Basic specifications of linear conveyor module

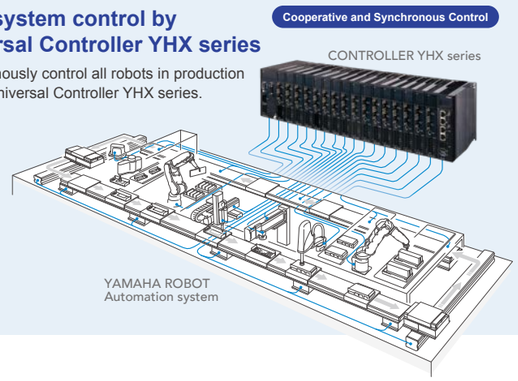
Drive method		Linear motor with moving magnet type core
Position Search		Full range absolute position detection sensor and full range slider ID detection
Maximum payload		15 kg
Maximum speed		3,000 mm/sec
Repeatability		+/-5 µm
Mechanical tolerance between robot sliders		+/-10 µm
Total stroke limit		Approx. 25 m *1
Maximum number of robot sliders		64 units *1
Minimum spacing between robot sliders		210 mm
Main frame dimensions	**Max. external size of frame cross-section**	W178 × H85 mm (Including robot slider)
	Linear module length	200 mm to 1,000 mm (1 module) select every 100 mm.
	Robot slider length	198 mm
Weight	**Linear module**	10 kg [Per 1 m of linear module]
	Robot slider	1.2 kg
	Connection unit	0.8 kg
Power supply	**Control power supply**	48 VDC +/-10%, 75 W [Per 1 m of linear module]
	Motor power supply *2	48 VDC +/-10%, approx. 200 W [Per 1 robot slider]
	Maximum current capacity *3	Total 30 A [Control power supply: 15 Amax., Motor power supply: 30 Amax]
Operating environment	**Operating temperature**	0 °C - 40 °C
	Storage temperature	-10 °C - 65 °C
	Operating humidity	35% - 85%RH [No condensation]
Controller		YHX series *4

*1. Subject to system configuration
*2. Different from one motion pattern to another
*3. Maximum current capacity for one input section (one connection unit). Where the electrical power demand exceeds the input capacity, supply electrical power through multiple input sections.
*4. The YHX controller requires a separate electrical power supply.

Total system control by Universal Controller YHX series

Cooperative and Synchronous Control

Synchronously control all robots in production line by Universal Controller YHX series.



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YAMAHA
Revs Your Heart

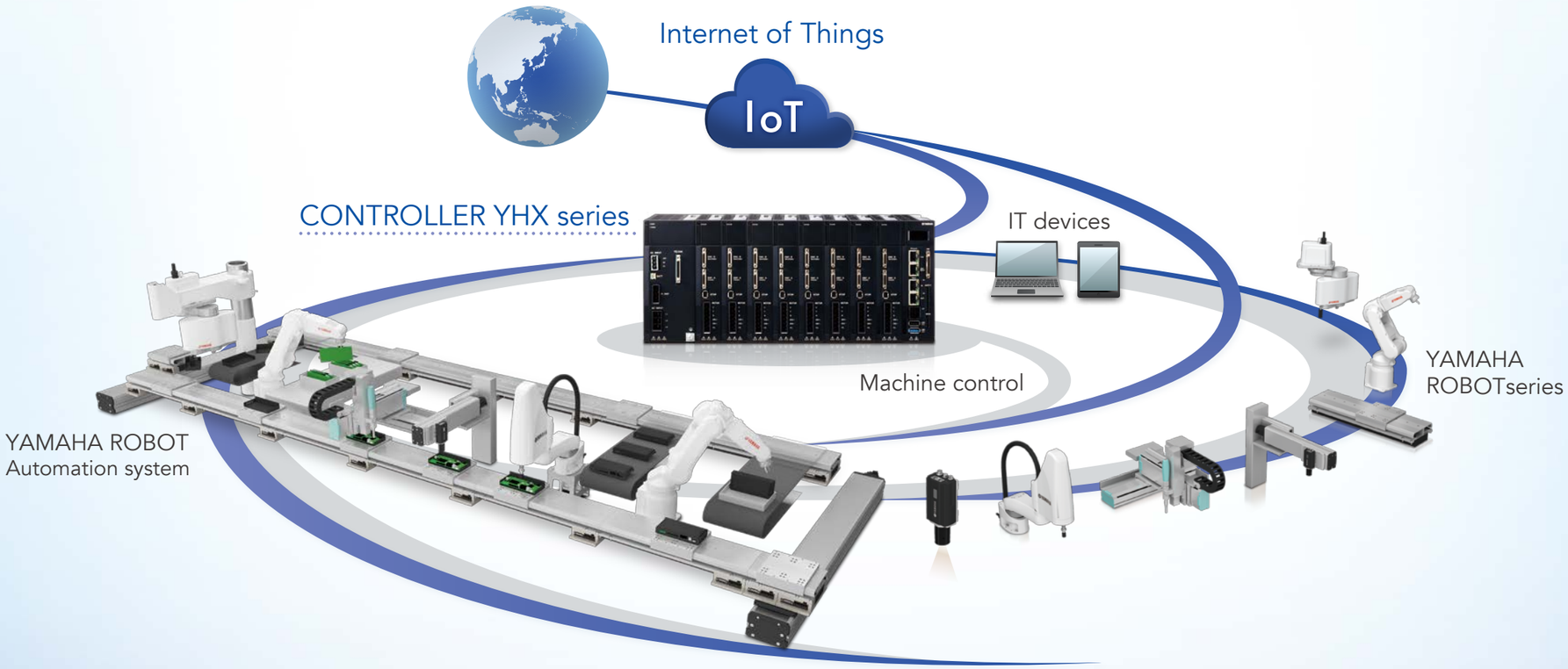
LINEAR CONVEYOR MODULES

LCM-X

ENGLISH

Yamaha's own unique univerersal robot control concept offers Total Optimization of your production line.

Helps building fully automated production line efficiently at lower cost in a short period of time. YAMAHA's Advanced Robotics Automation Platform in the product lineup is a good match with IoT.
Full range of robotic products used for various automated processes including transport, handling, assembly, and image recognition have been completely renewed. The newly released Universal Controller YHX series enables cooperative and synchronous control of the Yamaha robotic products. In addition, the linear conveyor module LCM-X series, new SCARA robot YKX series, single-axis robot GX and YLE series, and robot vision system YFAEYE are being released.
Yamaha is proud to offer this new product lineup providing solutions to the challenges in today's manufacturing scenes, and dramatically accelerate automated production to maximize your return of investment.



Advanced Robotics Automation Platform

The new universal control robot system that sharpens your competitive edge

Next generation of linear conveyor module.

Introducing LCM-X

Faster,
more accurate,
and easier to use

Improve space efficiency, transport accuracy, and acceleration / deceleration performance.

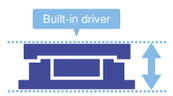
Taking the place of the predecessor model "LCM100" while employing module structures and high speed direct drive by linear motors, the "LCM-X" enables to build up high value-added yet general-purpose transport systems between processes.
Significantly improved space efficiency, higher transport accuracy and increased acceleration and deceleration performance, the linear conveyor modules realize higher level transport automatization ever before.

Maximum acceleration
5 G

Stop position repeatability
±5 μm

Span between sliders
210 mm

Low profile
H85 mm

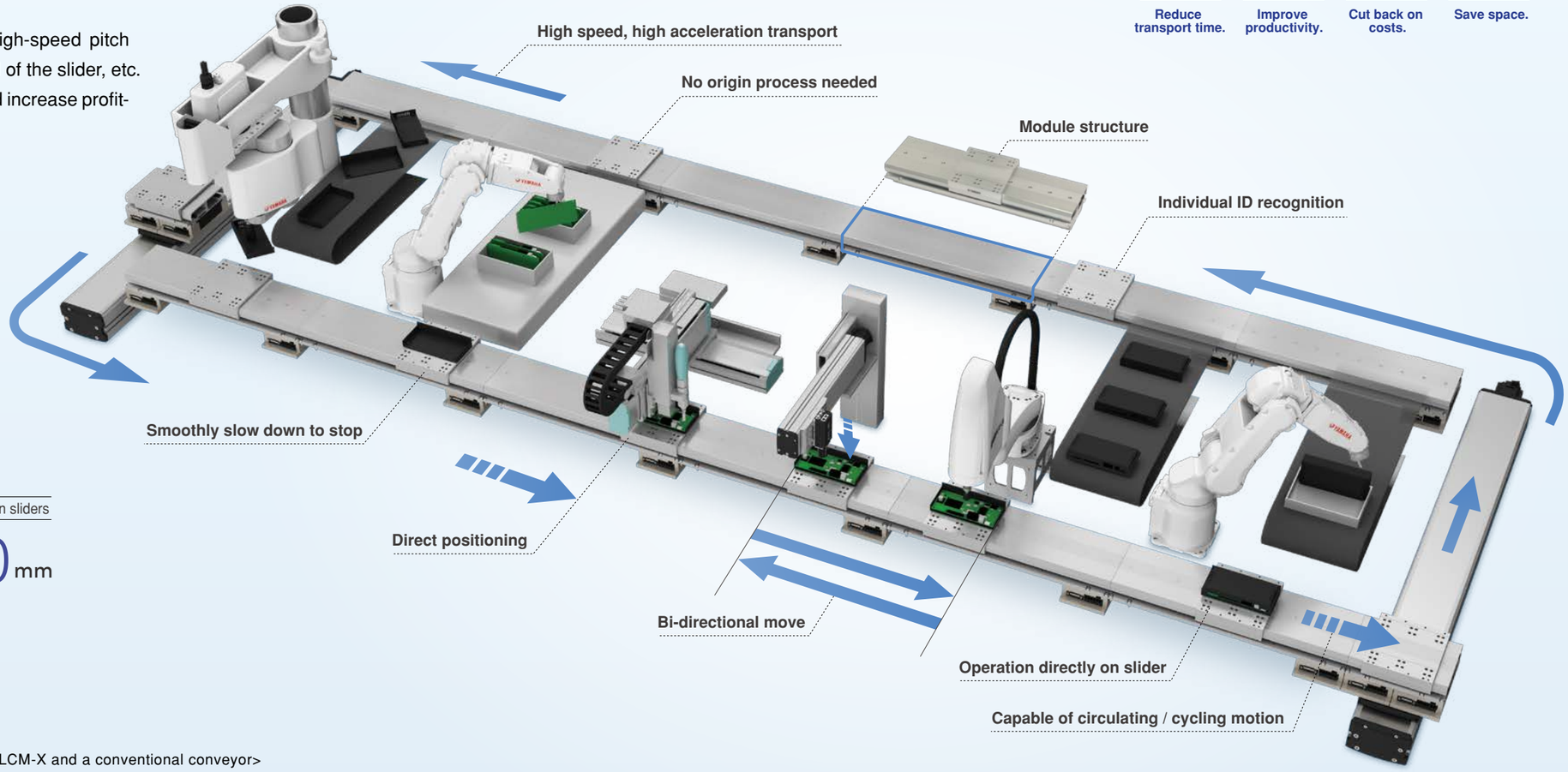


From ordinary “passive flow” to “active position transport”. By converting conveyor flow into active production process improves profitability.

Dramatically increase production line efficiency with the high-speed pitch operation, assembly work on the slider, and the reverse feed of the slider, etc. Eliminate wasted time and space in the transport process and increase profitability.

A production line using LCM-X linear conveyor modules

Reduce transport time. | Improve productivity. | Cut back on costs. | Save space.



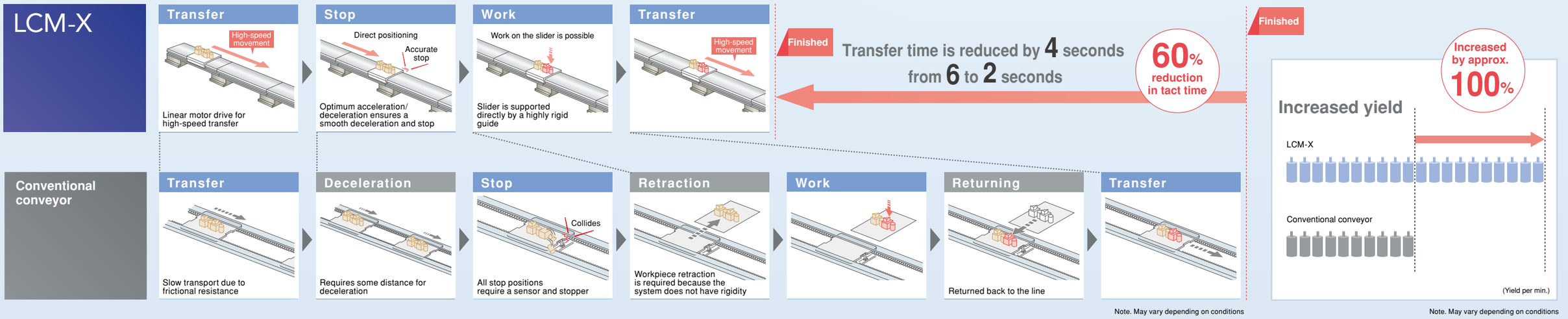
Highly accurate transport improves product quality.

Single device stop position repeatability	Error width (machine difference) between sliders
+/- 5 µm	+/- 10 µm

High efficiency in production

Maximum speed	Maximum acceleration	Span between sliders
3 m/sec	5 G	210 mm

Reduce transport time. <Comparison between LCM-X and a conventional conveyor>



Note. May vary depending on conditions

Note. May vary depending on conditions

Further advanced usability for central and coordinate control with one Universal Controller.

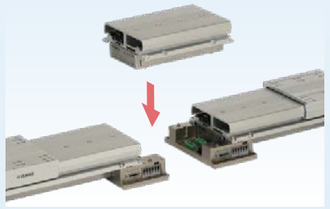
The module profile and pitch between sliders are approximately half the conventional sizes by incorporating the newly developed linear motor, sensor module, and integrated motor driver built into the body. At the same time, the acceleration/deceleration rate and stopping accuracy are both increased.

Centralized coordinate control

A single Universal Controller can control all the sliders in a centralized manner including slider circulation. Capable of cooperative motion with peripheral robots, the Universal Controller enables you to build up a highly sophisticated transport process.

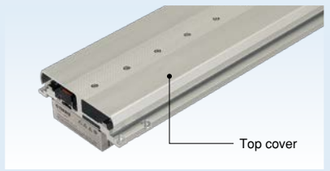
The bridge pier structure enables speedy setup.

Installation work, including coupling of each module, can be completed in a very easily in a short time using the connection unit that enables quick mechanical high-precision positioning and electrical connection of each model.



Top cover incorporated

A cover to protect the guide rail, motor, and sensors is attached to the top face to prevent faults caused by falling objects in each work process.



All the sliders can be operated / programmed independently.

Use of the motor driver integrated into and put together with the main body saves electrical wiring.

The unitized electro-mechanical structure with a motor driver built in the module controls entire LCM-X. Connecting with the Universal Controller via one YQ Link cable is all you have to do. It surely contributes to saving space in the control panel.

Recognize slider's individual IDs

The multi-track magnetic sensor enables to identify a slider ID at any point in the transport process. Even if you have unintentionally changed sliders, the system correctly identifies the ID of each slider.

Mechanical tolerance between sliders +/-10 µm

When stopping two or more sliders at a point one after another, the actual stop positions are inevitably different because each slider has its own error width (machine difference). The LCM-X minimizes the width error among the sliders within as little as +/-10 µm to best suit high accuracy processes. Costs can be reduced as there is no need for RFID, etc.

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.

Maximum acceleration 5 G

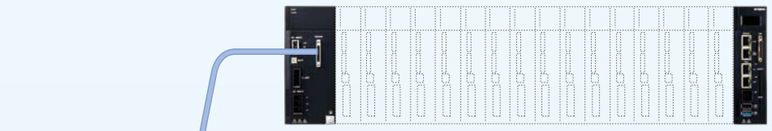
The maximum acceleration is 2.5 times the LCM100, allowing high speeds to be reached. High speed motion between an extremely short distance is possible even in a high density process or pitch feed.

Low profile structure

Use of the newly developed linear motor makes the module height approximately half compared with the previous model. You can also use a space under the frame.

Universal Controller YHX series

Centrally control all sliders on the transport process, including the circulation operation, and the peripheral robots.



Controllable line length Max. 25.5 m

Number of simultaneous controllable sliders Max. 64 units

Centralized, coordinate control

Complete absolute position system

No origin process needed

Maximum payload 15 kg

Maximum speed 3 m/sec

Maximum acceleration 5 G

Slider width 150 mm

Span between sliders 210 mm

Mechanical tolerance between sliders +/-10 µm

Single device stop position repeatability +/-5 µm

Realizing universal and high value-added transport between processes.

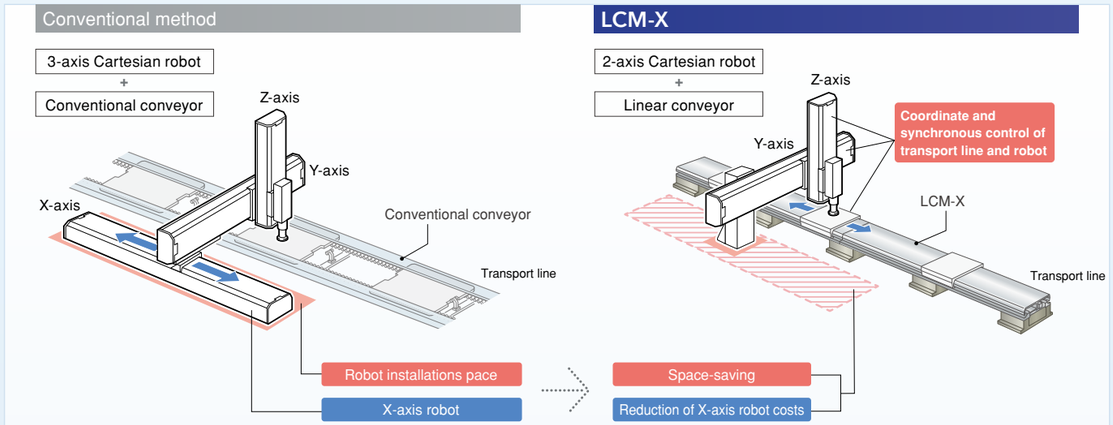
Reduce transport cycle time, and save equipment space.
Increase production ability, and contribute a stronger cost competitiveness.

Meanings of icons

Realize coordinate and synchronous control of transport and robot

Coordinate and Synchronous Control

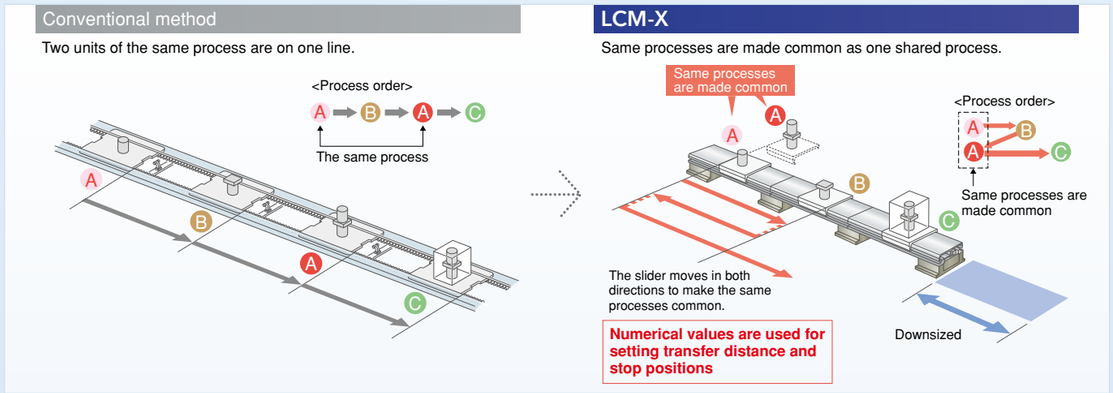
- Use the Universal Controller YHX series for cooperative and synchronous control of the transport line and robot.
- Save space and reduce costs by connecting a 2-axis Cartesian robot to the LCM-X transport line, and operating it as a Cartesian 3-axis robot.



Process sharing

Direct drive | Slider backward travel

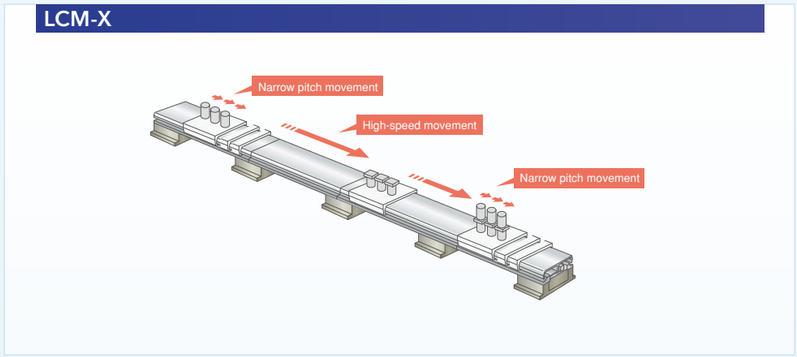
- Because the slider motion is bi-directional, the same processes can be shared, costs can be reduced, and the transport line can be downsized.
- Flexible operations including high-speed reciprocation and retracting just part of the slider are possible.



Can be moved efficiently between processes with different tacts

Direct drive | Narrow pitch operation

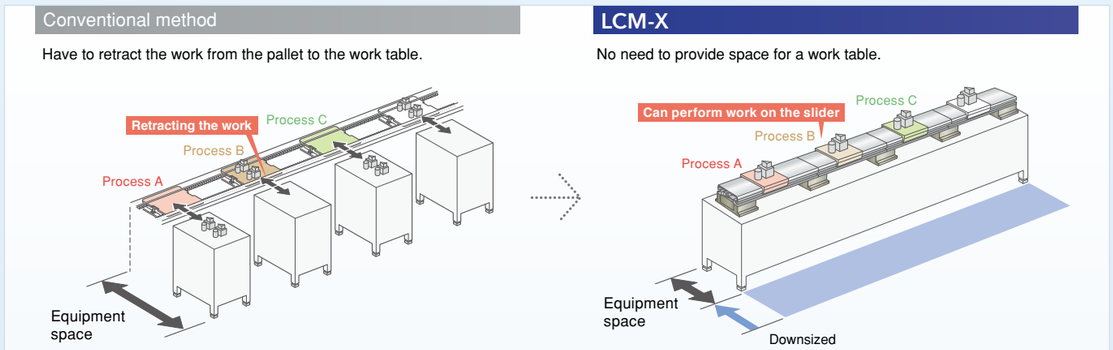
- Direct drive with the servo control eliminates the need to install mechanical stoppers and sensors for stopping.
- Set the stop position in a short time just by changing the program.
- Flexibly handle frequent setup required when changing part types.
- Narrow pitch movement makes it possible to perform pitch feed within the same process for short time processes.
  In long time processes, three workpieces can be moved together at a high-speed so the movement time can be reduced.



Workpieces do not need to be retracted

Highly rigid guide | Module support

- The highly rigid guide enables assembly and processing on the transport line.
- There's no need to pull the part from the transport line to the work table, the system can be downsized, and costs can be reduced.



Easily serviceability = Easy troubleshooting

- The top cover keeps dust away.
- The environment-resistant magnetic sensor is resilient to contamination.
- One-touch positioning eliminates the need for bothersome precision setting.
- Motors and scales do not make contact and are free from abrasion.
- As only the rails are sliding parts, dust generation is low.
- 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.

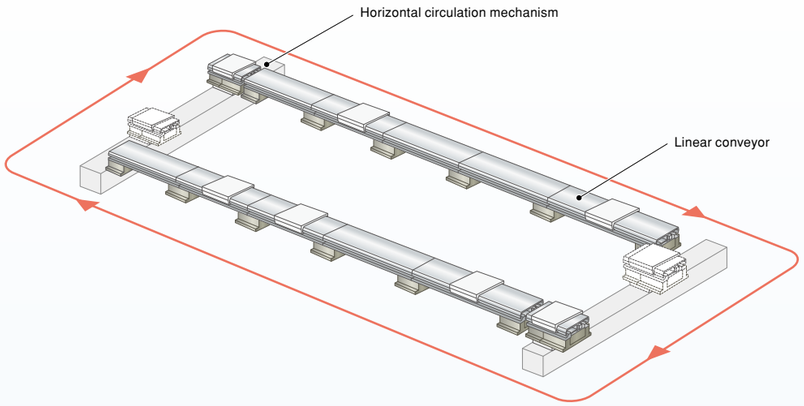
Sleek and simple configuration.
Easy to design transport system with high degree of freedom.

All slider operations in the transport process and control of the peripheral robots can be completed with a single Universal Controller.
Efficiently and easily build an automated production line.

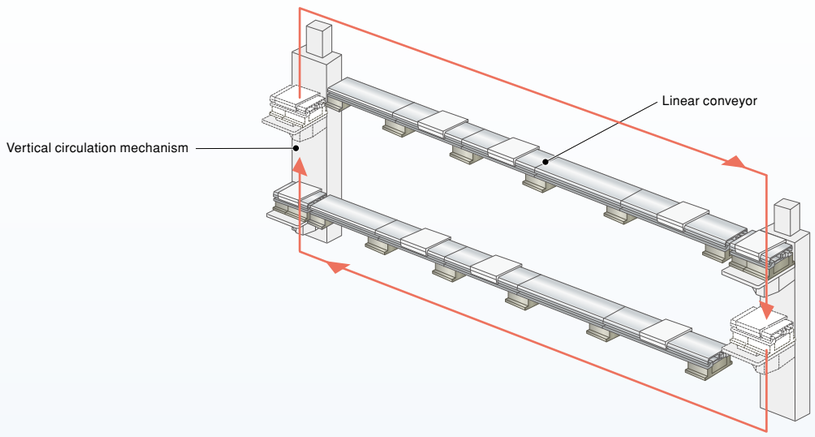
Freedom and flexibility in line layout design

- Layout examples by combining modules with circulation mechanisms

Example of horizontal circulation



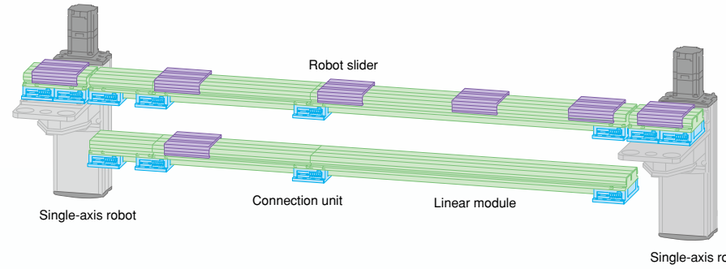
Example of vertical circulation

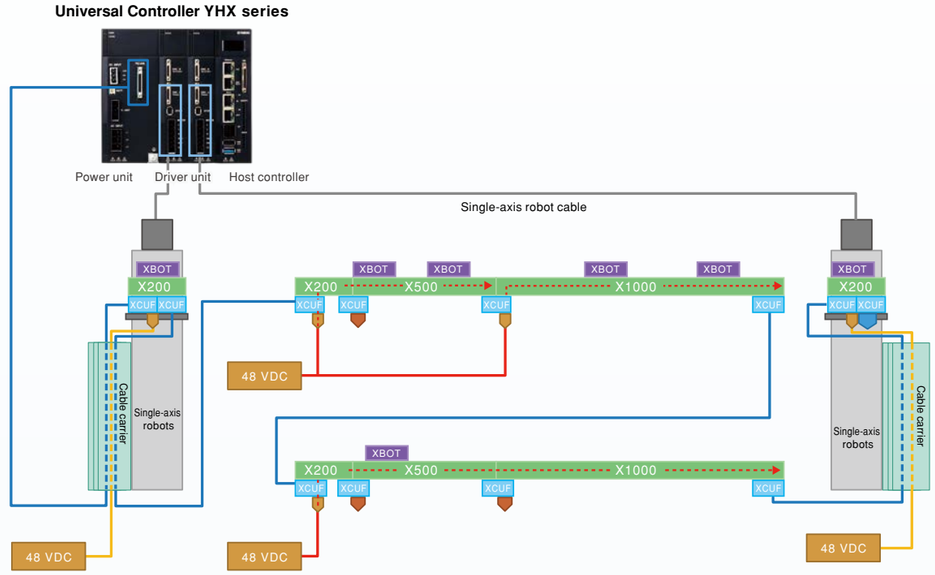


System configuration diagram

Configuration example — One way 1700 m, vertical circulation transport line

* 200 mm linear model and single-axis robot are used for circulation section (traverser)





Name	Icon	Description
Linear module		• The arrangement of each stroke variation can be selected freely. • The modules of the circulation section are also common.
Connection unit	XCUF	• Required quantity: “Number of connection modules” + 1 • When connecting a 200 mm, 500 mm, and 1000 mm linear module as shown above, a total of four units are required. • When only one linear module is used, such as shown at the circulation section, two units are required.
Robot slider	XBOT	• Length: 198 mm • Minimum pitch: 210 at distance between centers • If the jig pallet mounted on the robot slider is longer, the pitch will be the jig pallet length + 10 mm.
YQ Line terminating connector		Connect to the terminal end of the linear conveyor module that is connected with the Universal Controller.
Module drive power supply connector		3-pin
Module drive power jumper connector		6-pin
48 VDC power supply	48 VDC	48 VDC-1000 W
YQ Link cable		As shown above, the Universal Controller and each line of the linear conveyor module are connected from left to right with a single stroke.
Module power cable		The user must prepare a wire with diameter corresponding to the required power capacity.
Flexible power cable for movable module		This LCM-X power cable is a flexible cable that is especially connected within the cable conduit for the circulation section, etc.

Configuration parts

Linear module

	Model	Part No.
200 mm	LCM-X200	KFA-1K111-20
300 mm	LCM-X300	KFA-1K111-30
400 mm*	LCM-X400	KFA-1K111-40
500 mm	LCM-X500	KFA-1K111-50
600 mm*	LCM-X600	KFA-1K111-60
700 mm*	LCM-X700	KFA-1K111-70
800 mm*	LCM-X800	KFA-1K111-80
900 mm*	LCM-X900	KFA-1K111-90
1000 mm	LCM-X1000	KFA-1K111-A0

* Special order. Contact the Yamaha Sales Office for details.

Robot slider

Model	Part No.
LCM-XBOT	KFA-M2267-00

Connection unit

Use this unit to fix the modules to the frame, or to connect modules together.
■ Required quantity: "Number of connection modules" + 1

Type	Model	Part No.
Front type	LCM-XCUF	KFA-M2040-H0
Bottom type	LCM-XCUB	KFA-M2040-V0

Linear module support

Use this support to suppress linear module deformation under the transport weight or applied load. The guide for use is shown below.

Linear module	Payload	Applied load	Installation place
LCM-X200	(Not required)	(Not required)	(Not required)
LCM-X300	(Not required)	(Not required)	(Not required)
LCM-X500	(Not required)	300 N or more	Near applied load
LCM-X1000	5 kg or more	50 N or more	Center of module and near applied load

Model	Part No.
LCM-XMS	KFA-M2041-00

YQ Link movable cable

This cable connects the controller (YHX) and linear conveyor module. Refer to the system configuration drawing for a connection example.

Cable length	Model	Part No.
3 m	YHX-YQL-R3M	KFA-M5361-30
10 m	YHX-YQL-R10M	KFA-M5361-A0

YQ Link terminating connector

Connect to the terminal end of the linear conveyor module that is connected with the Universal Controller. Refer to the system configuration drawing for a connection example.

Model	Part No.
YHX-YQL-TC	KFA-M5361-00

Module electric power supply jumper connector (6 pins)

This connector supplies power from module to module.
This is a 6-pin jumper connector with wire for power bypass.

Model	Part No.
LCM-XCU-PJC	KFA-M4421-00

Module electric power supply connector (3 pins)

This is a 3-pin connector for power input that supplies power from the external power unit to the module. The applicable wire diameter is AWG24-10.

Model	Part No.
LCM-XCU-PSC	KFA-M4421-10

Module electric power supply (48 VDC-1000 W)

This general-purpose 48 VDC power supply unit can be used for both module control and motor drive.
- Rated output 21 A, peak output rating 42 A (within 5 sec.)
- Unit type general-purpose power, efficiency > 80%, power factor > 90%

Model	Part No.
LCM-XCU-PS-1000W	KFA-M6561-00

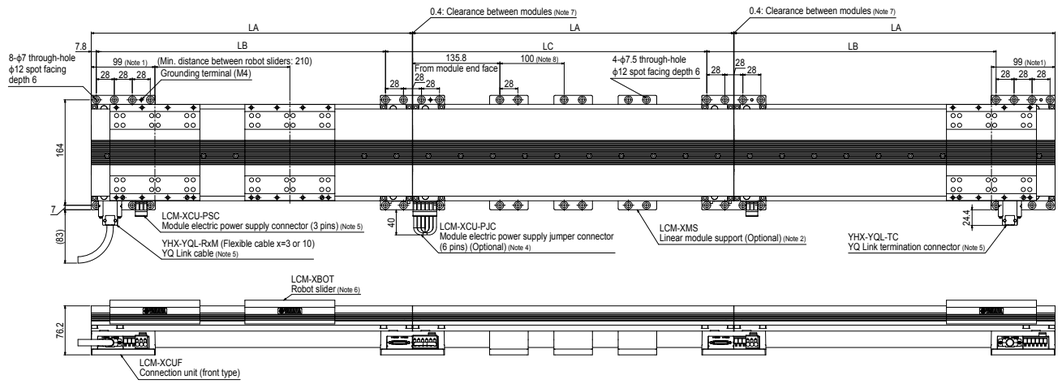
Module drive power movable cable (20 m)

This flexible cable is used mainly for the modules at the circulation section.
The user can cut the cable to the required length, and treat the ends.
- AWG18, 4-core, non-shielded cab-tire cable
- Rated power capacity 10 A * For approx. two slider units

Model	Part No.
LCM-XCU-PS-R20M	KFA-M539H-20

External view

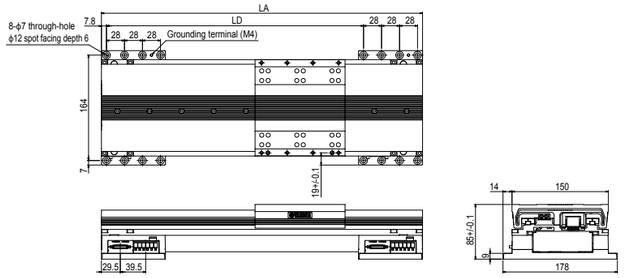
LCM-X Module connection and installation



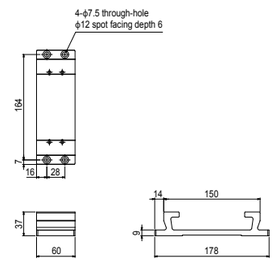
Module type	LA	LB	LC	LD	No. of installable LCM-XMS
LCM-X200	199.6	150	200	100	0
LCM-X300	299.6	250	300	200	1
LCM-X400	399.6	350	400	300	2
LCM-X500	499.6	450	500	400	3
LCM-X600	599.6	550	600	500	4
LCM-X700	699.6	650	700	600	5
LCM-X800	799.6	750	800	700	6
LCM-X900	899.6	850	900	800	7
LCM-X1000	999.6	950	1000	900	8

Note 1. A robot slider is unable to stop in an area 99 mm from both ends of the line.
The robot slider stopper juts out from the ends, which could cause collision.
(The dimensions refer to the robot slider center.)
Note 2. The linear module support (optional) may be necessary depending on the module type and payload.
Installable with LCM-X300 or longer (Refer to the Table).
Note 3. Any module types are freely combined within the same line.
Note 4. The jumper cable connector can bridge the electrical power supply (depending on the number of controlled sliders within the same power supply system).
Refer to the LCM-X manual for more details.
Note 5. Be sure to connect the YQ Link cable and supply the YQ Link cable with electrical power from the connection unit at the extreme left end viewed from the connector.
For signal communication between the lines, be sure to connect the YQ Link cable with connection unit at the extreme right end and then connect with the connection unit at the extreme left end of the other line.
Where the YQ Link cable is not connected from the line end to another line, install the YQ Link end connector.
Note 6. Sixty-four robot sliders can be installed in a system connected by the YQ Link cables (depending on the number of robots that are controlled by the same controller).
Note 7. Where modules are connected on the connection unit, the clearance between the adjacent modules is 0.4 mm.
Note 8. Linear module support can be installed every 100 mm.

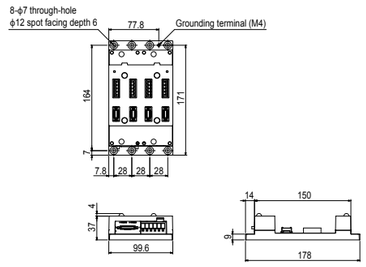
Installation of single LCM-X module



LCM-XMS linear module support



LCM-XCUF connection unit (front type)



LCM-XBOT robot slider