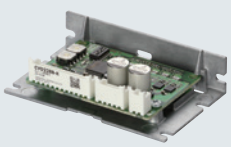
Oriental motor

Stepper Motor Driver

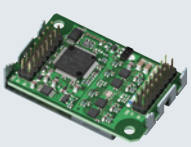
CVD Series

A Wide Product Line of Compact Microstepper Drivers To Suit Any Application



Pulse Input Type

RS-485 Communication Type



S Type

SC Type

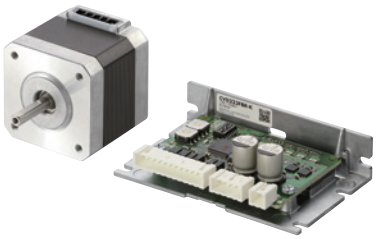
Fully Closed-Loop Control Type

4-Axis Driver

NEW 2-Axis Driver

Multi-Axis type EtherCAT compatible

The **CVD** Series of stepper motor drivers, now capable of compact, high-current drive, combined with the compact, high-torque **PKP** Series of stepper motors, meets the diverse requirements of our customers.



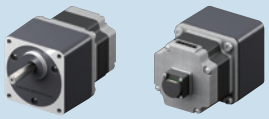
Product Line — CVD Series Stepper Motor Driver

Series Name		CVD Series							
Type		Pulse Input Type	RS-485 Communication Type	Fully Closed-Loop control Type	**S** Type SP Communication Compatible	**S** Type Pulse input Compatible*1	**SC** Type (Speed Control)	Multi-Axis Type EtherCAT	
								4-Axis Driver	2-Axis Driver
Driver		 Right Angle Type with Installation Plate	 Right Angle Type with Installation Plate	 Right Angle Type with Installation Plate	 Horizontal Mounting	 Horizontal Mounting	 Right Angle Type with Installation Plate	 Right Angle Type with Installation Plate	NEW  Right Angle Type with Installation Plate
		 With Installation Plate	 With Installation Plate	 With Installation Plate	–	 Vertical Mounting	 With Installation Plate	NEW  With Installation Plate	NEW  With Installation Plate
		 Without Installation Plate	–	–	–	–	–	NEW  Right Angle Type without Installation Plate	NEW  Right Angle Type without Installation Plate
								NEW  Without Installation Plate	NEW  With Installation Plate
Combinable Stepper Motors		2-Phase/5-Phase	2-Phase/5-Phase		2-Phase/5-Phase	2-Phase/5-Phase	5-Phase	2-Phase/5-Phase	
Control Method	I/O Control	–	Return to Home Operation Positioning Operation Speed Control Operation	Excitation off Compensation release Home confirmation	Return to Home Operation	–	Speed Control Operation	Input: 4 points Output: 1 point *Select the function to assign via parameters	
	Pulse Input	●	–	●	–	●	–	–	
	Modbus (RTU)	–	Return to Home Operation Positioning Operation Direct Data Operation*2 Speed Control Operation	Operation data, Parameter settings, Input of operating commands, Remote I/O, Detected positions, etc. Status Monitor	–	–	–	–	
	SPI Com-muni-cation	–	–	–	Return to Home Operation Direct Data Operation*2	–	–	–	
	EtherCAT	–	–	–	–	–	–	Operation data, Parameter settings, Input of operating commands Remote I/O Detected position, etc. Status Monitor	

*1 Information regarding the **CVD** Series **S** Type pulse input compatible I/O configuration. Products with pulse input compatible SPI communication settings are also available. Please enquire for further details.

*2 Direct data operation is operation that overwrites the position and speed information each time.

Product Line — PKP Series Stepper Motor

	Type	Frame Size	Additional Function		
			Standard	With Encoder	With Electromagnetic Brake
2-Phase	**Standard Type** (Basic Step Angle: 1.8°/step)  Standard / With Encoder*4 / With Electromagnetic Brake	☐ 13 mm*1	●	●	–
		☐ 20 mm	●	●	–
		☐ 28 mm	●	●	●
		☐ 35 mm	●	●	●
		☐ 42 mm	●	●	●
		☐ 56.4 mm	●	●	●
		☐ 60 mm*2	●	–	–
		☐ 85 mm	●	–	–
	High-Resolution Type (Basic Step Angle: 0.9°/step)  Standard / With Encoder*4 / With Electromagnetic Brake	☐ 28 mm	●	●	–
		☐ 42 mm	●	●	●
		☐ 56.4 mm	●	●	●
	Flat Type (Basic Step Angle: 0.018 to 1.8°/step)  Standard / With Encoder / With Harmonic Gear	☐ 42 mm	●	●	–
		☐ 60 mm	●	●	–
		☐ 51 mm*3	●	●	–
		☐ 61 mm*3	●	●	–
	SH Geared Type (Basic Step Angle: 0.05 to 0.5°/step)  Standard / With Encoder*4	☐ 28 mm	●	●	–
		☐ 42 mm	●	●	–
		☐ 60 mm	●	●	–
		☐ 90 mm*2	●	–	–
	CS Geared Type (Basic Step Angle: 0.09 to 0.36°/step)  Standard	☐ 28 mm	●	–	–
		☐ 42 mm	●	–	–
		☐ 60 mm	●	–	–
5-Phase	**Standard Type** (Basic Step Angle: 0.72°/step)  Standard / With Encoder*4	☐ 20 mm*2	●	●	–
		☐ 28 mm	●	●	–
		☐ 42 mm	●	●	–
		☐ 56.4 mm	●	●	–
		☐ 60 mm	●	●	–
		☐ 85 mm*2	●	–	–
	High-Resolution Type (Basic Step Angle: 0.36°/step)  Standard/With Encoder*4	☐ 28 mm	●	●	–
		☐ 42 mm	●	●	–
		☐ 60 mm	●	●	–
	TS Geared Type (Basic Step Angle: 0.024 to 0.2°/step)  Standard	☐ 42 mm	●	–	–
		☐ 60 mm	●	–	–

● About Electromagnetic Brakes

- The electromagnetic brake is a non-excitation operation type, so while it is useful for holding loads while stopped, it is not a mechanism intended to reliably hold loads. Do not use as a safety brake. Wait until the motor has stopped when using the electromagnetic brake to hold a load.
- The **CVD** Series does not have a function to control electromagnetic brakes. The system to control the electromagnetic brake must be prepared by the customer.

✻1 Harmonic geared types are also available. ✻2 This is the conventional PK Series. ✻3 With Harmonic Gear ✻4 For resolutions between 100 and 4.000 P/R, please contact your nearest Oriental Motor sales office.

The **CVD** Series drivers developed exclusively for the **PKP** Series stepper motors enables increased performance and functionality.

Features of the **CVD** Series

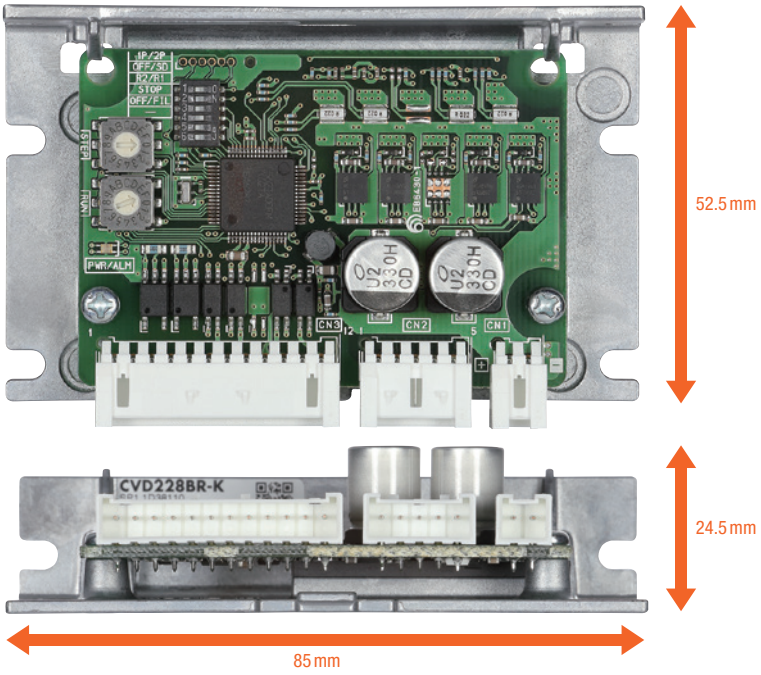
Industry's Top, Compact, High Performance Driver

These compact and lightweight drivers contribute to saving space. The 2-phase and 5-phase drivers are identical in size, installation and I/O connectors. This allows for the selection and evaluation of 2-phase or 5-phase drivers based on the required specifications.

- A 2-phase driver and 5-phase driver cannot be used together. Different phases require dedicated drivers.

Actual Size

Mass 20 g to 70 g
(Differs according to the driver type.)



Select Drivers by Mounting Method

Drivers with different shapes and connector locations are available to match the mounting method.

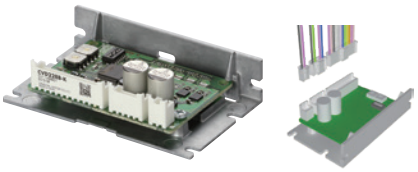
- Available for both 2-phase and 5-phase.

Right Angle Type with Installation Plate

The connector points outward.

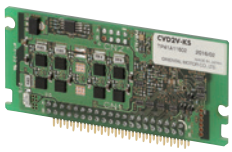
With Installation Plate

The connector points upward.



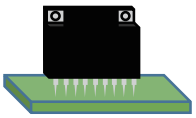
Board-Mount **S** Type

This is a board-mount type driver. For details, please contact your nearest Oriental Motor sales office.

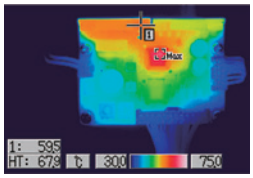


High-Efficiency Design

The **CVD** Series provides increased torque by increasing the output current compared to conventional products.
In order to allow the increase of output current, the design incorporates measures to reduce the amount of heat generated.



Conventional product
or custom-built driver

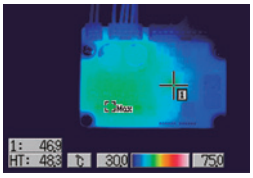


Thermographic driver heat distribution
when operated under identical conditions

Lower Heat Generation

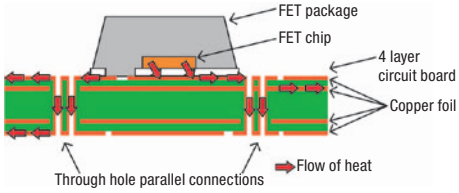
Increased Torque

CVD Driver

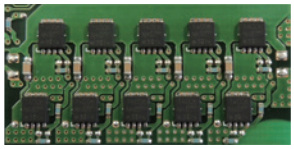


Thermographic driver heat distribution
when operated under identical conditions

- Adoption of low-loss FET
- Pattern design that accounts of heat dissipation to the circuit board
- Adoption of FET with good heat dissipation properties



Cross section schematic view of FET and printed circuit board



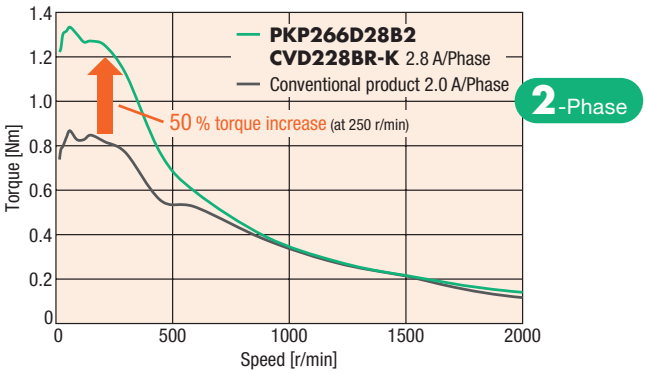
Actual printed circuit board pattern

High Torque

The combination of the **CVD** Series driver, which enables higher currents through improved drive circuit efficiency, and the **PKP** Series, featuring a revised motor winding design, achieves high torque.

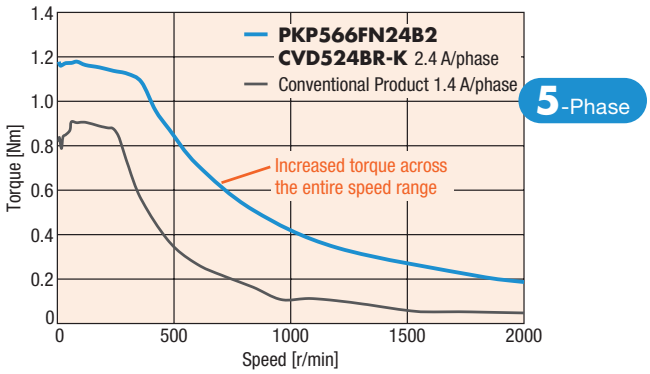
Enhanced Low Speed Torque

The maximum holding torque of the 2-phase motor's excitation has increased. Torque around 250 r/min in particular has increased by 50% compared to the previous model.



High Torque across All Speed Ranges

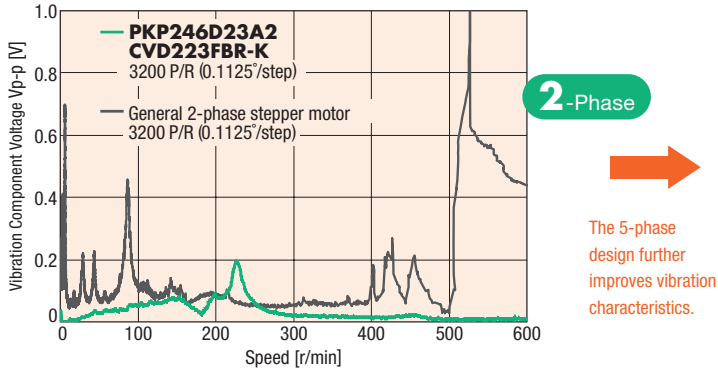
The performance of the 5-phase motor has been maximised, resulting in a significant increase in torque across the entire speed range and expanding its application scope.



Low Vibration

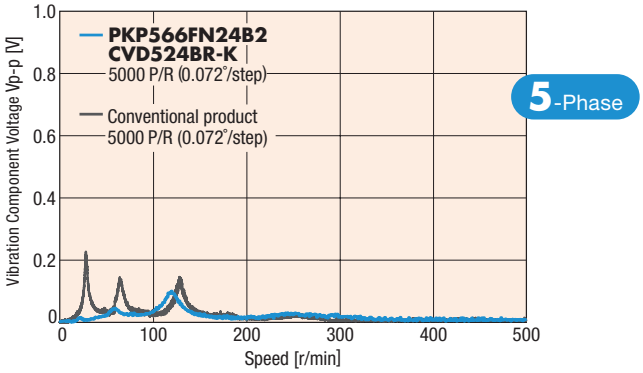
Full digital control with full-time microstep drive significantly improves vibration levels, achieving low vibration across the entire speed range.

Vibration Characteristics have been Significantly Improved across The Entire Speed Range.



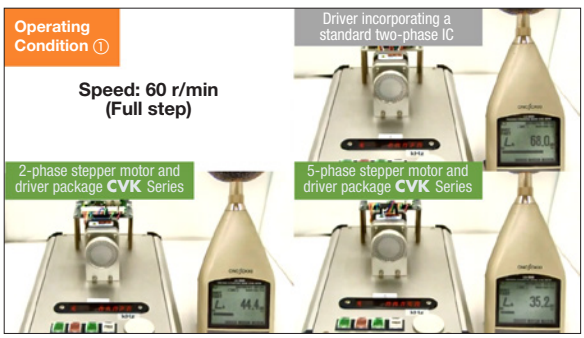
The 5-phase design further improves vibration characteristics.

Further Reduction in Vibration



Video now available on our website

Comparison of Stepper Motor Drive Sounds



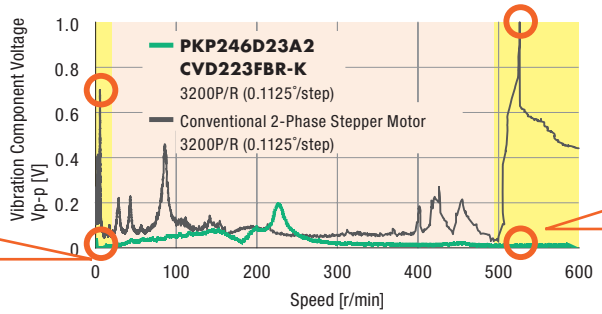
The video is here

Low Vibration Achieved by Full-Time Microstep Drive

The **CVD** Series is a fully digital control driver. Currents are controlled digitally and calculated by a high-performance CPU.
The waveform of the current for each phase is changed from the conventional trapezoidal to sinusoidal, which allows for micro-step driving in all speed regions, and has reduced vibration even more.

Reduction in Step Vibration

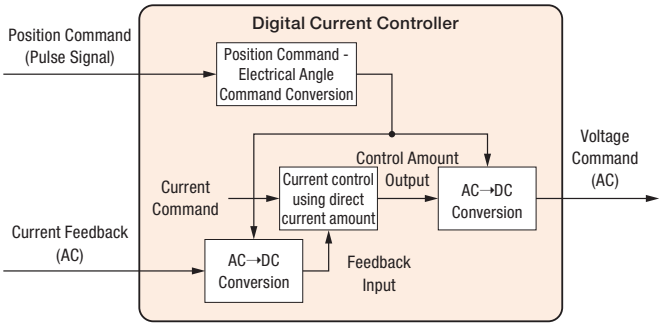
The new smooth drive control with its increased current control resolution allows the basic step angle to be divided into a max. of 2048 microstep angles. This has greatly reduced the step vibration at low speeds.



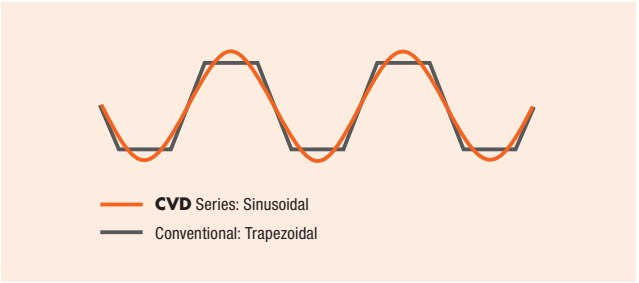
Vibration Suppression Control

Vibration in the medium speed regions, which generally occurs regardless of the number of phases and the drive system type, has been suppressed. This stabilizes the torque characteristics and allows the motor to operate at high speeds without mis-stepping.

■ Digital Current Controller Mechanism



■ Illustration of Motor Current Waveform

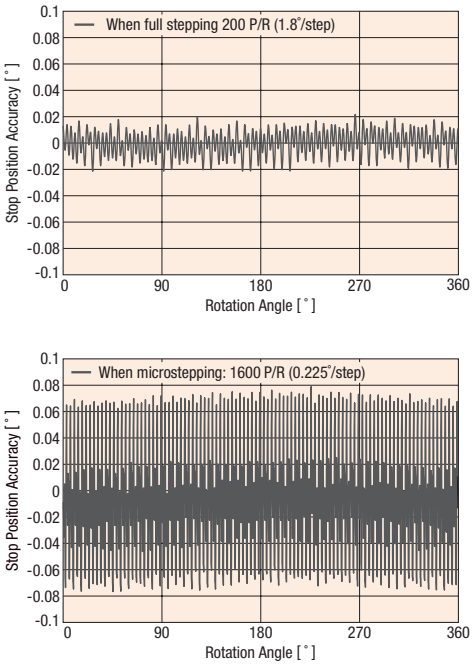


For even higher precision positioning, opt for a 5-Phase system.

Microstep drive enables resolution to be increased up to a maximum of 125,000 steps per revolution. During microstep drive, stopping accuracy is generally poorer compared to full step drive, with this being particularly pronounced in 2-phase operation. In such cases, employing the 5-phase driver from the **CVD** Series enables higher-precision positioning.

General 2-Phase Drivers and 2-Phase Motors

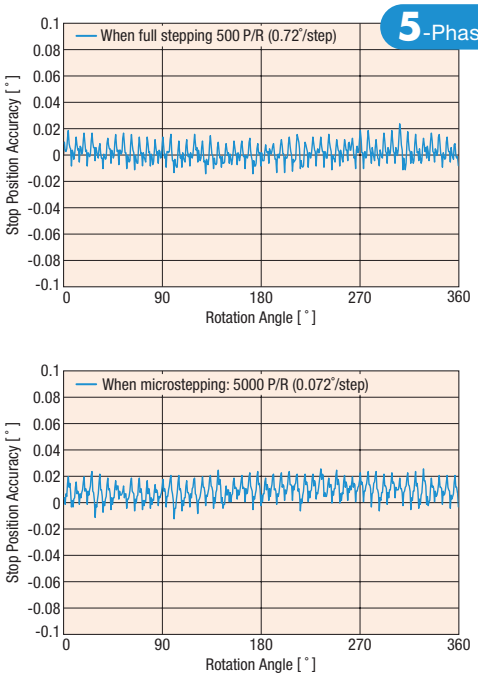
When performing a microstep drive with a general 2-phase driver, stopping accuracy may deteriorate due to torque ripple.



Microstepping reduces stopping accuracy.

5-Phase **CVD** Series driver and 5-Phase **PKP** Series motor

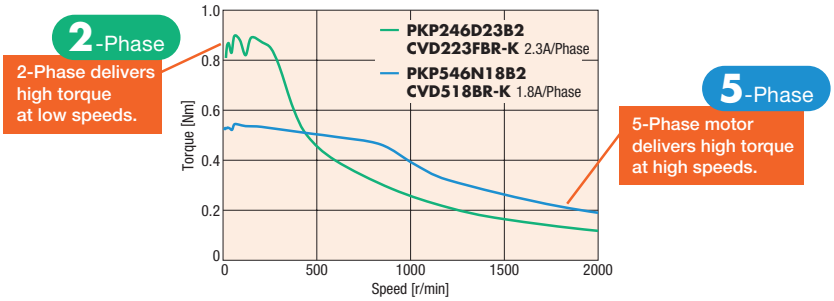
Microstep drive does not compromise stopping accuracy.



Microstepping does not reduce stopping accuracy.

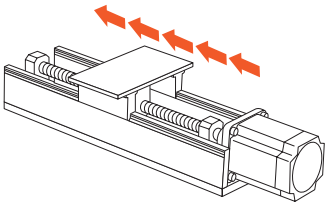
Select the motor best suited to your desired specifications from a wide range of speed and torque characteristics.

The 2-phase motor offers significantly increased torque at low speeds, while the 5-phase motor delivers substantially greater torque primarily at high speeds. From a wide range of speed and torque characteristics, you can select the motor best suited to your desired specifications.



Example Inching Operation Over Short Distances

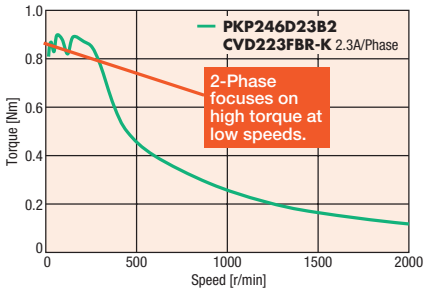
For applications that require rapid acceleration and deceleration, 2-phase stepper motors with high torque at low speeds are recommended.



2-Phase Stepper Motor
PKP Series

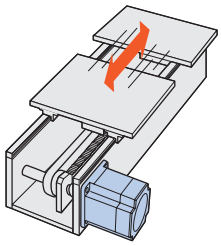
2-Phase Driver
CVD Series

■ High torque at low speeds



Example Drive long distances back and forth

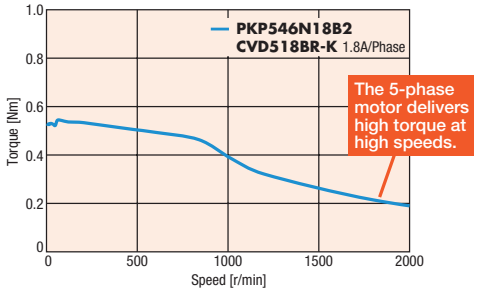
For applications that require long-distance positioning, high-speed, high torque, 5-phase stepper motors are recommended.



5-Phase Stepper Motor
PKP Series

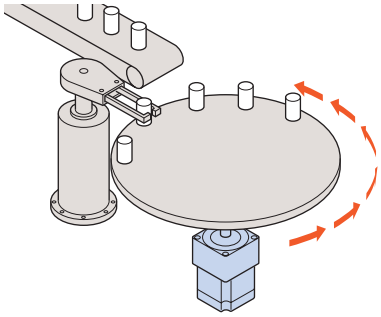
5-Phase Driver
CVD Series

■ High torque at high speeds



Example Inching Operation Over Short Distances with Large Amount of Inertia

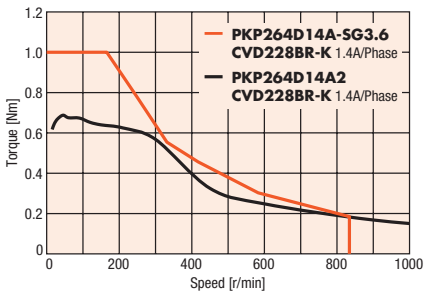
For applications that require rapid acceleration and deceleration with large amounts of inertia, 2-phase stepper motors with geared motors are recommended.



2-Phase Stepper Motor
PKP Series
SH Geared Type

2-Phase Driver
CVD Series

■ Comparison of Speed – Torque Characteristics



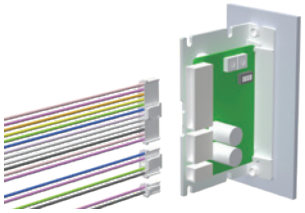
More powerful 5-phase **RK**Ⅱ Series stepper motors (AC input type) are also available.

Select the Type that Best Suits the Mounting Method

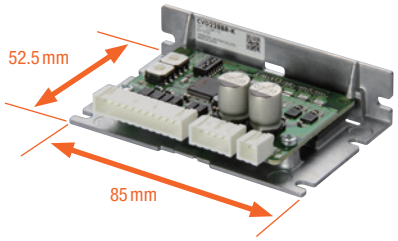
Different driver shapes and connection methods are available to meet a wide range of mounting locations.

Example Driver is Mounted Vertically

The connectors point out from the side of the board. Oriental Motor also provides DIN rail mounting hardware and circuit covers (for pulse input type) as peripheral equipment. Refer to the peripheral equipment page for details.

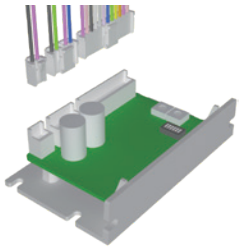


With Installation Plate
Right Angle

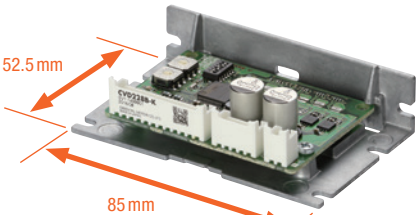


Example Driver is Mounted Horizontally

The connector points upward from the board.

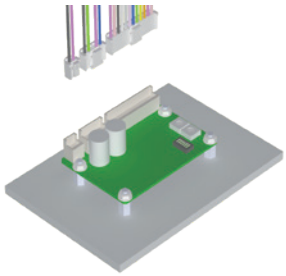


With Installation Plate

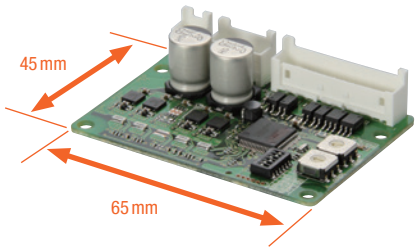


Example Driver is Mounted Horizontally on an Installation Plate

The connector points upward from the board. This type has no installation plate.



Without Installation Plate

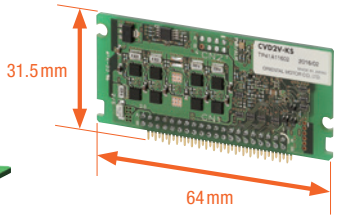


Example Driver Mounted to Printed Circuit Board

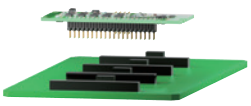
This type can be implemented into custom-made printed circuit boards. Both vertical mount and horizontal mount types are available.

● Vertical mounting

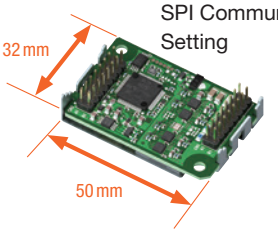
Pulse Input Type



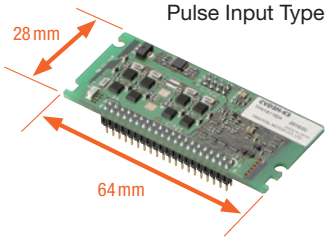
● Horizontal mounting



SPI Communication Setting



Pulse Input Type



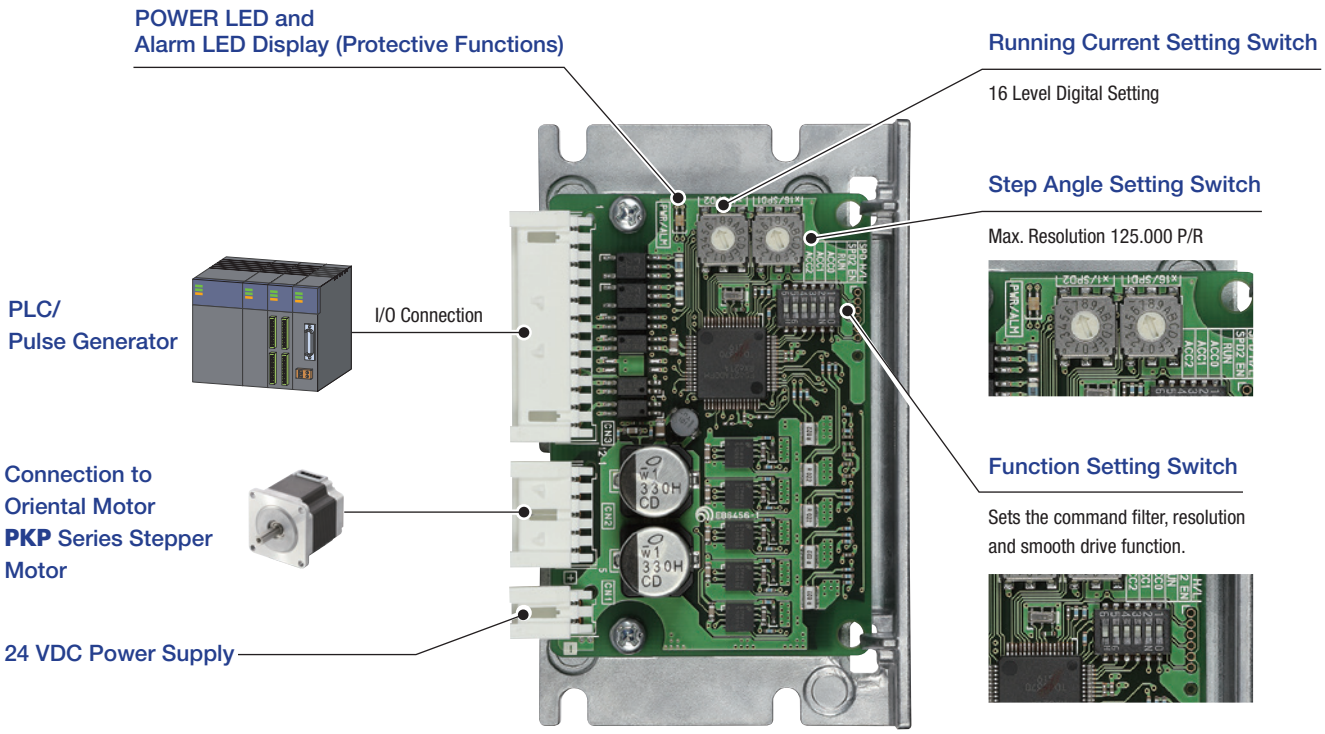
Driver Type (Control Method)	Setting Method	2-Phase		5-Phase	
		Horizontal mounting	Vertical mounting	Horizontal mounting	Vertical mounting
SPI Communication Setting	SPI Communication Settings	**CVD2H-KSS**	-	**CVD5H-KSS**	-
Pulse Input Type	I/O settings	**CVD2H-K**	**CVD2V-K**	**CVD5H-K**	**CVD5V-K**
	SPI Communication Settings	**CVD2H-KS**	**CVD2V-KS**	**CVD5H-KS**	**CVD5V-KS**

Stepper Motor Driver

CVD Series Pulse Input Type

This driver meets the need for easy synchronized operation with pulse input type drivers.

Names and Functions of Driver Parts



I/O Signals

	Signal Name	Function
Input Signals	CW+ (PLS+)	Rotates the motor in the CW direction. (Operation command pulse signal when in 1-pulse input mode)
	CW– (PLS–)	
	CCW+ (DIR+)	Rotates the motor in the CCW direction. (Rotation direction signal when in 1-pulse input mode)
	CCW– (DIR–)	
	AWO+	Stops motor excitation.
	AWO–	
	CS+	Switches the step angle.
	CS–	
Output Signals	ALM+	Outputs the alarm status for the driver (normally closed).
	ALM–	
	TIM+	Output when the excitation state of the motor is step "0".
	TIM–	

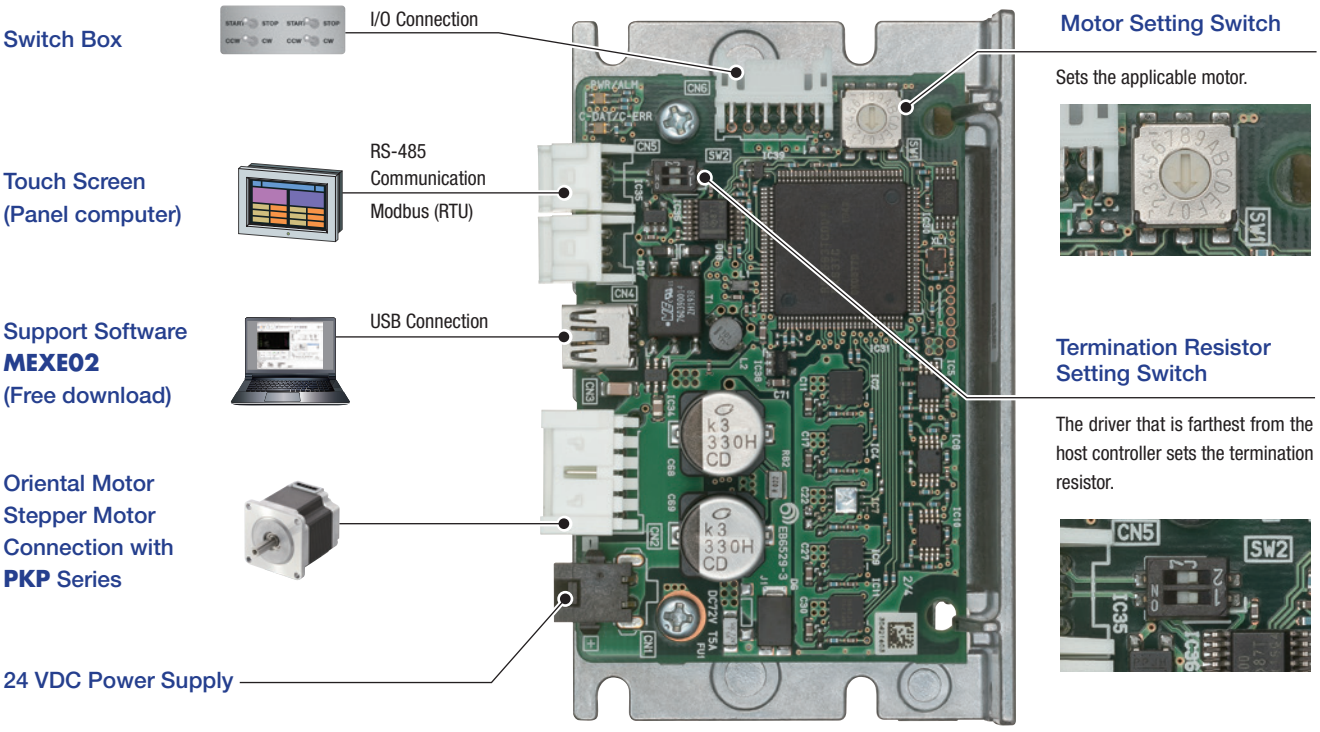
For details on motor and driver combinations, refer to www.orientalmotor.eu.

Compatible with the Modbus (RTU) Protocol.

Stepper Motor Drivers
CVD Series RS-485 Communication Type

Movement with Modbus (RTU) control?
Simple data setting with touch screen?
These drivers meet those needs.

Names and Functions of Driver Parts



Modbus (RTU)

- RS-485 communication, operation data and parameters can be set, and operation commands can be input.
- The protocol is compatible with Modbus (RTU), allowing for easy control from a PLC, etc.

Max. 31 Axes

- Up to 31 axes can be connected to one host control device. (Total extension distance: 10 m or less)

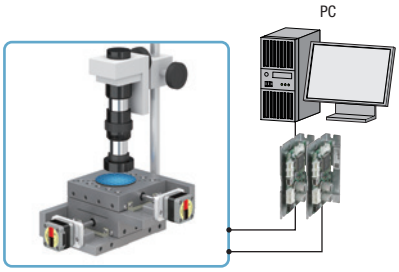
Pulse Generator Not Needed

- Operation data and parameters can be set, allowing for selected positioning operation. (Operation data settings: 256)
- RS-485 communication also supports direct data operations for writing position and speed data.

Movement Examples

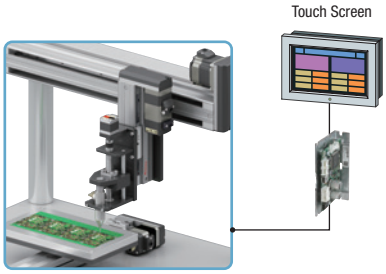
Movement from PC

Control the motor with RS-485 communication from a PC with imaging software



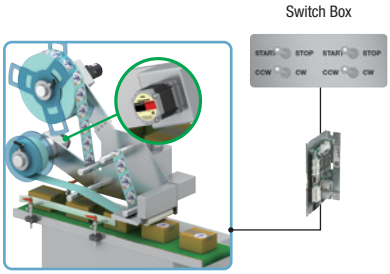
Movement from Touch Screen

End effect is also controlled from the touch screen along the X, Y, and Z axes



Movement by Switching a Switch

Easy control, just by switching a switch



Simple Editing and Setting of Operation Data and Parameters

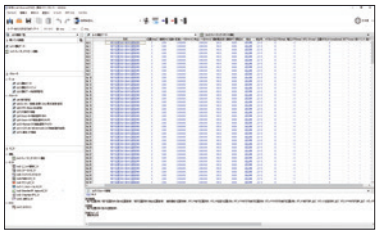
Support Software **MEXE02**

Basic settings, such as operation data editing and parameter settings, can be easily made from a computer. Sequence control is also possible, making simple system configuration possible without a host sequence. The support software can be downloaded from the Oriental Motor website.

Popular for being easy to handle, even if you're not an electrical designer!

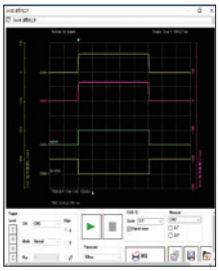
The program can be simplified with easy sequence functions

Settings can be copied and backed up



Easy to understand, easy to use
Intuitive operability

Teaching is also possible from a computer



Comes with a waveform monitor to check signal input conditions

Contributes to Visualization

Comes with a monitoring function that contributes to visualization.
See the operating manual for details.

Series Name / Type		**CVD** Series RS-485 Communication
Monitoring	Position	○*
	Speed	○*
	Driver temperature	○
	Travel distance Cumulative travel distance	○
Information	Driver overheat	○
	Travel distance Cumulative travel distance	○
Alarm	Driver overheat	○

*Only command values can be monitored

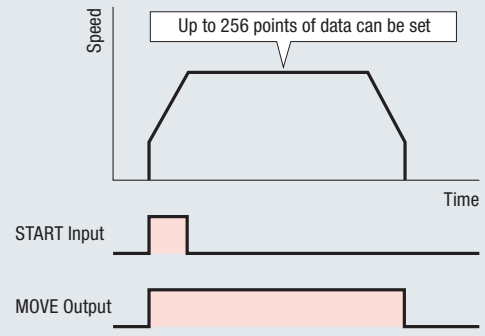
For details on motor and driver combinations, refer to www.orientalmotor.eu.

Pulse Generator not Needed

The RS-485 communication type can set operation data in the driver, allowing for operation data to be selected and executed from a host. Operation data can also be linked.

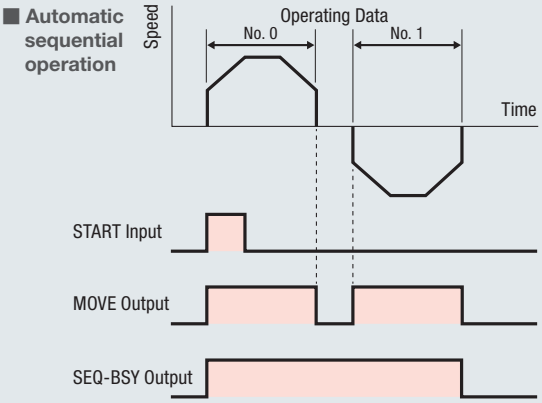
Operating Pattern

■ **Positioning SD operation**



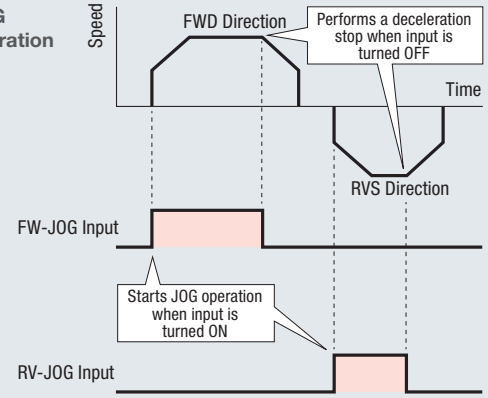
Performs trapezoidal drive from the present position to the target position by setting the motor's operating speed, position (travel amount), etc. in the operation data.

■ **Automatic sequential operation**



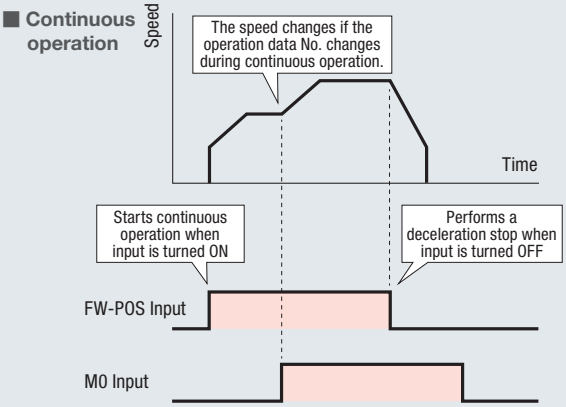
Automatically executes two or more operations sequentially. Once one operation ends, it stops for the "drive-complete delay time", after which operation of the operation data set in the "next data number" commences. If operation data with "no link" set is generated partway through, positioning SD operation is performed up to that operation data, then the motor stops.

■ **JOG operation**



Continuously operates the motor while the input signal is ON. Performs a deceleration stop when the input signal is turned OFF.

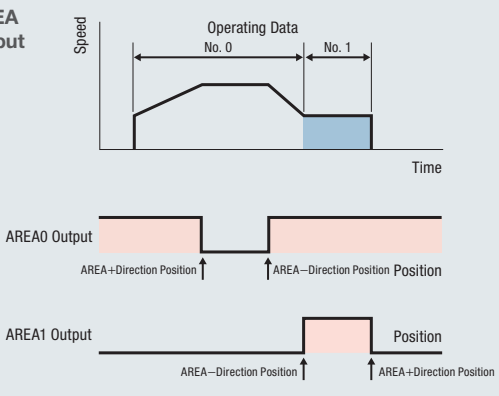
■ **Continuous operation**



Continuously operates the motor while the input signal is ON. The speed changes if the operation data number changes during continuous operation. The motor performs a deceleration stop when the input signal is turned OFF.

Output Signals

■ **AREA output**



AREA output turns ON when the motor's position is within the area range set for each operation data. Check "AREA range setting mode" in the operating manual for setting details.

Many I/O Signals

The main I/O signals of the RS-485 communication type are described here. See the operating manual for details about all I/O signals.

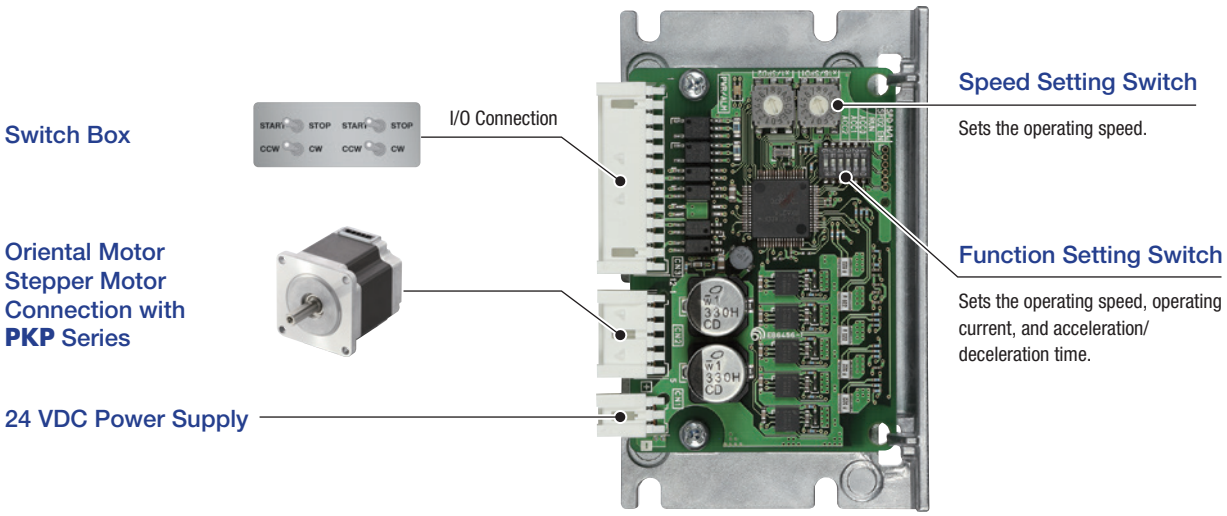
	Signal Name	Function
Input Signals	AWO	Interrupts the motor current and places it into a non-excitation state. (Non-excitation when ON)
	STOP	Stop the motor.
	ALM-RST	Resets the alarm.
	P-PRESET	Executes the position preset.
	FW-BLK	Stops operation in the FWD direction.
	RV-BLK	Stops operation in the RVS direction.
	FW-LS	Inputs a limit sensor in the FWD direction (external sensor).
	RV-LS	Inputs a limit sensor in the RVS direction (external sensor).
	HOMES	Inputs a mechanical home sensor (external sensor).
	SLIT	Inputs a slit sensor in the RVS direction (external sensor).
	START	Executes a positioning SD operation.
	SSTART	Executes a positioning SD operation. Executes the next data number operation during manual sequential operation.
	HOME	Execute the return-to-home operation.
	FW-JOG	Executes a JOG operation in the FWD direction.
	RV-JOG	Executes a JOG operation in the RVS direction.
	FW-POS	Executes a continuous operation in the FWD direction.
	RV-POS	Executes a continuous operation in the RVS direction.
	M0~M7	Uses 8 bits to select the operation data No.
	R0~R7	General purpose signals.
Output Signals	CONST-OFF	Output function is not used.
	ALM-A	Outputs the driver alarm status (normally open).
	ALM-B	Outputs the driver alarm status (normally closed).
	READY	Output when driver operation preparations are complete.
	MOVE	Output when the motor is operating.
	VA	Output when the operating speed reaches the target speed. (Command speed reference)
	CRNT	Output when the motor is excited.
	AUTO-CD	Output when in an auto current cutback state.
	HOME-END	Output when a return-to-home operation finishes and the position preset is executed.
	ABSPEN	Output when the coordinates are fixed.
	PLS-OUT	50 pulses are output for every rotation of the motor output shaft.
	FW-SLS	Output when the FWD direction software limit is reached.
	RV-SLS	Output when the RVS direction software limit is reached.
	TIM	Output every time the motor output shaft rotates 7.2° from home.
	AREA0	Output when the motor is in the area. (Command position reference)
	AREA1	Output when the motor is in the area. (Command position reference)
	SEQ-BSY	Output when a positioning SD operation is performed.
	DELAY-BSY	Output when the driver is in a standby state (Drive-complete delay time, Dwell).
	DCMD-RDY	Output when direct data operation preparations are complete.
	INFO-DRVTMP	Output when the conditions set in “Driver temperature information” are satisfied.
	INFO-OVOLT	Output when the conditions set in “Overvoltage information” are satisfied.
	INFO-UVOLT	Output when the conditions set in “Undervoltage information” are satisfied.
	INFO-START	Output when an “Operation start failure” occurs.
	INFO-PR-REQ	Output when either the position present or the return-to-home operation preset is executed.
	INFO-MSET-E	Output when a “Motor setting error” occurs.
	INFO-NET-E	Output when an “RS-485 communication error” occurs.
	INFO-FW-OT	Output when a “Forward direction operation prohibited” occurs.
	INFO-RV-OT	Output when a “Reverse direction operation prohibited” occurs.
	INFO-TRIP	Output when the motor output shaft’s total amount of rotation (command position reference) satisfies the conditions set in “TRIP information”.
	INFO-ODO	Output when the motor output shaft’s cumulative amount of rotation (command position reference) satisfies the conditions set in “ODO information”.
	INFO-DSLMTD	Output when “Operation startup restriction mode” occurs.
	INFO-IOTEST	Output when “I/O test mode” occurs.
	INFO-CFG	Output when “Configuration required” occurs.
	INFO-RBT	Output when “Reboot required” occurs.

Easy control with speed control motor sensing.

Stepper Motor Drivers
CVD Series *SC* Type

Simple speed control with a stepper motor.
Suppression of stop position variation in constant speed motors.
These drivers meet those needs.

Names and Functions of Driver Parts

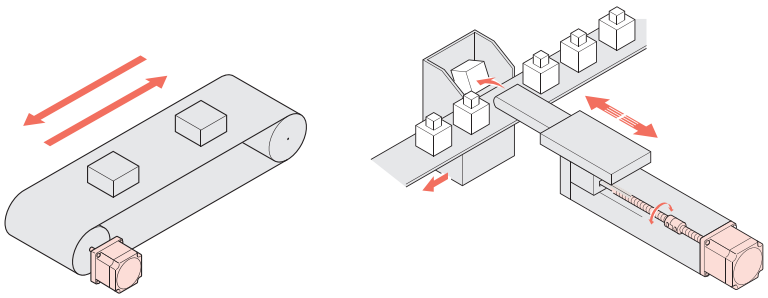


Simple Speed Control

This product continues to rotate at the setting speed while forward (reverse) input is ON, but instantly stops when the input is OFF. Various operations can be achieved from the PLC depending on the length of time the forward (reverse) input is ON.

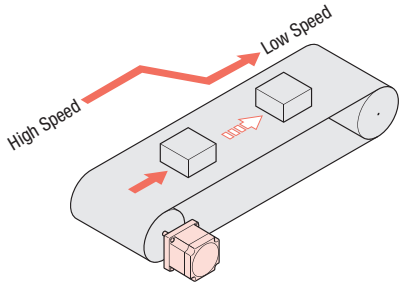
Back-and-forth operation

Operation is possible whether forward/reverse input is ON or OFF



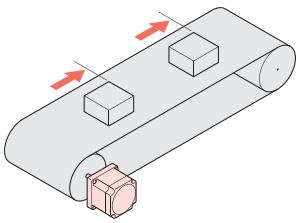
Two-speed switching operation

Two-speed switching operation is possible



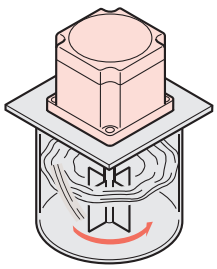
Regular feed operation

Operation is possible whether forward input is ON or OFF



Smooth low speed operation

The speed range is 0.02 r/min to 600 r/min



For details on motor and driver combinations, refer to www.orientalmotor.eu.

Contributes to Cost Reduction, Simple Control, and Improved Stopping Accuracy in Speed Control

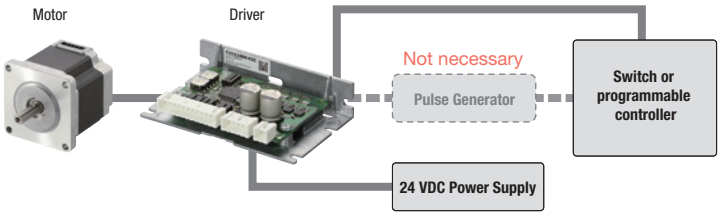
Using Stepper Motors

These motors are the answer to demands like keeping costs down with simple operations, and having a position holding function while stopped.

Pulse Generator Not Needed

Direct data can be set in the driver, so control is possible without a pulse generator.

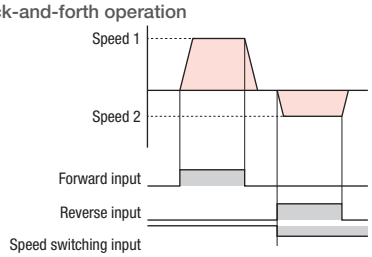
Direct settings with a driver switch
- Operating speed (0.02 r/min - 600 r/min)
- Acceleration/deceleration time (0.00 s - 3.00 s)
- Operating current (100 % or 70 %)



Back-and-Forth Operation Achieved with Only Three Input Signals

The operating speed and rotation direction can be switched externally.

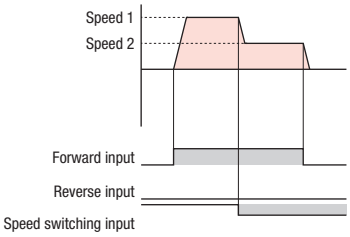
■ Back-and-forth operation



Two Speeds can be Set

The speed can even be switched during driving.

■ Two-speed switching operation



The Position is Also Held When Stopped

Because stepper motors supply current to the motor even when stopped, the position can be held.

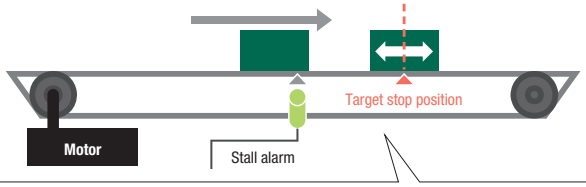
Using Constant Speed Motors and Inverters

Using a Stepper motor vs other motor types can improve stop position variation and sensor stopping accuracy.

Improved Stop Position Reproducibility

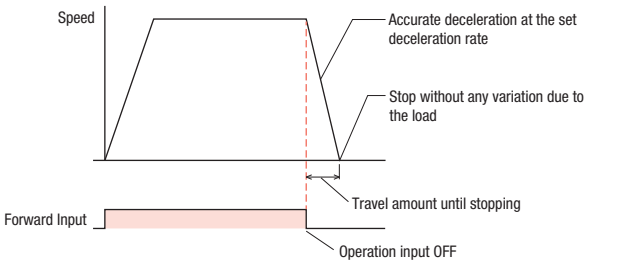
Because the travel amount is constant from the time the operation input is turned OFF until stopping, stop position reproducibility is improved. This allows the time needed to adjust the stall alarm's position to be reduced.

■ When the alarm is stopped with a belt conveyor



- Difficult to adjust the position of the alarm to get close to the intended stop position
- Variation in stop position due to weight of load

■ Travel amount from the time the operation input is turned OFF until stopping

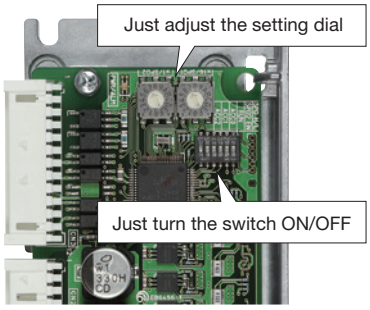


Easy Settings

Three types* of operation settings.

■ Setting Item

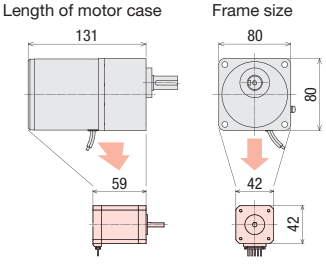
Set the operating speed
↓
Set the acceleration/ deceleration time
↓
Set the operating current



*Settings are not needed if the initial setting values are used.

Also Reduces the Motor Space

Motor downsizing is achieved with the same rotation speed and torque as an induction motor.



(Unit: mm)

Induction motor

Output 25 W, Gear ratio 3
Mass: 2.45 kg
Torque: 0.39 Nm

CVD Series SC Type

PKP546N18A2
Mass: 0.49 kg
Torque: 0.5 Nm

Driver for 5-Phase Stepper Motors

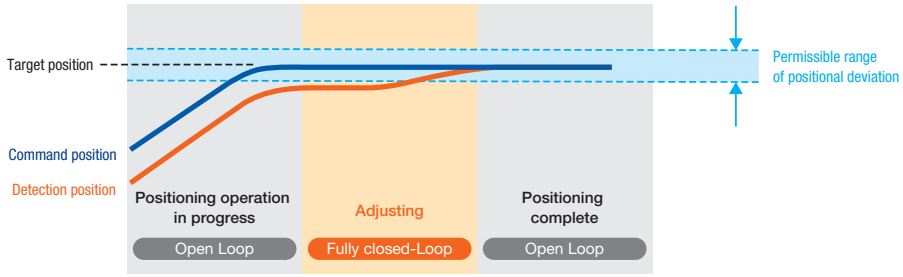
CVD Series
Fully Closed-Loop Control Type

If you require high precision positioning at the sub-micron level.
This driver meets that requirement.

Fully Closed-Loop Control of Stepper Motors

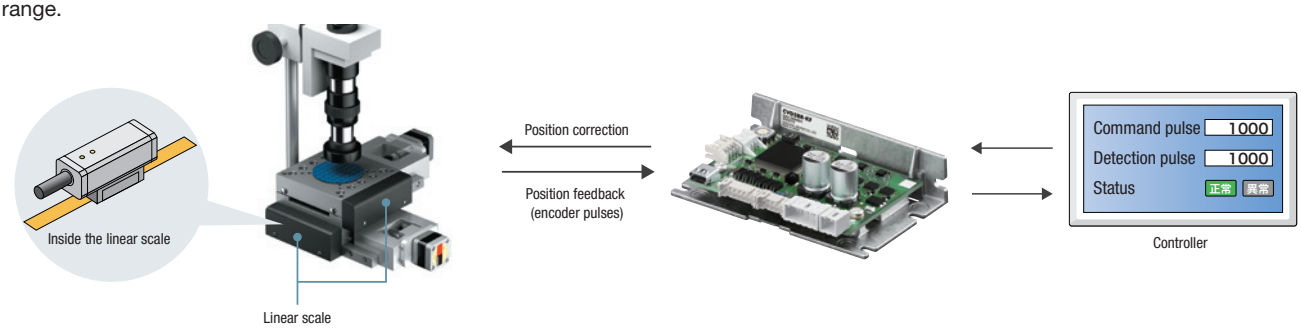
At the start of positioning, open loop control utilising the high responsiveness of the stepper motor is employed.
Once the position command is complete, position correction using feedback from an external sensor is performed.

CVD Series Fully Closed-Loop Control Type



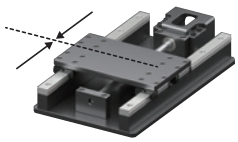
Achieving High Precision Positioning

Fully Closed-Loop control directly feeds back the mechanical position, correcting the difference between the detected position and the commanded position. This contributes to the design of equipment requiring high precision positioning within the sub-micron range.



For your reference

■ Lost Motion*1 Actual Measurement Data

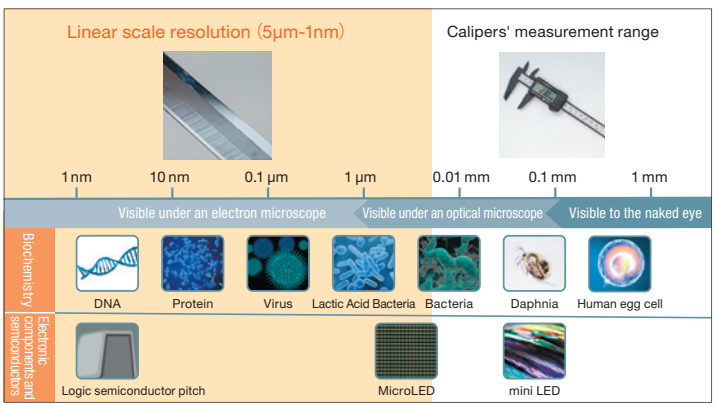


【Measurement conditions】
Lead screw pitch: 1 mm
Linear scale resolution: 0.1 µm
In-position range: 1 cm*1
Measured using laser distance measurement

Open Loop	Fully Closed-Loop
0.51 µm	**0.15 µm** (Target accuracy: within 0.2 µm)

*1 The difference in rotation direction at the stopping position when positioning the motor from both clockwise and counter-clockwise directions relative to the target position.
*2 Position corrected with an encoder pulse error of 1 count (-0.2 to 0.2 µm) as the target.

■ Linear scale resolution



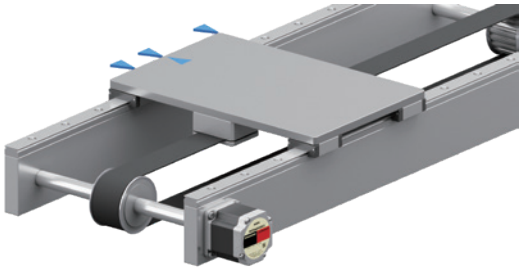
Stepper motor with no gain adjustment required and no hunting

No gain adjustment required

No gain adjustment tailored to the mechanism is required, as with servo motors. As positioning operation does not constantly utilise encoder feedback, adjustments tailored to the mechanism or load, such as belt pulleys or cams, are unnecessary.

Maintain the stopping position without the handbrake

Upon completion of positioning, there is no hunting; the motor stops by its own holding force. This is ideal for applications where vibration during stopping is undesirable.



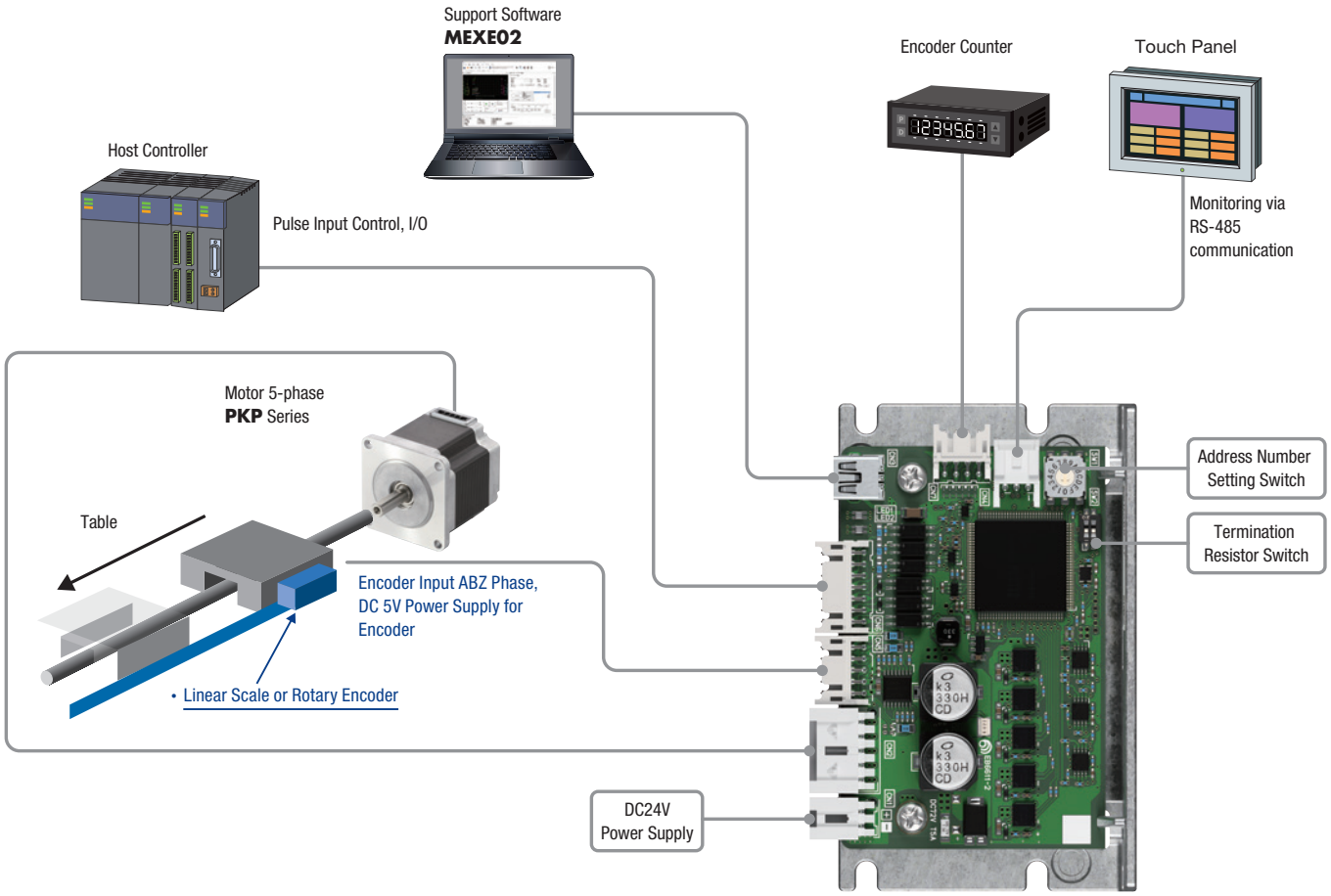
Eliminates the need for gain adjustment even with belt pulleys, enabling high precision positioning.

Compatible with various external sensors tailored to the mechanism

It is compatible with various sensors from different manufacturers, enabling the use of feedback from sensor types appropriate to the mechanism.

Mitutoyo HEIDENHAIN Magnescale SPEED × PRECISION RENISHAW apply innovation™

System Configuration



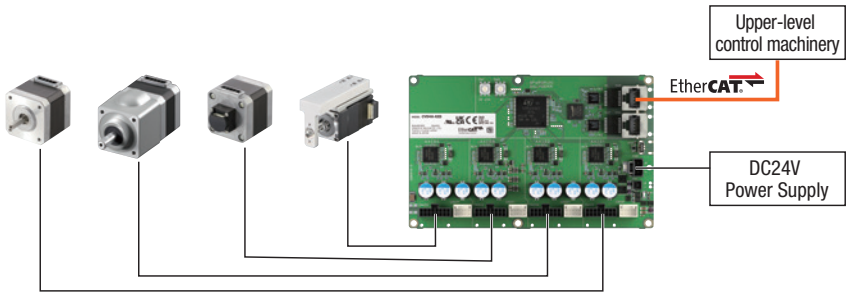
Driver for 2-Phase/5-Phase Stepper Motors

CVD Series Multi-Axis type, EtherCAT compatible

You wish to achieve reduced wiring and space-saving.
You wish to implement control via EtherCAT communication.
This driver addresses such requirements.

EtherCAT compatible, up to 4-Axis Control

I/O signal wiring can be connected via a single EtherCAT communication cable. Furthermore, communication lines and power supply lines for up to four axes are consolidated into a single driver.



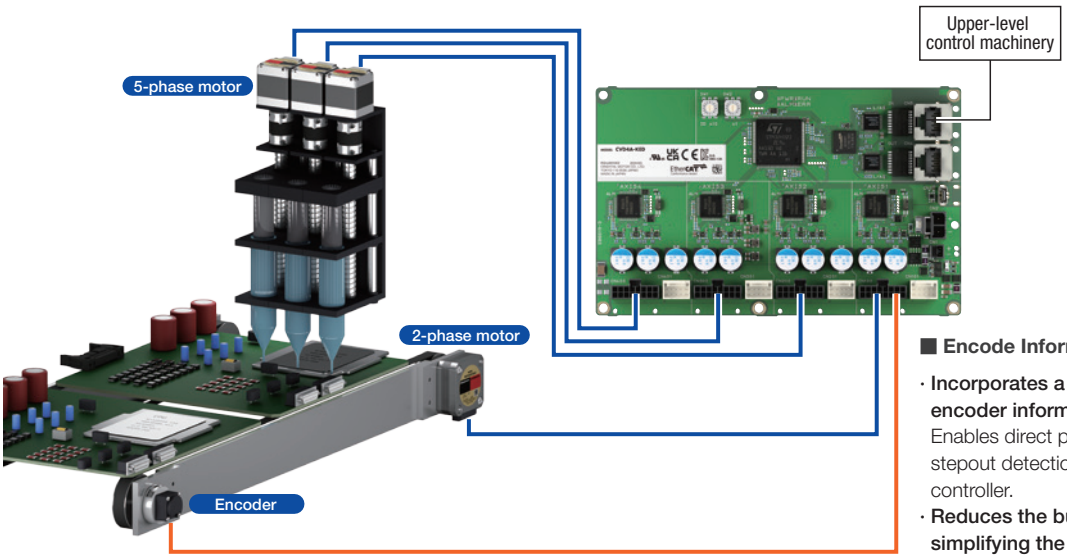
Compatible with both 2-Phase and 5-Phase Motors, featuring a convenient driver function

■ Compatible with both 2-Phase and 5-Phase motors

- **A single driver allows free selection between 2-phase and 5-phase Motors.**
- **Easily select motors according to specification changes or intended use.**
  2-phase motors: Applications requiring torque at low speeds
  5-phase motors: Applications requiring low vibration and high precision positioning

■ Convenient driver functionality

- **Electromagnetic Brake Automatic Control**
  Controllable from the driver, no brake control circuit is required.
- **24V Power Supply for Sensors**
  Supplied by the driver, eliminates the need for an external power supply, reducing wiring.



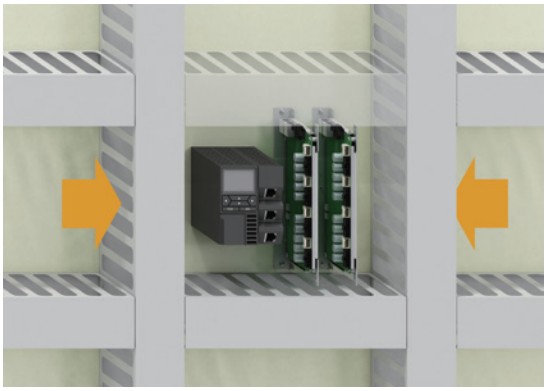
■ Encode Information Acquisition

- **Incorporates a function to import encoder information into the driver.**
  Enables direct position monitoring and stepout detection without requiring a host controller.
- **Reduces the burden on the host controller, simplifying the overall system configuration.**

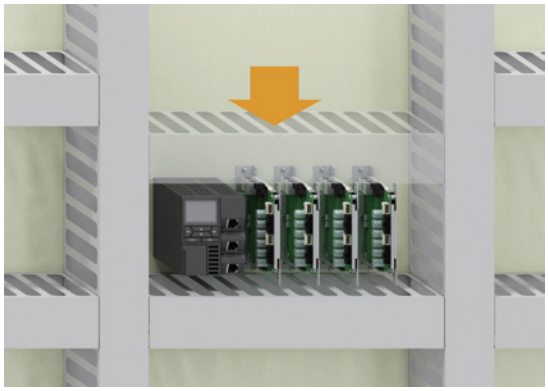
Selectable Lineup

The addition of the 2-axis driver to the product line-up enables layouts tailored to the available equipment space.

● 4-Axis Driver

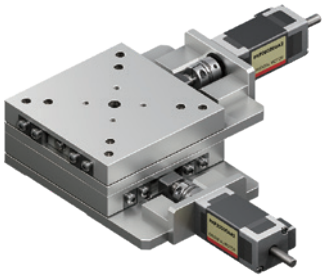


● 2-Axis Driver NEW

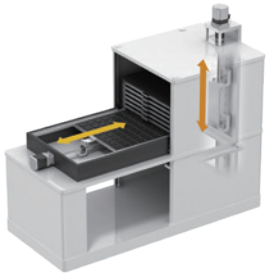


Examples of 2-Axis Drivers

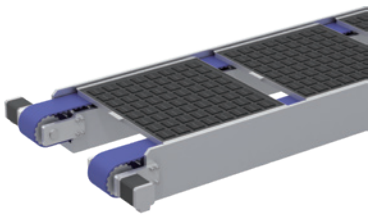
XY Stage



Loader/Unloader



Conveyor

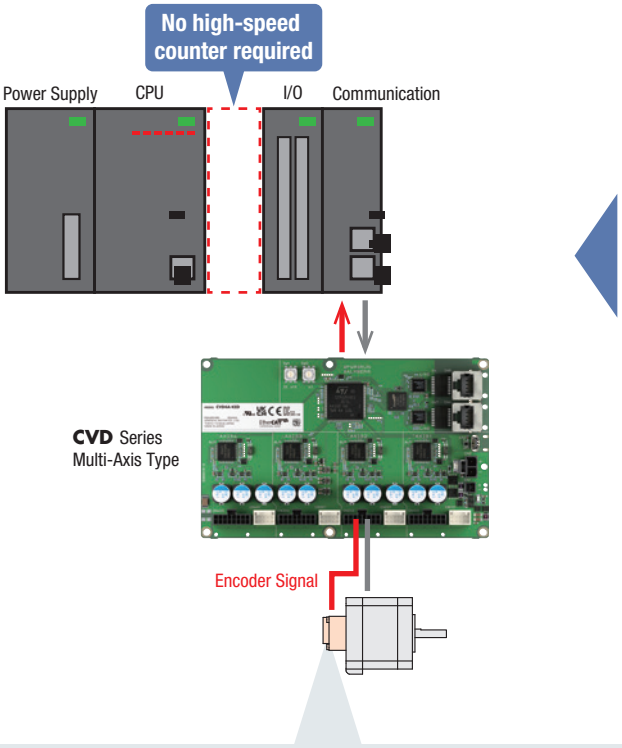


Capable of Acquiring Encoder Information and Detecting Positional Deviation

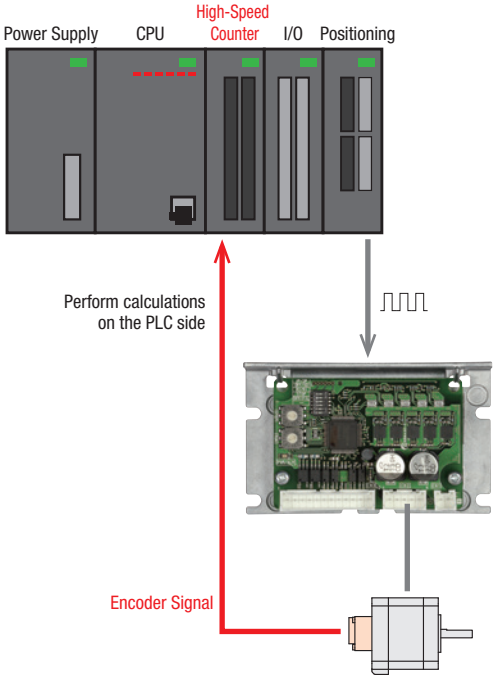
The driver incorporates a function to acquire encoder information. It can detect position deviation directly within the driver without requiring a host controller and output this as a signal. Furthermore, using the support software **MEXE02** enables monitoring of the motor's actual position and actual speed on a PC screen.

- No high-speed counter required, reducing the cost of host controllers
- Outputs signals to host controllers via EtherCAT communication. Reduces programming time

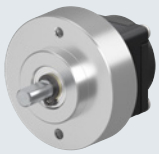
■ CVD Series Multi-Axis Type



■ Conventional Product



■ Compatible with both Encoder-Equipped Motors and Rotary Encoders

PKP Series With Encoder	Rotary Encoder
	
Resolution*1 2-phase motors: 200 P/R, 400 P/R, 1000 P/R 5-phase motors: 500 P/R, 1000 P/R	Resolution 100 - 4000 P/R

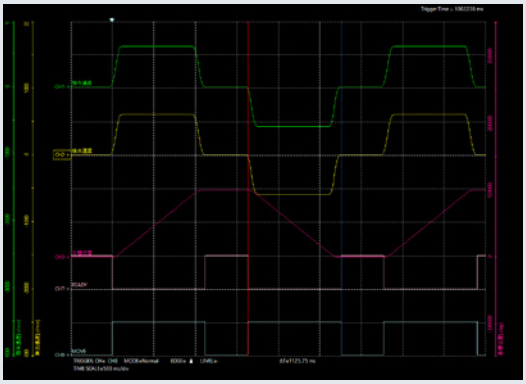
*1 For resolutions between 100 and 4.000 P/R, please contact your nearest Oriental Motor sales office.

Specification for the Encode Input Section		
Classification	Content	Explanation
Phase A Phase B	Output Format	Incremental
	Maximum Frequency	500 kHz (frequency for each of Phase A and Phase B)
	Edge Spacing	500 nsec or more
	Count Range	–2,147,483,648 to +2,147,483,647 counts
	Counting Method	90-degree phase-shift input
	Multiplier	4 times
	Interface	Differential Receiver*
Z-Phase	Input Width	1 ms or more
	Interface	Differential Receiver*
5 V Power Supply Output	Output Voltage	DC 5 V ±10%
	Output Current	Below 200 mA

*Please use an encoder with electrical characteristics equivalent to the 26C31.

■ Support software MEXE02 (free) enables monitoring of encoder detection information

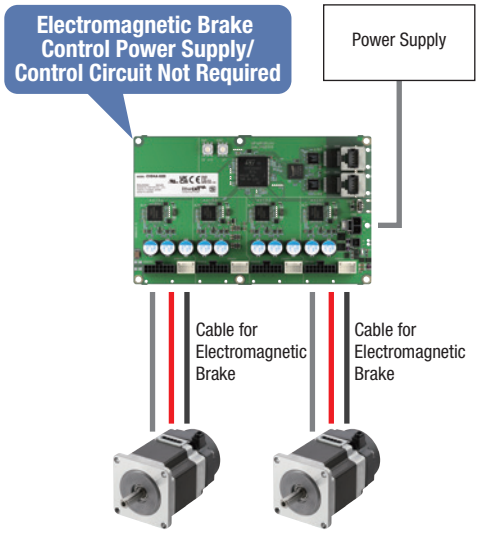
Measurement results can be saved as image files or CSV format data.



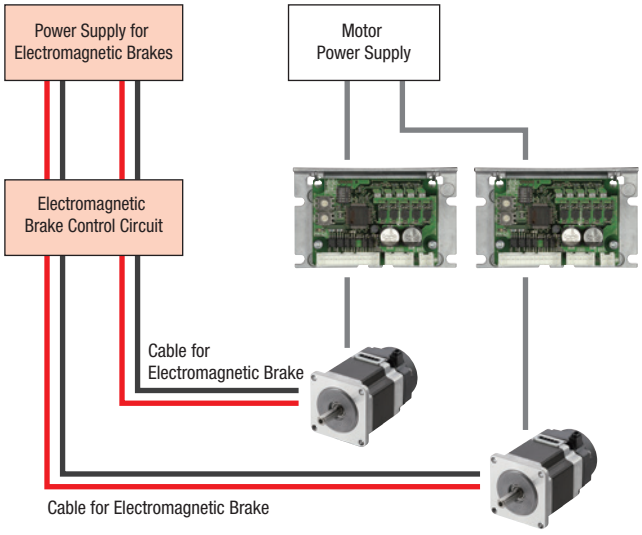
Capable of Automatic Electromagnetic Brake Control and Power Supply

- No electromagnetic brake control circuit required, reducing program creation time
- Reduced wiring labor

■ CVD Series Multi-Axis Type

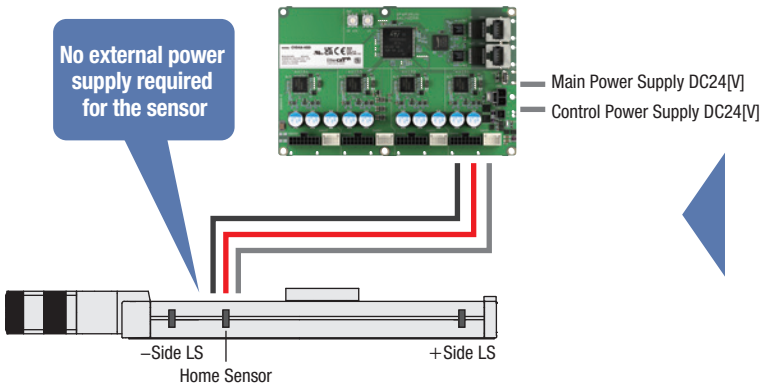


■ Conventional product

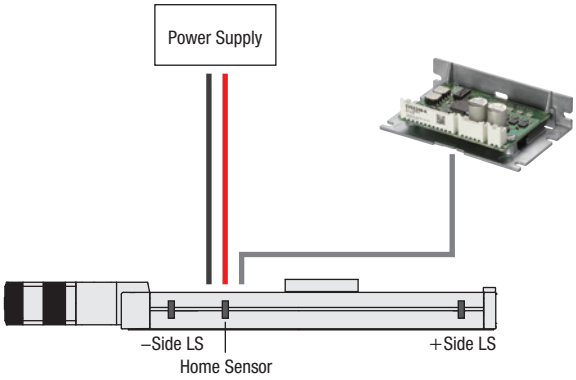


Capable of Supplying Power to Sensors

■ CVD Series Multi-Axis Type



■ Conventional Product



Alarm Information, etc.

■ Alarm Output

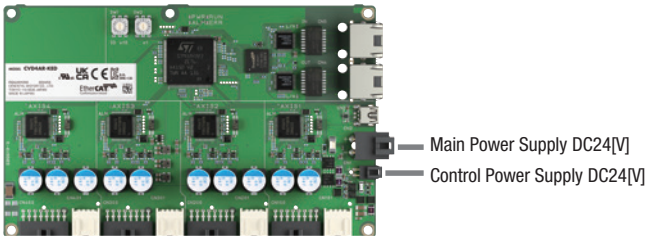
- Excessive position deviation alarm output enables motor de-synchronization detection (Main circuit overheat alarm output power also possible)

■ Information

- Driver temperature, overvoltage, undervoltage, etc. can be output as information data
- Monitorable via EtherCAT communication

■ Separation of Main Power Supply and Control Power Supply

- External safety relay can be added separately to handle main power disconnection
- Monitoring via EtherCAT communication remains possible even during main power disconnection



■ Inrush Current Suppression Function

- It incorporates a protective function for the main power supply circuit that is designed to protect it from inrush current occurring when the main power is turned on.

Stepper Motor

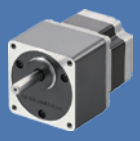
PKP Series

A wide variety of products is available for selecting the optimal motor that needs your design specifications.


Standard Type


High-Resolution Type


Flat Type


Geared Type


With Encoder


With Electromagnetic Brake

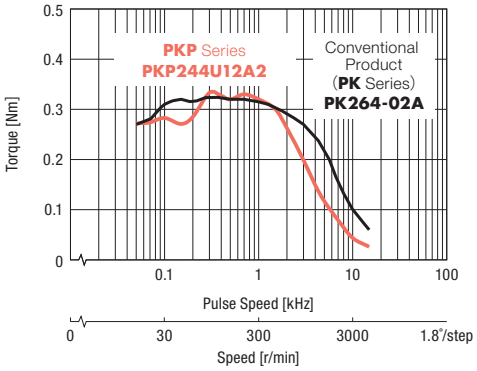
The **PKP** Series is smaller, has higher torque, and has improved basic performance over the conventional model.
The product line can be incorporated into equipment with a variety of restrictions, such as the “Flat type” for extremely short motors, and the ”High-resolution type” for motors resistant to frictional load.

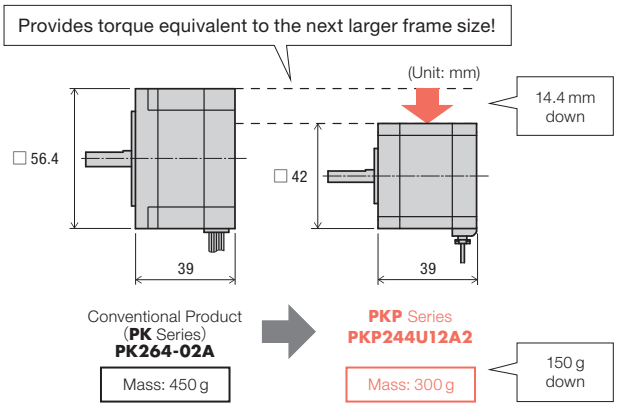
Smaller

Contributes to more Compact Equipment

The **PKP** Series enables a reduction in motor size compared to conventional products while maintaining the same high torque output.

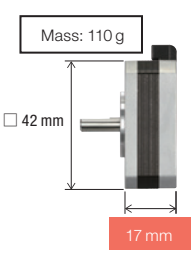
Torque Characteristics Comparison of the PKP Series and Conventional Products at Equivalent Torque



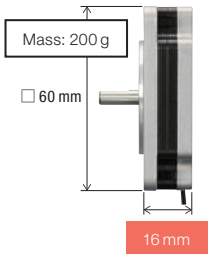


Flat Type, for Limited Space

This is our flattest type of 2-phase stepper motors.
Their mass is 110 g and 200 g respectively, and they are lightweight.



Maximum Holding Torque under excitation: 0.1 Nm



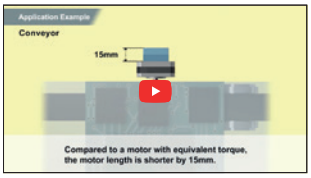
Maximum Holding Torque: 0.18 Nm

Feedback from customers who have introduced the flat type

Conveyor Belt

Due to mechanical constraints, space was limited, necessitating a product with the shortest possible motor length within the permissible torque range. This was achieved by adopting the □60 mm design.

Explanatory video for the “Flat Type” is available here



High-Torque

Increased Torque Contributes to Shorter Takt Times

Significant increases in torque have been achieved through magnetic and structural design revisions. Furthermore, the use of high-current type motors enables increases in torque even at high speeds. By adopting the **PKP** Series, it contributes to shorter takt times without changing the motor size.

■ Methods for Reducing Positioning Time

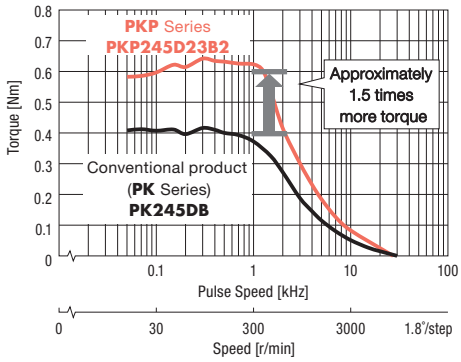
Reducing acceleration and deceleration times is effective. The shorter these times, the greater the torque required from the motor. In calculations comparing the **PKP** Series (**PKP245D23B2**) and the conventional model (**PK245DB**) of the same size, the **PKP** Series with 1.5 times greater torque enables approximately a 40 % reduction in positioning time.

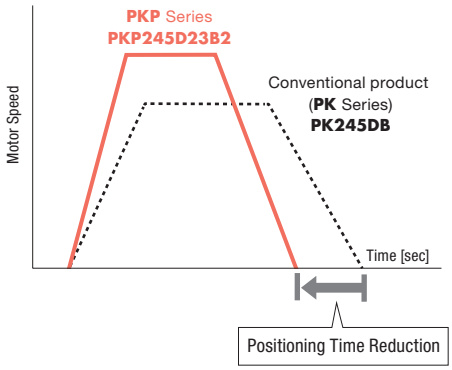
$$T_a\,[\mathrm{Nm}] = (J_0 + J_L) \cdot \frac{\pi \cdot \theta_S}{180} \cdot \frac{f_2 - f_1}{t_1}$$

f_1 : Start-up Pulse Speed [Hz]
f_2 : Drive Pulse Speed [Hz]
T_a : Acceleration Torque [Nm]
t_1 : Acceleration (Deceleration) Time [s]
J_0 : Rotor inertia [kgm²]
J_L : Total ilnertia [kgm²]

■ Comparison of Torque Characteristics Between PKP Series and Conventional Products of the Same Size

Constant Current Driver Power Supply Voltage: DC24V
With Clean Damper: JL = 34×10⁻⁷ kgm² (**PK245DB** only)



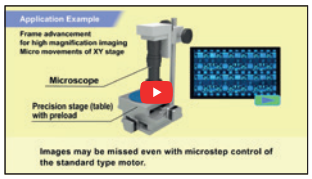


High Precision

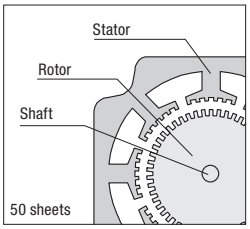
High-Resolution Type Resistant to Friction Loads

The high-resolution type features a rotor with twice the number of teeth compared to the standard type, totalling 100 teeth. It exhibits faster torque response and reduced friction load impact, resulting in improved stopping accuracy compared to the standard type.

Explanatory video for the "high-resolution type" is available here

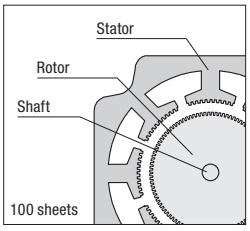


Basic Step Angle: 1.8°



Standard Type (50 teeth)

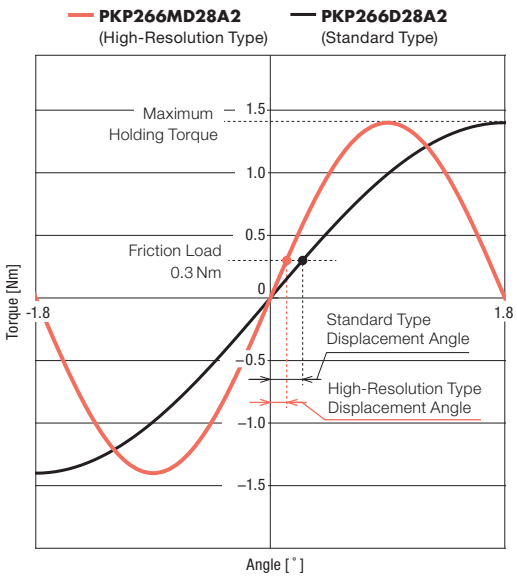
Basic Step Angle: 0.9°



High-resolution type (100 teeth)

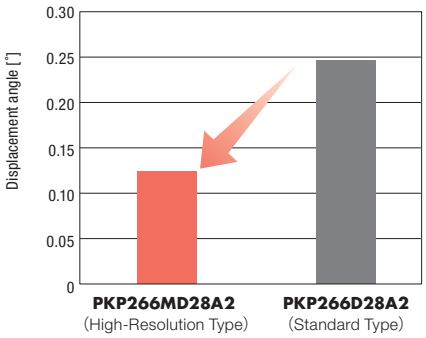
■ Angle-Torque Characteristic Comparison (Reference Value)

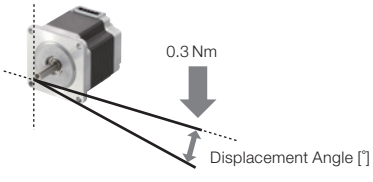
For a friction load of 0.3 Nm



■ Displacement Angle (Reference Value)

For a friction load of 0.3 Nm

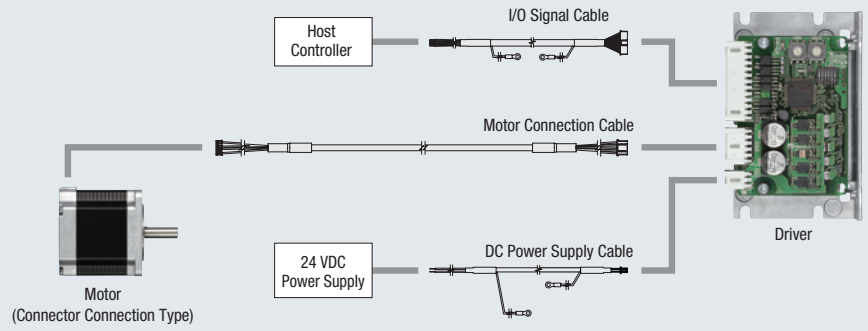




Introduction to Accessories

We offer a wide range of accessories to realise your motion control systems.

● 2-phase stepper motor **PKP** Series and **CVD** Series – Example of pulse input type driver



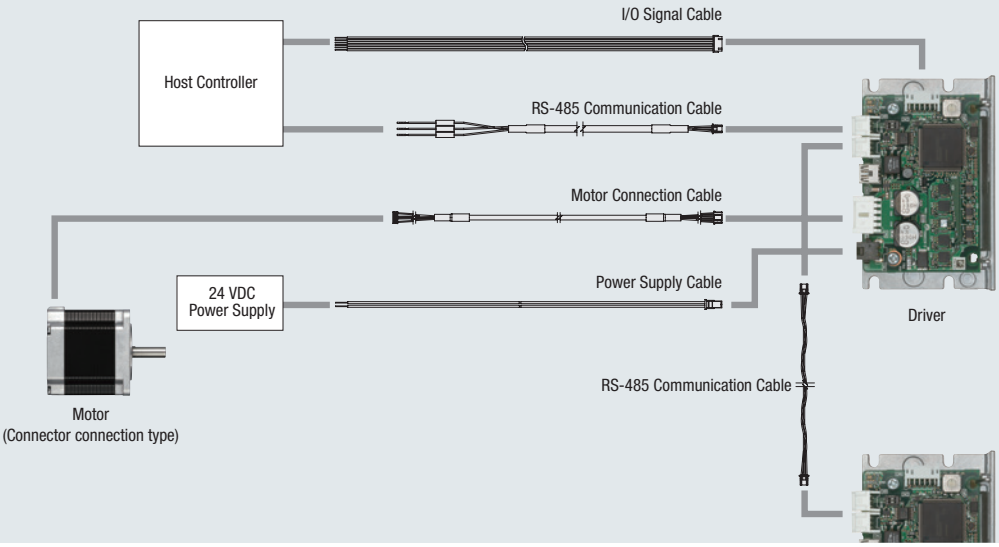
Product Type		Product Name
Motor	2-Phase Stepper mMotor Connector Connection Type	**PKP264D28B2**
Driver	With Mounting Plate Right Angle	**CVD228BR-K**
I/O Signal Cable	Connector Type – Length 1 m	**CC12D010-2**
Motor Connection Cable	Connection Cable – Length 1 m	**CCM010V2AEF**
DC Power Supply Cable	Connector Type – Length 1 m	**CC02D010-2**
Circuit Product Cover	Pulse Input Type With Mounting Plate Right Angle	**PADC-CVD2**
Mounting Brackets for Circuit Products	For Drivers	**MADP07**
	For Regeneration Units	**MADP03**
Regeneration Unit	DC24V	**RG4-K**

Circuit Product Cover

Mounting Bracket for Circuit Product

Regeneration Unit

● 2-phase stepper motor **PKP** Series and **CVD** Series – Example of RS-485 communication type driver



Product Type		Product Name
Motor	2-phase stepper motor Connector connection type	**PKP264D28B2**
Driver	With mounting plate Right angle	**CVD2BR-KR**
RS-485 Communication Cable	For connection to host controller - Length 3 m	**CC030-RS**
	For connection between drivers - Length 0.15 m	**LH0015-RWN**
Motor Connection Cable	Connection cable - Length 1 m	**CCM010V2AEF**
Power Supply Cable/ I/O Signal Cable Set	Connector type - Length 1 m	**LHS010CC**
Driver Cover	For right-angle fitting with mounting plate	**PADC-CVD2**
Mounting Brackets for Circuit Products	For drivers	**MADP07**

Orientalmotor

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www.orientalmotor.eu

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