

## Brushless Motor and Driver Package

**AXH Series** 

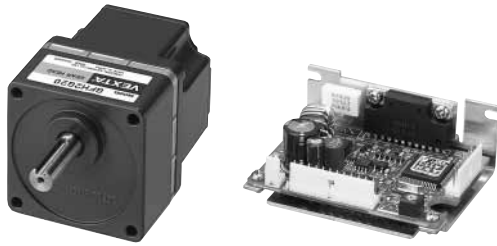
More compact, Higher power.

DC power supply drive type package with brushless DC motor and compact board-level driver.

The **AXH** series is optimal for incorporation as a set in equipment where space-saving is required.

The **AXH** series (30W and 50W) comes with the motor and its dedicated gearhead already assembled (Combination Type).

**AXH 015K-□** (15W) is geared type.



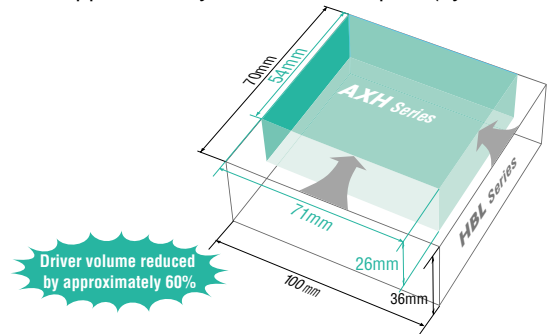
The **AXH** series includes the motor, gearhead and driver.

## Features

### ● Compact Board-Level Driver

The drivers for incorporation as a set in equipment have been made much more compact, smaller than the size of a business card.

Compared to Oriental Motor's **HBL** series driver, they are another approximately 60% more compact (by volume).



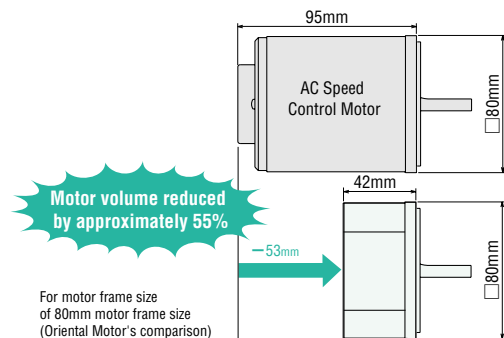
### ● Excellent Speed Stability

The fluctuation is only  $\pm 1\%$  for load, voltage and temperature. These motors provide excellent speed stability with extraordinarily minimal speed fluctuation.

### ● Thin and High Power

The total length of the motor section for the **AXH** series has been designed to a thin 42mm.

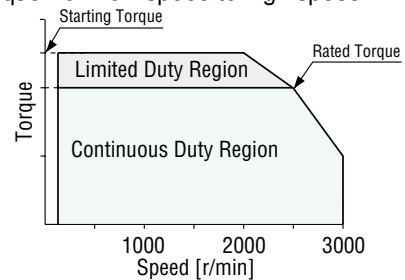
High power output (50W) with the frame size of 80mm has been realized.



### ● Wide Range of Speed Control

#### (A speed ratio of 1:30) Flat Torque

The speed can be set within the wide range from 100r/min to 3000r/min (1:30). Moreover, the **AXH** series output a constant torque from low speed to high speed.



Shown below are other features of the **AXH** series.

- The gearhead section is designed to be for high-strength.
- **AXH** series motors are equipped with various protection functions (overload/out-of-phase/overvoltage/under voltage/ overspeed protection function). When one of these protection functions detects an abnormality, it outputs an alarm signal, and brings the motor to a natural stop. Alarms can also be reset with external signals.
- Conforms to safety standards.

## Safety Standards

Products	Applicable Standards	Certification Body	Standards File No.	CE Marking
Motor	UL1950	UL	E208200	EMC Directive
	CSA C22.2 No.950			
Driver	UL1950	UL	E208200	
	CSA C22.2 No.950			

### Use Conditions

#### Installation Conditions

- Overvoltage category I
- Pollution degree 2
- Class III equipment

### Applicable Standards

#### EMI

Emission Tests	EN50081-2
Radiated Emission Test	EN55011

#### EMS

Immunity Tests	EN61000-6-2
Radiation Field Immunity Test	IEC61000-4-3
Electrostatic Discharge Immunity Test	IEC61000-4-2
Fast Transient/Burst Immunity Test	IEC61000-4-4
Conductive Noise Immunity Test	IEC61000-4-6
Power Frequency Magnetic Field Immunity Test	IEC61000-4-8

#### EMC

For compliance with the EMC directive, the product must be verified in the final use conditions, it located in the enclosure. Please refer to your nearest Oriental Motor office if EMC information is required.

## System Configuration



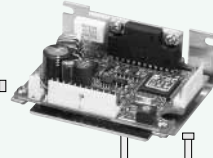
**Motor Mounting Brackets**  
(Sold separately)  
(→Page A-220)

**Combination Type**  
(Motor/Gearheads)



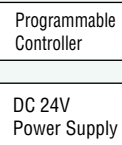
**Extension Cables (Sold separately)**  
Extension Cables used between  
motors and Driver. (→Page A-226)

**Driver**



**I/O Signal Cable**  
(Included)

**Power Supply Cable**  
(Included)



**AXH Series**

#### Example of System Configuration

(Body)

Combination Type  
**AXH450KC-30**

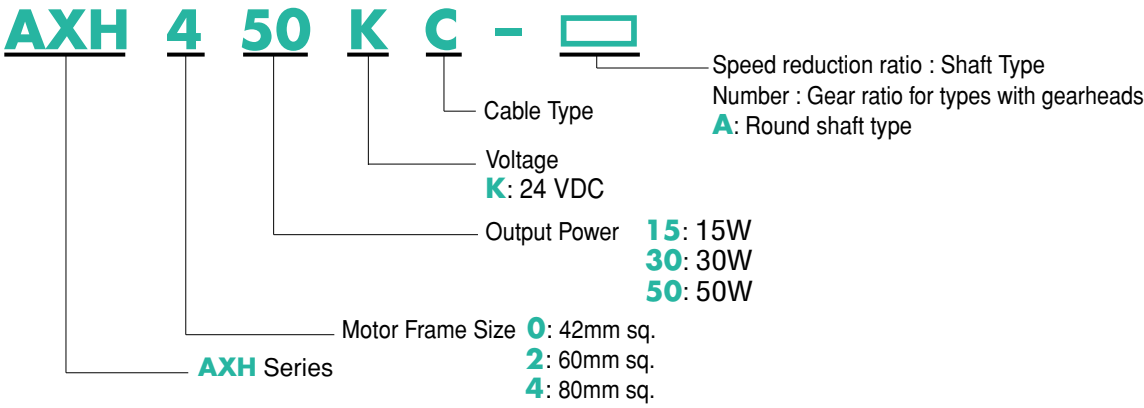
(Sold separately) +

Selectable according to necessity. Oriental Motor provides.

Extension Cables (1.5m)	Motor Mounting Bracket	External Speed Potentiometer
<b>CC02AXH</b>	<b>SOL4M6</b>	<b>PAVR-20KZ</b>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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

## Product Number Code



## Product Lines

### Combination Type

Output Power	Model	Gear Ratio
15W	<b>AXH015K-□</b>	<b>5, 10, 15, 20, 30, 50, 100</b>
30W	<b>AXH230KC-□</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
50W	<b>AXH450KC-□</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

- Enter the gear ratio in the box (□) within the model number.

### Round Shaft Type

Output Power	Model
15W	<b>AXH015K-A</b>
30W	<b>AXH230KC-A</b>
50W	<b>AXH450KC-A</b>

## Specifications

Model	Combination Type/Gear Type		<b>AXH015K-□</b>	<b>AXH230KC-□</b>	<b>AXH450KC-□</b>
	Round Shaft Type		<b>AXH015K-A</b>	<b>AXH230KC-A</b>	<b>AXH450KC-A</b>
Rated Output Power	W		15	30	50
Power Source Input	Voltage	V	DC24V ±10%		
	Maximum Input Current	A	2.0	3.5	5
Rated Torque	N·m		0.05	0.12	0.20
Starting Torque	N·m		0.075	0.15	0.24
Round Shaft Type					
Permissible Load Inertia	J×10 <sup>-4</sup> kg·m <sup>2</sup>		0.5	1.8	3.3
Maximum Speed	r/min		3000		
Rated Speed	r/min		3000	2500	
Speed Control Range	r/min		100~3000 (Speed ratio of 1 : 30)		
Speed Regulation	For Load		±1%Max. 0~Rated Torque, at reted speed		
	For Voltage		±1%Max. Power supply voltage ±10%, at rated speed with no load		
	For Temperature		±1%Max. 0°C~+50°C, at rated speed with no load		

## Common Specifications

Item	Specifications	
Speed Control Method	Any one of the following methods. 1. By built-in potentiometer    2. By external potentiometer    3. By DC voltage (DC0~5V)	
Input Signals	C-MOS negative logic	L : (ON) : 0~0.5V    H : (OFF) : 4~5V
	START/STOP input	L : START    H : STOP
	Brake input	L : RUN    H : Instantaneous stop
	Direction of Rotation input	L : CW    H : CCW
	Speed setting method	L : Internal    H : External
	Alarm reset	L : Reset    H : Normal
Output Signals	Open collector output    External use conditions DC 26.4V, 10mA max. Common to SPEED (30P/R), Alarm	
Protection Functions*1	When the following are activated, the alarm signal will be output and the motor will come to a natural stop. <ul style="list-style-type: none"> <li>Overload Protection: This will be activated when a load exceeding the rated torque is applied to the motor for approximately 5 seconds or more.</li> <li>Out-of-Phase Protection: This will be activated when the sensor wire inside the motor cable is disconnected.</li> <li>Overvoltage Protection: This will be activated when the voltage applied to the driver exceeds DC24V by approximately 15% or more.</li> <li>Under Voltage Protection: This will be activated when the voltage applied to the driver goes under DC24V by approximately 25% or more.</li> <li>Over Speed Protection: This will be activated when the motor rotates at an abnormal speed far beyond 3500r/min.</li> </ul>	
Motor Insulation Class*2	Class E (120°C)	
Rating	Continuous	

- \*1 With the **AXH** series, the motor speed can not be controlled in applications where the motor shaft is turned by the load, as in lowering operations. Also, if the load driven exceeds the permissible load inertia and during load lowering operation, the overvoltage protection function is activated and the motor stops naturally.
- \*2 Motor insulation is recognized as class A (105°C) by UL standard.

## General Specifications

Item	Motor	Driver
Insulation Resistance	100MΩ or more when DC500V megger is applied between the windings and the frame after continuous operation under normal ambient temperature and humidity.	100MΩ or more when DC500V megger is applied between the power supply input terminal and the frame after continuous operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand AC0.5kV at 50Hz applied between the windings and the frame for 1 minute after continuous operation under normal ambient temperature and humidity.	Sufficient to withstand AC0.5kV at 50Hz applied between the power supply input terminal and the frame for 1 minute after continuous operation under normal ambient temperature and humidity.
Temperature Rise	60°C or less measured by the thermocouple method after the temperature of the coil has stabilized under normal operation at the rated voltage and frequency under normal ambient temperature and humidity, with connecting a gearhead or equivalent heat radiation plate. (excluding <b>AXH015K-A</b> )*	—
Ambient Temperature	0°C~+50°C (nonfreezing)	
Ambient Humidity	85% maximum (noncondensing)	
Atmosphere	No corrosive gases or dust	
Degree of Protection	15W : IP40 30W, 50W : IP54 (Except for the mounting surface of the round shaft motor)	IP00

\*Size of heat radiation plate (material: Aluminum)

**AXH230KC-A**: 115mm×115mm Thickness:5mm

**AXH450KC-A**: 135mm×135mm Thickness:5mm

## Gearmotor–Torque Table

Model	Speed Range r/min Gear Ratio	Unit =N·m							
		20 ~ 500 (600)	10 ~ 250 (300)	6.7 ~ 167 (200)	5 ~ 125 (150)	3.3 ~ 83 (100)	2 ~ 50 (60)	1 ~ 25 (30)	0.5 ~ 12.5
<b>AXH015K-□</b>		0.23	0.45	0.68	0.86	1.3	2	2	—
<b>AXH230KC-□</b>		0.54	1.1	1.6	2.2	3.1	5.2	6	6
<b>AXH450KC-□</b>		0.9	1.8	2.7	3.6	5.2	8.6	16	16

● Enter the gear ratio in the box (□) within the model number.

● A colored background indicates gear shaft rotation in the same direction as the motor shaft; a white background indicates rotation in the opposite direction.

( ) represents the specifications of **AXH015K-□**

## Permissible Overhung Load and Permissible Thrust Load

Model	Gear Ratio	Permissible Overhung Load		Permissible Thrust Load N
		10mm from shaft end N	20mm from shaft end N	
<b>AXH015K-□</b>	<b>5,10,15,20,30,50,100</b>	50	—	30
<b>AXH230KC-□</b>	<b>5</b>	100	150	40
	<b>10,15,20</b>	150	200	
	<b>30,50,100,200</b>	200	300	
<b>AXH450KC-□</b>	<b>5</b>	200	250	100
	<b>10,15,20</b>	300	350	
	<b>30,50,100,200</b>	450	550	

● Enter the gear ratio in the box (□) within the model number.

### Round Shaft Type

Model	Permissible Overhung Load	
	10mm from shaft end N	20mm from shaft end N
<b>AXH015K-A</b>	50	—
<b>AXH450KC-A</b>	70	100
<b>AXH450KC-A</b>	120	140

● Avoid thrust load as much as possible.

If thrust load is unavoidable, keep it to no more than half the motor weight.

## Permissible Load Inertia J for Combination Type

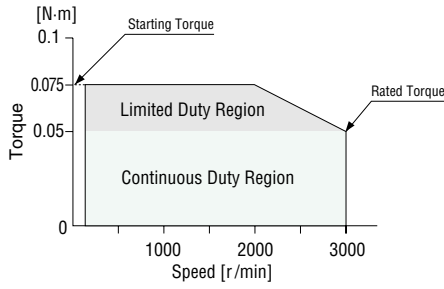
Model	Gear Ratio	Unit = J(×10 <sup>-4</sup> kg·m <sup>2</sup> )							
		5	10	15	20	30	50	100	200
<b>AXH015K-□</b>		0.4	1.7	3.9	7.0	15.7	43.7	43.7	—
<b>AXH230KC-□</b>		1.55	6.2	14.0	24.8	55.8	155	155	155
<b>AXH450KC-□</b>		5.5	22	49.5	88	198	550	550	550

● Enter the gear ratio in the box (□) within the model number.

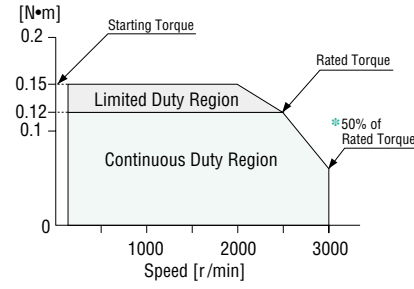
## Speed-Torque Characteristics

- For the combination type and geared type, the values are for the motor alone.
- Enter the gear ratio in the box (□) within the model number.

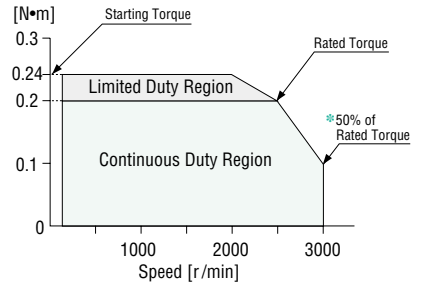
**AXH015K-□/AXH015K-A**



**AXH230KC-□/AXH230KC-A**



**AXH450KC-□/AXH450KC-A**



\*Values for DC24V with no extension cable \*Values for DC24V with no extension cable

## Dimensions (Scale 1/4 Unit = mm)

Mounting screws are included with the combination type.

Dimensions for screw included → Page A-13

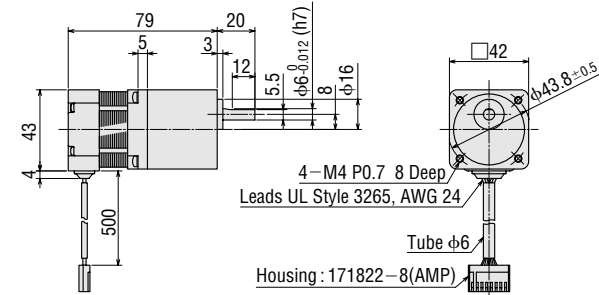
Enter the gear ratio in the box (□) within the model number.

### Motor/Gearhead

**AXH015K-□** (Geared Type)

Motor: AXHM015K-□

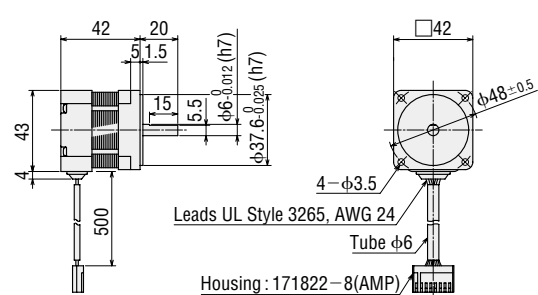
Mass: 0.5kg



**AXH015K-A** (Round Shaft Type)

Motor: AXHM015K-A

Mass: 0.25kg



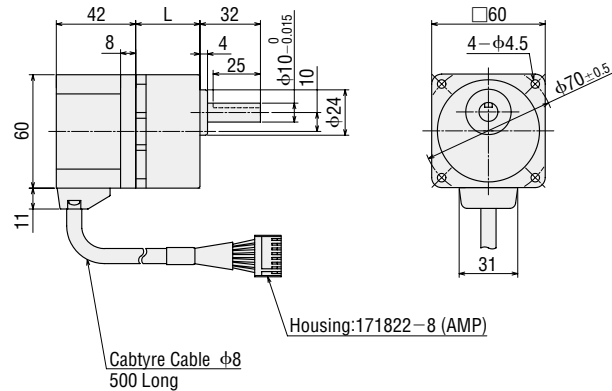
### Motor/Gearhead

**AXH230KC-□** (Combination Type)

Motor: AXHM230KC-GFH

Gearhead: GFH2G□

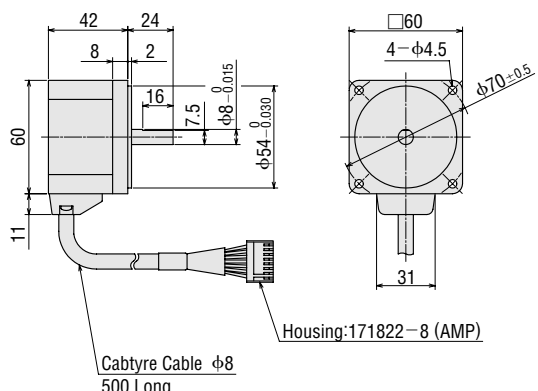
Mass: 1.0kg (Gearhead included)



**AXH230KC-A** (Round Shaft Type)

Motor: AXHM230KC-A

Mass: 0.5kg

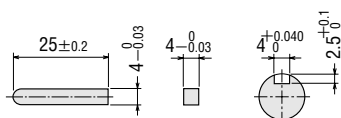


L=34 GFH2G5~20

L=38 GFH2G30~100

L=43 GFH2G200

### Key and Key Slot (Included with combination type)



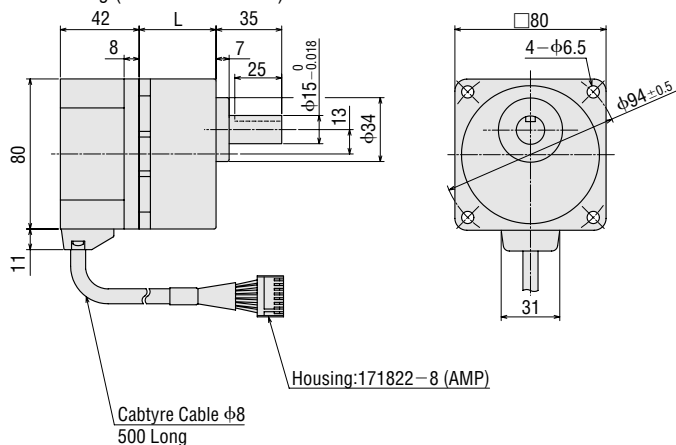
● **Motor/Gearhead**

**AXH450KC-□** (Combination Type)

Motor: AXHM450KC-GFH

Gearhead: GFH4G□

Mass: 1.8kg (Gearhead included)

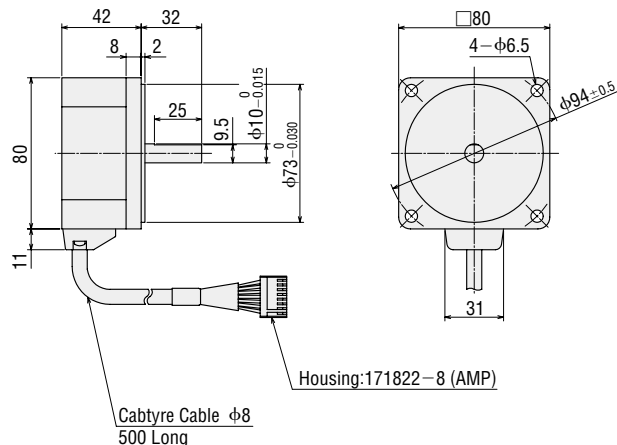


L=41 GFH4G5~20  
 L=46 GFH4G30~100  
 L=51 GFH4G200

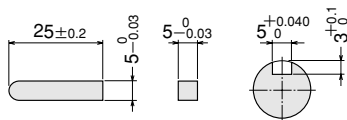
**AXH450KC-A** (Round Shaft Type)

Motor: AXHM450KC-A

Mass: 0.8kg



● **Key and Key Slot (Included with combination type)**



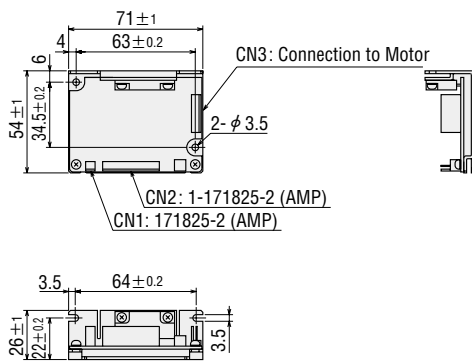
● **Driver**

AXHD15K

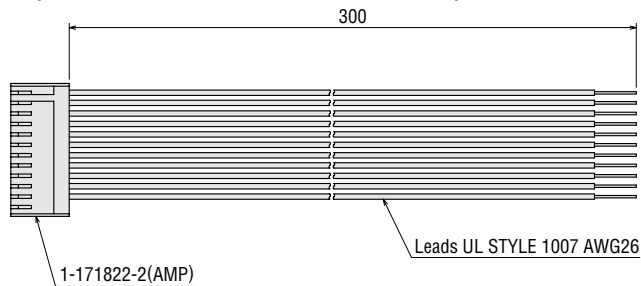
AXHD30K

AXHD50K

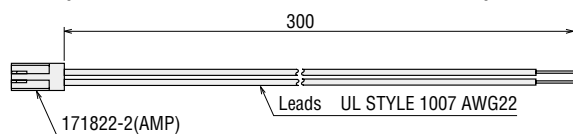
Mass: 0.1kg



● **Driver Input Signal Cable (Included, Common to All Models)**

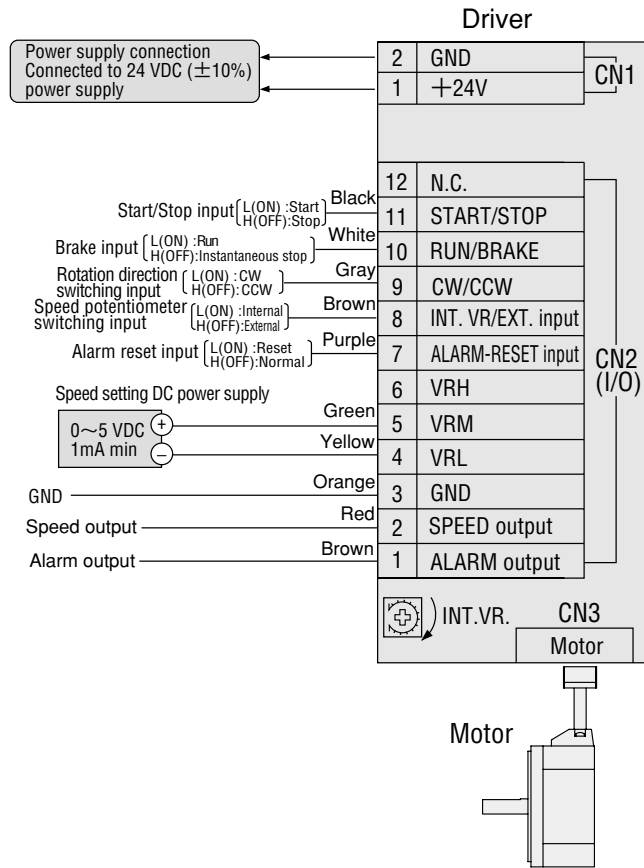


● **Driver Power Supply Cable (Included, Common to All Models)**



## Connection and Operation

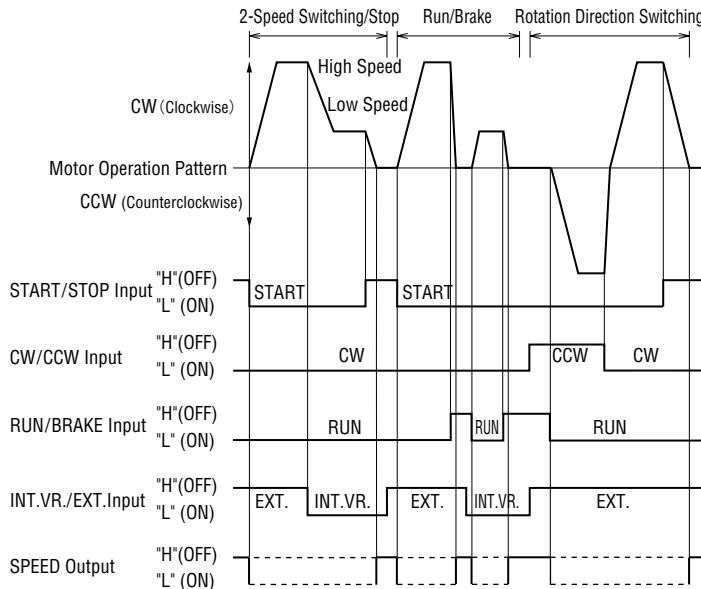
### Wiring Diagram



• When the motor cable is extended, use an optional extension cable (sold separately, 1.5m).

Extension Cable → Page A-226

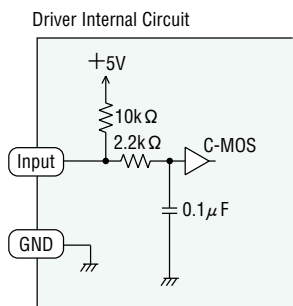
### Timing Chart (During Operation)



- Run/stop, instantaneous stopping and rotation direction switching operations can all be controlled with the START/STOP, RUN/BRAKE and CW/CCW signals.
- If both the START/STOP signal and the RUN/BRAKE signal are set to L level (ON), the motor rotates. At this time, if the CW/CCW signal is set to L level (ON), then the motor rotates clockwise as seen from the motor shaft side; if the CW/CCW signal is set to H level (OFF), the motor rotates in the counterclockwise direction.
- If the RUN/BRAKE signal is set to H level (OFF) while the START/STOP signal is L level (ON), the motor stops instantaneously. If the START/STOP signal is set to H level (OFF) while the RUN/BRAKE signal is set to L level (ON), the motor stops naturally.
- The duration of each input signal must be 10 msec or longer.
- Do not operate (turn ON/OFF) two or more input signals simultaneously.  
There must be a minimum interval of 10 msec after an input signal is operated before another input signal can be operated.

● **Input Signal Circuit**

◇ **Input Circuit**

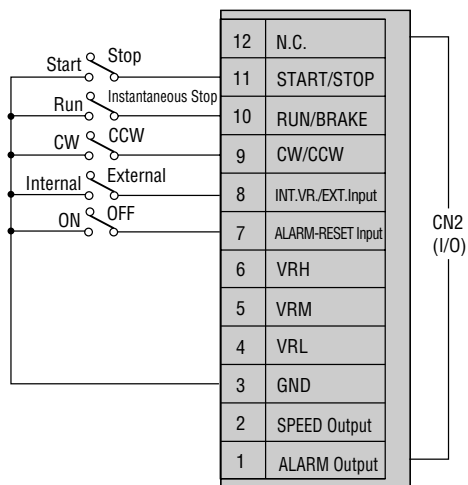


- Common to ALARM-RESET, INT.VR./EXT., CW/CCW, RUN/BRAKE, and START/STOP.

◇ **Example of Input Circuit Connection**

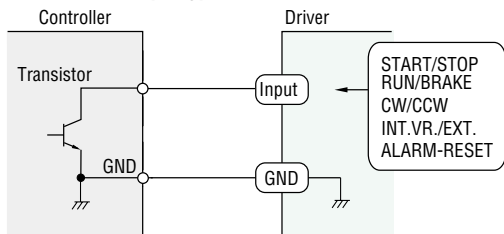
- **Control by Small Capacity Relay, Switch, or the like**

Switch Capacity : DC24V 10mA

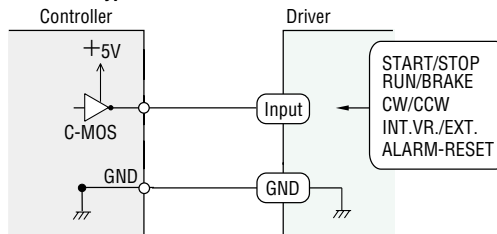


- **Control by Controller**

■ **Transistor output type**

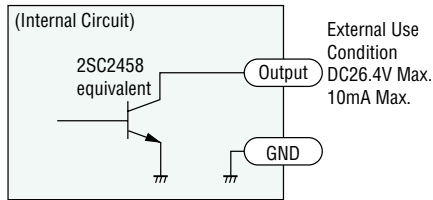


■ **C-MOS type**

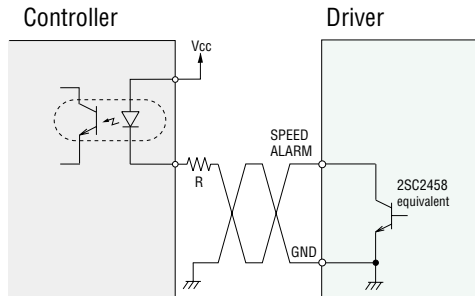


## ● Output Signal Circuit

### ◇ Output Circuit



### ◇ Example of Output Circuit Connection Output Signal Connections



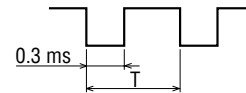
### SPEED Output

The system outputs pulse signals (with a width of 0.3ms) at a rate of 30 pulses per rotation of the motor output shaft synchronized with the motor drive.

You can measure the SPEED output frequency and calculate the motor speed.

$$\text{Motor speed (r/min)} = \frac{\text{SPEED output frequency (Hz)}}{30} \times 60$$

$$\text{SPEED output frequency (Hz)} = \frac{1}{T}$$



### ALARM Output

The ALARM output is normally L level (ON) and goes H level (OFF) when there is an alarm.

### ALARM-RESET

When the motor is stopped, setting this signal L level (ON), then returning it to H level (OFF) resets the alarm.

Please return either the START/STOP input or the RUN/BRAKE input to H level (OFF) before inputting the ALARM-RESET.

The ALARM-RESET is not accepted if both these signals are L level (ON).

#### Note:

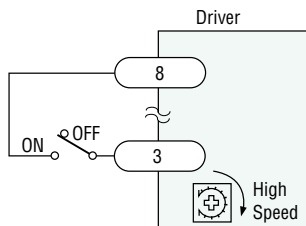
- Output signal is open collector output, so an external power supply (Vcc) is required.
- Use a power supply of no more than DC26.4V and connect a limit resistance (R) such that the output current does not exceed 10mA.

When using neither the speed output function nor the alarm output function, this connection is not required.

### ● Speed Setting Method

#### ◇ Internal Potentiometer

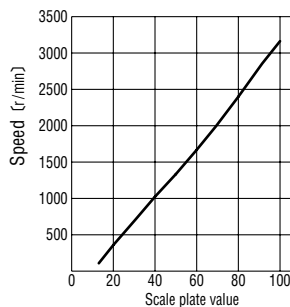
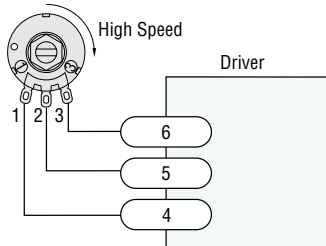
When INT.VR/EXT. input is set to L level (ON), the speed can be set with the internal speed potentiometer. There is no need for this connection when the internal potentiometer is not used.



#### ◇ External Potentiometer

When separating the motor speed setting from the driver, connect the optional external potentiometer as follows.

External Speed Potentiometer **PAVR-20KZ** (Sold separately)

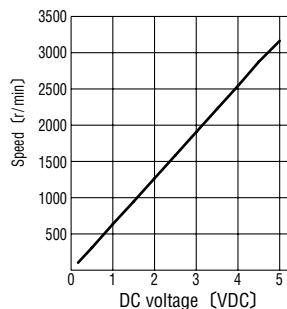
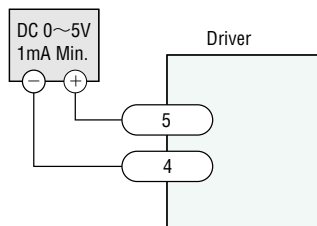


External Potentiometer Scale – Speed Characteristics (Representative Values)

#### ◇ External DC Voltage

When setting the motor speed with an external DC voltage, do so in the following manner.

External DC Power Supply



External DC Voltage – Speed Characteristics (Representative Values)

## ■ List of Motor and Driver Combinations

Output Power	Model	Motor Model	Gearhead Model	Driver Model
15W	<b>AXH015K</b> -□	AXHM015K-□	—	AXHD15K
30W	<b>AXH230KC</b> -□	AXHM230KC-GFH	GFH2G□	AXHD30K
50W	<b>AXH450KC</b> -□	AXHM450KC-GFH	GFH4G□	AXHD50K

● Enter the gear ratio in the box (□) within the model number.

### ● Round Shaft Type

Output Power	Model	Motor Model	Driver Model
15W	<b>AXH015K-A</b>	AXHM015K-A	AXHD15K
30W	<b>AXH230KC-A</b>	AXHM230KC-A	AXHD30K
50W	<b>AXH450KC-A</b>	AXHM450KC-A	AXHD50K