ORIENTAL MOTOR

HP-4117-3

5 Phase Stepping Motor and Driver

UPK • W Series

● **PN** Geared Type

OPERATING MANUAL

Table of Contents

Thank you for purchasing an Oriental Motor product.
This Operating Manual describes product handling procedures and safety precautions.
- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

1. Precautions

Precautions for Installation

- Do not use in a place where there is flammable gas and/or corrosive gas.
- Products for use only in equipment of protection class I.
- The motor and the driver must be properly grounded.
- When installing the motor into your equipment, ensure that the motor lead wires are fixed and do not move. In addition, do not apply any pressure to these lead wires.
- Installation must be performed by a qualified installer.
- Ensure the driver's terminal cover is attached before using products.

Precautions for Operation

- Always turn off the power to the driver before conducting checks or performing work on the product.
- The chassis temperature of this motor and driver can exceed 70°C (158°F) (depending on operation conditions). In case this product is accessible during operation, please attach the following warning label so that it is clearly visible.

Warning label

- The  markings on the driver's front panel indicate high voltage terminals. Do not touch these terminals while the power is ON. Contact could cause electric shock or fire.

Precautions for Troubleshooting

- Refer to "Troubleshooting" (chapter 9) if the motor or driver is not functioning properly. If the problem can not be corrected, contact your nearest ORIENTAL MOTOR office as indicated at the back of this manual. Do not disassemble the motor or driver.
- The driver incorporates double-pole/neutral fusing for the power input. If the driver POWER LED is Off, it is possible that only the neutral fuse is tripped. High voltage supplied on the hot side may cause electric shock. Turn the power Off immediately and request service.

2. Product Verification

2.1 Equipment Checklist

Confirm that the following equipment is included in your package.

Contact your nearest sales office if something is either not included or damaged.

- Motor 1
- Driver 1
- Hex Socket Screws for Mounting Motor 4
- Parallel Key 1

Enter A (single shaft) or B (double shaft) in the □ within the model numbers.

Motor/Driver Package Model Number		Mounting Screws	Parallel Key [mm (inch)]
UPK566□W-N5	UPK566□W-N7.2	M5 × P0.8 × 16	4 × 4 × 25 (0.157 × 0.157 × 0.984)
UPK566□W-N10	UPK564□W-N25		
UPK564□W-N36	UPK564□W-N50		
UPK566□JW-N5	UPK566□JW-N7.2		
UPK566□JW-N10	UPK564□JW-N25		
UPK564□JW-N36	UPK564□JW-N50		

- Connector for I/O Signals
  - Connector (MOLEX) 1
  - Connector Cover (MOLEX) 1
- Operating Manual 1

2.2 Model Numbers and Motor/Driver Combinations

The UPK·W series is a combined package which includes a stepping motor and a driver.

This operating manual is designated for the following products.

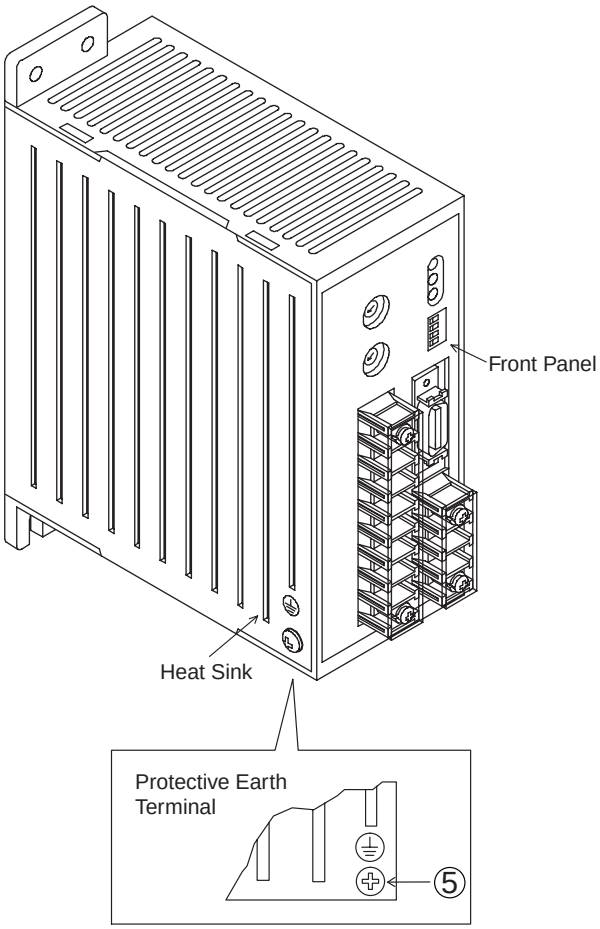
Enter A (single shaft) or B (double shaft) in the □ within the model numbers.

Package Model Number	Power Source Specifications	Motor			Driver	
		Model Number	Gear Ratio	Rated Current	Model Number	Output Current
UPK566□W-N5	Single phase 100-115V	PK566□W-N5	1 : 5	1.4A/phase	UDK5114NW2	1.4A/phase (max.)
UPK566□W-N7.2		PK566□W-N7.2	1 : 7.2			
UPK566□W-N10		PK566□W-N10	1 : 10			
UPK564□W-N25		PK564□W-N25	1 : 25			
UPK564□W-N36		PK564□W-N36	1 : 36			
UPK564□W-N50		PK564□W-N50	1 : 50			
UPK566□JW-N5	Single phase 200-230V	PK566□W-N5	1 : 5		UDK5214NW	
UPK566□JW-N7.2		PK566□W-N7.2	1 : 7.2			
UPK566□JW-N10		PK566□W-N10	1 : 10			
UPK564□JW-N25		PK564□W-N25	1 : 25			
UPK564□JW-N36		PK564□W-N36	1 : 36			
UPK564□JW-N50		PK564□W-N50	1 : 50			

Note

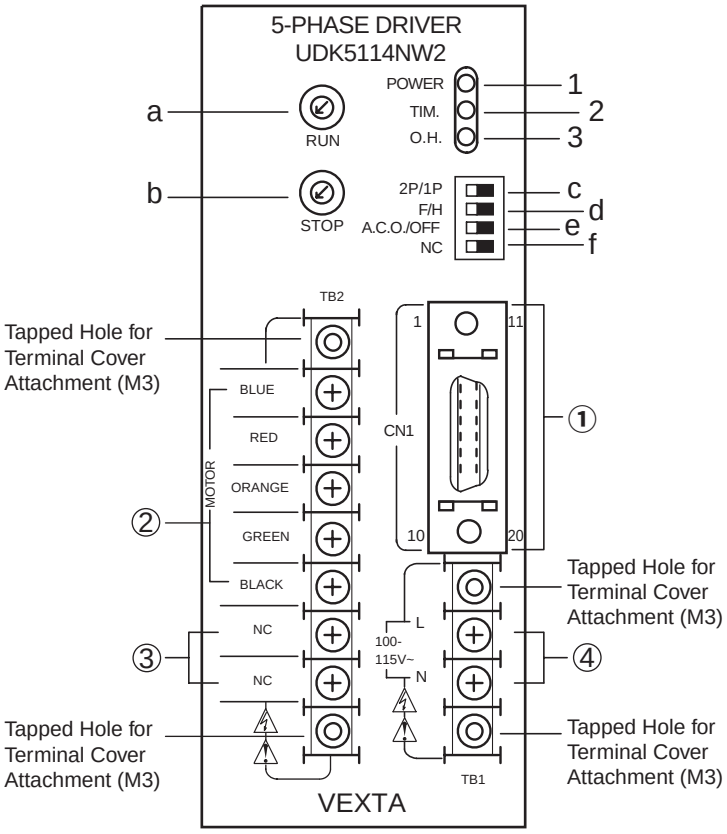
- The driver and the motor are precision equipments and should not be dropped or subject to any physical shocks.

3. Names and Functions of Driver Parts

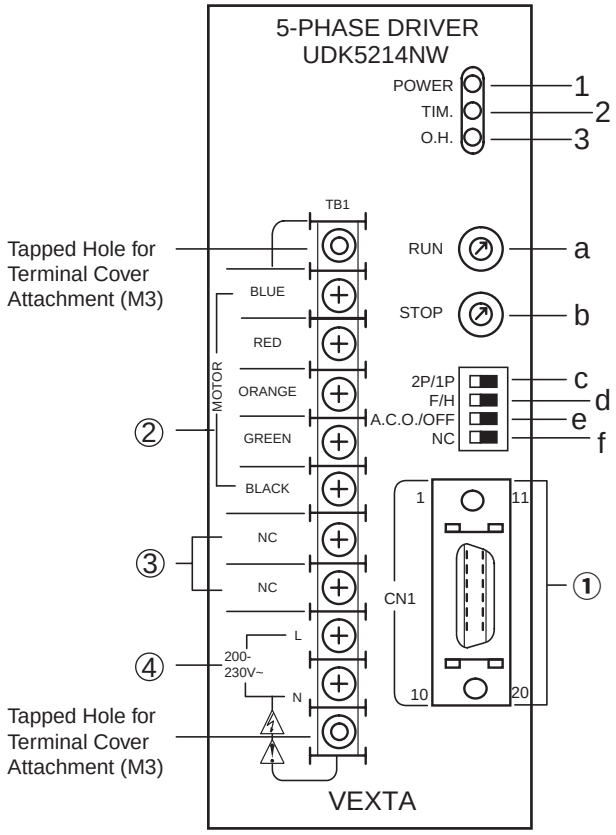


Front Panel

UDK5114NW2



UDK5214NW



3.1 LED Indications

The LED indicators show the state of various input/output signals.

They are indicated on page 4 as 1 ~ 3.

	LED Name	Indication	Color	Condition When LED ON	Page Reference
1	Power Input LED	POWER	Green	For UDK5114NW2, the Power Input LED lights when single phase 100-115V±15% (50/60Hz) is input. For UDK5214NW, the Power Input LED lights when single phase 200-230V$^{+10\%}_{-15\%}$ (50/60Hz) is input.	——
2	Excitation Timing Signal Output LED	TIM.	Green	Lights when the excitation timing signal is output.	Page 17
3	Overheat Signal Output LED	O.H.	Red	Lights when the overheat signal is output.	Page 18, 19

3.2 Switches

The switches adjust the motor current and enable/disable the various functions.

They are indicated on page 4 as a ~ f.

	Switch Name	Indication	Factory setting	Function	Page Reference
a	Motor Running Current Adjustment Rotary Switch	RUN	F	The motor's running current can be adjusted with this digital switch. Adjustment is simple, and an ammeter is not necessary.	Page 26, 27
b	Motor Standstill Current Adjustment Rotary Switch	STOP	9	The motor's standstill current can be adjusted with this digital switch. Adjustment is simple and an ammeter is not necessary.	Page 26, 27
c	Pulse Input Mode Switch	2P/1P	2P	The pulse signal input mode can be set to 1 pulse input mode or 2 pulse input mode with this switch.	Page 12
d	Step Angle Switch	F/H	F	The motor step angle can be set to full step or half step with this switch.	Page 12, 13
e	Automatic Current Off Function Switch	A.C.O./OFF	A.C.O.	This function will automatically cut the power to the motor when the internal temperature of the driver rises above 80°C (176°F). This function can be enabled or disabled with this switch.	Page 12, 13
f	No Connection	NC	NC	This switch has no function. It is a open switch which is not connected to the driver's circuitry.	——

3.3 Terminals

I/O Signals [Common to UDK5114NW2 and UDK5214NW]

Indication	Signal Type	Pin No.	Terminal Name	Function	Page Reference
① CN1	Input Signals	1	CW Pulse / Pulse Signal Input Terminal	The CW direction command signal is input to this terminal. When a pulse is input to the terminal, the motor output shaft rotates one step in the clockwise direction. (When in 1 pulse input mode a pulse signal is input to this terminal.)	Page 14, 15
		2			
		3	CCW Pulse / Rotation Direction Signal Input Terminal	The CCW direction command signal is input to this terminal. When a pulse is input to the terminal, the motor output shaft rotates one step in the counterclockwise direction. (When in 1 pulse input mode a rotation direction signal is input to this terminal.)	Page 14, 15
		4			
		5	All Windings Off Signal Input Terminal	The all windings off signal is input to this terminal. When a signal is input to the terminal, the driver cut the current supply to the motor. The motor torque will then be reduced to zero and the motor shaft can be rotated freely for adjustment. This function is used when manual positioning etc. is required.	Page 16
		10	+Common Terminal	This is the positive common terminal for the input signal (all windings off signal).	——
	Output Signals	11	Excitation Timing Signal Output Terminal	The excitation timing signal is output from this terminal. This signal is output when the motor excitation (current running though the winding) is in the initial stage.	Page 17
		12	Overheat Signal Output Terminal	The overheat signal is output from this terminal. This signal is output when the internal temperature of the driver rises above 80°C (176°F). This is used to prevent excess heat from damaging the driver.	Page 18, 19
		20	−Common Terminal	This is the negative common terminal for the output signals.	——

Motor/Power Supply [For UDK5114NW2]

Indication		Terminal Name	Function	Page Reference
② TB2	MOTOR	Motor Connection Terminal	This is the output terminal for the motor. Match the colors indicated on the driver front panel to the motor lead wires for connection.	Page 20, 24
③ TB2	NC	No connection	This terminal is not used. It is a open terminal which is not connected to the driver's circuitry.	——
④ TB1	100-115V~	Power Supply Connection Terminal	Connect this terminal to a power source of single phase 100-115V±15% (50/60Hz).	Page 20, 25
⑤	⏚	Protective Earth Terminal	This terminal is connected to the driver casing. (M4 screw size)	Page 24, 25

[For UDK5214NW]

Indication		Terminal Name	Function	Page Reference
② TB1	MOTOR	Motor Connection Terminal	This is the output terminal for the motor. Match the colors indicated on the driver front panel to the motor lead wires for connection.	Page 21, 24
③ TB1	NC	No connection	This terminal is not used. It is a open terminal which is not connected to the driver's circuitry.	——
④ TB1	200-230V~	Power Supply Connection Terminal	Connect this terminal to a power source of single phase 200-230V$^{+10\%}_{-15\%}$ (50/60Hz).	Page 21, 25
⑤	⏚	Protective Earth Terminal	This terminal is connected to the driver casing. (M4 screw size)	Page 24, 25

4. Installation

4.1 Motor Installation

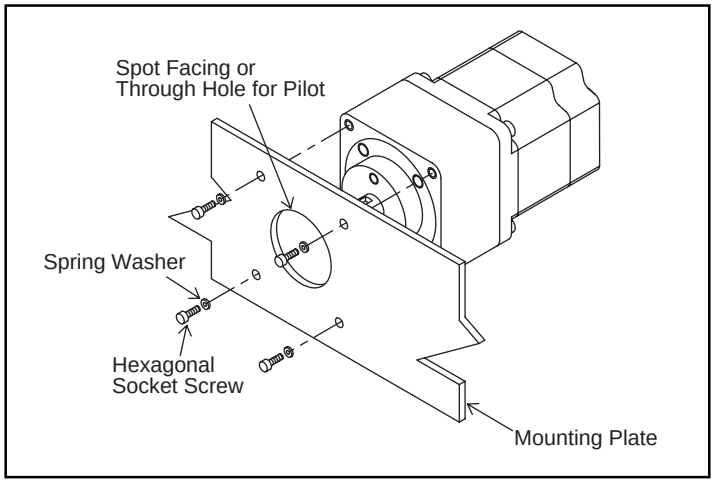
4.1.1 Motor Installation Location

To prevent motor damage, install in a location with the following conditions.

- Indoors (The motor is designed and manufactured to be used as an internal component within other equipment.)
- Ambient temperature range −10°C ~ +50°C (14°F ~ 122°F) (non-freezing)
- Ambient humidity below 85% (non-condensing)
- No explosive, combustible, or corrosive gases
- No direct sunlight
- No dust or conductive particles (i.e. metal chips or shavings, pins, or wire fragments etc.)
- No water, oil, or other fluids
- Where the motor is able to dissipate heat easily
- No continuous vibration or sudden shocks
- No nearby radiation, magnetic field, or air vacuum environment

4.1.2 How to Install the Motor

To allow for heat dissipation and to prevent vibration, be sure to securely attach the motor to solid metal surface.
The motor flange incorporates a pilot diameter. Use this pilot diameter as a guide for alignment when mounting the motor.



The following hardware is needed to mount the motor.

- Hexagonal Socket Screws ..... 4 (included)
- Spring Washers ..... 4 (prepared by users)

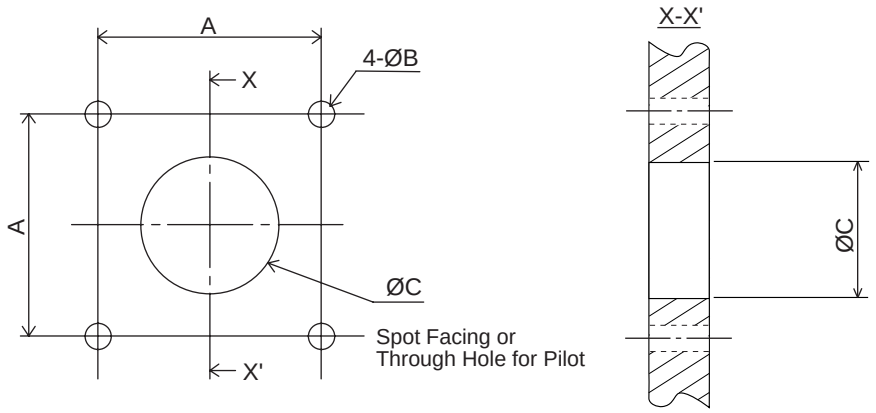
Enter A (single shaft) or B (double shaft) in the □ within the model numbers.

Motor Frame Size mm (inch)	Motor Model Number	Screw Type	Tightening Torque N·m (oz-in)	Effective depth of tapping hole of motor (for mounting) mm (inch)
60 (2.36)	PK566□W-N5, PK566□W-N7.2 PK566□W-N10, PK564□W-N25 PK564□W-N36, PK564□W-N50	M5 × P0.8 × 16	2.5 (347)	10 (0.39)

Select hexagonal socket screws with length appropriate for the thickness of the mounting plate.

4.1.3 Motor Mounting Plate Dimensions

Unit : mm (inch)

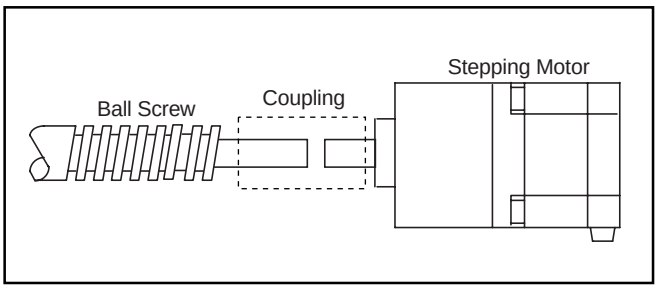


Enter A (single shaft) or B (double shaft) in the ☐ within the model numbers.

[Unit : mm (inch)]

Motor Frame Size	Motor Model Number	Mounting Plate Thickness	A	ØB	ØC
60 (2.36)	PK566☐W-N5 PK566☐W-N7.2 PK566☐W-N10 PK564☐W-N25 PK564☐W-N36 PK564☐W-N50	8 (.32) min.	49.5±0.2 (1.95±.008)	5.5 (.22DIA)	$37^{+0.039}_{0}$ (1.458DIA / 1.457DIA)

4.1.4 Connecting the Motor to the Drive Mechanism (Load)



Proper alignment is necessary when connecting the drive mechanism (load) to the motor shaft. Use a flexible coupling.

Note

- Inadequate alignment will cause vibration, shorten the bearing life, and possibly damage the motor shaft.
- When attaching a coupling, timing pulley, or other equipment, do not jolt the motor shaft by abruptly adding weight etc., or exceed the permissible overhung and thrust loads as this may damage the motor.
- Avoid an excess of impact force when use a hammer.

Permissible overhung load and permissible thrust load

Do not exceed the overhung and thrust load permissible values as indicated in the chart.

Enter A (single shaft) or B (double shaft) in the ☐ within the model numbers. [Unit : N (lbs.)]

Motor Frame Size mm (inch)	Motor Model Number	Overhung Load					Thrust Load
		Distance from the End of the Shaft [mm (inch)]					
		0 (0)	5 (.2)	10 (.4)	15 (.6)	20 (.8)	
60 (2.36)	PK566☐W-N5	200 (44.0)	220 (48.5)	250 (55.1)	280 (61.6)	320 (70.4)	100 (22.0)
	PK566☐W-N7.2 PK566☐W-N10	250 (55.1)	270 (59.4)	300 (66.1)	340 (74.8)	390 (85.8)	
	PK564☐W-N25 PK564☐W-N36 PK564☐W-N50	330 (72.6)	360 (79.2)	400 (88.1)	450 (99.0)	520 (114.4)	

Note

- Exceeding the permissible overhung load or permissible thrust load will damage or shorten the life span of the bearings and motor shaft.

4.2 Driver Installation

4.2.1 Driver Installation Location

To prevent driver damage, install in a location with the following conditions.

- Indoors (The driver is designed and manufactured to be used as an internal component within other equipment.)
- Ambient temperature range 0°C ~ +50°C (32°F ~ 122°F) (non-freezing). Install a forced-air cooling fan if ambient temperatures exceed 50°C (122°F).
- Ambient humidity below 85% (non-condensing)
- No explosive, combustible, on corrosive gases
- No direct sunlight
- No dust or conductive particles (i.e. metal chips or shavings, pins, or wire fragments etc.)
- No water, oil, or other fluids
- Where the driver is able to dissipate heat easily
- No continuous vibration or sudden shocks
- No nearby radiation, magnetic field, or air vacuum environment
- If the driver is installed in a switch box or other enclosed area, and near a heat source, be sure to establish ventilation holes. The heat generated by the driver will cause the ambient temperature to rise which could consequently damage the driver.
- If the driver is installed near a source of vibration, and this vibration is transmitted to the driver, attach a shock absorber to prevent driver damage.
- If the driver is installed near a source of noise interference (i.e. high frequency welding machine, electromagnetic switch, etc.) install a noise filter, or connect it to a separate power source to reduce the effect of the interference, otherwise the motor may not operate correctly.
- Leave a space of at least 25mm (1.0in.) between the driver and other equipment or structure. If using more than one driver, leave a space of at least 20mm (.787in.) between each driver. Driver heat generation will cause the ambient temperature to rise, and if the permissible ambient operating temperature is exceeded, driver damage may result.

4.2.2 How to Install the Driver

The driver is designed to cool naturally by convection.
Be sure to install the driver in an upright position as indicated on the next page.

The following hardware (not supplied) is needed to mount the driver.

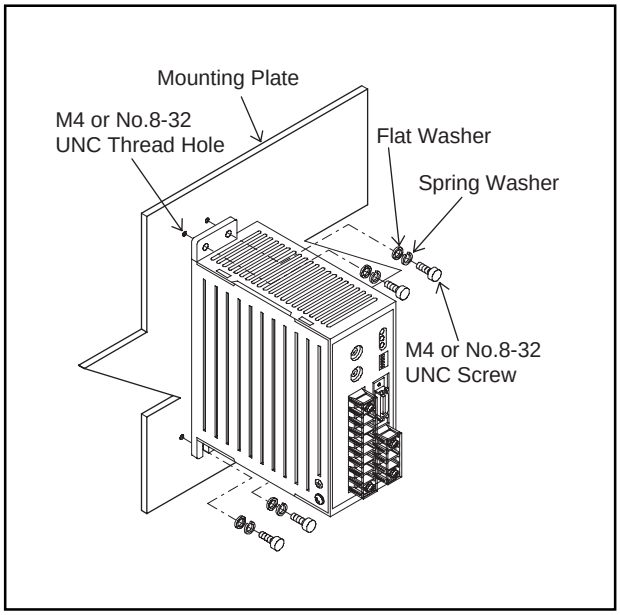
- M4 or No.8-32UNC Screws 4
- M4 or No.8 Flat Washers 4
- M4 or No.8 Spring Washers 4

Mounting the driver

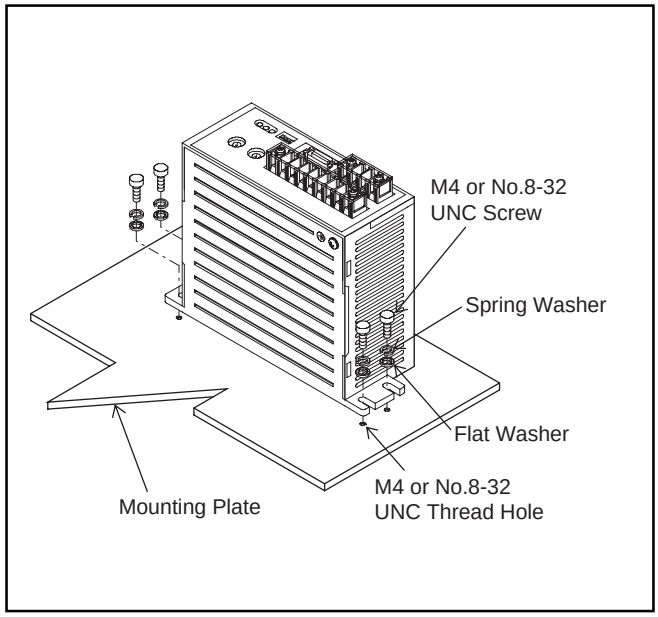
Secure the driver to a mounting plate within your equipment. (Secured through 4 screws)

The mounting plate should be at least 2mm (.0787in.) thick and be made of steel, aluminum or other material having good thermal conductivity.

Vertical Surface

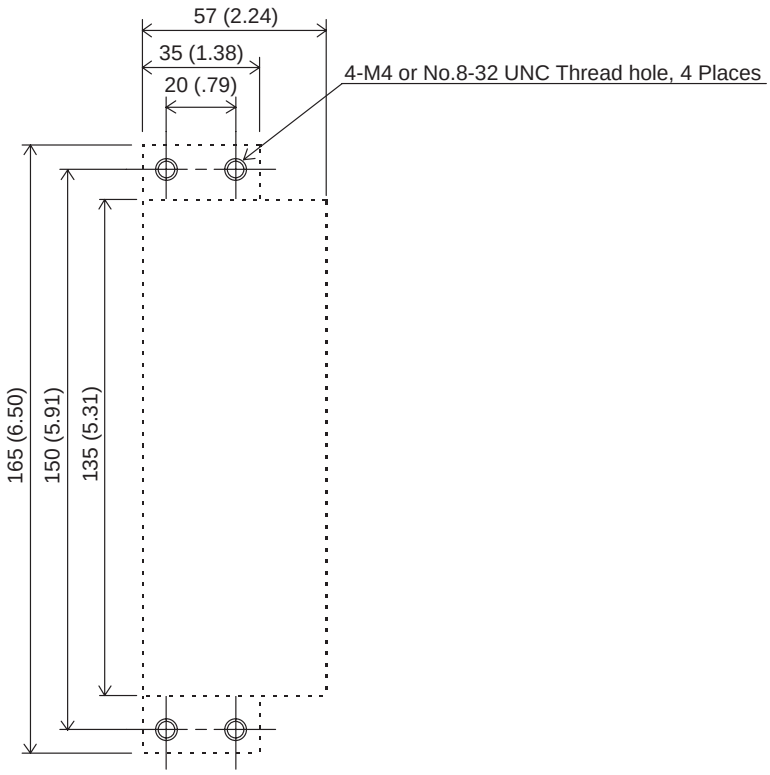


Horizontal Surface



4.2.3 Driver Mounting Plate Dimensions

Unit : mm (inch)

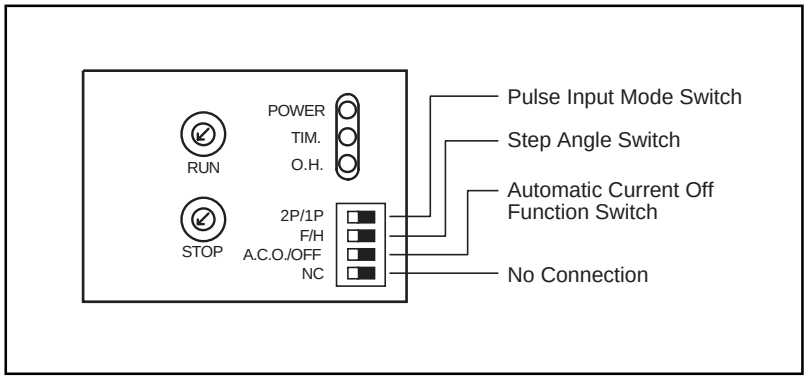


5. Driver Function Switches

The driver has various operation functions which are set with the function switches.

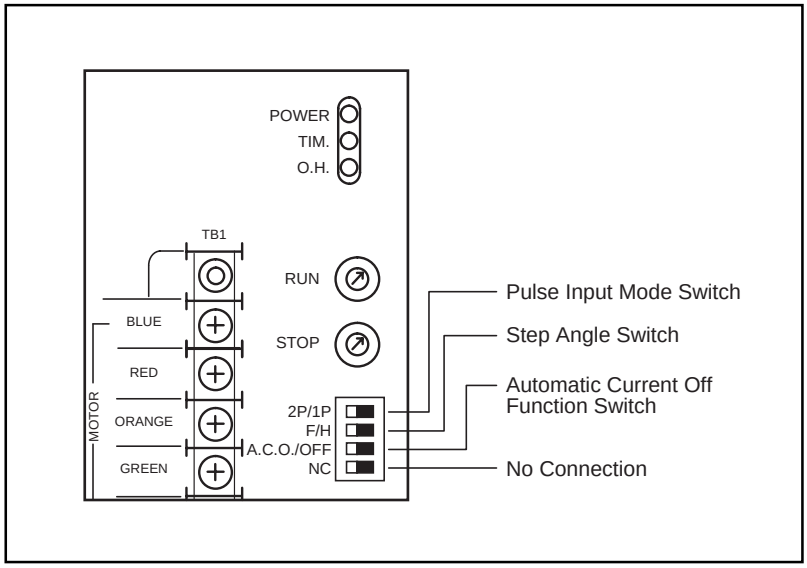
Driver Front Panel

UDK5114NW2



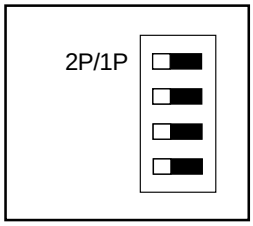
The white square section of the function switch represents the switch lever.

UDK5214NW



The white square section of the function switch represents the switch lever.

5.1 Pulse Input Mode Switch

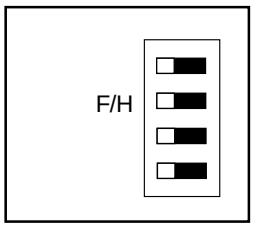


(Factory Setting : 2P)

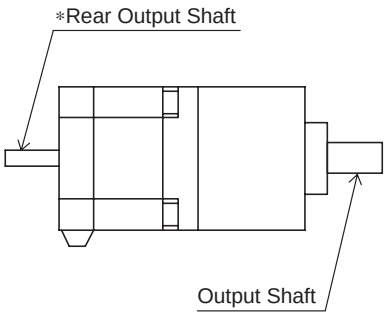
Select the appropriate pulse input mode to correspond to your controller with this switch.
When the pulse input mode switch is set to the 2P position, 2 pulse input mode is established and motor rotation is controlled by CW and CCW pulse signals.
When the switch is set to the 1P position, 1 pulse input mode is established and motor rotation is controlled by pulse signals and rotation direction signals.
(Refer to pages 14 and 15 for details.)

5.2 Step Angle Switch

(Factory Setting : F)



When the switch is set to:
F : full step operation is set
H : half step operation is set
The step angle for each setting varies according to the gear ratio (see chart below).

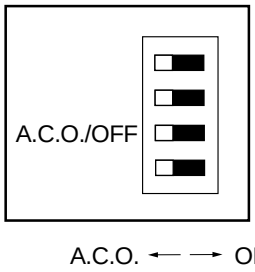


Gear Ratio	Step Angle Setting	Output Shaft Step Angle	∗Rear Output Shaft Step Angle
1:5	Full Step	0.144°/step	0.72°/step
	Half Step	0.072°/step	0.36°/step
1:7.2	Full Step	0.1°/step	0.72°/step
	Half Step	0.05°/step	0.36°/step
1:10	Full Step	0.072°/step	0.72°/step
	Half Step	0.036°/step	0.36°/step
1:25	Full Step	0.0288°/step	0.72°/step
	Half Step	0.0144°/step	0.36°/step
1:36	Full Step	0.02°/step	0.72°/step
	Half Step	0.01°/step	0.36°/step
1:50	Full Step	0.0144°/step	0.72°/step
	Half Step	0.0072°/step	0.36°/step

∗Double shaft type only

5.3 Automatic Current Off Function Switch

(Factory Setting : A.C.O.)



When the automatic current off function switch is set to the A.C.O. position, the automatic current off function is enabled. While enabled, if the internal temperature of the driver rises above 80°C (176°F), the overheat signal will be output, and the current to the motor will be cut off. (Refer to pages 18, 19 for details on the overheat signal.)
Cutting off the current to the motor will prevent driver heat damage.
When the switch is set to the OFF position, the automatic current off function is disabled.

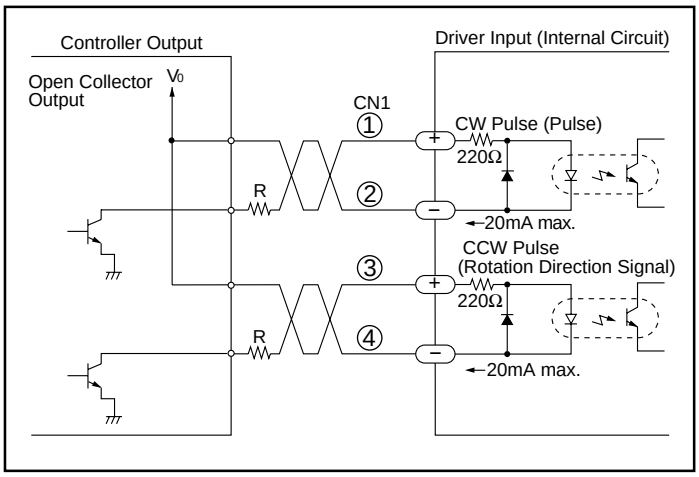
6. Input / Output Signals

6.1 Input Signals

The input signals to the driver and their functions are specified below.
The diagrams of this section are example connections to the CURRENT SINK (NPN) type controller.

6.1.1 CW Pulse / Pulse Signals
CCW Pulse / Rotation Direction Signals

The diagram below shows the input circuits and an example connection to a controller.



The number within ◯ refers to the pin number of driver connector CN1.

The information in the brackets ( ) refers to signals when in 1 pulse input mode.

Keep the voltage between DC5V and DC24V.
When voltage is equal to DC5V, external resistance R is not necessary.
When voltage is above DC5V, connect external resistance R and keep the input current below 20mA.

2 Pulse Input Mode

CW* pulse signal

When the photocoupler state changes from “ON” to “OFF”, the motor rotates one step in the clockwise direction.

CCW* pulse signal

When the photocoupler state changes from “ON” to “OFF”, the motor rotates one step in the counterclockwise direction.

* CW and CCW refer to clockwise and counterclockwise directions respectively, from a reference point of facing the motor output shaft.

1 Pulse Input Mode

Pulse signal

Pulse signal is input to the CW pulse / pulse signal input terminal.
When the photocoupler state changes from “ON” to “OFF”, the motor rotates one step.
The direction of rotation is determined by the following rotation direction signals.

Rotation direction signal

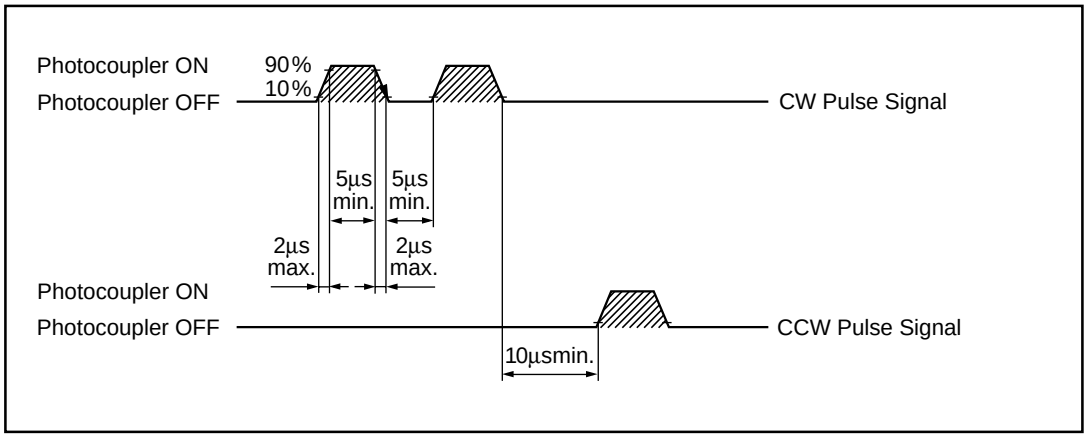
The rotation direction signal is input to CCW pulse / rotation direction signal input terminal.
A “photocoupler ON” signal input commands a clockwise direction rotation.
A “photocoupler OFF” signal input commands a counterclockwise direction rotation.

Relation to the Pulse Input Mode Switch (See page 12)

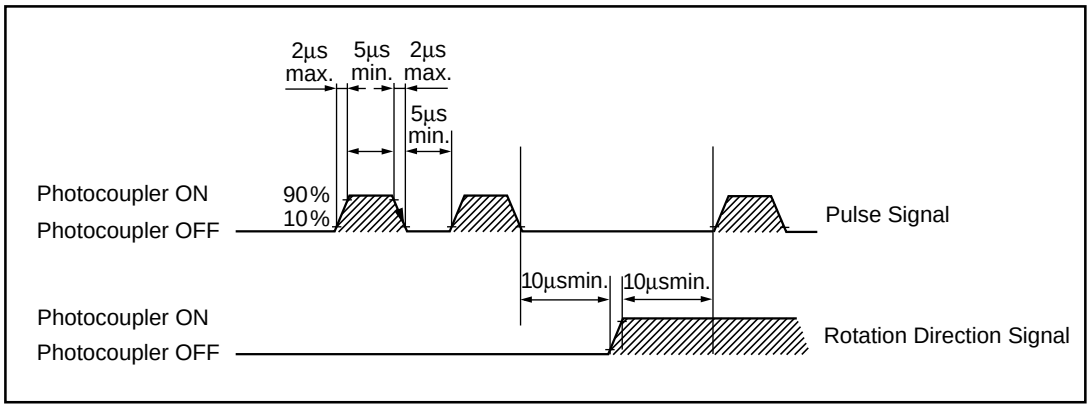
When the switch is set to the 2P position, motor rotation is controlled by CW pulse signals and CCW pulse signals.
When the switch is set to the 1P position, motor rotation is controlled by pulse signals and rotation direction signals.

Pulse Waveform Characteristics (Photocoupler state corresponding the input pulse)

2 Pulse Input Mode



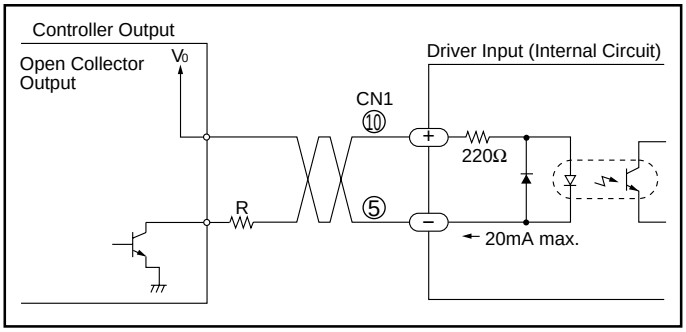
1 Pulse Input Mode



- The shaded area indicates when the photocoupler diode is ON. The motor moves when the photocoupler state changes from ON to OFF as indicated by the arrow.
- The pulse voltage is 4 ~ 5V in the “photocoupler ON” state, and 0 ~ 0.5V in the “photocoupler OFF” state.
- Input pulse signals should have a pulse width over 5µsec, pulse rise/fall below 2µsec, and a pulse duty below 50%.
- Keep the pulse signal in the “photocoupler OFF” state when no pulse is being input.
- The minimum interval time when changing rotation directions is 10µsec.
  This value varies greatly depending on the motor type, pulse frequency, and load inertia. It may be necessary to increase this time interval.
- In 2 pulse input mode, do not input CW and CCW pulse signals at the same time. Inputting a pulse signal while the other pulse signal is already in the “photocoupler ON” state will result in erratic motor rotation.
- In 1 pulse input mode, leave the pulse signal at rest “photocoupler OFF” when changing rotation directions.

6.1.2 All Windings Off Signal

The diagram below shows the input circuit and an example connection to a controller.



The number within ◯ refers to the pin number of driver connector CN1.

Keep the voltage between DC5V and DC24V.
When voltage is equal to DC5V, external resistance R is not necessary.
When voltage is above DC5V, connect external resistance R, and keep the input current below 20mA.

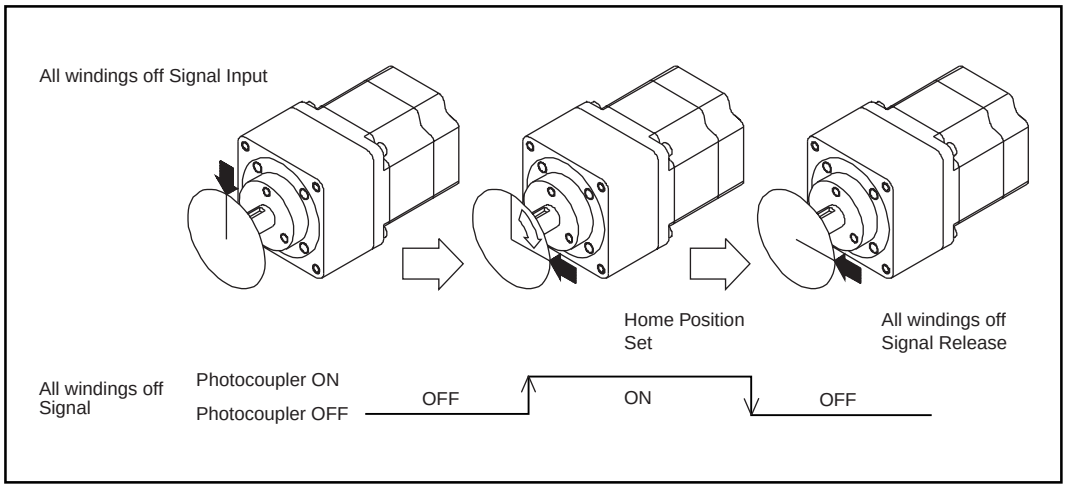
When the all windings off signal is in the “photocoupler ON” state, the current to the motor is cut off and motor torque is reduced to zero. The motor output shaft can then be rotated freely by hand.
When the all windings off signal is in the “photocoupler OFF” state, the motor holding torque is proportional to the current set by the current adjustment rotary switches. During motor operation be sure to keep the signal in the “photocoupler OFF” state.
This signal is used when moving the motor by external force or manual home positioning etc. is desired. If this function is not needed, it is not necessary to connect this terminal.

Switching the all windings off signal from “photocoupler ON” to “photocoupler OFF” does not alter the excitation sequence.
When the motor shaft is manually adjusted with the all windings off signal input, the shaft will shift from the position set after the all windings off signal is released up to ±3.6° divided by the gear ratio. (Example : A motor with a gear ratio of 1:10 will shift up to ±0.36°.)

Manual Detection of the Home Position

Input the all windings off signal, set the motor to the desired position, then release the all windings off signal.

The PN geared type has a small amount of holding torque when the motor is not energized. This is a normal characteristic of the PN geared type.



Note

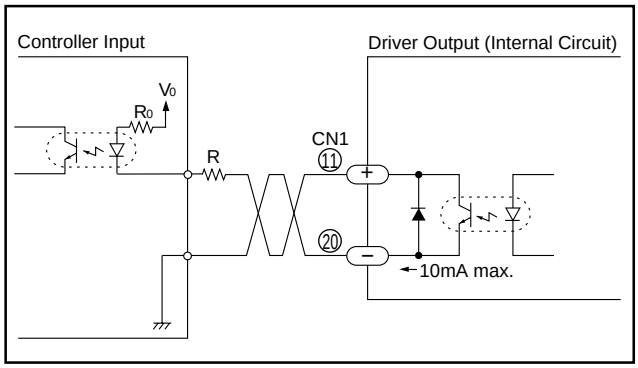
- Be sure to input the all windings off signal before manually rotating the output shaft of the TH geared type, otherwise motor damage may result.

6.2 Output Signals

The output signals from the driver and their functions are specified below.

6.2.1 Excitation Timing Signal

The diagram below shows the output circuit and an example connection to a controller.



The number within ◯ refers to the pin number of driver connector CN1.

Keep the voltage between DC5V and DC24V.
Keep the current below 10mA.
If the current exceeds 10mA, connect external resistance R.

The excitation timing signal is output to indicate when the motor excitation (current flowing through the winding) is in the initial stage (step “0” at power up).
The excitation timing signal can be used to increase the accuracy of home position detection by setting mechanical home position of your equipment (photo-sensor etc.) to coincide with the excitation sequence initial stage (step “0”).
When connected as shown in the example connection, the signal will be “photocoupler ON” at step “0”.

The excitation timing signal is output simultaneously with a pulse input each time the excitation sequence returns to step “0”.
The excitation sequence will complete one cycle for every motor output shaft rotation of 7.2° divided by the gear ratio.
(Example : 0.72° for a motor with a gear ratio of 1:10)
When the power is turned ON, the excitation sequence is reset to step “0”.

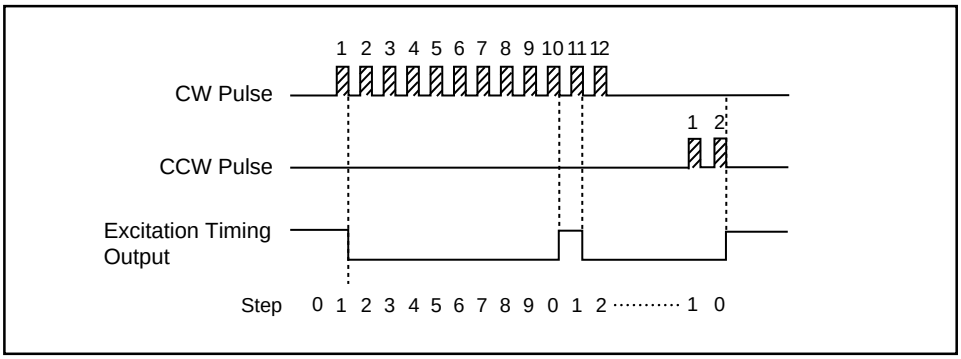
Relation to the Excitation Timing Signal Output (TIM.) LED (See pages 4, 5)

The TIM. LED lights when the excitation signal is output.
While the motor is rotating, the LED will turn ON and OFF at a high speed and will appear to be continuously lit.

Relation to the Step Angle Switch (See pages 12, 13)

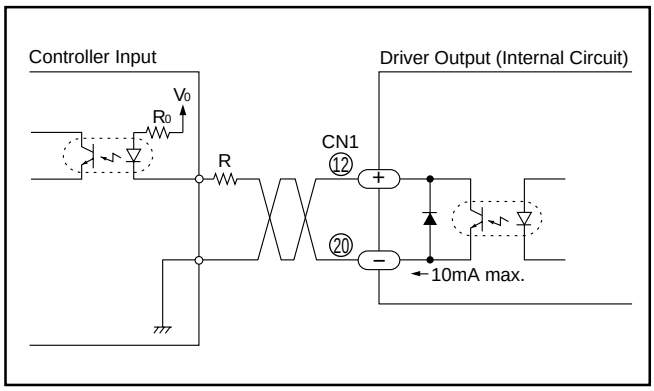
When the switch is set to the F position :
Full step : signal is output once every 10 pulses
When the switch is set to the H position :
Half step : signal is output once every 20 pulses
The step angle for each setting depends on the gear ratio. Refer to page 13.

Timing chart when in full step mode



6.2.2 Overheat Signal

The diagram below shows the output circuit and an example of the connection to a controller.



The number within ◯ refers to the pin number of driver connector CN1.

Keep the voltage between DC5V and DC24V.
Keep the current below 10mA.
If the current exceeds 10mA, connect external resistance R.

The overheat signal is output to protect the driver from heat damage if the internal temperature of the driver rises above 80°C (176°F).
When connected as shown in the example connection, the signal will be "photocoupler OFF" during normal conditions, and "photocoupler ON" when the temperature exceeds above 80°C (176°F).

When the overheat signal is output, turn the driver power OFF, then adjust the operating conditions (ambient temperature, driver/controller settings, etc.), or use a fan etc. to cool the driver. After taking appropriate measures, turn the power ON. Turning the power ON will reset the overheat signal, and release the automatic current off condition.

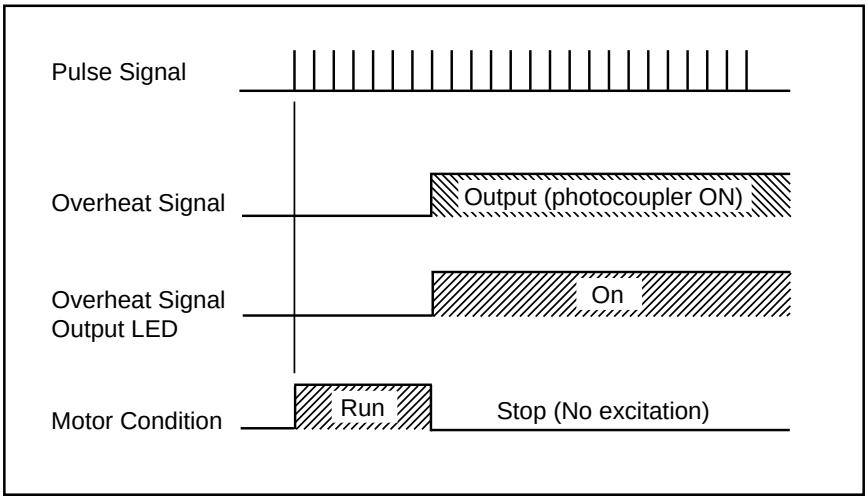
Relation to the Overheat Signal Output (O.H.) LED (See pages 4, 5)

The O.H. LED lights when the overheat signal is output.

Relation to the Automatic Current Off Function Switch (See pages 12, 13)

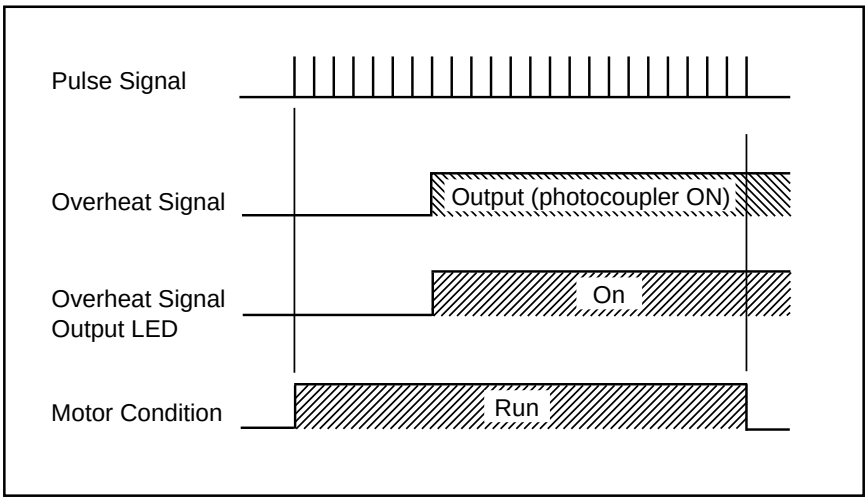
When set to A.C.O.

1. The overheat signal is output when the internal temperature of the driver exceeds above 80°C (176°F) during operation.
2. Regardless of any pulse signals input, motor excitation will cease (shaft free) and the motor will come to a natural stop.



When set to OFF

1. The overheat signal is output when the internal temperature of the driver exceeds above 80°C (176°F) during operation.
2. The motor will continue to run regardless of the overheat signal output.



7. Connections

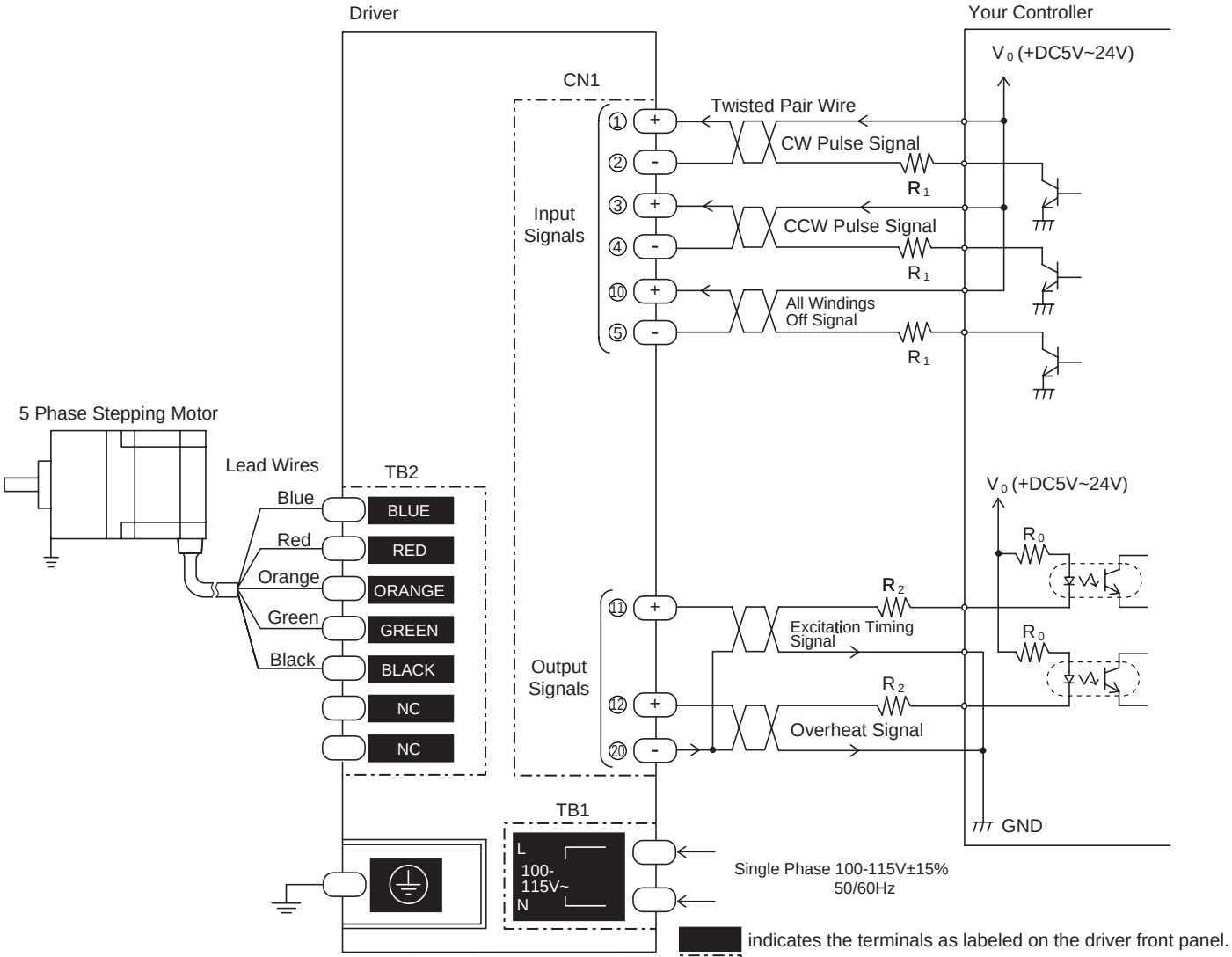
Make connections in the following order.

1. Connect the motor and driver.
2. Connect the driver and controller.
3. Ground the motor, driver, and controller.
4. Connect the power to the driver.

7.1 Example Connections

The connections between the motor, driver, and controller are explained below.

7.1.1 For UDK5114NW2 (Single phase 100-115V Input)



Input signal connections

Keep the voltage between DC5V and DC24V.
When voltage is equal to DC5V, external resistance R_1 is not necessary.
When voltage is above DC5V, connect external resistance R_1 and keep the input current below 20mA.

Output signal connections

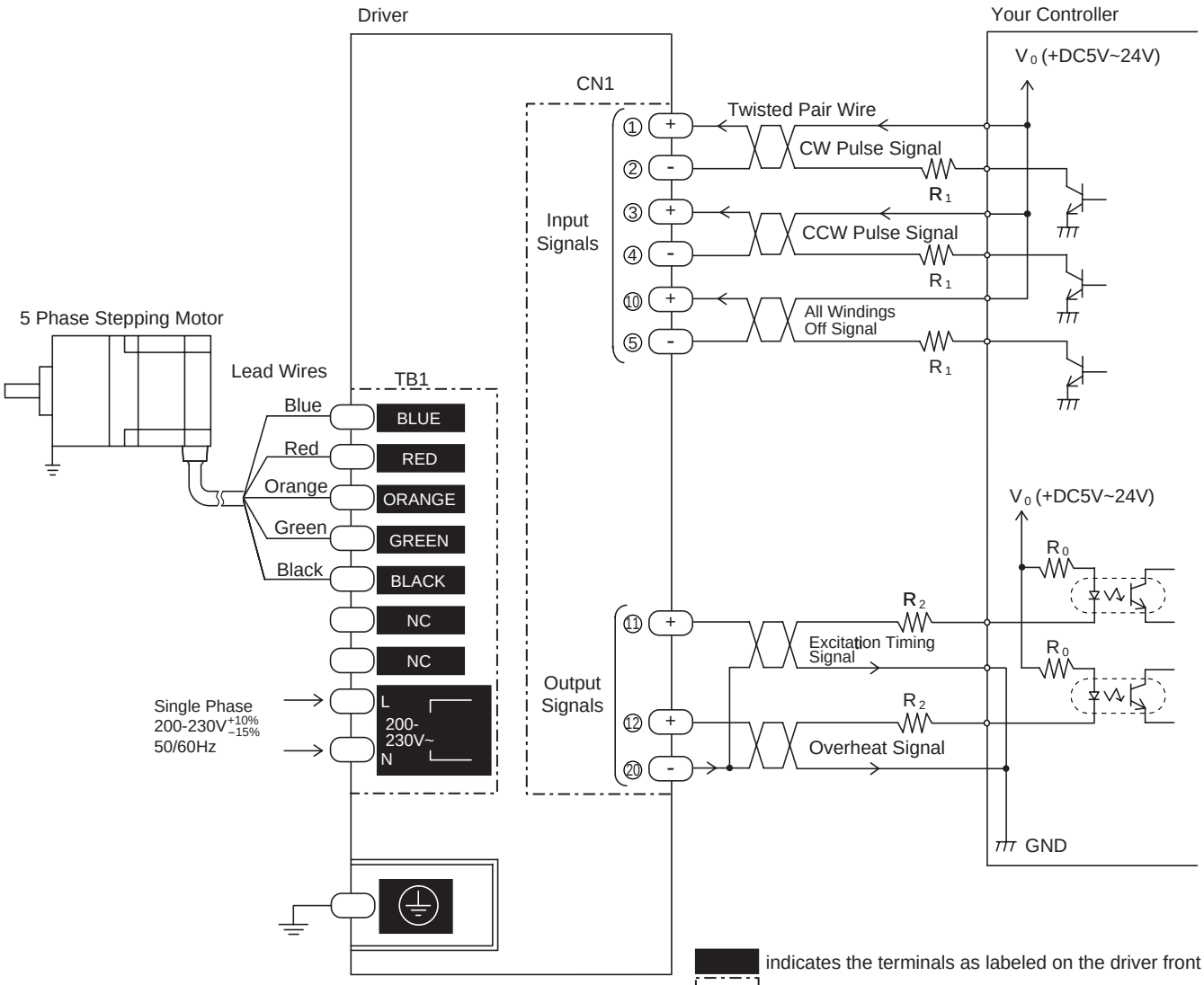
Keep the voltage between DC5V and DC24V.
Keep the current below 10mA.
If the current exceeds 10mA, connect external resistance R_2.

Terminal connections

Refer to pages 25 and 26, and securely connect the terminals.

* The connection of the input signal shown above is 2 pulse input mode.
  For 1 pulse input mode turn the pulse input mode switch to “1P”, and input pulse signal to CW pulse input terminal and input rotation direction signal to CCW pulse input terminal. (Refer to the pages 12, 14 and 15 for details.)

7.1.2 For UDK5214NW (Single phase 200-230V Input)



Input signal connections

Keep the voltage between DC5V and DC24V.
When voltage is equal to DC5V, external resistance R_1 is not necessary.
When voltage is above DC5V, connect external resistance R_1 and keep the input current below 20mA.

Output signal connections

Keep the voltage between DC5V and DC24V.
Keep the current below 10mA.
If the current exceeds 10mA, connect external resistance R_2.

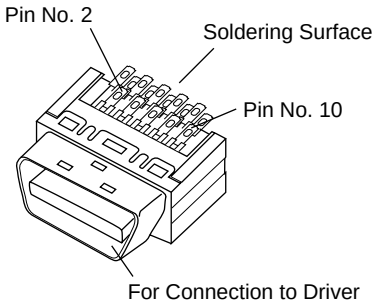
Terminal connections

Refer to pages 25 and 26, and securely connect the terminals.

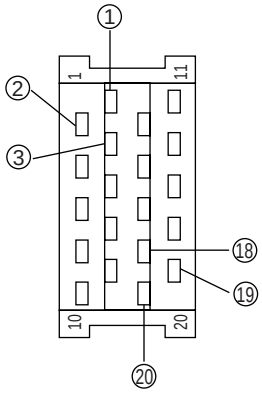
* The connection of the input signal shown above is 2 pulse input mode.
  For 1 pulse input mode turn the pulse input mode switch to “1P”, and input pulse signal to CW pulse input terminal and input rotation direction signal to CCW pulse input terminal. (Refer to the pages 12, 14 and 15 for details.)

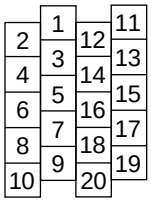
7.2 Preparing the I/O Signal Connector

Refer to the terminal description chart of section 3.3 (page 6) and solder the signal lines to the relevant pin numbers. After soldering, assemble the I/O signal connector and connect it to the driver connector CN1.



Connector





I/O Signal Connector (Accessory)
Connector : 54306-2011 (MOLEX)
Connector cover : 54331-1201 (MOLEX)

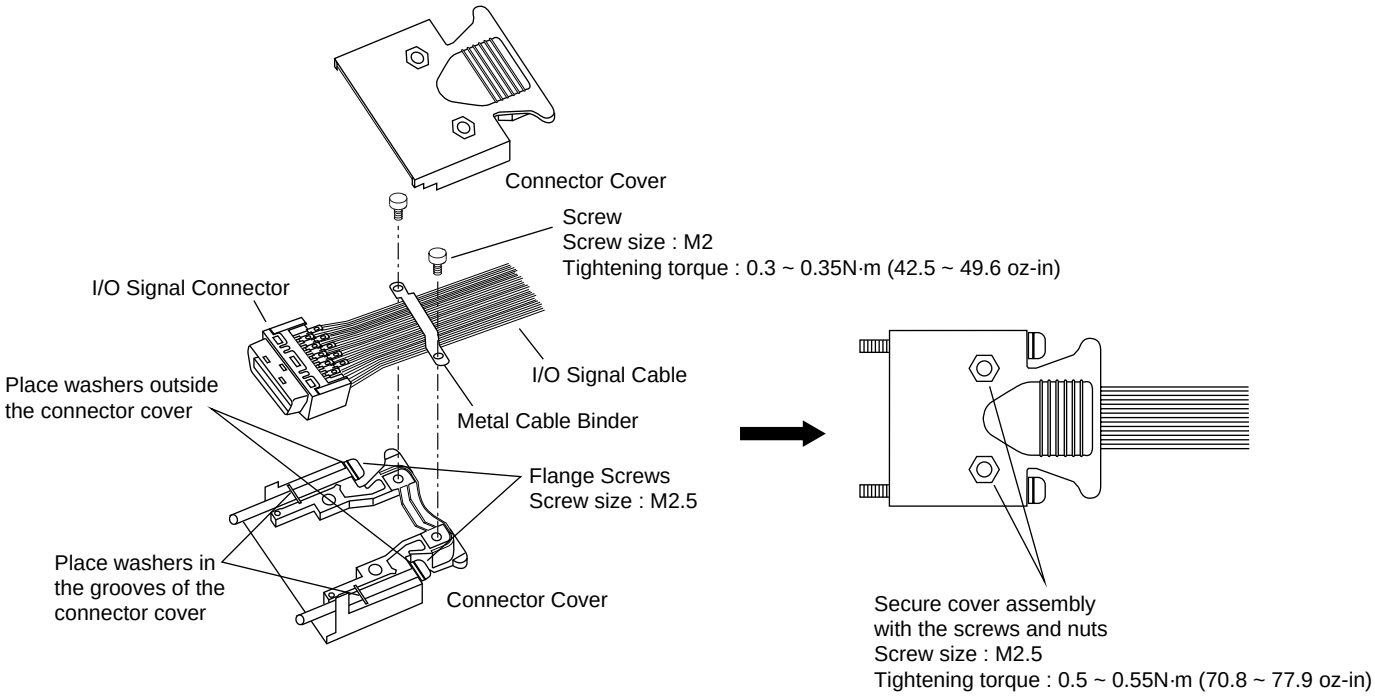
Equivalent Product
Connector : 10120-3000VE (Sumitomo 3M)
Connector cover : 10320-52A0-008 (Sumitomo 3M)

Connector Pin Arrangement
(As seen from side to be soldered)

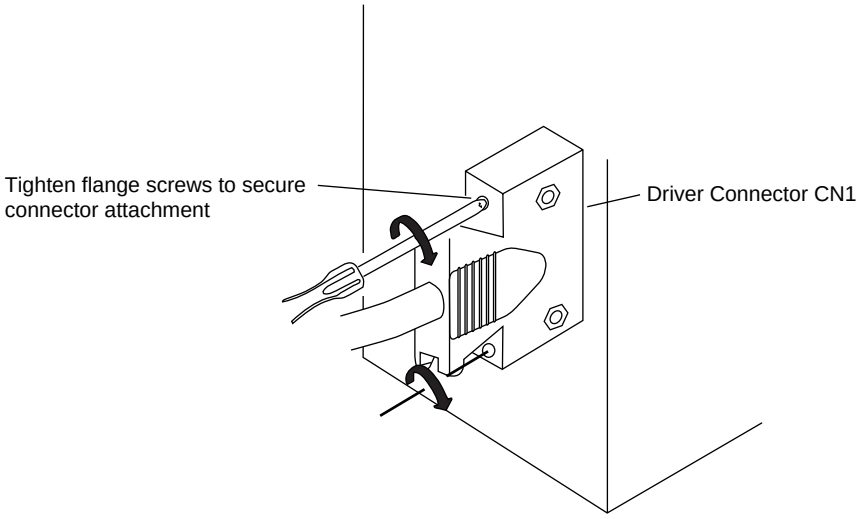
7.3 Connector Cover Assembly and Connection to the Driver

After soldering the signal lines to the I/O connector, attach the connector cover.

(1) Place the I/O signal cable and flange screws in the connector cover.
Place the washers as shown in the diagram below.
Place the I/O signal cable on the connector cover, hold it by the metal binder and secure the metal binder with the screws.
Connect both sides of the connector cover and secure the assembly with the screws and nuts.



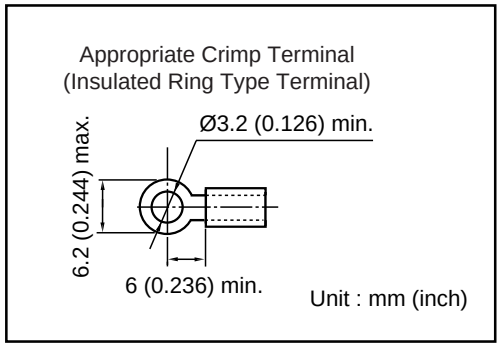
(2) Plug the I/O connector into driver connector CN1, then tighten the flange screws to secure the connector to the driver.
(Screw tightening torque: 0.3 ~ 0.35N·m (42.5 ~ 49.6oz-in))



7.4 Connecting the Motor and Driver

Connect the motor to the driver as follows:

1. Loosen the terminal cover screws (M3) and remove the terminal cover.
2. Attach crimp terminals to the motor lead wires.
3. Loosen the terminal screws (M3), connect the motor lead crimp terminals to the driver terminals, and then tighten the terminal screws. (Screw tightening torque: 0.5 N·m (69 oz-in))
4. Reattach the terminal cover, and tighten the terminal cover screws. (Screw tightening torque: 0.5 N·m (69 oz-in))



- When extending the motor lead wires use wire of AWG20 (0.5 mm^2) or greater.

7.5 Connecting the Driver and Controller

Connect the driver to the controller.

Confirm the following when making the connections.

- For signal lines, use twisted pair wire of AWG24 (0.2 mm^2) or greater, and 2 m (6.56 ft.) or less in length.
- Separate the signal lines from the power lines and motor lead wires by at least 10cm (4in.). Do not band the wires together. This is to prevent noise interference from entering the signal lines and subsequent erratic motor operation.
- Use an open collector transistor (sink type) for the controller signal output.

If electrical noise generated by other equipment causes operational errors, shield the signal lines with conductive tape or wire mesh etc. (not supplied).

Connect the shield material to the driver's protective earth terminal for grounding.

Note

- Do not excessively pull, bend, or pinch the signal lines. Damage may result.

7.6 Ground

7.6.1 Grounding the Motor

The motor is designed with a Class I basic insulation construction.

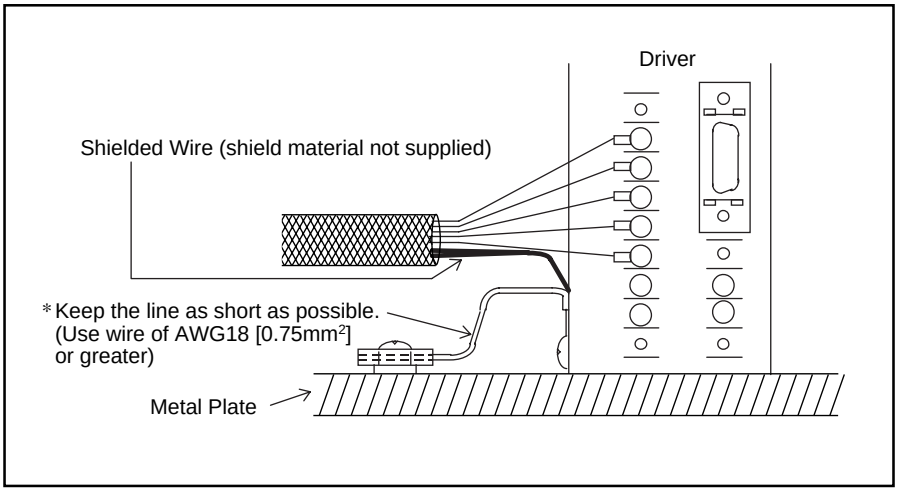
If electrical noise interference from the motor cable becomes a problem, shield the cable with conductive tape or wire mesh (not supplied).

Connect the shield material to the driver's protective earth terminal for grounding.

7.6.2 Grounding the Driver

The driver is designed with a Class I basic insulation construction.

To prevent electric shock, connect the driver's protective earth terminal (Screw tightening torque : 0.5 ~ 0.6 N·m (69 ~ 85 oz-in)) to a metal plate.



7.7 Connecting the Power Source

Connect to a power source of single phase 100-115 V±15% 50/60 Hz for UDK5114NW2 and single phase 200-230 V$^{+10\%}_{-15\%}$ 50/60 Hz for UDK5214NW.

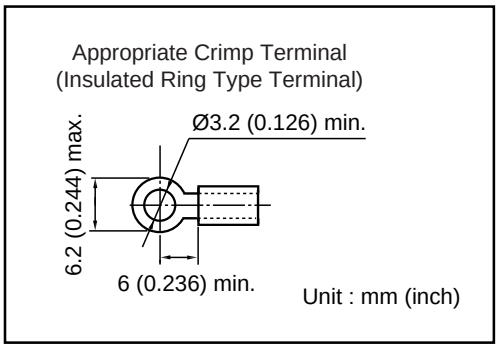
Use a power source which will supply sufficient input current.

The current value for input power as indicated in the specifications on pages 31 ~ 34 is the maximum value.

The current value will vary according to the pulse frequency.

Refer to the speed - torque characteristics in the product guide or the general catalog for the relationship between the input current and pulse frequency.

1. Loosen the terminal cover screws (M3) and remove the terminal cover.
2. Attach crimp terminals to the power lines.
3. Loosen the terminal screws (M3), connect the power line crimp terminals to the driver terminals, and then tighten the terminal screws. (Screw tightening torque : 0.5 N·m (69 oz-in))
4. Reattach the terminal cover, and tighten the terminal cover screws. (Screw tightening torque : 0.5 N·m (69 oz-in))



Note

- For power lines, use wire type AWG18 (0.75 mm²) or greater.
- If the current from the power source is insufficient the motor torque will be reduced and the transformer may be damaged. The following abnormalities may also occur.
  - Erratic motor rotation during high speeds
  - Delayed motor start-up and stopping

7.8 Turning On the Power

Before turning the power ON, be sure that the signal lines, motor lead wires, power line, and earth line are all properly connected, and that the terminal cover is attached.

8. Motor Current Adjustment

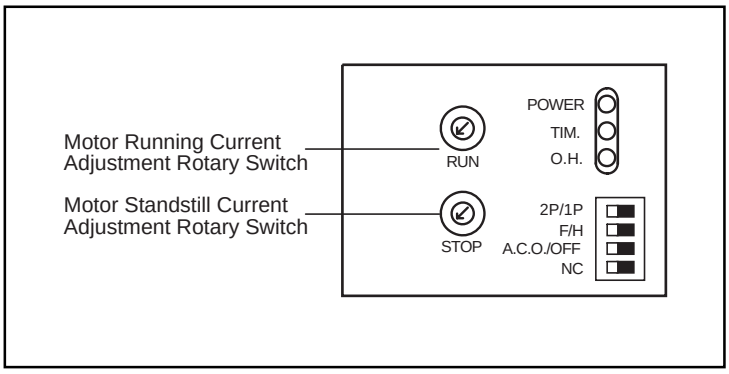
If maximum motor torque is not needed, the motor running current or the motor standstill current can be adjusted to reduce motor vibration and motor and driver heat generation.

To reduce temperature rise of the motor and driver ⇒ Reduce the motor running current and the motor standstill current

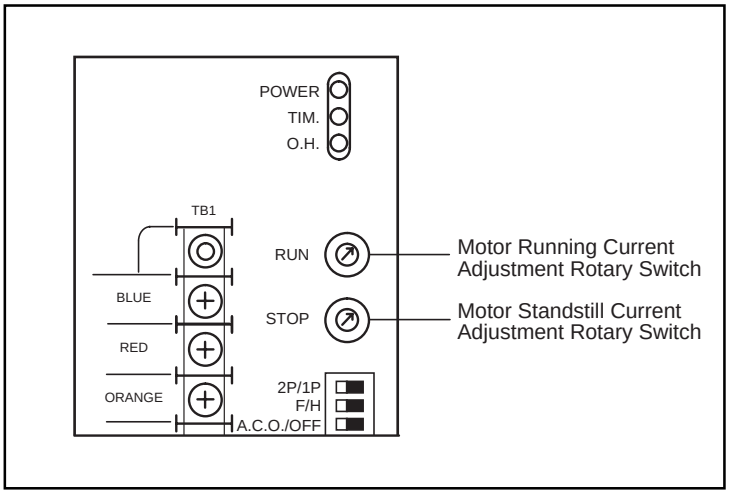
To reduce motor vibration ⇒ Reduce the motor running current

Driver Front Panel

UDK5114NW2



UDK5214NW



8.1 Motor Running Current Adjustment

The motor running current is factory set to the motor's rated current.
(Motor running current adjustment switch RUN set to "F")
Adjust the motor running current by turning the RUN rotary switch with a small slot screwdriver.
The RUN switch settings and corresponding current values are indicated in the following chart.

RUN switch settings and corresponding current values (representative values)

RUN Switch Settings	Running Current [A/phase]	
	UDK5114NW2	UDK5214NW
0	0.35	0.46
1	0.42	0.52
2	0.50	0.58
3	0.56	0.65
4	0.63	0.71
5	0.70	0.77
6	0.77	0.84
7	0.84	0.90
8	0.96	0.96
9	0.98	1.02
A	1.05	1.09
B	1.12	1.15
C	1.19	1.21
D	1.26	1.28
E	1.33	1.34
F	1.40	1.40

8.2 Motor Standstill Current Adjustment

The current is automatically reduced to the standstill current approximately 0.1 sec. after pulse signals stop.
The current at motor standstill can be adjusted to reduce motor/driver heat generation. The motor standstill current is factory set to approximately 50 % of the rated current. (Standstill current adjustment switch STOP set to "9").
Adjust the motor standstill current by turning the STOP rotary switch with a small slot screwdriver.
The amount of current reduction is proportional to the setting of the motor running current.

$$\text{Standstill Current [A/phase]} = \frac{\text{Running Current Setting [A/phase]} \times \text{Standstill Current Setting [\%]}}{100}$$

STOP switch settings and corresponding rate of current reduction (representative values)

STOP Switch Settings	Standstill Current Setting [%]	
	UDK5114NW2	UDK5214NW
0	7	19
1	7	19
2	7	22
3	13	26
4	19	30
5	26	33
6	32	37
7	38	41
8	44	45
9	50	48

9. Troubleshooting

Consult the following chart if the motor is not functioning properly. If the motor is still not functioning properly after confirming the checkpoints below, contact your nearest sales office as listed at the back of this manual.

PROBLEM	CHECK POINTS	MEASURES
No excitation in the motor. (The motor has no holding torque and the shaft can be turned freely by hand)	1. Is the driver POWER LED On? (If On, condition is normal)	If the POWER LED is not On, check if the power source is properly connected. Verify that single phase 100-115V±15% 50/60Hz for UDK5114NW2 or 200-230V$^{+10\%}_{-15\%}$ 50/60 Hz for UDK5214NW is input correctly. CAUTION : Double-pole/neutral fusing The driver incorporates double-pole/neutral fusing for the power input. If the driver POWER LED is Off, it is possible that only the neutral fuse is tripped. High voltage supplied on the hot side may cause electric shock. Turn the power Off immediately and request service.
	2. Is the all windings off signal being input to the driver?	When the all windings off signal is input the motor will lose all excitation (no holding torque). Return the all windings off signal to “photocoupler OFF”.
	3. Is the driver overheat LED Off? (If Off condition is normal)	The overheat LED lights when the overheat signal is output. If the automatic current off function switch is set to the “A.C.O.” position when this signal is output, the motor will lose all excitation (no holding torque). Refer to items 21 ~ 24 (page 30) and take the necessary steps to prevent the overheat signal from being output.
	4. Are the driver and motor correctly connected?	Check the driver connection terminals. If the motor cable has been extended check the extension connection.
	5. Are the current adjustment rotary switches (RUN or STOP) set too low?	These rotary switches control the output current to the motor (refer to pages 26, 27). If they are set too low return them to the factory set positions.
	Note : If the motor still has no torque after checking the above conditions, the driver is probably Defective. After reconfirming that the current voltage and connections are correct, contact your nearest sales office for service.	
The motor does not rotate.	First check the 5 items above.	
The motor does not rotate when a pulse signal is input.	6. Are the pulse signal lines correctly connected? Are the pulse signal waveform characteristics correct?	Check the connections, the pulse signal voltage, and pulse waveform characteristics (refer to pages 14, 15). Use a controller which is able to output a standard pulse signal.
	7. In 2 pulse input mode (pulse input mode switch in 2P position) is either the CW pulse/pulse or CCW pulse/ rotation direction signal in the “photocoupler ON” state?	The motor will not rotate if a pulse signal is input when the other pulse signal input terminal is already in the “photocoupler ON” state. Be sure to keep the pulse signal in the “photocoupler OFF” state.
	8. In 1 pulse input mode (pulse input mode switch in 1P position) is the pulse signal connected to the CCW pulse/rotation direction signal input terminal?	Connect the pulse signal to the CW pulse/pulse signal input terminal.

PROBLEM	CHECK POINTS	MEASURES
The motor rotates in the wrong direction.	9. In 2 pulse input mode (pulse input mode switch in 2P position) are the CW and CCW pulse signal lines connected backwards?	Connect the CW pulse signal line to the CW pulse/pulse signal input terminal, and connect the CCW pulse signal line to the CCW pulse/rotation direction signal input terminal.
	10. In 1 pulse input mode (pulse input mode switch in 1P position) leave the CCW pulse/rotation direction signal input terminal unconnected and try inputting a pulse signal to the CW pulse/pulse signal input terminal.	If the motor rotates in a counterclockwise direction, the motor and driver are normal. Recheck the rotation direction signal. (“photocoupler ON” = clockwise, “photocoupler OFF” = counterclockwise)
Motor rotation is erratic.	First check items 4, 5, and 6.	
Motor start up is unstable.	11. Are the motor shaft and load properly aligned? Is the load too heavy for the motor?	Make sure the motor shaft and load are securely attached and properly aligned. Recheck the operating conditions, and if necessary lighten the load.
The motor rotates too far or not far enough.	12. Does the step angle required by your equipment match the step angle of the stepping motor?	Check the setting of the step angle switch located on the driver.
	13. Is the number of pulses set to match the amount of motor rotation?	Check the controller pulse setting.
The motor loses synchronization during acceleration or while running.	14. Is the overheat signal output LED Off? (If Off, condition is normal)	The overheat signal output LED lights when the overheat signal is output. If the automatic current off function switch is set to the “A.C.O.” position when this signal is output, the motor will lose all excitation (no holding torque). Refer to items 21 ~ 24 (page 30) and take the necessary steps to prevent the overheat signal from being output.
	15. Is the starting pulse frequency too high?	Check this by decreasing the frequency.
	16. Is the acceleration/deceleration time too short?	Check this by increasing the acceleration/deceleration time.
	17. Is the motor being affected by noise interference?	Check this by running the motor while the machine suspected of producing the noise interference is off.
Motor vibration is very high.	18. Is the output torque too high?	Try reducing the motor running current with the current adjustment rotary switch “RUN”.
	19. Try changing the pulse frequency.	If the vibration decreases after the pulse frequency has been adjusted, this means the motor is resonating. Either adjust the frequency or change the step angle. Also try installing the optional (sold separately) clean damper (for double shaft model only).

PROBLEM	CHECK POINTS	MEASURES
Motor temperature is very high.	20. Is the motor running time too long?	Shorten the running time or increase the resting time. (The temperature of the motor may rise considerably depending on the operating conditions. During high speeds and depending on the duty drive cycle, the motor could be susceptible to heat damage. Allow for sufficient heat dissipation from the motor.) For UL and CSA standards, insulation is Class A (105°C (221°F)). (Keep the temperature of the motor case below (75°C (167°F)) For other standards insulation is Class B (130°C (266°F)). (Keep the temperature of the motor case below (100°C (212°F))
The overheat signal is output.	21. Is the driver ambient temperature 0°C ~ +50°C (32°F ~ 122°F)?	If not, take the necessary steps to keep the ambient temperature within 0°C ~ +50°C (32°F ~ 122°F).
	22. Is the driver located in an enclosed or poorly ventilated area?	Install the driver in a well ventilated area, or install a ventilation fan.
	23. Is the driver mounted to a metal surface?	If not, mount the driver to a metal surface or install a ventilation fan.
	24. Is the driver continuously operating at a pulse rate, which requires the maximum input current?	If changing the pulse rate is a possibility, try adjusting it enough to decrease the input current. For details refer to the driver input current indicated in the “speed vs. torque characteristics” in the general catalog.

10. Specifications

10.1 Single phase 100-115V Input Unit

Model Number	single shaft	UPK566AW-N5	UPK566AW-N7.2	UPK566AW-N10
	double shaft	UPK566BW-N5	UPK566BW-N7.2	UPK566BW-N10
Maximum Holding Torque	N·m (lb-in)	3.5 (30.3)		
Rotor Inertia	kg·m² (oz-in²)	280 × 10^{-7} (1.53)		
Rated Current	A / phase	1.4		
Basic Step Angle		0.144°	0.1°	0.072°
Gear Ratio		1:5	1:7.2	1:10
Permissible Torque	N·m (lb-in)	3.5 (30.3)		
Permissible Thrust Load	N (lbs.)	100 (22.0)		
Permissible Overhung Load	N (lbs.)	250 (55.0)	300 (66.0)	
Backlash	minutes	3 (0.05°)		
Angle Transfer Error	minutes	6 (0.1°)		
Permissible Speed Range	Full Step	0 ~ 15000Hz (0 ~ 360r/min)	0 ~ 15000Hz (0 ~ 250r/min)	0 ~ 15000Hz (0 ~ 180r/min)
(Output Shaft Rotation Speed)	Half Step	0 ~ 30000Hz (0 ~ 360r/min)	0 ~ 30000Hz (0 ~ 250r/min)	0 ~ 30000Hz (0 ~ 180r/min)
Insulation Class		Class B (130°C (266°F)) UL / CSA : Class A (105°C (221°F))		
Power Source		Single phase 100-115V±15% 50/60Hz 5.5 A		
Output Current	A / phase	1.4		
Excitation Mode	Full Step	0.144° / step	0.1° / step	0.072° / step
	Half Step	0.072° / step	0.05° / step	0.036° / step
Input Signals: Input Signal Circuit		Photocoupler input, input resistance 220Ω, input current 20mA max. Signal voltage photocoupler ON : +4 ~ +5V, photocoupler OFF : 0 ~ +0.5V		
Input Signals: • CW Pulse Signal (Pulse Signal)		CW direction command pulse signal (step command pulse signal when in 1 pulse input mode) Pulse width : 5µsec min., pulse rise / fall : 2µsec max. Motor moves when the photocoupler state changes from ON to OFF.		
Input Signals: • CCW Pulse Signal (Rotation Direction Signal)		CCW direction command pulse signal (rotation direction signal when in 1 pulse input mode) photocoupler ON : CW, photocoupler OFF : CCW Pulse width : 5µsec min., pulse rise / fall : 2µsec max. Motor moves when the photocoupler state changes from ON to OFF.		
Input Signals: • All Windings Off Signal		When in the "photocoupler ON" state the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state the current level set by the RUN switch is supplied to the motor.		
Output Signals: Output Signal Circuit		Photocoupler · open collector output (emitter common) External use condition DC24V max.,10mA max.		
Output Signals: • Excitation Timing Signal		The signal is output every time the excitation sequence returns to the initial stage "0". (photocoupler : ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses		
Output Signals: • Overheat Signal		The signal is output when the internal temperature of the driver rises to above approximately 80°C (176°F). (photocoupler : ON) The motor stops automatically if the automatic current off function is ON.		
Functions		Automatic current cutback, Automatic current off, Step angle switch, Pulse input mode switch		
Indicators (LED)		Power input, Excitation timing signal output, Overheat signal output		
Cooling Method (Driver)		Convection		
Weight	Motor kg (lbs.)	1.5 (3.31)		
	Driver kg (lbs.)	0.95 (2.10)		
Insulation Resistance	Motor	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.		
Insulation Resistance	Driver	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the following places: • Power input terminal - protective earth terminal • Motor output terminal - protective earth terminal • Signal input / output terminals - power input terminal • Signal input / output terminals - motor output terminal		
Dielectric Strength	Motor	Sufficient to withstand 1.5kV, 50Hz applied for one minute between the motor coils and casing under normal temperature and humidity.		
Dielectric Strength	Driver	Sufficient to withstand the following for one minute, under normal temperature and humidity. • Power input terminal - protective earth terminal AC1.5kV 50Hz • Motor output terminal - protective earth terminal AC1.5kV 50Hz • Signal input / output terminals - power input terminal AC3.0kV 50Hz • Signal input / output terminals - motor output terminal AC3.0kV 50Hz		
Ambient Temperature Range	Motor	-10°C ~ +50°C (14°F ~ 122°F)		
	Driver	0°C ~ +50°C (32°F ~ 122°F)		

- Maximum holding torque is the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation), with consideration given to the permissible strength of the gear. Use this value to compare motor torque performance. When using the motor with the included driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50 %.
- The power source input current value represents the maximum current. (The input current varies according to the pulse frequency.)
- The permissible torque represents the torque value limited by the mechanical strength of the gear. The total torque including acceleration torque and load torque should not exceed this value.
- The permissible overhung load is the value at a position 10 mm (.4in.) from the end of the output shaft.

Model Number	single shaft / double shaft	UPK564AW-N25 / UPK564BW-N25	UPK564AW-N36 / UPK564BW-N36	UPK564AW-N50 / UPK564BW-N50
Maximum Holding Torque	N·m (lb-in)	6 (52.0)		
Rotor Inertia	kg·m² (oz-in²)	175 × 10^{-7} (0.96)		
Rated Current	A / phase	1.4		
Basic Step Angle		0.0288°	0.02°	0.0144°
Gear Ratio		1:25	1:36	1:50
Permissible Torque	N·m (lb-in)	6 (52.0)		
Permissible Thrust Load	N (lbs.)	100 (22.0)		
Permissible Overhung Load	N (lbs.)	400 (88.0)		
Backlash	minutes	3 (0.05°)		
Angle Transfer Error	minutes	6 (0.1°)		
Permissible Speed Range (Output Shaft Rotation Speed)	Full Step	0 ~ 15000Hz (0 ~ 72r/min)	0 ~ 15000Hz (0 ~ 50r/min)	0 ~ 15000Hz (0 ~ 36r/min)
	Half Step	0 ~ 30000Hz (0 ~ 72r/min)	0 ~ 30000Hz (0 ~ 50r/min)	0 ~ 30000Hz (0 ~ 36r/min)
Insulation Class		Class B (130°C (266°F)) UL / CSA : Class A (105°C (221°F))		
Power Source		Single phase 100-115V±15% 50/60Hz 5.5 A		
Output Current	A / phase	1.4		
Excitation Mode	Full Step	0.0288° / step	0.02° / step	0.0144° / step
	Half Step	0.0144° / step	0.01° / step	0.0072° / step
Input Signals: Input Signal Circuit		Photocoupler input, input resistance 220Ω, input current 20mA max. Signal voltage photocoupler ON : +4 ~ +5V, photocoupler OFF : 0 ~ +0.5V		
Input Signals: • CW Pulse Signal (Pulse Signal)		CW direction command pulse signal (step command pulse signal when in 1 pulse input mode) Pulse width : 5µsec min., pulse rise / fall : 2µsec max. Motor moves when the photocoupler state changes from ON to OFF.		
Input Signals: • CCW Pulse Signal (Rotation Direction Signal)		CCW direction command pulse signal (rotation direction signal when in 1 pulse input mode) photocoupler ON : CW, photocoupler OFF : CCW Pulse width : 5µsec min., pulse rise / fall : 2µsec max. Motor moves when the photocoupler state changes from ON to OFF.		
Input Signals: • All Windings Off Signal		When in the "photocoupler ON" state the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state the current level set by the RUN switch is supplied to the motor.		
Output Signals: Output Signal Circuit		Photocoupler · open collector output (emitter common) External use condition DC24V max.,10mA max.		
Output Signals: • Excitation Timing Signal		The signal is output every time the excitation sequence returns to the initial stage "0". (photocoupler : ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses		
Output Signals: • Overheat Signal		The signal is output when the internal temperature of the driver rises to above approximately 80°C (176°F). (photocoupler : ON) The motor stops automatically if the automatic current off function is ON.		
Functions		Automatic current cutback, Automatic current off, Step angle switch, Pulse input mode switch		
Indicators (LED)		Power input, Excitation timing signal output, Overheat signal output		
Cooling Method (Driver)		Convection		
Weight	Motor kg (lbs.)	1.5 (3.31)		
	Driver kg (lbs.)	0.95 (2.10)		
Insulation Resistance	Motor	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.		
Insulation Resistance	Driver	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the following places: • Power input terminal - protective earth terminal • Motor output terminal - protective earth terminal • Signal input / output terminals - power input terminal • Signal input / output terminals - motor output terminal		
Dielectric Strength	Motor	Sufficient to withstand 1.5kV, 50Hz applied for one minute between the motor coils and casing under normal temperature and humidity.		
Dielectric Strength	Driver	Sufficient to withstand the following for one minute, under normal temperature and humidity. • Power input terminal - protective earth terminal AC1.5kV 50Hz • Motor output terminal - protective earth terminal AC1.5kV 50Hz • Signal input / output terminals - power input terminal AC3.0kV 50Hz • Signal input / output terminals - motor output terminal AC3.0kV 50Hz		
Ambient Temperature Range	Motor	-10°C ~ +50°C (14°F ~ 122°F)		
	Driver	0°C ~ +50°C (32°F ~ 122 °F)		

- Maximum holding torque is the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation), with consideration given to the permissible strength of the gear. Use this value to compare motor torque performance. When using the motor with the included driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50 %.
- The power source input current value represents the maximum current. (The input current varies according to the pulse frequency.)
- The permissible torque represents the torque value limited by the mechanical strength of the gear. The total torque including acceleration torque and load torque should not exceed this value.
- The permissible overhung load is the value at a position 10 mm (.4in.) from the end of the output shaft.

10.2 Single phase 200-230V Input Unit

Model Number	single shaft	UPK566AJW-N5	UPK566AJW-N7.2	UPK566AJW-N10
	double shaft	UPK566BJW-N5	UPK566BJW-N7.2	UPK566BJW-N10
Maximum Holding Torque	N·m (lb-in)	3.5 (30.3)		
Rotor Inertia	kg·m² (oz-in²)	280 × 10^{-7} (1.53)		
Rated Current	A / phase	1.4		
Basic Step Angle		0.144°	0.1°	0.072°
Gear Ratio		1:5	1:7.2	1:10
Permissible Torque	N·m (lb-in)	3.5 (30.3)		
Permissible Thrust Load	N (lbs.)	100 (22.0)		
Permissible Overhung Load	N (lbs.)	250 (55.0)	300 (66.0)	
Backlash	minutes	3 (0.05°)		
Angle Transfer Error	minutes	6 (0.1°)		
Permissible Speed Range	Full Step	0 ~ 5000Hz (0 ~ 360r/min)	0 ~ 15000Hz (0 ~ 250r/min)	0 ~ 15000Hz (0 ~ 180r/min)
(Output Shaft Rotation Speed)	Half Step	0 ~ 30000Hz (0 ~ 360r/min)	0 ~ 30000Hz (0 ~ 250r/min)	0 ~ 30000Hz (0 ~ 180r/min)
Insulation Class		Class B (130°C (266°F)) UL / CSA : Class A (105°C (221°F))		
Power Source		Single phase 200-230V$^{+10\%}_{-15\%}$ 50/60Hz 3.5 A		
Output Current	A / phase	1.4		
Excitation Mode	Full Step	0.144° / step	0.1° / step	0.072° / step
	Half Step	0.072° / step	0.05° / step	0.036° / step
Input Signals: Input Signal Circuit		Photocoupler input, input resistance 220Ω, input current 20mA max. Signal voltage photocoupler ON : +4 ~ +5V, photocoupler OFF : 0 ~ +0.5V		
Input Signals: • CW Pulse Signal (Pulse Signal)		CW direction command pulse signal (step command pulse signal when in 1 pulse input mode) Pulse width : 5µsec min., pulse rise / fall : 2µsec max. Motor moves when the photocoupler state changes from ON to OFF.		
Input Signals: • CCW Pulse Signal (Rotation Direction Signal)		CCW direction command pulse signal (rotation direction signal when in 1 pulse input mode) photocoupler ON : CW, photocoupler OFF : CCW Pulse width : 5µsec min., pulse rise / fall : 2µsec max. Motor moves when the photocoupler state changes from ON to OFF.		
Input Signals: • All Windings Off Signal		When in the "photocoupler ON" state the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state the current level set by the RUN switch is supplied to the motor.		
Output Signals: Output Signal Circuit		Photocoupler · open collector output (emitter common) External use condition DC24V max.,10mA max.		
Output Signals: • Excitation Timing Signal		The signal is output every time the excitation sequence returns to the initial stage "0". (photocoupler : ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses		
Output Signals: • Overheat Signal		The signal is output when the internal temperature of the driver rises to above approximately 80°C (176°F). (photocoupler : ON) The motor stops automatically if the automatic current off function is ON.		
Functions		Automatic current cutback, Automatic current off, Step angle switch, Pulse input mode switch		
Indicators (LED)		Power input, Excitation timing signal output, Overheat signal output		
Cooling Method (Driver)		Convection		
Weight	Motor kg (lbs.)	1.5 (3.31)		
	Driver kg (lbs.)	0.95 (2.10)		
Insulation Resistance	Motor	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.		
Insulation Resistance	Driver	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the following places: • Power input terminal - protective earth terminal • Motor output terminal - protective earth terminal • Signal input / output terminals - power input terminal • Signal input / output terminals - motor output terminal		
Dielectric Strength	Motor	Sufficient to withstand 1.5kV, 50Hz applied for one minute between the motor coils and casing under normal temperature and humidity.		
Dielectric Strength	Driver	Sufficient to withstand the following for one minute, under normal temperature and humidity. • Power input terminal - protective earth terminal AC1.8kV 50Hz • Motor output terminal - protective earth terminal AC1.8kV 50Hz • Signal input / output terminals - power input terminal AC3.2kV 50Hz • Signal input / output terminals - motor output terminal AC3.2kV 50Hz		
Ambient Temperature Range	Motor	-10°C ~ +50°C (14°F ~ 122°F)		
	Driver	0°C ~ +50°C (32°F ~ 122°F)		

- Maximum holding torque is the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation), with consideration given to the permissible strength of the gear. Use this value to compare motor torque performance. When using the motor with the included driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50 %.
- The power source input current value represents the maximum current. (The input current varies according to the pulse frequency.)
- The permissible torque represents the torque value limited by the mechanical strength of the gear. The total torque including acceleration torque and load torque should not exceed this value.
- The permissible overhung load is the value at a position 10 mm (.4in.) from the end of the output shaft.

Note

- Do not measure insulation resistance or perform the dielectric withstand test while the motor and driver are connected.

Model Number	single shaft	UPK564AJW-N25	UPK564AJW-N36	UPK564AJW-N50
	double shaft	UPK564BJW-N25	UPK564BJW-N36	UPK564BJW-N50
Maximum Holding Torque	N·m (lb-in)	6 (52.0)		
Rotor Inertia	kg·m² (oz-in²)	175 × 10^{-7} (0.96)		
Rated Current	A / phase	1.4		
Basic Step Angle		0.0288°	0.02°	0.0144°
Gear Ratio		1:25	1:36	1:50
Permissible Torque	N·m (lb-in)	6 (52.0)		
Permissible Thrust Load	N (lbs.)	100 (22.0)		
Permissible Overhung Load	N (lbs.)	400 (88.0)		
Backlash	minutes	3 (0.05°)		
Angle Transfer Error	minutes	6 (0.1°)		
Permissible Speed Range	Full Step	0 ~ 15000Hz (0 ~ 72r/min)	0 ~ 15000Hz (0 ~ 50r/min)	0 ~ 15000Hz (0 ~ 36r/min)
(Output Shaft Rotation Speed)	Half Step	0 ~ 30000Hz (0 ~ 72r/min)	0 ~ 30000Hz (0 ~ 50r/min)	0 ~ 30000Hz (0 ~ 36r/min)
Insulation Class		Class B (130°C (266°F)) UL / CSA : Class A (105°C (221°F))		
Power Source		Single phase 200-230V$^{+10\%}_{-15\%}$ 50/60Hz 3.5 A		
Output Current	A / phase	1.4		
Excitation Mode	Full Step	0.0288° / step	0.02° / step	0.0144° / step
	Half Step	0.0144° / step	0.01° / step	0.0072° / step
Input Signals — Input Signal Circuit		Photocoupler input, input resistance 220Ω, input current 20mA max. Signal voltage photocoupler ON : +4 〜 +5V, photocoupler OFF : 0 〜 +0.5V		
Input Signals — • CW Pulse Signal (Pulse Signal)		CW direction command pulse signal (step command pulse signal when in 1 pulse input mode) Pulse width : 5µsec min., pulse rise / fall : 2µsec max. Motor moves when the photocoupler state changes from ON to OFF.		
Input Signals — • CCW Pulse Signal (Rotation Direction Signal)		CCW direction command pulse signal (rotation direction signal when in 1 pulse input mode) photocoupler ON : CW, photocoupler OFF : CCW Pulse width : 5µsec min., pulse rise / fall : 2µsec max. Motor moves when the photocoupler state changes from ON to OFF.		
Input Signals — • All Windings Off Signal		When in the "photocoupler ON" state the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state the current level set by the RUN switch is supplied to the motor.		
Output Signals — Output Signal Circuit		Photocoupler · open collector output (emitter common) External use condition DC24V max.,10mA max.		
Output Signals — • Excitation Timing Signal		The signal is output every time the excitation sequence returns to the initial stage "0". (photocoupler : ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses		
Output Signals — • Overheat Signal		The signal is output when the internal temperature of the driver rises to above approximately 80°C (176°F). (photocoupler : ON) The motor stops automatically if the automatic current off function is ON.		
Functions		Automatic current cutback, Automatic current off, Step angle switch, Pulse input mode switch		
Indicators (LED)		Power input, Excitation timing signal output, Overheat signal output		
Cooling Method (Driver)		Convection		
Weight	Motor kg (lbs.)	1.5 (3.31)		
	Driver kg (lbs.)	0.95 (2.10)		
Insulation Resistance	Motor	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.		
	Driver	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the following places: • Power input terminal - protective earth terminal • Motor output terminal - protective earth terminal • Signal input / output terminals - power input terminal • Signal input / output terminals - motor output terminal		
Dielectric Strength	Motor	Sufficient to withstand 1.5kV, 50Hz applied for one minute between the motor coils and casing under normal temperature and humidity.		
	Driver	Sufficient to withstand the following for one minute, under normal temperature and humidity. • Power input terminal - protective earth terminal AC1.8kV 50Hz • Motor output terminal - protective earth terminal AC1.8kV 50Hz • Signal input / output terminals - power input terminal AC3.2kV 50Hz • Signal input / output terminals - motor output terminal AC3.2kV 50Hz		
Ambient Temperature Range	Motor	-10°C ~ +50°C (14°F ~ 122°F)		
	Driver	0°C ~ +50°C (32°F ~ 122°F)		

- Maximum holding torque is the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation), with consideration given to the permissible strength of the gear. Use this value to compare motor torque performance. When using the motor with the included driver, the driver's automatic current cutback at motor standstill function reduces maximum holding torque by approximately 50 %.
- The power source input current value represents the maximum current. (The input current varies according to the pulse frequency.)
- The permissible torque represents the torque value limited by the mechanical strength of the gear. The total torque including acceleration torque and load torque should not exceed this value.
- The permissible overhung load is the value at a position 10 mm (.4in.) from the end of the output shaft.

Note

- Do not measure insulation resistance or perform the dielectric withstand test while the motor and driver are connected.

Stepping Motor

Model	single shaft	PK566AW-N5 PK566AW-N7.2 PK566AW-N10	PK564AW-N25 PK564AW-N36 PK564AW-N50
	double shaft	PK566BW-N5 PK566BW-N7.2 PK566BW-N10	PK564BW-N25 PK564BW-N36 PK564BW-N50
Degree of Protection		IP30	
Operation Environment	Ambient Temperature	−10 ~ +50°C (14 ~ 122°F) (non-freezing)	
	Humidity	85 % max. (non-condensing)	
	Altitude	Up to 1000m (3280ft.) above sea level	
	Surrounding Atmosphere	No corrosive gas, dust, water or oil	
Storage Environment	Ambient Temperature	−25 ~ +70°C (−13 ~ +158°F)	
	Humidity	85 % max. (non-condensing)	
	Altitude	Up to 3000m (9840ft.) above sea level	
	Surrounding Atmosphere	No corrosive gas, dust, water or oil	
Shipping Environment	Ambient Temperature	−25 ~ +70°C (−13 ~ +158°F)	
	Humidity	85 % max. (non-condensing)	
	Altitude	Up to 3000m (9840ft.) above sea level	
	Surrounding Atmosphere	No corrosive gas, dust, water or oil	
Applicable Standards	UL, CSA Standards	UL1004, UL519 [UL File No. E64199] CSA C22.2 No.77, 100 • Recognized by UL for CSA standards.	
	EN Standards	EN60950, EN60034-1, EN60034-5 [VDE Licence No. 6763ÜG]	
Installation Conditions		Built-in type Class I equipment Overvoltage category : II Pollution degree : Class 2	

Stepping Motor Driver

Model		UDK5114NW2	UDK5214NW
Protective Range		———	
Operation Environment	Ambient Temperature	0 ~ +50°C (32 ~ 122°F) (non-freezing)	
	Humidity	85 % max. (non-condensing)	
	Altitude	Up to 1000m (3280ft.) above sea level	
	Surrounding Atmosphere	No corrosive gas, dust, water or oil	
Storage Environment	Ambient Temperature	−25 ~ +70°C (−13 ~ +158°F)	
	Humidity	85 % max. (non-condensing)	
	Altitude	Up to 3000m (9840ft.) above sea level	
	Surrounding Atmosphere	No corrosive gas, dust, water or oil	
Shipping Environment	Ambient Temperature	−25 ~ +70°C (−13 ~ +158°F)	
	Humidity	85 % max. (non-condensing)	
	Altitude	Up to 3000m (9840ft.) above sea level	
	Surrounding Atmosphere	No corrosive gas, dust, water or oil	
Applicable Standards	UL, CSA Standards	UL508C [UL File No. E171462] CSA C22.2 No.14 • Recognized by UL for CSA standards.	
	EN Standards	EN60950 (DEMKO Certificate No. 123356-08 (Single Phase 100-115V input) 123913-05 (Single Phase 200-230V input)) EN50178 (DEMKO Certificate No. 123860-09 (Single Phase 100-115V input) 123893-05 (Single Phase 200-230V input))	
Installation Conditions		Built-in type Class I equipment Overvoltage category : II Pollution degree : Class 2	

• Motors and drivers are not measured individually for EMC. Perform the EMC test when products are incorporated into the final equipment.

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