Yokogawa Direct Drive Motors

For safety, please read Instruction Manual before using any Yokogawa product.

Depending on specification and purpose of its usage, exporting the products may require approval from Japanese government.

If the product is used in where health and safety of human life is directly affected, please contact Yokogawa, before the implementation.

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Evolving World of Motion Dynamics
Provide Positioning for Leading Edge Machines

Direct Drive Motor

High Accuracy and High Resolution Model, DM1□
High Accuracy with Absolute Accuracy ±15 arc sec (DM1A/DM1B*)
High Resolution of 4,096,000 pulses/rev (DM1A)

Flat Profile Model, DR5H00
10N·m & 20N·m: 42mm
40N·m: 62mm

Large Center Aperture, High Speed, High Torque Model,
DR1□/DR5□
DR1A & DR5A: Large Center Aperture ø150mm
DR5□: High Speed
DR5A: High Torque (Max 500N·m)

Absolute Encoder Model DB5C
Absolute Encoder Included

* Excl. DM1B-006
Direct Drive Motor DYNASERV™

**Direct Drive Motor**

- **Accurate Positioning**
  - Repeatable Accuracy of ±1 arc sec and Absolute Accuracy of ±15 arc sec. A high resolution up to 4,096,000 pulses per revolution. This is equivalent to 1.5µm at the end of an 1,000mm arm.

- **Low Heat Emission and Low Energy Consumption**
  - A hybrid magnetic circuit that uses the magnetic bias methods, generates high torque with less current, thus reducing heat emission and saving energy consumption.

- **Ability to Withstand External Forces**
  - I-PD control provides high servo stiffness. This enables DYNASERV to withstand sudden change in external force.

**Moves Smoothly and Stops Accurately**

**Direct Mounting of Construction is Possible**

Direct Drive Motor provides stable platform comparing to other types of motor, because the mechanism can be directly mounted to its outer rotor. This makes index table can be as accurate as DYNASERV. Direct mounting is energy saving solution because there is no energy loss from gear.

**Large Center Hole**

Large Center Aperture: A very useful structure that allows a wire, shaft, and laser beam to pass through.

**Contamination Free (& No Maintenance Required)**

Cross Roller Bearing does not generate dust or oil spillage. Thus DYNASERV achieves Class 10 Cleanliness (no more than 10 particles of size bigger than 0.5µm can be found within a cubic foot of air), DYNASERV is therefore suitable for clean rooms. Also, the bearing is fully enclosed and there is no need to grease at all. This avoids contamination from maintenance.

**Energy Efficient Motor**

A hybrid magnetic circuit using the magnetic bias methods generates high torque with less current, thus reducing heat emission and saving energy consumption.

**Low Run-Out Guaranteed**

Up to 5 µm axial run out and radial run out can be selected.

If you need more than 5 µm mechanical accuracy, please consult with Yokogawa.

**Why Direct Drive Motor? (Comparing with conventional AC servo motor)**

DYNASERV is all-in-one construction. Since load can be directly mounted to the motor, no loss of accuracy occurs between motor and index table. This, in turn, increases accuracy of the machine which uses DYNASERV. There is no loss of energy that normally happen with AC servo motor with gearbox, because there is no gear mechanism. Moreover, Direct Drive makes it simple to increase or decrease index positions by changing program, whereas gearbox system is limited by gear ratio.
**High Accuracy, High Resolution, and High Stiffness**

- **High Accuracy**
  - Absolute accuracy ±15 arc sec
  - Repeatability accuracy ±1 arc sec

- **High Resolution**
  - Encoder resolution: 4,096,000 pulses/rev

- **High Stiffness**
  - I-PD control

**Highly Efficient Motors enables Higher Productivity**

- Hybrid Magnetic Circuit has high energy efficiency. This has advantages of Low Heat Emission, Shorter Duty Cycle and Continuous High Speed Operation.
- Moreover, I-PD control loop makes settling time to much shorter than conventional motors.
- These all contribute toward high production efficiency, higher product output and shorter cycle time. This is why DYNASERV is widely used in semiconductor industry.

**Higher Efficiency of Machine using Yokogawa DDMs**

- Motor always stops at the same position
- Very high encoder resolution
- Control method to ensure the motor stops precisely and does not move

**Flexible Response to Design Changes**

- Mechanically, because DYNASERV has no gear mechanism, motion profile and number of index can be changed easily and simply by adjusting commands. Whereas normal gear system has to change gearbox according to gear ratio.

**Absolute Encoder Types**

- These models that have a built-in absolute encoder provide absolute positioning.

**High Performance Driver Unit**

- Intelligent Driver Unit for DYNASERV improves control and operational performance. It comes with an Auto Tuning Function that automatically set the servo parameters, the most suited to the load inertia. It is also compatible with various types of field networks.

**Lineup of 45 Different Models**

- You can select from a wide variety of models, including a small model, a flat shape with low height model, and even a high output large model, according to the application.

**Excellent Service and Support**

- **Useful Tool**
  - Software “DrvX3 Support Tool” is useful for start-up, servo setting, and maintenance.

- **CAD Data Online and on CD-ROM**
  - Various 2-Dimensional and 3-Dimensional Data are available online.

- **Technical Documents**
  - A variety of technical documents required for operation of motor and driver are available online.

**Compatible with Various Types of Field Network**

- Compatible with the MECHATROLINK-II, CC-Link, and PROFIBUS-DP interfaces in addition to the high-speed pulse interface.

**Motor Selection Service**

- Yokogawa provides consulting service for selecting the most suitable motor for each customer’s requirement.

**High Load Capacity**

- High Rigidity Cross Roller Bearing has high load capacity. It withstand fluctuation of load while operating. (No need to design support structure.)

**Compatible with Various Types of Field Network**

- Complied with UL, CE & KC
- For more information, please contact Yokogawa’s sales office or sales representative.

**LINEARSERV™**

- LINEARSERV is linear motor that uses the same direct drive motor technology to DYNASERV.
- It uses Yokogawa’s unique technology of interpolated linear encoder with glass scale, which enables smooth motion and accurate control.
- It is also all-in-one construction, consist of a linear guide, a scale and a slider unit.
- Maximum thrust force of 400N and maximum speed of 2m/sec.

**DD Stage**

- DD Stage is unique X-Y-θ stage that integrates the direct drive motor (DYNASERV) and linear direct drive motor (LINEARSERV).
- It has High Accuracy and High Speed Motion with compact construction.
- Like DYNASERV and LINEARSERV, DD Stage has the minimum contamination factor and maintenance-free structure.
- Mounting Accuracy is tuned and guaranteed by Yokogawa.
- Many DD Stages are used by LCD Manufacturing and Semiconductor Manufacturing, especially in terms of inspection machines.

* According to a 2010 Mechatronics Parts Market Survey conducted by Fuji-Keizai.
DrvX3 Support Tool for DYNASERV™ and LINEARSERV™ Useful for Startup, Servo Setting, and Maintenance

Improve Start up and Performance of the motor.

**Startup and Servo Setting**

The Supporting Software guides users through start up of the motor. Even first time user can set up Yokogawa Motor using this software.

- **Connection**
  - Connecting a PC to driver unit and start up the software.
  - The software will establish communication with DYNASERV.

- **Auto Tuning**
  - Difficult tuning procedure can be done easily by a touch of button using Auto Tuning Function. The motor oscillates to find loaded inertia to that can be used to set most suitable parameter.

- **Auto Filter**
  - Motor resonance, which is always problem for machine, can be removed or reduced by using this function. Motor oscillates to find resonance frequency to apply filter setting.

**Other Useful Features**

- **4 channel Oscilloscope Function.**
  - Oscilloscope function can be used to monitor various parameters. Simultaneously up to four variables can be measured.
  - By using this function, not only characteristic of motion is comprehended, but also problem can be analyzed and diagnosed.
  - Data from oscilloscope function can be saved as a file to analyzed later.

- **Virtual (without motor) Simulation**
  - Parameter and motion program can be tested and debugged without connected to actual motor. This is useful for reducing developing and set-up time for new machine.

- **Multi-lingual Support**
  - Japanese, English, and Chinese (simplified and traditional) are available.

**Maintenance and Trouble Shooting**

- **Parameter and Program Data Management**
  - Parameter and motion program can be downloaded and copied. This eliminates time and effort to set up identical machines.
  - Also it makes it easier to adjust parameter setting and program remotely.

- **Error Log Display**
  - Up to 16 error incidents can be stored.
  - By selecting a specific error message, detail information of error can be displayed.

**Available Free of Charge**

- **Downloadable from Yokogawa’s website.** (Registration is required)

www.yokogawa.com/ddm/

**Additional Finer Tuning of Motors**

- **Increasing Servo Stiffness**
  - Servo Stiffness can be adjusted using the software.
  - Higher servo stiffness means shorter settling time and withstand external force.

- **Shorter Settling Time**
  - By increasing Value of Feed Forward, settling time can be shortened.

- Feed Forward can be changed by changing values here.

There are many other useful functions available.

**Ready to use**

Start the motor
A Wide Variety of DYNASERV™ Models

### High Accuracy and High Resolution Models
- **DM1A**: ø264a58
- **DM1B**: ø116a25
- **DM1C**: ø116a25
- **DR5H00**: ø224a50

**Features**
- High accuracy and high resolution
- Optical encoder included
- Excellent torque to weight ratio
- Aluminum based chassis type

### Large Center Aperture, High Speed, and High Torque Models
- **DR1A**: ø264a150
- **DR1E**: ø205a76
- **DR1B**: ø158a56
- **DR5A**: ø264a224

**Features**
- Large center aperture: DR1A/DR5A (Max. ø150 mm)
- High speed type: DR5
- High torque type: DR5A (Max. 500 N·m)
- Magnetic encoder included

### Flat Profile Models
- **DR5E**: ø205a76
- **DR5B**: ø150a66
- **DR5C**: ø116a56

**Features**
- Flat shape with low height model
- Magnetic encoder included

### Absolute Encoder Models
- **DB5C**: ø25a10
- **LM105**: ø25a5

**Features**
- Absolute encoder included
- High speed type

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**LINEARserv™**

LINEARserv is a linear motor that uses the same direct drive method as the DYNASERV. It has a unique built-in interpolated linear encoder using a glass scale and is characterized by its highly accurate position control, whose loop is fully closed, and smooth motion. A maximum of 400 N thrust and a maximum of 2 m/s velocity are available.

The most suitable motor can be selected by Yokogawa to meet your requirements. Just Click [www.yokogawa.com/ddm/](http://www.yokogawa.com/ddm/)
Application Examples

DYNASERVTM Supports Leading Edge Manufacturing Equipment

**Highly Functional Film**
- Roll to Roll: Directly connected DYNASERVTM and roll
  - Space saving & easy to design.
  - Simple structure makes easy for maintenance work.
  - Highly accurate micrometer feeding system.
  - No backlash and reducing twist and delay response.

**LED**
- **LED Inspection System**
  - Improving Mechanical Accuracy.
  - Reducing Cycle Time.
  - No heat or dust to impact quality of production.

**Smartphone**
- **Touch Panel Glass Bonding Machine**
  - Improving bonding accuracy.
  - No possibility of dust contamination.
  - Reducing machine cycle time to increase production output.
  - Easy to design and integrate in machine.

**Photovoltaic**
- **Electrode Forming Machine for Crystalline Solar Cell**
  - Reducing Shadow Loss by improving printing accuracy.
  - Easy to adjust to cell size changes (changing of load inertia).
  - Reducing machine cycle time to increase production output.
  - Easy to design and integrate in machine.

**Highly Accurate Positioning Enhances Equipment Performance**

**Semiconductor**
- **IC Tester**
  - Suitable for variable indexer adaptable to design change in terms of positioning, IC size and inspection level.
  - Reducing machine cycle time to increase production output.
  - Suits for high speed inspection & transfer.

**LCD**
- **LCD Rubbing Machine**
  - Highly accurate positioning.
  - Simplified mechanism (eliminated mechanical brake).

**Photovoltaic**
- **LCD Rubbing Machine**
  - Highly accurate positioning.
  - Simplified mechanism (eliminated mechanical brake).

**Application Examples of DYNASERVTM and LINEARSEVTM**

**Optical Media**
- **DVD Sputtering Machine**
  - Improving Mechanical Accuracy.
  - Reducing Cycle Time.
  - No heat or dust to impact quality of production.

**Electric Parts**
- **Electric Parts Transfer Robot**
  - Improving Mechanical Accuracy.
  - Reducing Cycle Time.
  - No heat or dust to impact quality of production.

**Automobile**
- **Steering Test System**
  - Accurately repeating the same manoeuvre all the same.
  - No maintenance required.

**Medical**
- **Coating Machine for Haemogluco Paper**
  - Improves uniformity of coating to stabilize quality of the paper.
  - Class 10 Cleanliness to avoid contamination.

**Semiconductor**
- **Focusing Mechanics for Large Astronomical Telescope**
  - Low Heat Emission to prevent image distortion from heat.
  - Fine focusing can be achieved.
  - No maintenance required.

**Applicaiton Examples**

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Clean and Maintenance free Use

**Optical Media**

**DVD Bonding Machine**
- Variable Indexer.
- Easy to design.
- Reducing cycle time.
- No need for maintenance work.
- Improving bonding accuracy.

**Machine Tool**

**Automatic Assembly Line**
- Improving reliability.
- Reducing cycle time.
- No need for maintenance work.
- Easy to design.
- High adjustability to change of production.

**High Servo Stiffness of DYNASERV™ and LINEARSERV™ is Ideal for Application of Stopping Motor Precisely**

**Semiconductor**

**Wafer Dicing Machine**
- High servo stiffness to withstand blade movement and to improve cutting accuracy.
- Faster cutting to increase production rate.
- Higher accuracy in positioning and angle.
- Simpler mechanism. (No need for clamp or break mechanism to hold wafer)

**Servo Press**
- High Servo Stiffness.
- High Torque.
- Simpler mechanism to reduce space.
- No need for maintenance work.

**Cost Reduction Using DYNASERV™ and LINEARSERV™**

**Optical Media**

**Color Filter Coating Machine**
- Improvement in uniformity of coating.
- Shorter cycle time to increase production rate.
- Reducing manufacturing cost.

**CVD/PVD Sputtering Machine**
- Improving transfer accuracy.
- Reduction of mechanical interference with vacuum chamber.
- Reducing cycle time.
- High speed transfer of heavy load became possible.

**High Speed Transfer and Highly Accurate Positioning**

**Electrode Fabrication Equipment**

**LCD Scribe**
- High servo stiffness to withstand blade movement and improvement in cutting accuracy.
- Faster cutting to increase production rate.
- No need for maintenance work.
- Simpler mechanism.

**Offset CD/DVD Printing Machine**

**Wafer**
- 90° rotation time: 0.4 s or less
- Repeatable accuracy: ±6 µm or less (±3 arc sec) within 400 mm from the rotation center
- Improving processing accuracy.
- Reducing cycle time to increase.
- Suitable for variable indexing system.
- Easy to design and integrate into machine.
- Adjustable to change in indexing motion.
- Reducing cycle time.
- Improvement in printing accuracy.

Application Examples