

Orientalmotor

Hybrid Stepper Servo α STEP

AZ Series

Battery-Free Absolute Mechanical
Sensor Equipped Motor

Hybrid Stepper Servo
 α STEP



Absolute + Battery-free = Advanced Positioning

Hybrid Stepper Servo *αSTEP*

AZ Series

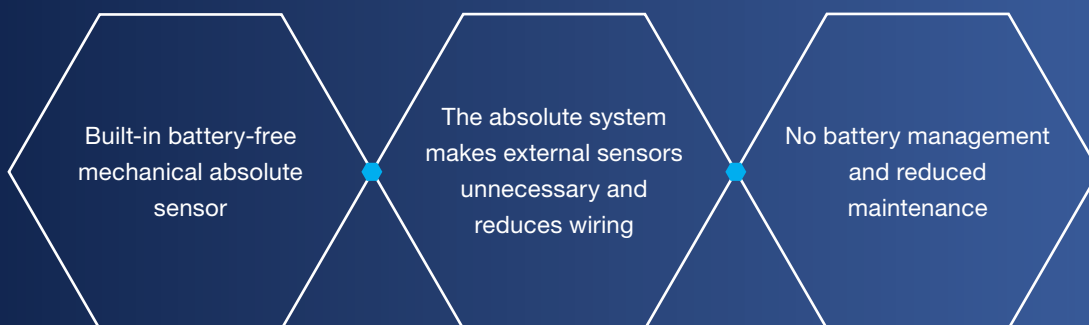
Built-in Battery-Free Absolute Sensor

● Prices start at 626.00 € [Price includes motor, driver and cable (1 m)]

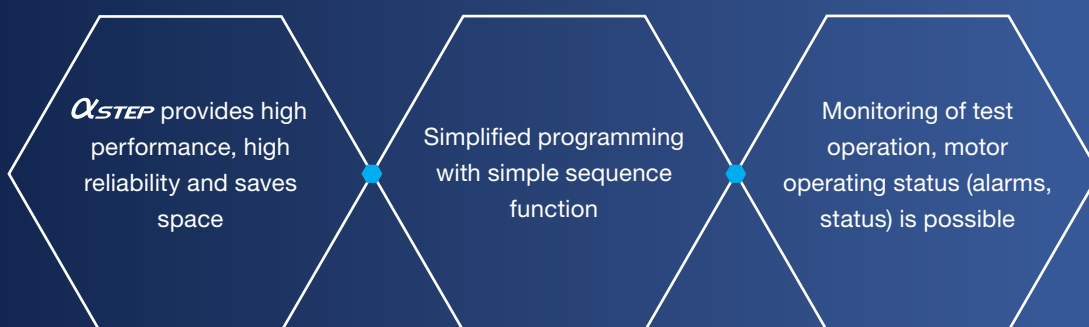


The **AZ** Series has a built-in absolute sensor (patented), which provides a battery-free absolute system. The drive system uses a *αSTEP*. This provides both ease of use and reliability.

● Equipped with absolute sensor. Provides battery-free absolute system



● *αSTEP*. Compact, high response, high reliability, high efficiency motors



What is the *αSTEP*?

αSTEP are stepper motor-based motors which provide unique control that are a hybrid of the advantages of both open loop control and closed loop control. The motor's position is always monitored, and it can automatically switch between the two control types depending on conditions. It normally operates in open loop control, and activates synchronously with commands, providing high responsiveness. Under an overload condition, the motor position is corrected and it operates in the closed loop control mode. These motors combine ease of use with reliability.



AZ Series Product Line

A product line to support a wide variety of equipment, controllers and systems.

Motor

Standard Type



Frame Size 20 mm - 85 mm

TS Geared Type

<Spur Gear Mechanism>

Low Backlash

High Speed Operation



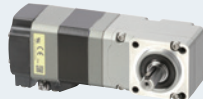
Frame Size 42 mm - 90 mm

Right-Angle FC Geared Type

<Face Gear Mechanism>

Low Backlash

Space Saving



Frame Size 42 mm, 60 mm

PS Geared Type

<Planetary Gear Mechanism>

Low Backlash

High Torque



Frame Size 28 mm - 90 mm

PN Geared Type

<Planetary Gear Mechanism>

Non-Backlash

High Accuracy



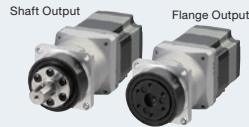
Frame Size 28 mm

HPG Geared Type

<Harmonic Planetary>

Non-Backlash

High Torque, High Accuracy



Frame Size 40 mm - 90 mm

Harmonic Geared Type

<Harmonic Drive>

Non-Backlash

High Torque, High Accuracy



Frame Size 30 mm - 90 mm

Driver

Network Compatible Driver

FA Network Control

The driver can be controlled directly from the host control device via the FA network.



AC Input



DC Input

Built-in Controller Type

FLEX

Positioning data is set to the driver (256 points). Capable of FA network control when a network converter (sold separately) is used.

I/O Control/
Modbus Control



AC Input



DC Input

Modbus (RTU)

FLEX is the collective name for products that support I/O control, Modbus (RTU) control and FA network control via network converters.

Pulse Input Type with RS-485 Communication

Pulse Signal Control

Motor position, speed, torque, alarms and temperature can be monitored using RS-485 communication.

Pulse Input Type

The motor is controlled from the positioning module (pulse generator).



AC Input



DC Input

mini Driver

A network compatible driver that is smaller and lighter than box-type drivers. Also compatible with battery power supplies.

Details about this product are in the separate mini driver catalog.



DC Input

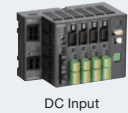
Network Compatible Multi-Axis Driver

FA Network Control

This is a multi-axis driver that is compatible with SSCNET III/H, MECHATROLINK-III and EtherCAT driver profiles.

It can connect to 2, 3 or 4 axes.

Details about this product are in the separate multi-axis driver catalog.



DC Input

Linear and Rotary Actuators Equipped with AZ Series

Because the same motors and drivers are used, wiring, control and maintenance parts have been standardized, startup time is reduced and operation is simplified.

Electric Linear Slides

EZS Series



Electric Linear Cylinders

EAC Series



Electric Gripper

EH Series



Compact Electric Linear Cylinders

DR Series

DRS2 Series



Hollow Rotary Actuators

DGII Series



Rack-and-Pinion System

L Series



Related Products

NEW

Servo Motors

AZX Series

Battery-Free Absolute Mechanical Sensor Equipped Motor
Standard Type / PS Geared Type 400W, 600W



- These servo motors are equipped with a battery-free absolute sensor.
- They achieve high torque in the high speed range.
- The basic operations are the same as the AZ Series.
- For detailed information please refer to the AZX Series catalogue on our website.

● EtherCAT is a patented technology licensed from Beckhoff Automation GmbH (Germany) and is a registered trademark of that company.

● EtherNet/IP is a registered trademark of ODVA, CC-Link is a registered trademark of CC-Link Partner Association, and Modbus (RTU) is a registered trademark of Schneider Automation Inc.

● PROFIBUS is a registered trademark or trademark of PROFIBUS Nutzerorganisation e.V. (PNO)

● Harmonic Planetary, Harmonic Drive and HSD are registered trademarks of Harmonic Drive Systems Inc.

Equipped with a Newly Developed Absolute Mechanical Sensor, Advanced Technology is Available at an Affordable Price

Newly Developed Absolute Mechanical Sensor

A newly developed compact, low cost, battery-free absolute mechanical sensor (patented) is developed which contributes to productivity improvements and cost reductions.



●Mechanical Sensor

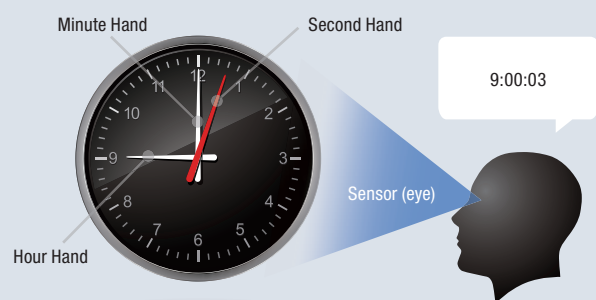
Analog clocks measure the current time based on the positions of the second hand, minute hand and hour hand. The newly developed sensor is a mechanical sensor equipped with multiple gears equivalent to the hands on a clock. Because it detects positioning information by detecting the angles of the respective gears, a battery is not required.

●Multiple - Rotation Absolute System

Absolute position detection is possible with ± 900 rotations (1800 rotations)* of the motor shaft from the home position.

*The frame sizes 20 mm and 28 mm are ± 450 rotations (900 rotations).

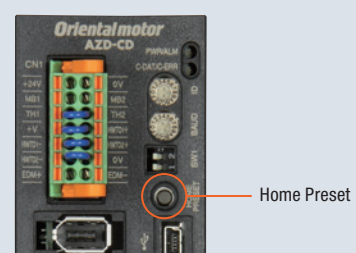
• Basic principles are like an analog clock



●Home Setting Method

By pressing the switch on the driver surface, home position can be set simply, and the home position can be saved with the sensor. Furthermore, it is possible to set the home position using the support software (**MEXE02**) or the external input signal.

• Home Position Setting



Eliminate Extra Sensors with a Battery-Free Absolute System

No External Sensors Required

External sensors such as the home sensor or limit sensor are not required with an absolute system.

●High-Speed Return-to-Home + Improved Return-to-Home Accuracy

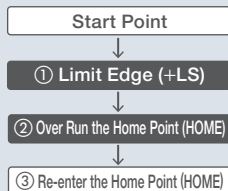
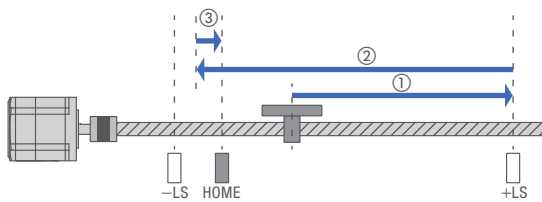
High speed return-to-home is possible without the use of a home sensor.

Reducing return-to-home time helps to shorten the machine cycle.

Home position accuracy is increased because variations in sensor sensitivity are eliminated.

Previous Home Detection for Control Motor

The home position is detected by detecting the limit sensor ($\pm$ LS) and home sensor (HOME).

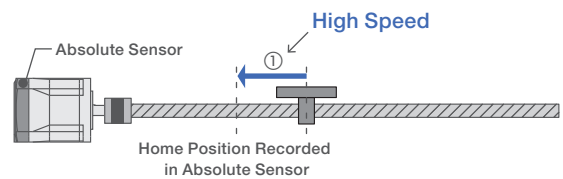


Return-to-home takes a long time...



Return-to-Home Operation of AZ Series

There is no need to detect the limit sensor, and it can travel directly at high speed to the home position recorded by the absolute sensor.



High-speed return-to-home shortens the machine cycle!



●Decrease Costs

Sensor costs and wiring costs can be reduced.

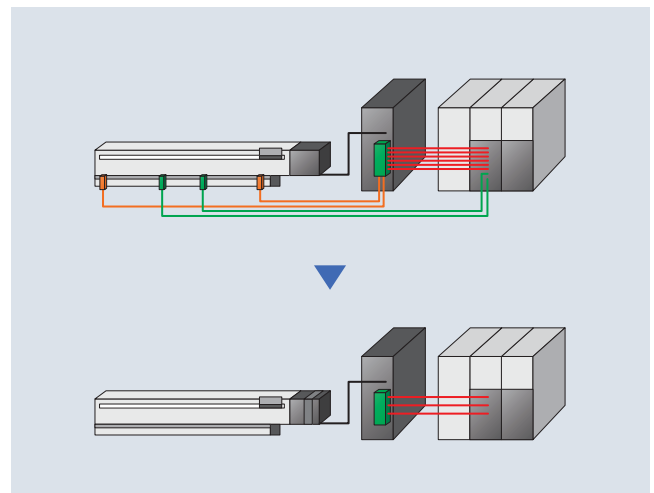
●Reduced Wiring

Sensor cables are no longer necessary, so the degree of freedom for equipment design is increased.

●External Sensor Malfunctions Have No Impact

There is no concern about sensor malfunctions (when operating in environments filled with oil mist or filled with metal pieces due to metal processing), sensor failures or wire disconnections.

●Software limits on the driver can be used to prevent operation beyond the limits.



Battery-Free Absolute System

Battery-Free

No battery is necessary for a mechanical-type sensor.
Positioning information is managed mechanically by the absolute sensor.

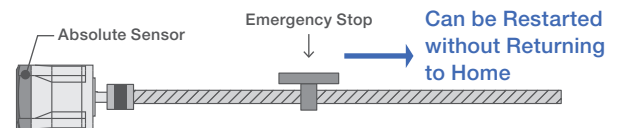


●Operation Resumes Immediately from the Stopped Position Even After an Emergency Stop

Even if the power shuts down during a positioning operation or the cable between the motor and the driver is disconnected, the positioning information is retained. With the built-in controller type, you can restart the positioning operation, without performing return-to-home after an emergency stop on the production line or a blackout.

- Because the positioning information is stored in the Absolute sensor, the home position must be reset if the motor is replaced.

Built-in Controller Type



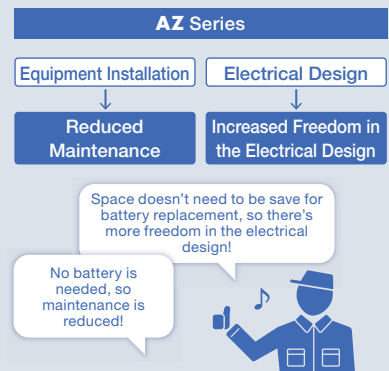
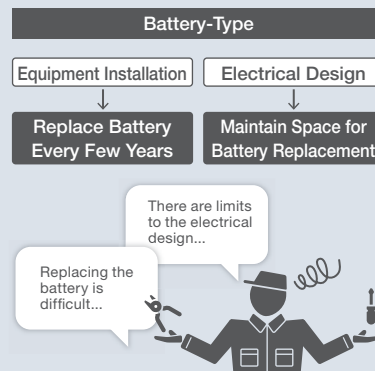
●No Battery to Replace

Reduces maintenance time and costs.

●Unlimited Driver Installation Possibilities

Because there is no need to secure space for battery replacement, there are no restrictions on the installation location of the driver, improving the flexibility and freedom of the layout design of the control cabinet.

• Maintenance



●Safe for Overseas Shipping

Normal batteries will self-discharge, so care must be taken when the equipment requires a long shipping time, such as when being sent overseas. The absolute sensor does not require a battery, so there is no limit as to how long the positioning information is maintained. In addition, there is no need to worry about various safety regulations, which must be taken into consideration when shipping a battery overseas.

• Overseas Shipping



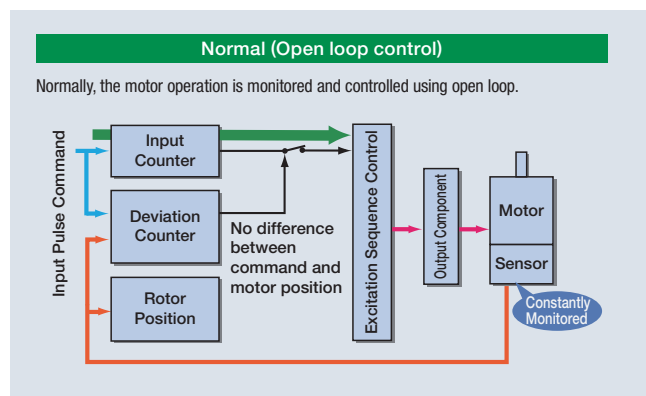
Features of α STEP

Hybrid Control Allows for Control that is Both Easier to Use and More Accurate

α STEP is a stepper motor-based series of motors with a unique hybrid control system that combines the advantages of both open loop and closed loop control.

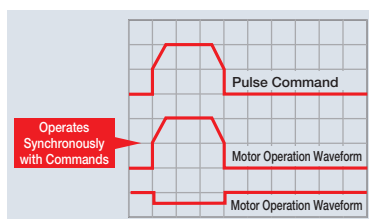
The motor position is constantly monitored and control is switched to one of the two types depending on the situation.

●The Control is Normally Open Loop, and Provides Ease of Use Similar to a Stepper Motor



High Response

By utilizing the high responsiveness of the stepper motor, moving a short distance for a short time is possible. The motors can execute commands without lagging.



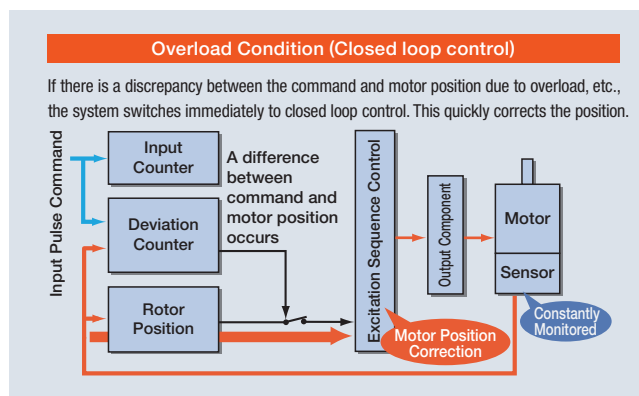
Holding the Stop Position without Hunting

During positioning, the motor stops with its own holding force without hunting. Because of this, it is ideal for applications where the low rigidity of the mechanism requires absence of vibration upon stopping.

Tuning-Free

Because it is normally operated with open loop control, positioning is still possible without gain adjustment even when the load fluctuates etc. due to the use of a belt mechanism, cam or chain drive, etc.

●Control Switches to Closed Loop During a Overload, Allowing for More Reliable Operation



Continues Operation Even with Sudden Load Fluctuation and Sudden Acceleration

It operates synchronously with commands using open loop control during normal conditions. In an overload condition, it switches immediately to closed loop control to correct the position.

Alarm Signal Output in Case of Abnormality

If an overload is applied continuously, an alarm signal is output. When the positioning is complete, an END signal is output. This ensures the same level of reliability as a servo motor.

●Smooth Operation Even at Low Speed

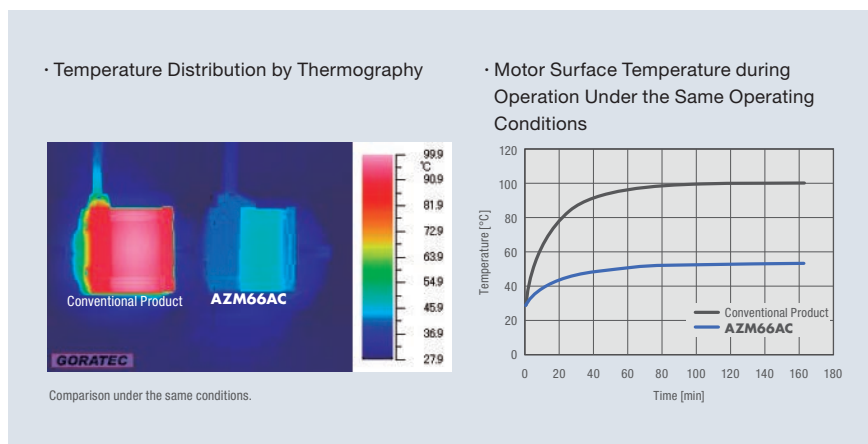
Thanks to the standard microstep drive and smooth drive function*, vibration is reduced even at low speed and the motor can move objects smoothly.

*The smooth drive function automatically microsteps based on the same traveling amount and speed used in the full step mode, without changing the pulse input settings.

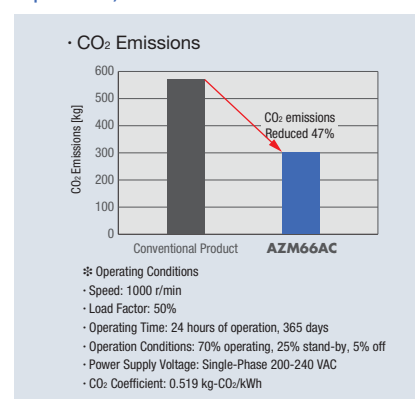
Power Saving, Low Heat Generation

High-efficiency motors reduce heat generation and save energy.

●Significantly Reduced Heat Generation



●Power Consumption and CO₂ Emissions 47% Less than Conventional Products (Compared to other Oriental Motors products)



Driver Types

AC : Single-Phase 100-120 VAC, Single-Phase/Three-Phase 200-240 VAC Input

DC : 24/48 VDC Input

Interface	Driver Type (Driver type names)		
	 Single-Axis Driver	 mini Driver	 Multi-Axis Driver
EtherCAT 	AC DC EtherCAT Drive Profile Compatible *	DC EtherCAT Drive Profile Compatible *	DC EtherCAT Drive Profile Compatible *
EtherNet/IP	AC DC EtherNet/IP Compatible	DC EtherNet/IP Compatible	—
PROFINET	AC DC PROFINET Compatible	DC PROFINET Compatible	—
Modbus (TCP, UDP)	—	DC Ethernet Type	—
Modbus (RTU)	AC DC Built-in Controller Type	DC RS-485 Communication Type	—
Pulse	AC DC Pulse Input Type Pulse Input Type with RS-485 Communication	—	—
I/O	AC DC Built-in Controller Type	—	—

* EtherCAT drive profile compatible drivers have passed the official EtherCAT conformance test.

Single-Axis Driver

A wide variety of interface types and power supply input types are available.
AC input drivers can create high torque, which contributes to a reduction in positioning time.
Compact DC input drivers contribute to saving installation space and making equipment smaller and lighter.
Consider the purpose and application when selecting.

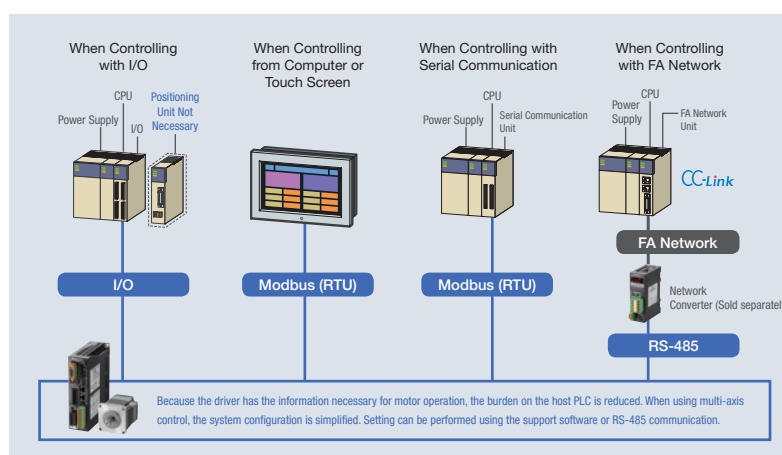
Network Compatible Driver

These are compatible with the major industrial networks used around the globe.
This helps with centralized management of equipment information and reduced wiring.
Compatible interfaces: EtherCAT, EtherNet/IP, PROFINET, MECHATROLINK-III, SSCNET III/H, Modbus (RTU)



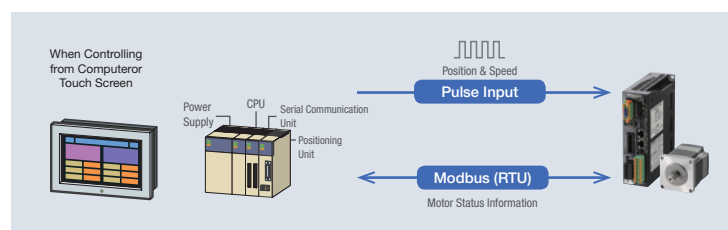
Built-in Controller Type CFLEX

- The operating data, such as position or speed, is set in the driver, and is then selected and executed from the I/O unit. A maximum of 256 points of operating data can be registered.
- Control can be performed using I/O, Modbus (RTU) or a network converter (gateway). When used with a network converter, control via CC-Link is possible.



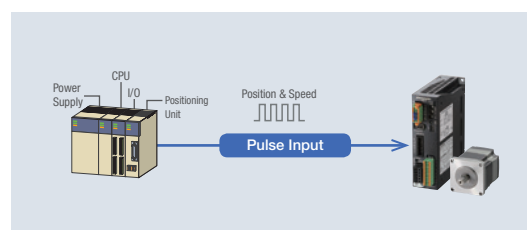
Pulse Input Type with RS-485 Communication

Operation is executed according to the pulse signal input to the driver.
Motor status information (position, speed, torque, alarms and temperature) can be monitored using RS-485 communication.



Pulse Input Type

Operation is executed according to the pulse signal input to the driver. Alarm history can be checked and various conditions can be monitored with the support software **MEXE02**.



mini Driver

Modular Automation Compatible Products

Compact and lightweight design was pursued. Can be installed in narrow spaces.
The broad voltage specifications that can be used with a battery power supply make this suitable for integration into self-powered equipment.



"Modular Automation Compatible Products" are a group of products based on the shared concept of battery operation, compact size and lightweight. Ideal for installation in self-propelled equipment and mobile facilities, they contribute to the creation of flexible automation lines and modular automation, which will see increasing demand in the future.

●Please refer to the appropriate separate catalog for details about the products.

Multi-Axis Driver

Multiple axes (max. 4 axes) can be controlled with a single driver.
The host control device and power supply connections have been consolidated into a single driver, which contributes to space and reduced wiring.



Easy Setup and Convenient Functions of the **AZ** Series.



Support Software **MEXE02**

The support software **MEXE02** can be downloaded from the Oriental Motor website.

Easy Setting and Easy Operation

The support software **MEXE02** can be used for basic settings such as editing operation data and setting parameters. In addition, the sequence function allows for advanced motions using simple inputs.

● Unit Setting Wizard

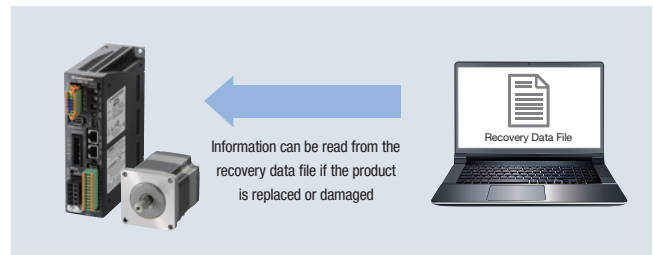
This is a function that allows the traveling amount, speed, etc. to be displayed and input in the designated units. Display and settings can be made in the units (mm, deg) that match the mechanism that is being used, eliminating the need for unit conversion and simplifying the input of operating data.



● Creation of Recovery Data Files

A file that contains the product's settings at time of shipping is created initially for use when the product is replaced for maintenance or during a breakdown.

Make sure that a recovery file is created when using linear & rotary actuators.



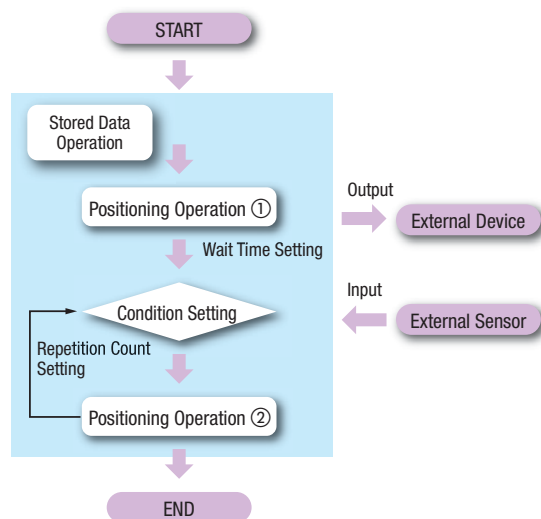
● Simplified Main Program Thanks to the Sequence Function

For the **AZ** Series, stored data operation includes a wide variety of sequence functions such as linked operation, timer settings between operations, conditional branching and loop counts.

Sequence programming of the host system can be simplified.

Built-in Controller Type

- Number of Positioning Operation Data Sets (Up to 256)
- General-Purpose I/O Signal Counts (Input 10, output 6)
- Communication I/O Signal Counts (Input 16, output 16)

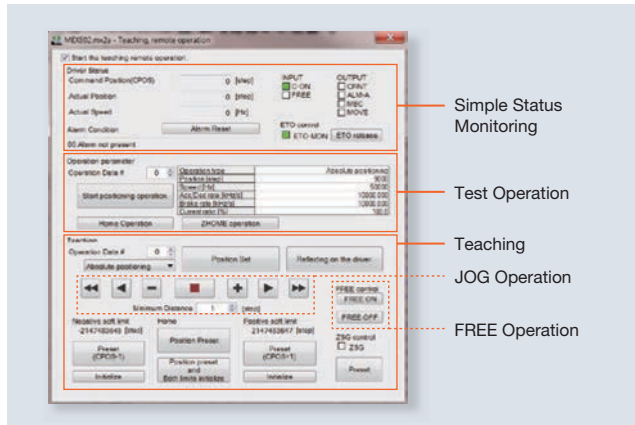


Test Function

This function enables stand-alone operation of a motor or checking the connection to the host system. Using this function at equipment startup can lead to shortening the time needed.

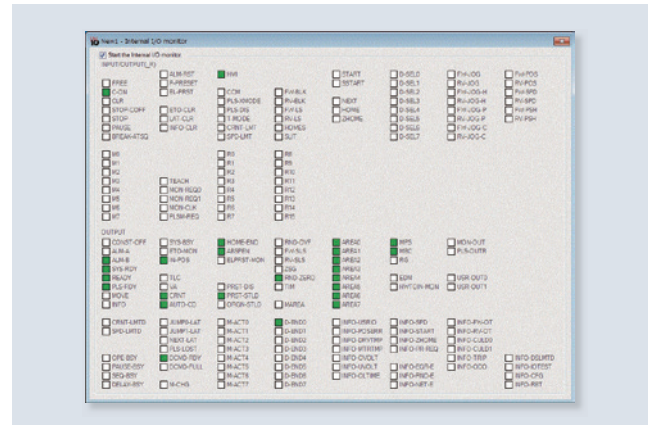
● Teaching and Remote Operation On startup

Data setting software can be used to easily perform the home setting and also drive the motor. Teaching and test operation can be performed before connecting to the host system, which contributes to reduce startup time of the equipment.



● I/O Tests On startup For operation

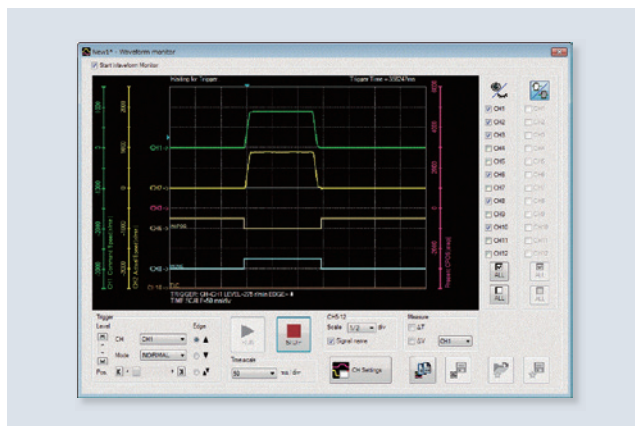
Input monitors can be monitored and output signals can be deliberately output. This function is useful when checking the wiring to the host system and for remote I/O operation.



Various Monitoring Functions

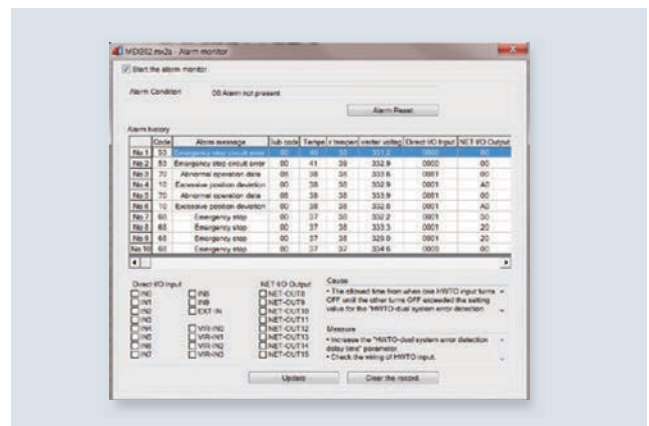
● Waveform Monitoring On startup

The operating status of the motor and output signals used to can be monitored using an oscilloscope-like image. This can be used for equipment start-up and adjustment.



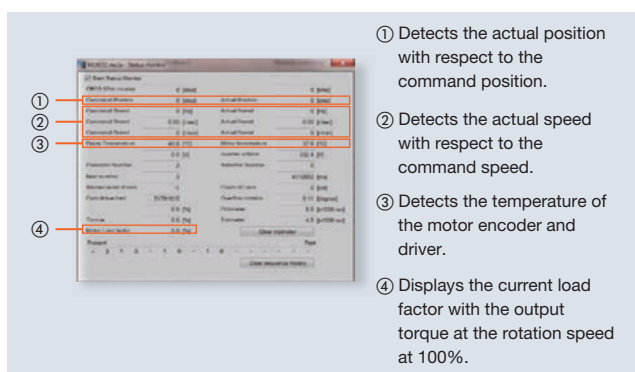
● Alarm Monitoring On startup

When an abnormality occurs, the details of the abnormality, the operating status at the time of the occurrence, and the solution can be checked.



● Status Monitor On startup

In addition to being able to monitor the speed, motor, driver temperature, and load factor during operations, the integrating rotation amount, etc. can be monitored from the start of use. The signal for each item can be output at your discretion, which leads to effective maintenance.



- ① Detects the actual position with respect to the command position.
- ② Detects the actual speed with respect to the command speed.
- ③ Detects the temperature of the motor encoder and driver.
- ④ Displays the current load factor with the output torque at the rotation speed at 100%.

● Multi-Monitoring Compatible

Multiple setting screens such as data setting, test operation and monitoring can be opened and used simultaneously on separate screens. This makes equipment startup and adjustment easier to carry out.



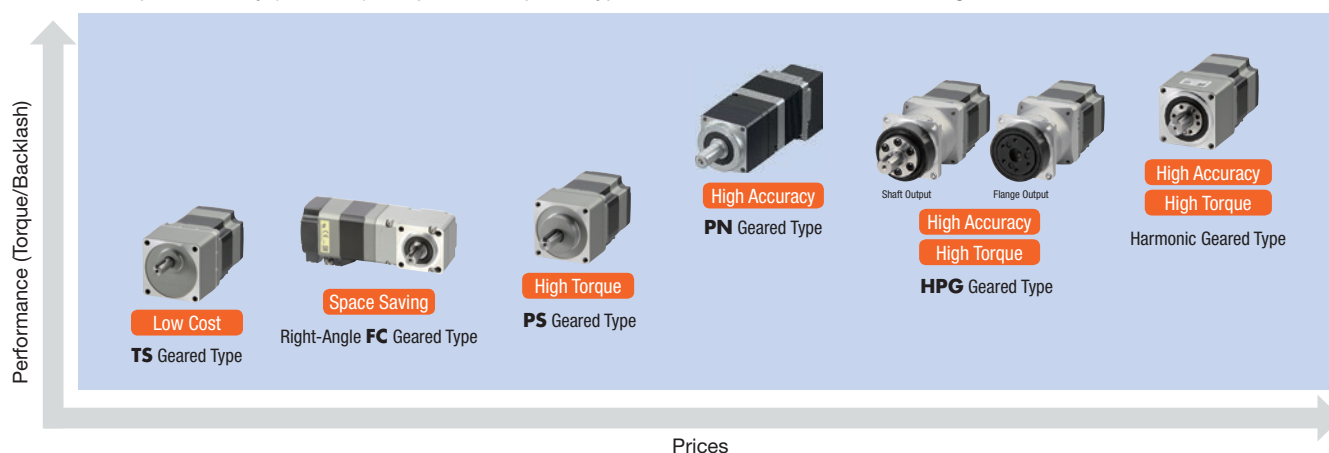
Type	Electromagnetic Brake	20 mm	28 mm*6	43 mm*2	60 mm	85 mm 90 mm*4	
Standard *1		Not equipped	DC*1	DC*1	AC DC	AC DC	AC
		Equipped	—	—	AC DC*3	AC DC*3	AC*5
Low Backlash	TS Geared *2 (Spur gear mechanism) Low Gear Ratio, High Speed Operation Gear Ratio: 3.6, 7.2, 10, 20, 30	Not equipped	—	—	AC DC	AC DC	AC
		Equipped	—	—	AC DC	AC DC	AC
	Right-Angle FC Geared (Face gear mechanism) Right-Angle Gear for Positioning Gear Ratio: 7.2, 10, 20, 30	Not equipped	—	—	AC DC	AC DC	—
		Equipped	—	—	AC DC	AC DC	—
	PS Geared (Planetary gear mechanism) Gear Ratios for Selecting the Desired Step Angle Gear Ratio: 5, 7.2, 10, 25, 36, 50	Not equipped	—	DC*1	AC DC	AC DC	AC
		Equipped	—	—	AC DC	AC DC	AC
Non-Backlash	PN Geared (Planetary gear mechanism) NEW High Positioning Accuracy Gear Ratio: 10	Not equipped	—	DC*1	—	—	—
		Equipped	—	—	—	—	—
	HPG Geared *3 (Harmonic Planetary®) High Positioning Accuracy Gear Ratio: 5, 9, 15	Not equipped	—	—	AC DC	AC DC	AC
		Equipped	—	—	AC DC	AC DC	AC
	Harmonic Geared Type (Harmonic drive) High Positioning Accuracy Gear Ratio: 50, 100	Not equipped	—	DC*1	AC DC	AC DC	AC
		Equipped	—	—	AC DC	AC DC	AC

*1 24 VDC only *2 HPG Geared Type is 40 mm *3 AZM46 only *4 Geared Type only *5 AZM98 only *6 Harmonic Geared Type is 30 mm

Note

Please use the above values as reference to see the differences between each type. These values vary depending on the motor frame size and gear ratio.

Geared motors, which have been pre-assembled with gears, are offered as variants of the **AZ** Series.
Based on torque, accuracy (backlash) and price, the optimal type can be selected from the various geared motors.



Permissible Torque and Max. Instantaneous Torque [Nm]	Backlash [arcmin]	Basic Resolution	Output Shaft Speed [r/min]
Max. Holding Torque 4	—	0.36	6000
Permissible Torque / Maximum Instantaneous Torque 25 45	10	0.012	833
Permissible Torque 10.5	10	0.012	416
Permissible Torque / Maximum Instantaneous Torque 37 60	7	0.0072	600
Max. Holding Torque 0.9	—	0.036	600
Permissible Torque / Maximum Instantaneous Torque 24 33	3	0.024	900
Permissible Torque / Maximum Instantaneous Torque 52 107	0	0.0036	70

Driver

Type
Network Compatible EtherCAT[®] EtherNet/IP[™] PROFINET[®] AC DC
Built-in Controller  Modbus (RTU) AC DC
Pulse Input Type with RS-485 Communication Pulse Input AC DC
mini Driver EtherCAT[®] EtherNet/IP[™] PROFINET[®] Modbus (TCP, UDP) Modbus (RTU) Pulse Input Type with RS-485 Communication DC
Network Compatible Multi-Axis Driver EtherCAT[®] DC

Introduction of Related Products

NEW Servo Motors

AZX Series

Battery-Free Absolute Mechanical Sensor Equipped Motor
Standard Type / PS Geared Type 400W, 600W



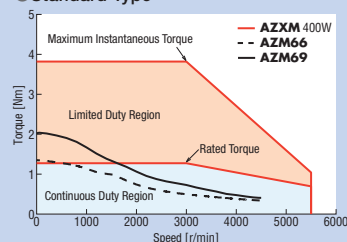
EtherCAT[®] EtherNet/IP[™] PROFINET[®]

●For detailed information please refer to the **AZX** Series catalogue on our website.

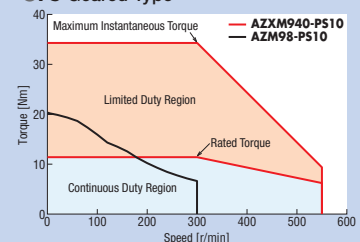
◇Achieves High Torque in the High Speed Range

The **AZX** Series achieves high torque in the high speed range.
It is suitable for positioning applications with a large amount of travel (e.g.: ball screw driving).

●Standard Type



●PS Geared Type



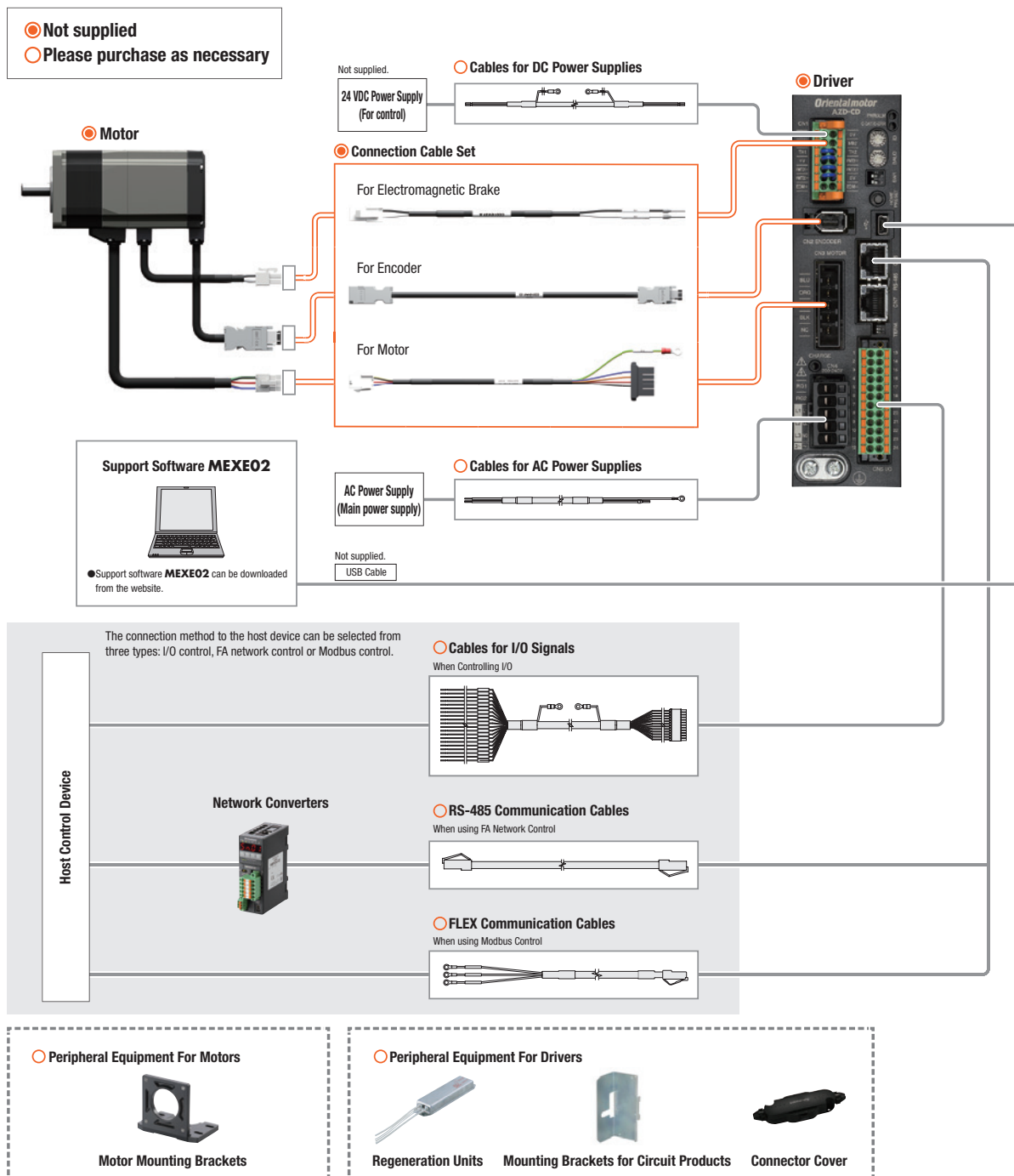
●This is a comparison of the speed – torque characteristics of the **AZX** Series and **AZ** Series.
The **AZX** Series offers superior torque in the high speed range, the **AZ** Series is better in the low speed range.

α STEP AZ Series AC Input

System Configuration

Combination of Standard Type Motor with Electromagnetic Brake and Built-in Controller Type or Pulse Input Type Driver with RS-485 Communication

An example of a configuration using RS-485 communication or I/O control with a built-in controller type driver is shown below. Motors, drivers, and connection cable sets/flexible connection cable sets need to be ordered individually.



Example of System Configuration

Motor	Driver	Cables		Peripheral Equipment
AZM66MC	AZD-CD	Connection Cable Set (1 m)	Cables for I/O Signals Connector Type (1 m)	Mounting Brackets for Circuit Products
○	○	CC010VZFB	CC16D010B-1	MADP06
○	○	○	○	○

● The system configuration shown above is an example. Other combinations are also available.

Note

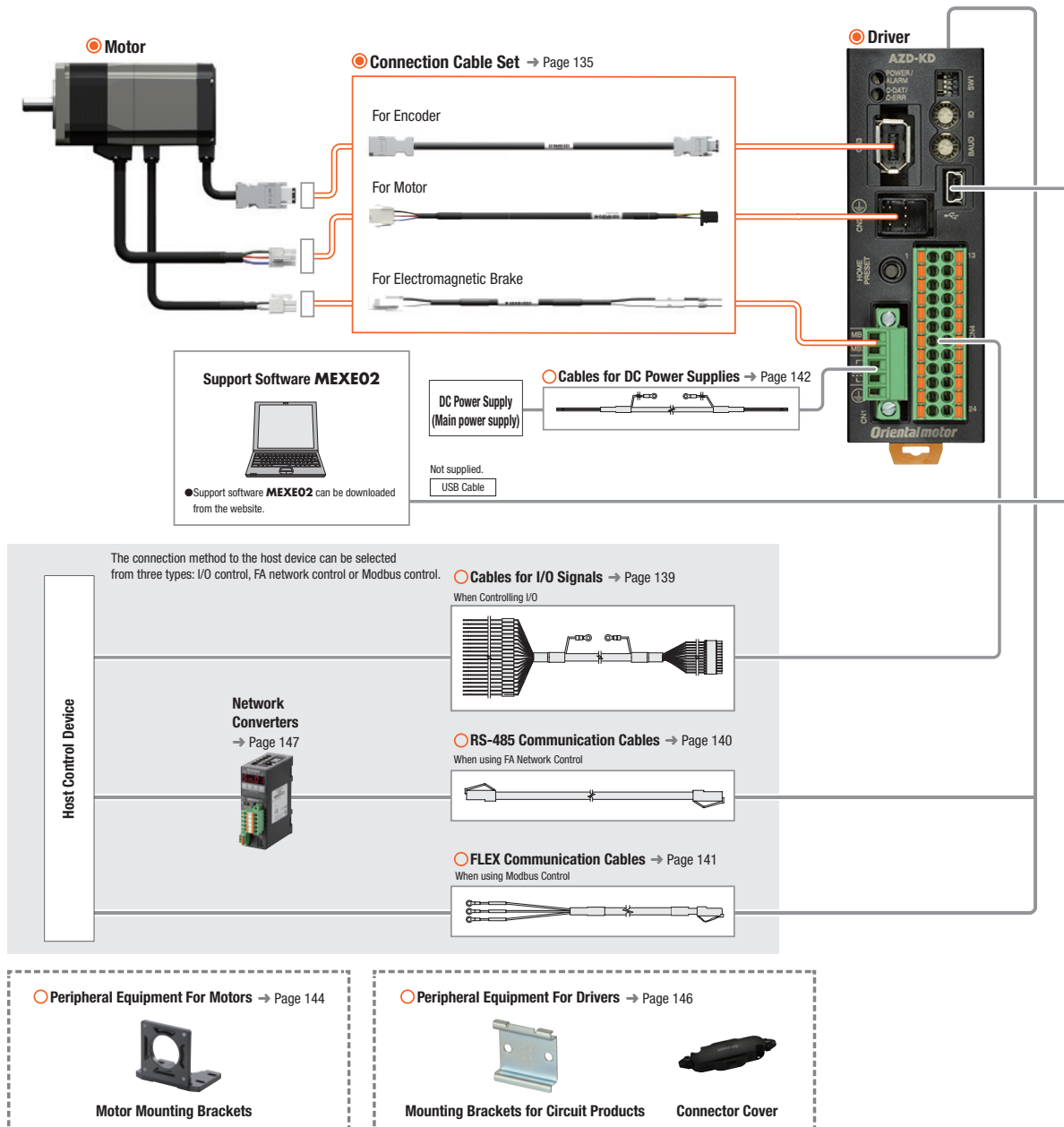
● The motor cable and electromagnetic brake cable from the motor cannot be connected directly to the driver. When connecting to a driver, use a connection cable.

System Configuration

Combination of Standard Type Motor with Electromagnetic Brake and Built-in Controller Type Driver or Pulse Input Type Driver with RS-485 Communication

An example of a configuration using RS-485 communication or I/O control with a built-in controller type driver is shown below. Motors, drivers, and connection cable sets/flexible connection cable sets must be ordered individually.

- Not supplied
- Please purchase as necessary



Example of System Configuration

Motor	+	Driver	+	Cables		+	Peripheral Equipment
AZM66MK		AZD-KD		Connection Cable Set (1 m)	Cables for I/O Signals Connector Type (1 m)		Mounting Brackets for Circuit Products
○		○		CC010VZFB2	CC16D010B-1		MAFP02
				○	○		○

● The system configuration shown above is an example. Other combinations are also available.

Note

● The motor cable and electromagnetic brake cable from the motor cannot be connected directly to the driver. When connecting to a driver, use a connection cable.



Orientalmotor

These products are manufactured at plants certified with the international standards **ISO 9001** (for quality assurance) and **ISO 14001** for systems of environmental management).

Specifications are subject to change without notice. This catalogue was published in March 2025.

ORIENTAL MOTOR (EUROPA) GmbH

European Headquarters

Schießstraße 44
40549 Düsseldorf, Germany
Tel: 0211 5206700 Fax: 0211 52067099

Spanish Office

Ronda de Poniente 2, Ed. 12, 2ª planta
28109 Tres Cantos (Madrid), Spain
Tel: +34 919 61 06 76

ORIENTAL MOTOR (UK) LTD.

UK Headquarters

Unit 5, Faraday Office Park,
Rankine Road, Basingstoke,
Hampshire RG24 8AH, U.K.
Tel: +44 1256 347090 Fax: +44 1256 347099

ORIENTAL MOTOR ITALIA s.r.l.

Italy Headquarters

Via XXV Aprile 5
20016 Pero (MI), Italy
Tel: +39 2 93906346 Fax: +39 2 93906348

Customer Service Center

(Support in German & English)

00800 22 55 66 22*

Mon - Thu: 08:00 - 16:30 CET

Friday: 08:00 - 15:00 CET

*Free Call Europe

info@orientalmotor.de

