Efficiency of time and space in production

Linear Conveyor Module
LCMR200

Yamaha’s answer to Next Generation of Production Line design
Adding productivity to transportation process

Convert transfer process into “value-added” assembly process

**LCMR200 Features**

- 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.

**YHX Features**

- Complete absolute position system. No origin process needed.
- Built-in driver and reduced wiring.

**LCMR200 Specifications**

- Controllable line length Max. 25.5 m *
- Number of simultaneous controllable sliders Max. 64 units *

* It may differ depending on the system configuration.
From ordinary “passive flow” to “active position transport”.

By converting conveyor flow into active production process improves profitability.
Superior performance that improves the transfer environment.

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

All the sliders can be operated / programmed independently. Speed and acceleration can be programmed by each move. All carriages can be controller individually.

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.

Saves space through proximity installation of forward and returning modules
The cable extraction direction of a module can be selected. When installing on a device, it increases the flexibility of electrical wiring layout. Especially in the horizontal circulation layout, by making the cable extraction direction reverse in the forward and returning modules, the modules can be positioned as close as 200 mm apart at most, and therefore, cycle time reduction is possible at circulation and installation space can be reduced. The LED indicator that shows the module state can be visually checked from both front and rear side of the module.

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.

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.

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.

Concentrated control by the YHX controller
Including the operation environment, all sliders and single-axis robots on the transfer process can be controlled.

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 <<See Page 12 for detail>>.
Versatile and value added transport between work process.

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

**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.

**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.

**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.

**Assembly can be done while parts are on 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.

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

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

- Layout example with a combination of the module and circulation unit.
Linear conveyor module “LCMR200” can be controlled via YHX controller from the host PLC.

**YHX controller**

Reduces production line configuration time

Stacking modular structure

No wiring between modules needed.

Incorporation of 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.

**System configuration diagram**

**Configuration example**

One way 2000 mm, vertical circulation transport line

* 300 mm linear model and single-axis robot are used for circulation section

**Typical photo image of stacking structure**

Driver unit up to 16 units Stackable

**Configuration example**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear module</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Robot slider</td>
<td>A slider that operates on the linear module.</td>
<td></td>
</tr>
<tr>
<td>End plate</td>
<td>Position a linear module on both ends of a cluster.</td>
<td></td>
</tr>
<tr>
<td>Connection plate</td>
<td>The adjacent modules are positioned and connected.</td>
<td></td>
</tr>
<tr>
<td>End unit</td>
<td>Connect with the YQLink cable or YQLink terminal end unit on both ends of a cluster.</td>
<td></td>
</tr>
<tr>
<td>Connection unit</td>
<td>Between module communication of adjacent modules is connected.</td>
<td></td>
</tr>
<tr>
<td>Control power supply connector</td>
<td>A connector to supply control power source from 48 VDC power source to the linear module.</td>
<td></td>
</tr>
<tr>
<td>Control power source jumper</td>
<td>A jumper cable to supply control power source to adjacent module.</td>
<td></td>
</tr>
<tr>
<td>Motor power source connector</td>
<td>A connector to supply motor power source from 48 VDC power source to the linear module.</td>
<td></td>
</tr>
<tr>
<td>Motor power source jumper</td>
<td>A jumper cable to supply motor power source to adjacent module.</td>
<td></td>
</tr>
<tr>
<td>Motor power source jumper (for 1000 mm module relay)</td>
<td>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 each control power source and motor power source.</td>
<td></td>
</tr>
<tr>
<td>YQ Link cable</td>
<td>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 YQ Link connectors on each of the end clusters.</td>
<td></td>
</tr>
<tr>
<td>48 VDC power supply</td>
<td>General-purpose 48 VDC power source device that can be applied to both control and motor operations.</td>
<td></td>
</tr>
<tr>
<td>Flexible power cable for movable module</td>
<td>Flexible cable to supply power source to the module that performs reciprocating operation mainly in the circulation part.</td>
<td></td>
</tr>
</tbody>
</table>
What is a standard profile
A project file for LCMR200 that moves a single-axis robot and LCMR200 as a positioner via field network from the host PLC.

Features of YHX standard profile

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

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 true point, specified positioning and direct value command specified positioning
- Comparative robot: LCMR200, LCM X and CX series
- Interface: YWY-PF and field network communication
- Operation type: Absolute position moving
- Maximum number of points that can be registered: 65535

Significant reduction of launching man-hour.
Significant reduction of startup time and process.
Controlled by ladder logic code of host PLC.
Numbers of improvements in line design and operation.

Implementing a task is simple and easy

Configuration parts

LCMR200 Main Body
- Linear module
  - Length: 400mm, 500mm, 600mm
  - Front cable extension: LCMR200-F2, LCMR200-F3
  - Rear cable interruption: LCMR200-B2, LCMR200-B3
- Robot slider
  - Model: LCMR200-MSOT

LCMR200 Connection Parts
- Module connection kit
  - Model: LCMR200-CKIT
- Module terminal kit
  - Model: LCMR200-CKIT

YQLink cable
- YQLink movable cable
  - The cable connects the controller (YHX) and linear conveyor module.
  - Refer to the system configuration drawing for a connection example
- YQLink terminating connector
  - Model: YHX-YQL-TC

Maintenance items
- Control power supply connector
  - Model: LCMR200-CFC
- Motor power source jumper
  - Model: LCMR200-CFC
  - Model: LCMR200-MFC
- Motor power source jumper
  - Model: LCMR200-MJU
  - Model: LCMR200-MPV (for 1000 mm module relay)
- End plate
  - Model: LCMR200-EP
- Connection plate
  - Model: LCMR200-CP
- End unit
  - Model: LCMR200-EL
- Connection unit
  - Model: LCMR200-CU

Other power source options
- Module electric power supply (48 VDC-1000 W)
  - Rated output: 21 A, peak output rating: 42 A (within 5 sec.)
  - Unit type: general purpose power, efficiency: 98%, power factor: 90%
  - Model: LCMR200-CPS-1000W

Flexible power cable for movable module
- Model: LCMR200-FTSC-ROM

*1 When a circulation unit made by Yamaha is not used, one terminal kit is necessary for one cluster. The same part is included for the circulation unit made by Yamaha.

*2 These are single unit types of each part attached to the module connection kit, module terminal kit, and circulation units.

YQLink cable
- YQLink movable cable
  - The cable connects the controller (YHX) and linear conveyor module.
  - Refer to the system configuration drawing for a connection example
- YQLink terminating connector
  - Model: YHX-YQL-TC

Other power source options
- Module electric power supply (48 VDC-1000 W)
  - Rated output: 21 A, peak output rating: 42 A (within 5 sec.)
  - Unit type: general purpose power, efficiency: 98%, power factor: 90%
  - Model: LCMR200-CPS-1000W

Flexible power cable for movable module
- Model: LCMR200-FTSC-ROM

*1 When a circulation unit made by Yamaha is not used, one terminal kit is necessary for one cluster. The same part is included for the circulation unit made by Yamaha.

*2 These are single unit types of each part attached to the module connection kit, module terminal kit, and circulation units.

LCMR200 Features
YHX Features

LCMR200 Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Configuration parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCMR200-CKIT</td>
<td>Connection unit</td>
</tr>
<tr>
<td>LCMR200-CKIT</td>
<td>Module terminal kit</td>
</tr>
<tr>
<td>LCMR200-MPJ</td>
<td>Control power supply connector</td>
</tr>
<tr>
<td>LCMR200-MPJ</td>
<td>Motor power source jumper</td>
</tr>
<tr>
<td>LCMR200-MPC</td>
<td>Motor power source jumper</td>
</tr>
<tr>
<td>LCMR200-MPJ</td>
<td>End plate</td>
</tr>
<tr>
<td>LCMR200-CU</td>
<td>Connection plate</td>
</tr>
<tr>
<td>LCMR200-EL</td>
<td>End unit</td>
</tr>
<tr>
<td>LCMR200-CU</td>
<td>Connection unit</td>
</tr>
</tbody>
</table>

*1 These are single unit types of each part attached to the module connection kit, module terminal kit, and circulation units.

*2 When a circulation unit made by Yamaha is not used, one terminal kit is necessary for one cluster. The same part is included for the circulation unit made by Yamaha.

*3 These are single unit types of each part attached to the module connection kit, module terminal kit, and circulation units.
External view

**LCMR200 Module connection and installation**

### Front* cable extraction

#### Linear module (Front* cable extraction)

- **Module type**
  - LA: 196.4 / LB: 183
  - LCMR200-F1: 196.4 / LCMR200-F2: 186.4
  - LCMR200-F3: 199.4 / LCMR200-F4: 183
  - LCMR200-F5: 199.4 / LCMR200-F6: 183
  - LCMR200-F10: 199.4 / LCMR200-F12: 183

- **Connection unit**
  - LA: 0.6 / LB: 0.6

- **End unit**
  - LA: 0.6 / LB: 0.6

- **Robot slider**
  - LA: 0.6 / LB: 0.6

- **End plate**
  - LA: 0.6 / LB: 0.6

- **Connection plate**
  - LA: 0.6 / LB: 0.6

### Rear* cable extraction

#### Linear module (Rear* cable extraction)

- **Module type**
  - LA: 196.4 / LB: 183
  - LCMR200-B1: 196.4 / LCMR200-B2: 186.4
  - LCMR200-B3: 199.4 / LCMR200-B4: 183
  - LCMR200-B5: 199.4 / LCMR200-B6: 183
  - LCMR200-B10: 199.4 / LCMR200-B12: 183

- **Connection unit**
  - LA: 0.6 / LB: 0.6

- **End unit**
  - LA: 0.6 / LB: 0.6

- **Robot slider**
  - LA: 0.6 / LB: 0.6

- **End plate**
  - LA: 0.6 / LB: 0.6

- **Connection plate**
  - LA: 0.6 / LB: 0.6

---

**Note 1:** A robot slider is available to stop in an area 99 mm from both ends of the line. The robot slider is designed to stop from the end, which could cause collision.

**Note 2:** A module type can be freely combined on the same line after aligning the front/rear of the cable extraction direction.

**Note 3:** The control power source and motor power source can be passed and received by the jumper connector. See the manual for the jumper connector.

**Note 4:** For connection between modules, use a connection plate and connection unit, and for the line end, use an end plate and end unit.

**Note 5:** The control power source connector and motor power source connector can be passed and received by the jumper connector. See the manual for detail."
Basic specifications of LCMR200

<table>
<thead>
<tr>
<th>Drive method</th>
<th>Linear motor with moving magnet type core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position Search</td>
<td>Magnetic absolute position sensor</td>
</tr>
<tr>
<td>Maximum payload</td>
<td>15 kg</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>2,500 mm/sec*1</td>
</tr>
<tr>
<td>Repeatability</td>
<td>+/-5 μm</td>
</tr>
<tr>
<td>Mechanical tolerance between robot sliders</td>
<td>+/-30 μm (Dowel hole standard)</td>
</tr>
<tr>
<td>Total stroke limit</td>
<td>25.5 m*2</td>
</tr>
<tr>
<td>Maximum number of robot sliders</td>
<td>64 units*3</td>
</tr>
<tr>
<td>Minimum spacing between robot sliders</td>
<td>210 mm*4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Main frame dimensions</th>
<th>Max. external size of frame cross-section: W175 x H109 mm (Including robot slider)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear module length</td>
<td>200 mm / 300 mm / 500 mm / 1000 mm</td>
</tr>
<tr>
<td>Robot slider length</td>
<td>198 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>Linear module: Approx 20 kg [Per 1 m of linear module]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Robot slider: 2.4 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Control power supply: 48 VDC +/-5 %, Max. 30 A*5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motor power supply: 48 VDC +/-15 %, Max. 30 A*5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating environment</th>
<th>Operating temperature: 0 °C to 40 °C*6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Storage temperature: -10 °C to 65 °C</td>
</tr>
<tr>
<td></td>
<td>Operating humidity: 35 % to 85 %RH [No condensation]</td>
</tr>
</tbody>
</table>

| Controller | YHX controller*7 |

---

**Note.**
- When conveying weight exceeds 10 kg, it will drop to 2,000 mm/sec according to the weight.
- When the jig palette to equip to the robot slider is longer, it shall be the jig palette length + 10 mm.
- Up to 10 m linear module can be supplied with the optional 1000 W power source.
- Up to 2 robot sliders can be supplied with the optional 1000 W power source.
- Operate LCMR200 in the temperature environment (+/-5 °C) that installation and adjustment were performed.
- The YHX controller requires a separate electrical power supply.

## Allowable Load

**Load: Horizontal Direction**

**Payload: Common up to 15 kg.**

<table>
<thead>
<tr>
<th>Loading Position X [mm]</th>
<th>Loading Position Z [mm]</th>
<th>Loading Position Y [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>611</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>517</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>447</td>
<td>40</td>
</tr>
<tr>
<td>60</td>
<td>394</td>
<td>60</td>
</tr>
<tr>
<td>80</td>
<td>353</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>319</td>
<td>100</td>
</tr>
</tbody>
</table>

Unit: [N]

**Load: Vertical Direction**

**Payload: 5 kg**

<table>
<thead>
<tr>
<th>Loading Position X [mm]</th>
<th>Loading Position Y [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>924</td>
</tr>
<tr>
<td>20</td>
<td>760</td>
</tr>
<tr>
<td>40</td>
<td>647</td>
</tr>
<tr>
<td>60</td>
<td>562</td>
</tr>
<tr>
<td>80</td>
<td>498</td>
</tr>
<tr>
<td>100</td>
<td>446</td>
</tr>
</tbody>
</table>

**Payload: 10 kg**

<table>
<thead>
<tr>
<th>Loading Position X [mm]</th>
<th>Loading Position Y [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>874</td>
</tr>
<tr>
<td>20</td>
<td>721</td>
</tr>
<tr>
<td>40</td>
<td>613</td>
</tr>
<tr>
<td>60</td>
<td>533</td>
</tr>
<tr>
<td>80</td>
<td>471</td>
</tr>
<tr>
<td>100</td>
<td>423</td>
</tr>
</tbody>
</table>

**Payload: 15 kg**

<table>
<thead>
<tr>
<th>Loading Position X [mm]</th>
<th>Loading Position Y [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>826</td>
</tr>
<tr>
<td>20</td>
<td>680</td>
</tr>
<tr>
<td>40</td>
<td>578</td>
</tr>
<tr>
<td>60</td>
<td>503</td>
</tr>
<tr>
<td>80</td>
<td>445</td>
</tr>
<tr>
<td>100</td>
<td>399</td>
</tr>
</tbody>
</table>

Unit: [N]