system makes it possible to perform the calibration using system operation. As the teaching steps can be reduced, the equipment startup time is shortened and labor cost can be reduced.

Pick & place work

■ Component pick & place work is improved using RCXiVY2+ system.

MOVIE
Web site
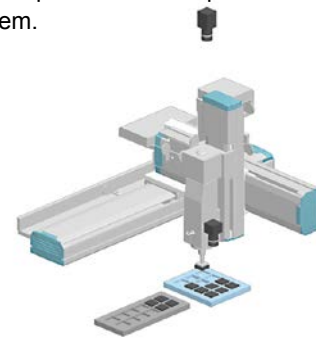
POINT

1. As the position detection function using the RCXiVY2+ system is added, components on soft pallets or pallets with low accuracy can be gripped correctly.
2. Therefore, merits are provided that the pallet manufacture cost is reduced, positioning mechanism is simplified, and equipment cost is reduced.
3. Two camera input channels are provided on one controller.
4. The camera can be incorporated into the robot or secured outside the robot.
   Simple calibration work can be performed under either of the conditions.

Sealing correction

■ Sealing tasks for placing gaskets or applying adhesives in parts
■ Coating trajectory correction using RCXiVY2+ system

MOVIE
Web site
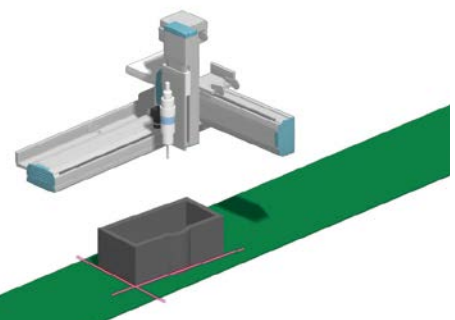
POINT

1. Use of RCXiVY2+ system makes corrections to Cartesian robot sealing tasks.
2. RCXiVY2+ system detects deviations and tilting even if workpiece strayed from its main position, and automatically corrects the coating trajectory.
3. Maintains high coating quality even during low positioning accuracy on component side.

Labeling device

■ Affixing labels to food packages
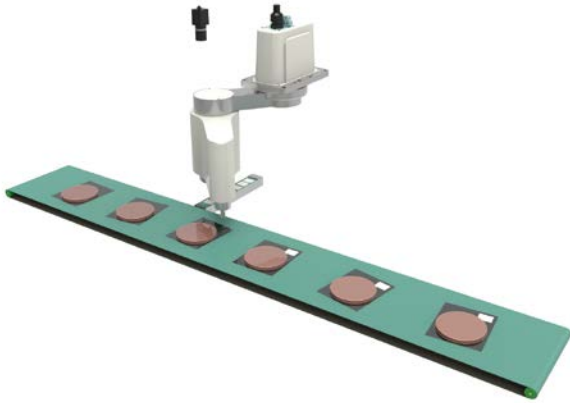
POINT

1. Even if the incoming workpieces are irregularly spaced or positioned, labels can be affixed at the same position.

Screw attachment position detection

■ Television panel screw attachment
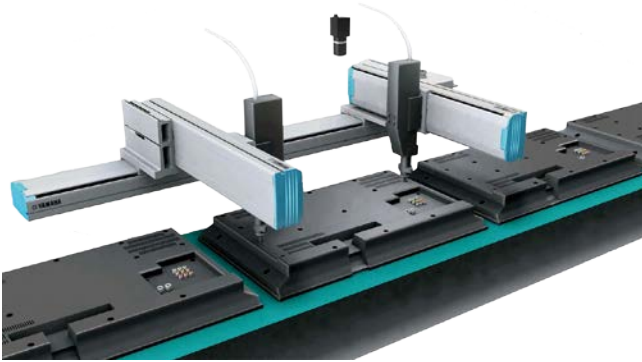
POINT

1. Hole position is detected, and screws are fastened accurately.

Position compensation with upward-facing camera

■ Installing irregularly-shaped parts on a circuit board
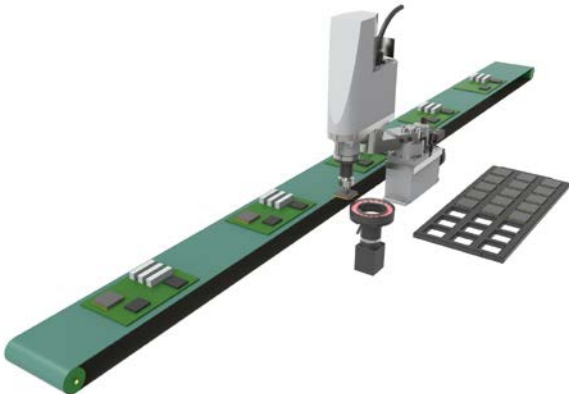
POINT

1. The roughly-positioned circuit board connector is picked up, the upward-facing camera is used to apply position compensation, and the part is mounted directly on the circuit board.

Linear conveyor modules **LCMR200**

Single-axis robots **GX**

Controller **YHX**

Linear conveyor modules **LCM100**

SCARA robots **YK-X**

Robot Vision **RCX iVY2+**

Single-axis robots **Robonity**

Linear motor single-axis robots **PHASER**

Single-axis robots **FLIP-X**

Compact single-axis robots **TRANSERVO**

Cartesian robots **XY-X**

Pick & place robots **YP-X**

CLEAN

CONTROLLER

Electric Gripper **YRG**

APPLICATION

SERVICE PERIOD

Officially discontinued models and service period

Models listed in the current model column are equivalent items. Since these might not be compatible in some cases, please contact Yamaha if you are considering replacement.
E-MAIL robotn@yamaha-motor.co.jp

Articulated robots

Series	Model	Sale discontinued time	Service period	Current model (equivalent)
YA 6-axis	YA-RJPDF	Dec. 2022	Dec. 2029	–
	YA-R3FPDF			
	YA-R5FPDF			
	YA-R5LFPDF			
	YA-R6FPDF			
YA 7-axis	YA-U5FPDF			
	YA-U10FPDF			
	YA-U20FPDF			

Single-axis robots

Series	Model	Sale discontinued time	Service period	Current model (equivalent)
FLIP–X	YMS45	Dec. 2013	Dec. 2020	–
	YMS55			
	T4	Dec. 2012	Dec. 2019	T4L
	T4H			T4LH
	T5			T5L
	T5H			T5LH
	T6			T6L
	C4			C4L
	C4H			C4LH
	C5			C5L
	C5H			C5LH
	C6			C6L
	T7	Dec. 2009	Dec. 2016	–
	F17 (Former model)	Sep. 2002	Sep. 2009	F17 (Latter model)
	F17 (Latter model)	–	–	On sale
	F20 (Former model)	Sep. 2002	Sep. 2009	F20 (Latter model)
	F20 (Latter model)	–	–	On sale
	T9 (Former model)	Oct. 2001	Oct. 2008	T9 (Latter model)
	T9 (Latter model)	–	–	On sale
	T9H (Former model)	Oct. 2001	Oct. 2008	T9H (Latter model)
	T9H (Latter model)	–	–	On sale
	F10 (Former model)	Oct. 2001	Oct. 2008	F10 (Latter model)
	F10 (Latter model)	–	–	On sale
	F14 (Former model)	Oct. 2001	Oct. 2008	F14 (Latter model)
	F14 (Latter model)	–	–	On sale
	F14H (Former model)	Oct. 2001	Oct. 2008	F14H (Latter model)
	F14H (Latter model)	–	–	On sale
PHASER	MR12/12D	Dec. 2019	Dec. 2026	MF7
	MR16/D (Horizontal specification)	Dec. 2011	Dec. 2018	MF7/7D
	MR16/D (Wall-mount specification)			MF15/15D
	MR16H/16HD	Dec. 2011	Dec. 2018	MF15/15D
	MR20/20D			MF20/20D
	MR25/25D			MF30/30D
	MF50/50D	Mar. 2011	Mar. 2018	MF75
	MF100/100D			
Pico	T4P	Dec. 2009	Dec. 2016	–
	T5P			
FLIPt	FSt	Jan. 2002	Jan. 2009	F10
	BFSt			B10
	LTt			T9
	LSt			F14
	BLSt			B14
	LRt			–
	LTHt			T9H
	LSHt			F14H
	BLSHt			B14H
	MSt			F17
	HSt			F20
	HSLt			F20N
	BHS			–
	FROP–Ft			R5
	FROP–St			R10
	FROP–Mt			R20
	TR			–
	FTt			–
Economy Type	BPS	Jan. 2002	Jan. 2009	–
	PS			
	BSt			

* When checking the basic specifications and external views of the discontinued models, refer to the catalog PDF on the "Discontinued models and repair support periods" page at YAMAHA's website.

Single-axis robots (continued)

Series	Model	Sale discontinued time	Service period	Current model (equivalent)
FLIP AC	BFSA	Jul. 1998	Jul. 2005	B10
	BLSA			B14
	BSA			–
	FROP–FA			R5
	FROP–HA			–
	FROP–MA			R20
	FSA			F10
	FTA			–
	HSA			F20
	HSC			C20
	HSLA			F20N
	LRA			–
	LSA			F14
	LTA			T9
	MS			–
	MSA			F17
	MTA			T9H
FLIP DC	BFS	Jul. 1998	Jul. 2005	B10
	BLSII			B14
	BS			–
	FROP–F			R5
	FROP–M			R20
	FROP–H			–
	FS			F10
	FT			–
	FTB			
	HS			
	HSL			
	LR			
	LS/LSII/LSB/LSI			F14
	LT/LTB/LTI			T9
	MS			F17
	MT			T9H

Cartesian robots

Series	Model	Sale discontinued time	Service period	Current model (equivalent)
XY–X	MXYX 3 axis ZF	Jan. 2005	Jan. 2012	MXYX 3 axis ZFL/ZFH
	MXYX 4 axis ZRF			MXYX 4 axis ZRFL/ZRFH
	MXYX pole type ZPM			MXYX pole type
	TXYX	Mar. 2004	Mar. 2011	PXYX
	SXYX (Former model)	Oct. 2001	Oct. 2008	SXYX (Latter model)
	SXYX (Latter model)	–	–	On sale
	MXYX (Former model)	Oct. 2001	Oct. 2008	MXYX (Latter model)
	MXYX (Latter model)	–	–	On sale
	HXYX (Former model)	Sep. 2002	Sep. 2009	HXYX (Latter model)
	HXYX (Latter model)	–	–	On sale
XYt	FXYt	Jan. 2002	Jan. 2009	FXYBX
	SXYt–C			SXYX
	SXYt–S			
	SXYLt			SXYBX
	MXYt–C			MXYX
	MXYt–S			
	HXYt–C			HXYX
	HXYt–S			
	HXYLt			HXYLX
XY AC	SXYA	Jan. 1999	Jan. 2006	SXYX
	SXYLA			SXYBX
	MXYA			MXYX
	HXYA			HXYX
	HXYLA			HXYLX
XY DC	FXY	Jan. 1999	Jan. 2006	–
	FXYL			
	SXY			SXYX
	SXYI			
	SXYL			–
	MXY	Oct. 1995	Oct. 2002	–
	MXYL			

LCMR200 Linear conveyor modules
GX Single-axis robots
YHX Controller
LCM100 Linear conveyor modules
YK-X SCARA robots
RCX iVY2+ Robot Vision
Robonity Single-axis robots
PHASER Linear motor single-axis robots
FLIP-X Single-axis robots
TRANSERVO Compact single-axis robots
XY-X Cartesian robots
YP-X Pick & place robots
CLEAN
CONTROLLER
YRG Electric Gripper
APPLICATION
SERVICE PERIOD

Pick & place robots

Series	Model	Sale discontinued time	Service period	Current model (equivalent)
YP	YPX220	Apr. 2001	Apr. 2008	YP220BX
YP AC	YP320A	Apr. 2001	Apr. 2008	YP320X
	YP340A			YP340X
	YP330A			YP330X
YP DC	YPS21	Jul. 1998	Jul. 2005	–
	YP340	May 1996	May 2003	YP340X
	YP330			YP320X
	YP320			

* When checking the basic specifications and external views of the discontinued models, refer to the catalog PDF on the "Discontinued models and repair support periods" page at YAMAHA's website.

SCARA robots

Series	Model	Sale discontinued time	Service period	Current model (equivalent)
YK–XR	YK400XR	Jun. 2020	Jun. 2027	YK400XE-4
YK–XP	YK500XP	Dec. 2013	Dec. 2020	YK500XGP
	YK600XP			YK600XGP
	YK700XP			YK700XGP
	YK800XP			YK800XGP
	YK1000XP			YK1000XGP
	YK250XP	Dec. 2012	Dec. 2019	YK250XGP
	YK350XP			YK350XGP
	YK400XP			YK400XGP
YK–XC	YK250XC(H)	Dec. 2012	Dec. 2019	YK250XGC
	YK350XC(H)			YK350XGC
	YK400XC(H)			YK400XGC
YK–XS	YK300XHS	Dec. 2012	Dec. 2019	YK300XGS
	YK400XHS			YK400XGS
	YK500XS			YK500XGS
	YK600XS			YK600XGS
	YK700XS			YK700XGS
	YK800XS			YK800XGS
	YK1000XS			YK1000XGS
YK–X	YK250X(H)	Dec. 2012	Dec. 2019	YK250XG
	YK350X(H)			YK350XG
	YK400XH			YK400XG
	YK550X(H)	Dec. 2009	Dec. 2016	–
	YK120X	Dec. 2008	Dec. 2015	YK120XG
	YK150X			YK150XG
	YK400X			YK400XG
	YK500X			YK500XG
	YK600X			YK600XG
	YK700X			YK700XG
	YK800X			YK800XG
	YK1000X			YK1000XG
YK AC (SANYO motor model)	YK550H	Mar. 2003	Mar. 2010	YK550X(H)
	YK420A–I/420ALZ–I/440A–I	Mar. 2001	Mar. 2008	YK400XG
	YK540A–I/541A–I			YK500XG
	YK520A–I			
	YK640A–I/641A–I			YK600XG
	YK620A–I			
	YK740A–I/741A–I			YK700XG
	YK720A–I			
	YK840A–I/841A–I			YK800XG
	YK820A–I			
	YK1041A–I			YK1000XG
	YK1043A–I			–
	YK1243A–1			YK1200X
YK AC (YASUKAWA motor model)	YK420A/420ALZ/440A	Dec. 1995	Dec. 2002	YK400XG
	YK520A/540A/541A			YK500XG
	YK620A/640A/641A			YK600XG
	YK720A/740A/741A			YK700XG
	YK820A/840A/841A			YK800XG
	YK1041A			YK1000XG
	YK1043A			–
	YK1243A			YK1200X

SCARA robots (continued)

Series	Model	Sale discontinued time	Service period	Current model (equivalent)
YK DC	YK5020/5021	May 1997	May 2004	Replacement unavailable
	YK7011/7012/7022			
	YK4000/4000LZ/4040			YK400XG
	YK420/420LZ/440			
	YK520/540/541			YK500XG
	YK620/640/641			YK600XG
	YK720/740/741			YK700XG
	YK820/840/841			YK800XG
	YK1041			YK1000XG
	YK1200			YK1200X
CAME	YK5012	Mar. 1990	Mar. 1997	–
	YK8050			
	YK8080			

* When checking the basic specifications and external views of the discontinued models, refer to the catalog PDF on the "Discontinued models and repair support periods" page at YAMAHA's website.

Controllers

Model	Sale discontinued time	Service period	Service availability	Replacing models for maintenance	Current model (equivalent)
YAC100	Dec. 2022	Dec. 2029	Being continued	–	–
RCX221	Dec. 2022	Dec. 2029	Being continued	RCX320	RCX320
RCX222					
RCX240/RCX240S	Dec. 2019	Dec. 2026	Being continued	RCX340	RCX340
RDX/RDP	Aug. 2015	Aug. 2022	Being continued	RDV–X/RDV–P	RDV–X/RDV–P
TS–S	Sep. 2013	Sep. 2020	Already discontinued	TS–S2	TS–S2
DRCX	Dec. 2012	Dec. 2019	Already discontinued	–	–
ERCX	Jul. 2011	Jul. 2018	Already discontinued	–	–
SRCP30	Mar. 2011	Mar. 2018	Already discontinued	–	–
PRC	Dec. 2009	Dec. 2016	Already discontinued	Replacement unavailable	No current model
RCX141	Dec. 2008	Dec. 2015	Already discontinued	RCX340	RCX340
RCX142					
RCX142–T				Replacement unavailable	No current model
SRCX	Apr. 2008	Apr. 2015	Already discontinued	SR1–X	SR1–X
SRCP05/10/20				SR1–P RDP	SR1–P RDP
SRCD				SR1–X RDX	SR1–X RDX
TRCX				Replacement unavailable	RCX340
RCX40	Oct. 2005	Oct. 2012	Already discontinued	RCX340	RCX340
QRCX	Mar. 2002	Mar. 2009	Already discontinued	Replacement unavailable Note. 1	RCX340
QRCX–E					RCX340
SRCH	Jan. 2002	Jan. 2009	Already discontinued	Replacement unavailable	SR1–X
DRCH					RCX320
TRCH3					RCX340
TRCH4					
DRC–R	Apr. 2001	Apr. 2008	Already discontinued	Replacement unavailable	No current model
QRCH	Mar. 2001	Mar. 2008	Already discontinued	Replacement unavailable	RCX340
QRCH–E					
QRCH–P					
MRCH					No current model Note. 2
MRCH–E					No current model Note. 2
SRCA (Latter model)	Oct. 1999	Oct. 2006	Already discontinued	Replacement unavailable	SR1–X
DRCA (Latter model)					RCX320
ERC					SR1–X
MRCA	Nov. 1997	Nov. 2004	Already discontinued	Replacement unavailable	No current model Note. 2
DRC	Sep. 1997	Sep. 2004	Already discontinued	Replacement unavailable	RCX320
SRC–1					SR1–X
SRC–2					
QRC	May 1997	May 2004	Already discontinued	Replacement unavailable	RCX340
QRCA					

LCMR200 | Linear conveyor modules
GX | Single-axis robots
YHX | Controller
LCM100 | Linear conveyor modules
YK-X | SCARA robots
RCX iVY2+ | Robot Vision
Robonity | Single-axis robots
PHASER | Linear motor single-axis robots
FLIP-X | Single-axis robots
TRANSERVO | Compact single-axis robots
XY-X | Cartesian robots
YP-X | Pick & place robots
CLEAN
CONTROLLER
YRG | Electric Gripper
APPLICATION
SERVICE PERIOD

Controllers (continued)

Model	Sale discontinued time	Service period	Service availability	Replacing models for maintenance	Current model (equivalent)
SRC–3	Dec. 1995	Dec. 2002	Already discontinued	Replacement unavailable	SR1–X
SRC–4					
SRCA (Former model)					RCX320
DRCA (Former model)					
MRCA					RCX340
MRC					
RCH20	Mar. 1994	Mar. 2001	Already discontinued	Replacement unavailable	RCX340
SRC2A					SR1–X
SRC4A					
RCH40	Mar. 1992	Mar. 1999	Already discontinued	Replacement unavailable	RCX340
RCH41					
RCS40	Mar. 1990	Mar. 1997	Already discontinued	Replacement unavailable	RCX340
RCS41					
LP					SR1–X

If a replacing model for maintenance is available, it can be used as a set including the controller and the cable for conversion.
When replacing with the current model, it is necessary to replace the robot and the controller as a set.
Note 1. The replacement can be performed using the QRCX→RCX240→RCX340 conversion cable. (Some models are not supported.)
Note 2. Replacement with the current model is possible under certain conditions.

Robot vision

Model	Sale discontinued time	Service period	Service availability	Current model (equivalent)
iVY2 system	Dec. 2020	Dec. 2027	Being continued	RCXiVY2+ system
iVY system	Dec. 2019	Dec. 2026	Being continued	RCXiVY2+ system

* When checking the basic specifications and external views of the discontinued models, refer to the catalog PDF on the "Discontinued models and repair support periods" page at YAMAHA's website.

Programming box

Model	Sale discontinued time	Service period	Service availability	Current model (equivalent)
YAP	Dec. 2022	Dec. 2029	Being continued	–
TP-2	Dec. 2009	Dec. 2016	Already discontinued	–
MPB	Jan. 2009	Jan. 2016	Already discontinued	RPB [Note]
TP-1	Oct. 2005	Oct. 2012	Already discontinued	TP-2
TPB	Jun. 2005	Jun. 2012	Already discontinued	HPB
DPB	Jan. 1999	Jan. 2006	Already discontinued	HPB
YPU20	Mar. 1994	Mar. 2001	Already discontinued	–
SPB-2	Aug. 1992	Aug. 1999	Already discontinued	–
YPU1	Mar. 1992	Mar. 1999	Already discontinued	–
YPU2				
YPU3				
SPB	Jan. 1990	Jan. 1997	Already discontinued	–

Note. Customers using the RCX40/RCX141/RCX142 controllers will use a connector adaptor cable.

Software

Model	Usage	Sale discontinued time	Current model (equivalent)
RCX-Studio Pro	RCX320/RCX340 controller	May. 2020	RCX-Studio 2020
RCX-Studio	RCX340 controller	Jul. 2016	RCX-Studio 2020
TOP	Robot driver RDX/RDP	Aug. 2015	RDV-Manager
POPCOM	ERC series / SRC series / DRC series / SR1 series	Jul. 2013	POPCOM+
VIP	For multi-axis controller	Dec. 2009	VIP+
YPB-Win	Pico series	Dec. 2009	–

* When checking the basic specifications and external views of the discontinued models, refer to the catalog PDF on the "Discontinued models and repair support periods" page at YAMAHA's website.

MEMO

Linear conveyor modules LCMR200

Single-axis robots GX

Controller YHX

Linear conveyor modules LCM100

SCARA robots YK-X

Robot Vision RCX iVY2+

Single-axis robots Robonity

Linear motor single-axis robots PHASER

Single-axis robots FLIP-X

Compact single-axis robots TRANSERVO

Cartesian robots XY-X

Pick & place robots YP-X

CLEAN

CONTROLLER

Electric Gripper YRG

APPLICATION

SERVICE PERIOD

Global service and safe support system

In addition to Japan, China, and Southeast Asia, we also have sales and service offices in the United States and Europe.

These offices and our worldwide network of distributors enable us to provide close service to our customers in every region of the world.

We will continue to strive to further improve our services and support for our customers with a complete system.

YAMAHA MOTOR CO., LTD.

Robotics Operations
Sales & Marketing Section
FA Sales & Marketing Division

127 Toyooka, Chuo-Ku, Hamamatsu, Shizuoka 433-8103, Japan
Telephone +81-53-525-8350 / Facsimile +81-53-525-8378

WEB

Inquiry

Youtube

Case Example Handbook

Japan: Sales and service offices

● **Robotics East Japan Sales Office**
Totsu Bldg 1F, 1-11-7 Sakuragi, Omiya-ku, Saitama City,
Saitama 330-0854, Japan
TEL +81-48-657-3281

● **Robotics Central Japan Sales Office**
127 Toyooka, Chuo-Ku, Hamamatsu, Shizuoka 433-8103, Japan
TEL +81-53-525-8325

● **Robotics West Japan Sales Office**
#1 MT Bldg 5F, 5-13-9 Nishinakajima, Yodogawa-ku, Osaka City,
Osaka 532-0011, Japan
TEL +81-6-6305-0830

● **Robotics Kyushu Sales Office**
3-6-11 Hakataekihigashi, Hakata-ku, Fukuoka City, Fukuoka
812-0013, Japan
TEL +81-92-432-8106

Overseas: Sales and service offices

● **YAMAHA MOTOR IM (SUZHOU) CO., LTD.**
#8 Building No.17 East Suhong Road, Suzhou Industrial Park,
China 215026
TEL +86-512-6831-7091

● **YAMAHA MOTOR IM（SUZHOU）CO., LTD.
SHENZHEN BRANCH**
1/F, Bd. 1, Yesun Intelligent Community I,Guanguang Rd.
1301-70,Guanlan St,Longhua District Shenzhen ,Guangdong,P.R.C.
TEL +86-755-2393-9910

● **Yamaha Motor Corporation, U.S.A.**
3065 Chastain Meadows Pkwy NW #100, Marietta, GA 30066
TEL +1-770-420-5825

● **YAMAHA MOTOR EUROPE N.V. German Branch Office,
Robotics Business**
Hansemannstrasse 12, 41468 Neuss, Germany
TEL +49-(0)2131-2013 (Ext520)

● **Thai Yamaha Motor Co., Ltd**
64 Moo 1, Debaratna Road, Tambol Srira Jorrake Yai, Amphur
Bangsaothong, Samutprakarn 10570, Thailand
TEL +66-96-779-7680

● **Yamaha Robotics Solutions Asia Pte. Ltd.**
Address: 3 Ang Mo Kio Street 62 #01-40, Singapore 569139
TEL +65-6028-3540

Sales network

Thailand
Thai Yamaha Motor Co., Ltd

Singapore Yamaha Robotics Solutions Asia Pte. Ltd.

China YAMAHA MOTOR IM (SUZHOU) CO., LTD.

Robotics West Japan Sales Office

**Main office/
Robotics Central Japan Sales Office**

**Robotics Kyushu
Sales Office**

Robotics East Japan Sales Office

USA
Yamaha Motor Corporation,
U.S.A.

Germany
YAMAHA MOTOR EUROPE N.V.
German Branch Office,
Robotics Business

China YAMAHA MOTOR IM（SUZHOU）CO., LTD.
SHENZHEN BRANCH

YAMAHA MOTOR CO., LTD.

⚠ **Safety Precautions**

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

● Specifications and appearance are subject to change without prior notice.

202401-PE