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HP-4062-2

SUPER VEXTA®

UL, CSA Standards Recognized

5 Phase Stepping Motor and Driver

UPK·W series

- Standard Type
- High Speed Type

OPERATING MANUAL

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Thank you for purchasing ORIENTAL MOTOR products.
Please read this operating manual thoroughly before installing and operating products, and always keep the manual where it is readily accessible.

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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.
- Motor and driver safety standards are approved separately. Safety standard details are indicated on Page.43.

Precautions for Operation

- Always turn off the power to the driver before conducting checks or performing work on the product.
- The enclosure temperature of this motor and driver can exceed 70℃ (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.

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2. Product Verification

2. 1 Equipment Checklist

Confirm that the following equipment is included with your unit.
Contact your nearest sales office if something is either not included or damaged.

- Motor 1
- Driver 1
- Operation Manual 1

2. 2 Model Numbers And Motor/Driver Combinations

The **UPK·W** series is a combined package which includes a stepping motor and driver.
This operation manual is designated for the following products.

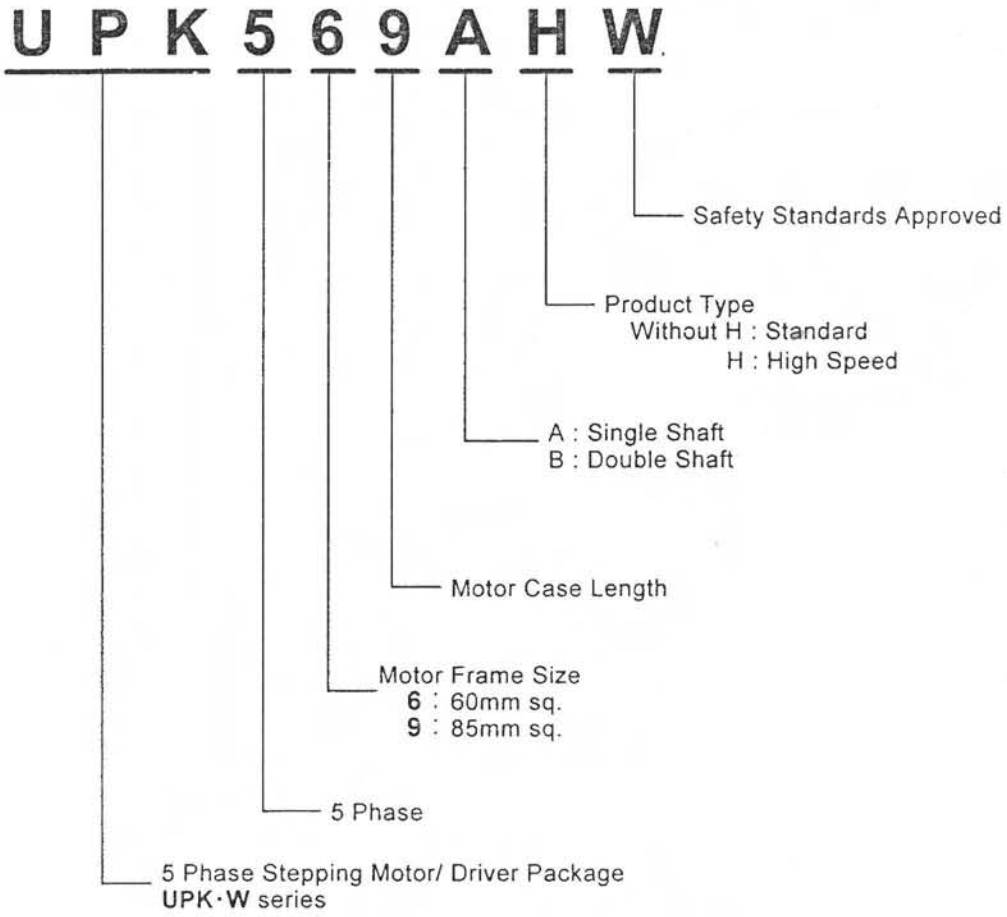
Product Type	Package Model Number	Motor		Driver	
		Model Number	Rated Current	Model Number	Output Current
Standard	**UPK564AW** **UPK564BW** **UPK566AW** **UPK566BW** **UPK569AW** **UPK569BW** **UPK596AW** **UPK596BW** **UPK599AW** **UPK599BW** **UPK5913AW** **UPK5913BW**	PK564AW PK564BW PK566AW PK566BW PK569AW PK569BW PK596AW PK596BW PK599AW PK599BW PK5913AW PK5913BW	1.4A/phase	UDK5114NW	1.4A/phase (max.)
High Speed	**UPK569AHW** **UPK569BHW** **UPK596AHW** **UPK596BHW** **UPK599AHW** **UPK599BHW** **UPK5913AHW** **UPK5913BHW**	PK569AHW PK569BHW PK596AHW PK596BHW PK599AHW PK599BHW PK5913AHW PK5913BHW	2.8A/phase	UDK5128NW	2.8A/phase (max.)

Note

- The driver and motor is precision equipment and should not be dropped or subject to any physical shocks.
- Motor and driver safety standards are approved separately.
- Safety standards for the motor and driver as a combined unit must be evaluated when installed in the final product.

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2. 3 Interpreting The Model Number

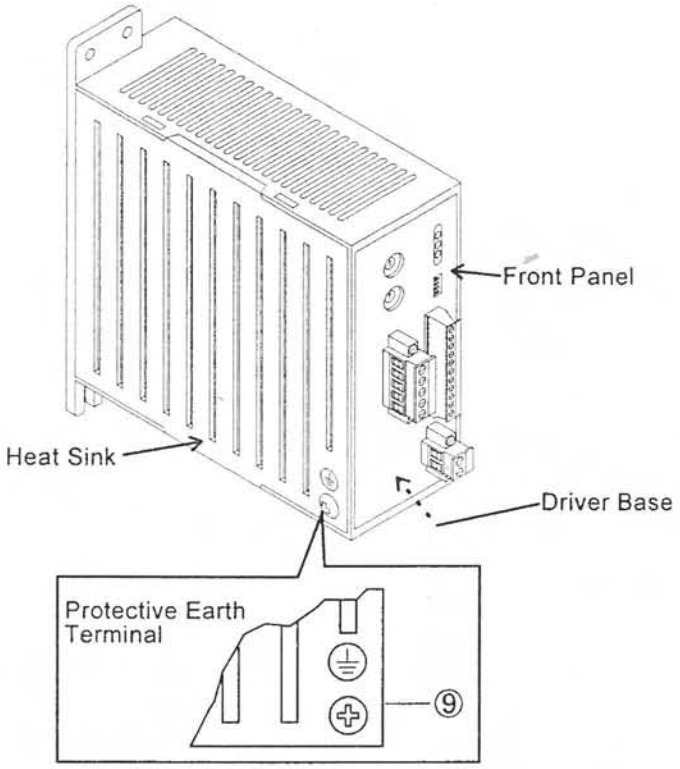


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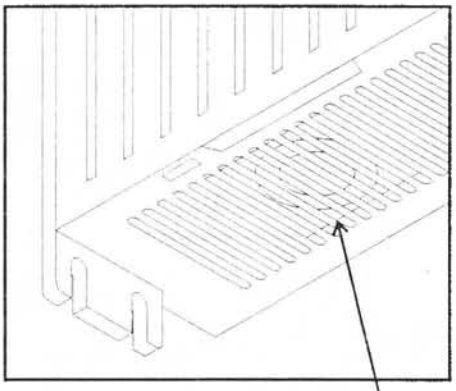
3. Names and Functions of Driver Parts

Standard Type / High Speed Type

Standard : UDK5114NW
High Speed : UDK5128NW



Driver Base



Front Panel

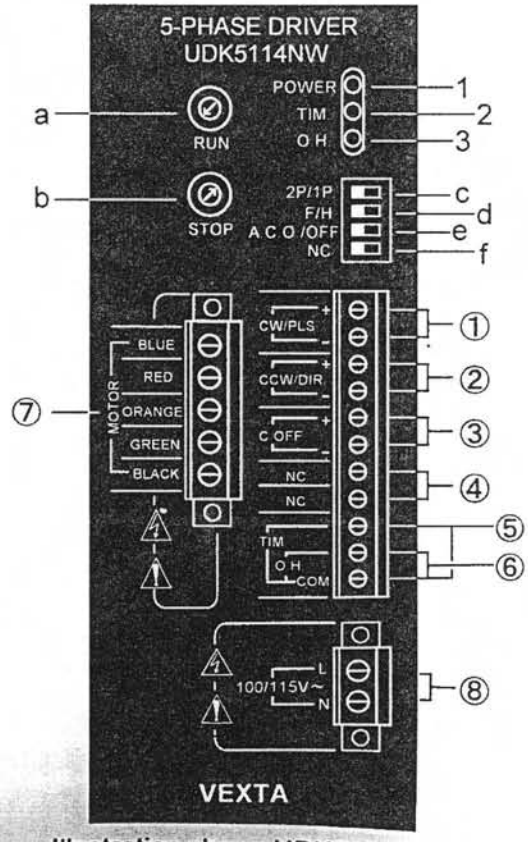


Illustration shows UDK5114NW

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3. 1 LED Indicators

The LED indicators show the state of various input/output signals.
They are indicated on page 6 as 1~3.

	LED Name	Indication	Color	Condition When LED ON	Page Reference
1	Power Input LED	POWER	Green	Lights when single phase 100V±15% (50/60Hz) or single phase 115V±15% (60Hz) is input.	–
2	Excitation Timing Signal Output LED	TIM.	Green	Lights when the excitation timing signal is output.	–
3	Overheat Signal Output LED	O.H.	Red	Lights when the overheat signal is output.	Page 24

3. 2 Switches

The switches are indicated on page 6 as **a~f**

	Switch Name	Indication	Factory Setting	Function	Page Reference
a	Motor Running Current Adjustment Rotary Switch	RUN	F	The current while the motor is running can be adjusted with this digital switch. Adjustment is simple, and an ammeter is not necessary.	Page 32,33
b	Motor Standstill Current Adjustment Rotary Switch	STOP	7	The current while the motor is at standstill can be reduced with this digital switch. Adjustment is simple and an ammeter is not necessary. Be sure to keep the switch set to 7 or below.	Page 32,33
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 18
d	Step Angle Switch	F/H	F	The motor step angle can be set to full step or half step with this switch.	Page 18
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℃. This function can be enabled or disabled with this switch.	Page 18,19
f	No Connection	NC	NC	This switch has no function. It is an open terminal which is not connected to the driver.	–

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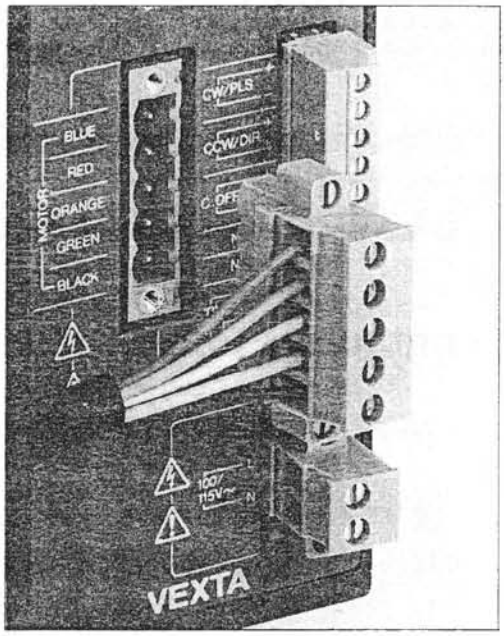
3. 3 Terminals

The input and output terminals are indicated on Page.6 as ①~⑨.

Terminal Name	Indication	Function	Page Reference
① CW Pulse Signal Input Terminal	CW	The CW direction command signal is input to this terminal. When a pulse is input to the terminal the motor output shaft will rotate one step in a clockwise direction. (When in 1 pulse input mode a pulse signal is input to this terminal.)	Page.20,21
② CCW Pulse Signal Input Terminal	CCW	The CCW direction command signal is input to this terminal. When a pulse is input to the terminal the motor output shaft will rotate one step in a counterclockwise direction. (When in 1 pulse input mode a rotation direction signal is input to this terminal.)	Page.20,21
③ Output Current Off Signal Input Terminal	C.OFF	The output current off signal is input to this terminal. When a signal is input to the terminal the driver will cut the power 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 to manually set the motor to the home position etc.	Page.22
④ No Connection	NC	This terminal has no function. It is an open terminal which is not connected to the driver.	—
⑤ Excitation Timing Signal Output Terminal	TIM.	The excitation timing signal is output from this terminal. This signal is output when the motor excitation (current running through the winding) is in the initial stage.	Page.23
⑥ Overheat Signal Output Terminal	O.H.	The overheat signal is output from this terminal. This signal is output when the internal temperature of the driver rises above 80°C. This is used to prevent excess heat from damaging the driver.	Page.24,25
⑦ Motor Connection Terminal	MOTOR	This is the output terminal for the motor. The colors indicated on this terminal are matched to the motor lead wires for connection.	Page.26 ~28
⑧ Power Source Connection Terminal	100/115V~	This is connected to a single phase 100V±15% 50/60Hz or 115V±15% 60Hz power source.	Page.31
⑨ Protective Earth Terminal	⏚	This terminal is connected to the driver casing.	Page.30

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3. 4 Connector

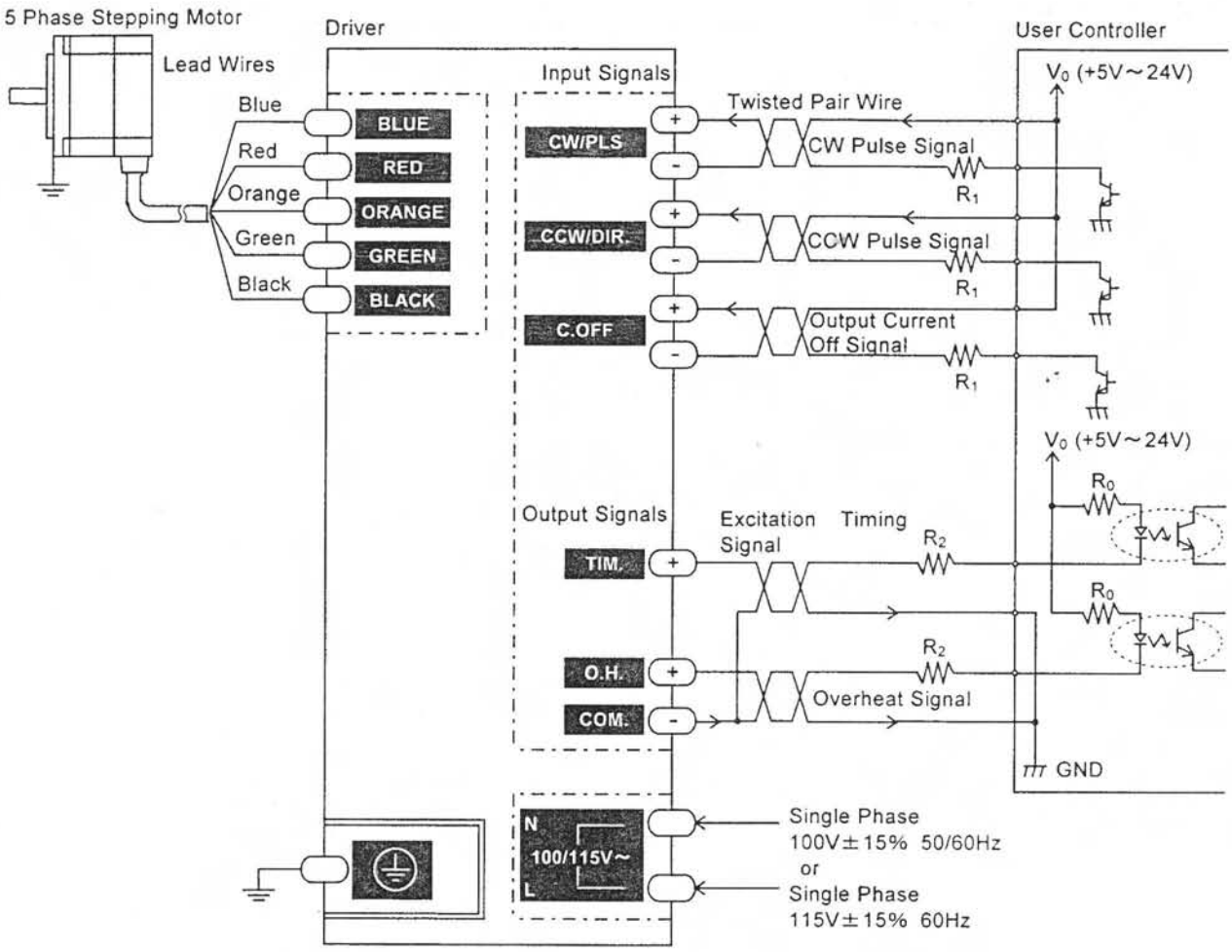


Two types of combination connectors are used on the driver. These combination connectors are very easy to use and have the benefits of both a conventional terminal block and a connector type terminal. Simply insert the signal lines, motor lead wires, and power lines into the connector and tighten the screws. The combination connector incorporates a mechanism to prevent loosening, and is very dependable without the use of a crimp terminal.

The connectors used for the motor leads (cabtyre cable) and power line have a screw flange. Be sure to properly tighten the flange screws.

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7. 1. 2 Connections To Your Controller



indicates the terminals as they appear on the front panel of the driver.

indicates the combination connectors.

indicates the driver's side panel.

Pulse input signal connections

Keep the voltage between 5V and 24V.
When voltage is equal to 5V external resistance R is not necessary.
When voltage is above 5V, connect external resistance R and keep the input current below 15mA.

Other input signal connections

Keep the voltage between 5V and 24V.
When voltage is equal to 5V external resistance R is not necessary.
When voltage is above 5V connect external resistance R_1 and keep the input current below 20mA.

Output signal connections

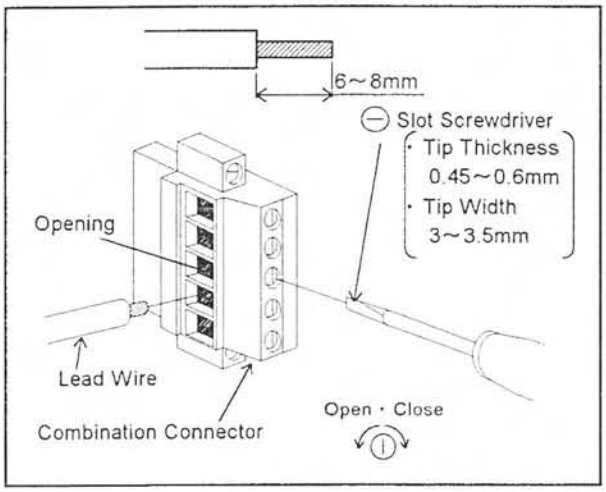
Keep the voltage between 5V and 24V.
Keep the current below 10mA.
If the current exceeds 10mA connect external resistance R_2.

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7. 2 Connections To The Combination Connector

It is not necessary to use a crimp terminal to connect the lead wires when using the combination connector. Follow the connection procedure below.

Connector for motor and power lines



① Use a slot screwdriver to loosen the combination connector flange screws.

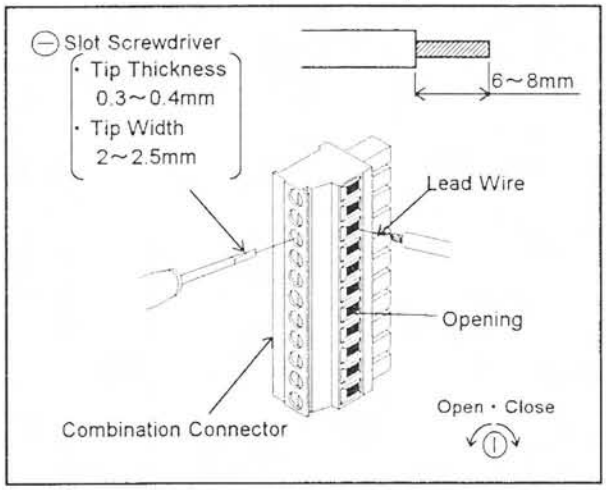
② Cut back the wire insulation 6~8 mm from the end of the wire and twist the wire strands together.
- Use wire type : AWG28~12 (0.08mm^2~4mm^2)
- Be sure that no loose wire stands cause a short circuit with the adjacent terminal
- Do not solder the ends of the lead wires as this may result in a poor connection contact.

③ Use a slot screwdriver to loosen and fully open the combination connector opening.

④ Insert the lead wire into the connector and tighten the screw.
- Tightening torque : 0.5~0.6 N·m (5~6 kgcm)

⑤ Tighten the combination connector flange screws.
- Tightening Torque : 0.3~0.5 N·m (3~5 kgcm)

Connector for input / output signals



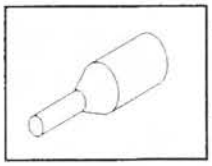
① Cut back the wire insulation 6~8 mm from the end of the wire and twist the wire strands together.
- Use wire type AWG28~16 (0.08~1.5mm^2)
- Be sure that no loose wire stands cause a short circuit with the adjacent terminal
- Do not solder the ends of the lead wires as this may result in a poor connection contact.

② Use a slot screwdriver to loosen and fully open the combination connector opening.

③ Insert the lead wire into the connector and tighten the screw.
- Tightening torque: 0.22~0.25 N·m (2.2~2.5 kgcm)

If using a crimp terminal for connection, use the type indicated in the illustration below.
The crimp terminal used will vary according to the wire gage.

Pheonix terminal



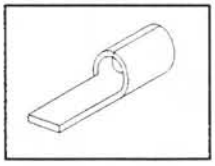
AI 0.25-6
Appropriate Wire Gage : AWG24 (0.2mm^2)

AI 0.34-6
Appropriate Wire Gage : AWG22 (0.35mm^2)

AI 0.5-6
Appropriate Wire Gage : AWG20 (0.5mm^2)

AI 0.75-6
Appropriate Wire Gage : AWG18 (0.75mm^2)

Nichifu terminal



BT-1.25-9-1
Appropriate Wire Gage : AWG22~16 (0.35~1.5mm^2)

※ The Nichifu terminal can not be used for input signal connections.

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7. 3 Connecting The Motor And Driver

Connect the motor to the driver.

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

7. 4 Connecting The Driver And Controller

Connect the driver to the controller.

Confirm the following when making the connection.

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

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

To ground the shield material, connect it to the driver's protective earth terminal.

7. 5 Ground

7. 5. 1 Grounding The Motor

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

The Protective Earth is a terminal which provides a means of grounding the conductive parts which are capable of assuming hazardous voltages if the basic insulation fails.

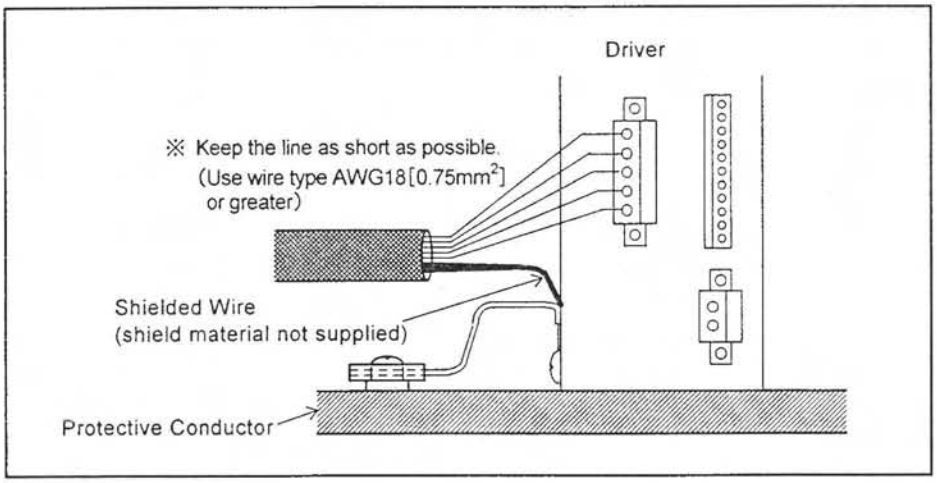
If electrical noise interference from the motor cable becomes a problem, shield the wire with conductive tape or wire mesh (not supplied).

To ground the shield material, connect it to the driver's protective earth terminal for grounding.

7. 5. 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 to a protective conductor.



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7. 6 Connecting The Powers Source

Connect to a power source of single phase 100V± 15% 50/60Hz or single phase 115V± 15% 60Hz.
Use a power source which will supply sufficient input current.
The current valve for input power as indicated in the specifications on Page.38 ~ Page.41 is the maximum valve.
The current valve will vary according to the pulse frequency.
Refer to the speed - torque characteristics in the product guide or the general catalog for the input current value - pulse frequency relationship.

Note

- Use wire type AWG18 (0.75mm^2) or greater for power lines.
- 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. 7 Turning On The Power

Before turning on the power, be sure that the signal lines, motor lead wires (cabtyre type), power lines, and earth line are all connected properly.

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8. Motor Current Adjustment

If maximum motor torque is not needed, adjustment of the motor running current or the motor standstill current can be used to control motor vibration, and motor and driver heat generation.

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

To reduce motor vibration ⇨ **Reduce the motor running current**

Driver Front Panel

Standard : UDK5114NW
High Speed : UDK5128NW

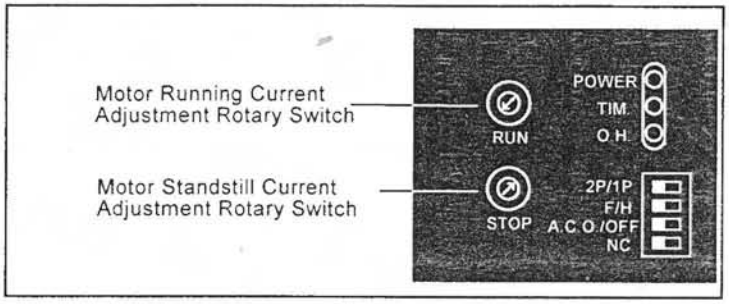


Illustration shows UDK5114NW

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8.1 Motor Running Current Adjustment

The motor running current is factory set to the motor's rated current.
(motor running current rotary switch RUN: 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 listed in the following chart.

RUN switch settings and corresponding current values (representative values)



RUN Switch Settings	Running Current [A/phase]	
	UDK5114NW	UDK5128NW
0	0.35	0.70
1	0.42	0.80
2	0.50	0.95
3	0.56	1.05
4	0.63	1.23
5	0.70	1.35
6	0.77	1.50
7	0.84	1.63
8	0.96	1.80
9	0.98	1.98
A	1.05	2.10
B	1.12	2.25
C	1.19	2.40
D	1.26	2.50
E	1.33	2.70
F	1.40	2.80

8.2 Motor Standstill Current Adjustment

The current at motor standstill can be adjusted to reduce motor/driver heat generation. The motor standstill current is factory set to approximately 43% (UDK5114NW), or 41% (UDK5128NW) of the rated current (standstill current adjustment switch "STOP" set to "7"). Be sure to keep the switch set to 7 or below.
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	% of Running Current	
	UDK5114NW	UDK5128NW
0	6	7
1	6	7
2	6	7
3	14	13
4	21	20
5	28	27
6	35	34
7	43	41
8	50	46
9	57	55
A	64	63
B	71	71
C	79	79
D	86	86
E	93	93
F	100	100

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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 lit up? (If lit, operation is normal)	If the power LED is not lit up, check if the power source is properly connected. Verify that AC100V or AC115V is being input.
	2. Is the driver overheat LED OFF?	The overheat LED lights up when the O.H. signal is output. If the automatic current off function switch is set to the ACO position at this time the motor will lose all excitation (no holding torque). Refer to Page.6～7 and take the necessary steps to prevent the overheat signal from being output.
	3. Are the driver and motor correctly connected?	Check the driver connection terminals. If the motor cable has been extended check the extension connection.
	4. Are the current adjustment rotary switches (RUN or STOP) set too low?	These rotary switches control the output current to the motor. (Refer to Page.32,33) 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 4 items above.	
The motor does not rotate when a pulse signal is input.	5. Are the pulse signal lines correctly connected? Are the pulse signal waveform characteristics correct?	Check the connections and pulse signal waveform characteristics (refer to Page.20,21) Use a controller which is able to output a standard pulse signal.
	6. While in 2 pulse input mode (pulse input mode switch set to the 2P position) are either the CW or CCW pulse signal input terminals at "L" level?	The motor will not rotate when inputting a pulse signal if the other pulse signal is at "L" level. Be sure to keep the signal at "H" level.
	7. While in 1 pulse input mode (pulse input mode switch set to the 1P position) is the pulse signal connected to the CCW pulse signal terminal?	Connect the pulse signal to the CW pulse signal terminal.
The motor rotates in the wrong direction.	8. While in 2 pulse input mode (pulse input mode switch set to the 2P position) are the CW and CCW pulse signal lines connected backwards?	Connect the CW pulse signal line to the CW pulse signal input terminal and connect the CCW pulse signal line to the CCW pulse input terminal.
	9. While in 1 pulse input mode (pulse input mode switch set to the 1P position) leave the CCW pulse signal terminal unconnected and try inputting a pulse signal to the CW pulse signal terminal.	If the motor rotates in a counterclockwise direction the motor and driver are normal. Recheck the rotation direction signal levels. ("L" level = clockwise, "H" level = counterclockwise)
Motor rotation is erratic.	First check items 4,5, and 6.	

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PROBLEM	CHECK POINTS	MEASURES
Motor start up is unstable	10.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.	11.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.
	12.Is the input pulse frequency set to match the amount of motor rotation?	Check the controller pulse frequency setting.
The motor looses synchronization during acceleration or while running.	13.Is the overheat signal output LED OFF? (If OFF, operation 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 pages 24,25 and take the necessary steps to prevent the overheat signal from being output.
	14. Is the starting pulse frequency too high?	Check this by decreasing the frequency.
	15.Is the acceleration or deceleration time too short?	Check this by increasing the acceleration/ deceleration time.
	16.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.	17. Is the output torque too high?	Try reducing the motor running current with the current adjustment rotary switch (RUN).
	18. 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).
Motor temperature is very high.	19.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 discharge from the motor.) For UL,C-UL standards insulation is Class A(105℃). (Keep the temperature of the motor case below 75℃) For other standards insulation is Class B(130℃) (Keep the temperature of the motor case below 100℃)
	20.Is the STOP current adjustment rotary switch set to "8" or above?	When the switch is set to "8" or above the current will not be reduced when the motor is at standstill. Refer to pages 32, 33 and set the switch to "7" or below.

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PROBLEM	CHECK POINTS	MEASURES
The overheat signal is output	21. Is the driver ambient temperature 0℃～50℃?	If not, take the necessary steps to make the ambient temperature of 0℃～50℃.
	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 causes the input current to be at maximum?	If changing the pulse rate is a possibility, try adjusting it enough to decrease the input current. For a detailed explanation refer to the "speed vs. torque characteristics" for the driver in the general catalog.

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