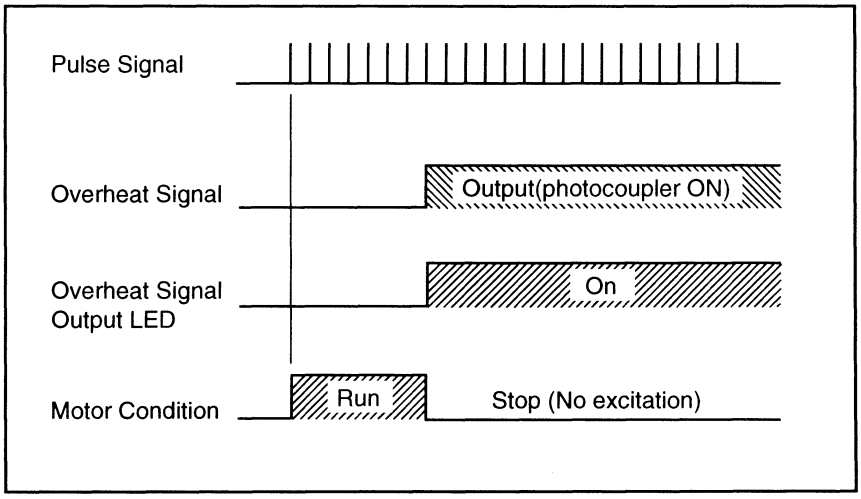
Relation to the Automatic Current Off Function Switch (See page 12)

When set to A.C.O.

① The overheat signal is output when the internal temperature of the driver exceeds above 80℃ (176°F) during operation.

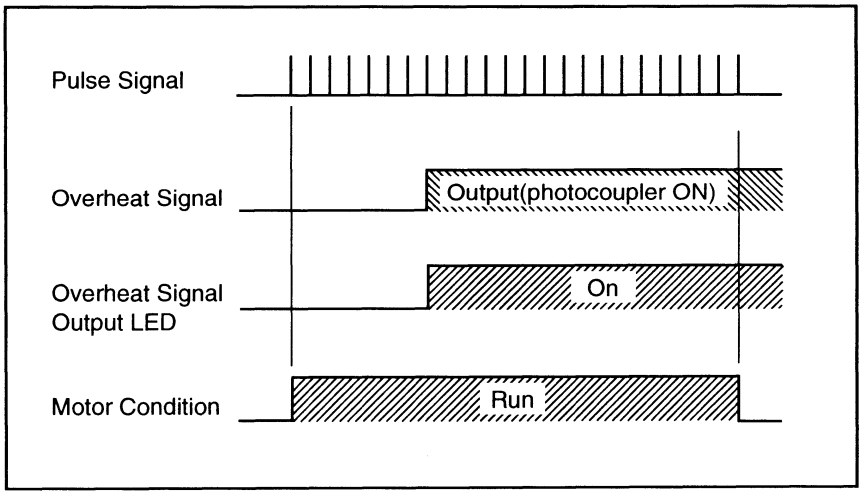
② Regardless of any pulse signals input, motor excitation will cease (shaft free) and the motor will come to a natural stop.



When set to OFF

① The overheat signal is output when the internal temperature of the driver exceeds above 80℃ (176°F) during operation.

② The motor will continue to run regardless of the overheat signal output.



7. Connections

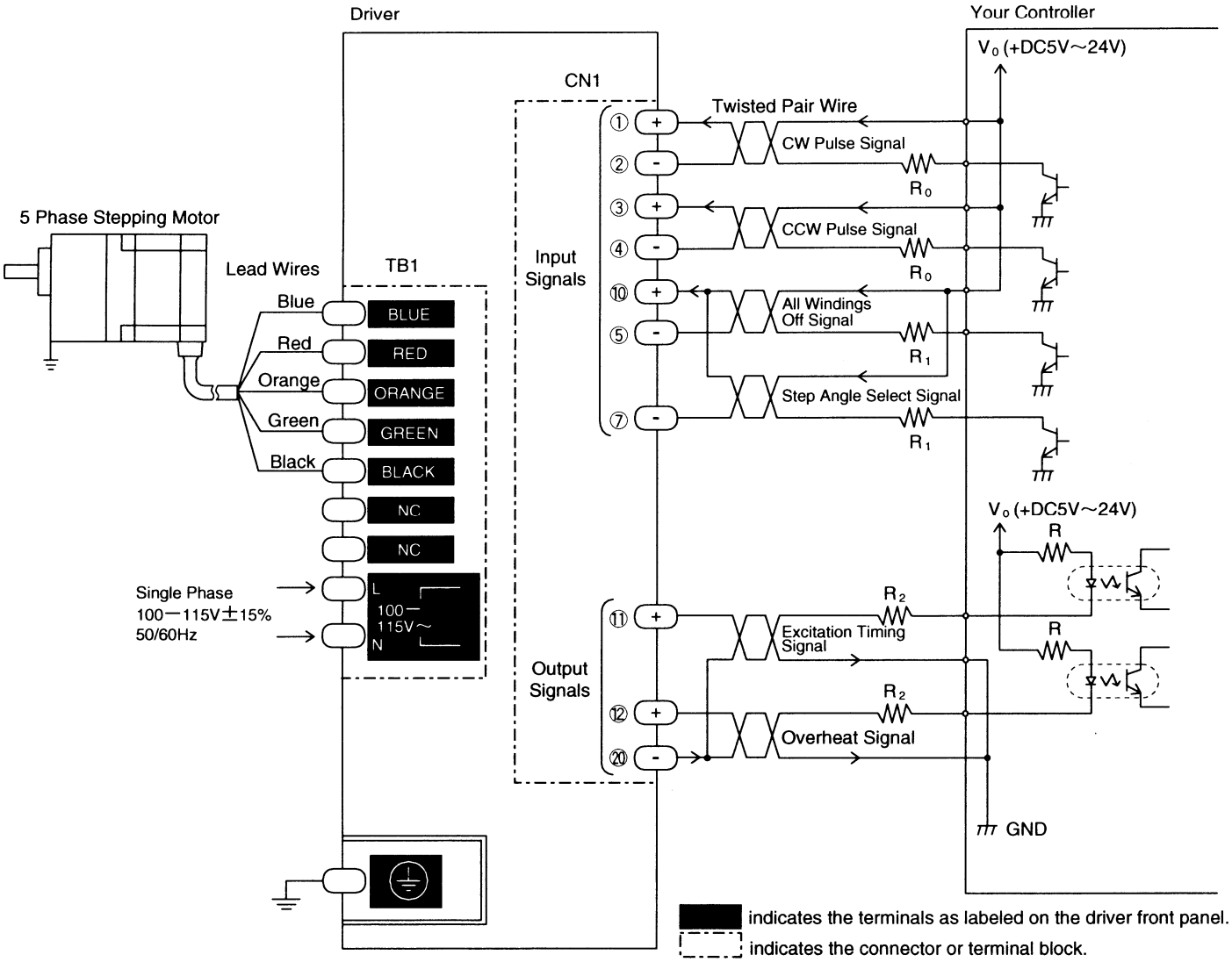
Make connections in the following order.

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.

The illustration on the following page is a simplification of the front panel of the DFU1514W driver.



indicates the terminals as labeled on the driver front panel.

indicates the connector or terminal block.

indicates the heat sink side of the driver.

The numbers within ○ on the driver indicate the pin number of connector CN1.

Pulse signal connections

Keep the voltage between DC5V and DC24V.
When voltage is equal to DC5V, external resistance R_0 is not necessary.
When voltage is above DC5V, connect external resistance R_0 and keep the input current below 15mA.

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.

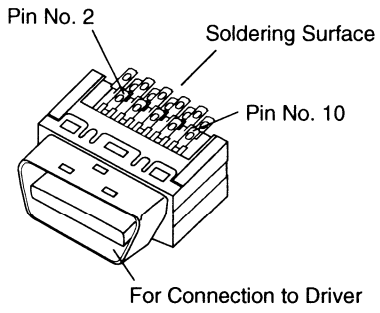
Terminal connections

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

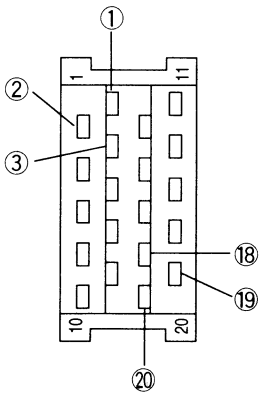
* The connection of the input signal shown above is 2 pulse input mode.
For 1 pulse input mode turn the pulse input mode switch to "1P", and input pulse signal to CW pulse input terminal and input rotation direction signal to CCW pulse input terminal. (Refer to the pages 12, 14, 15, and 16 for details.)

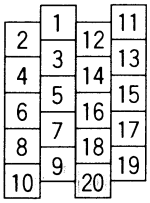
7.2 Preparing the I/O Signal Connector

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)

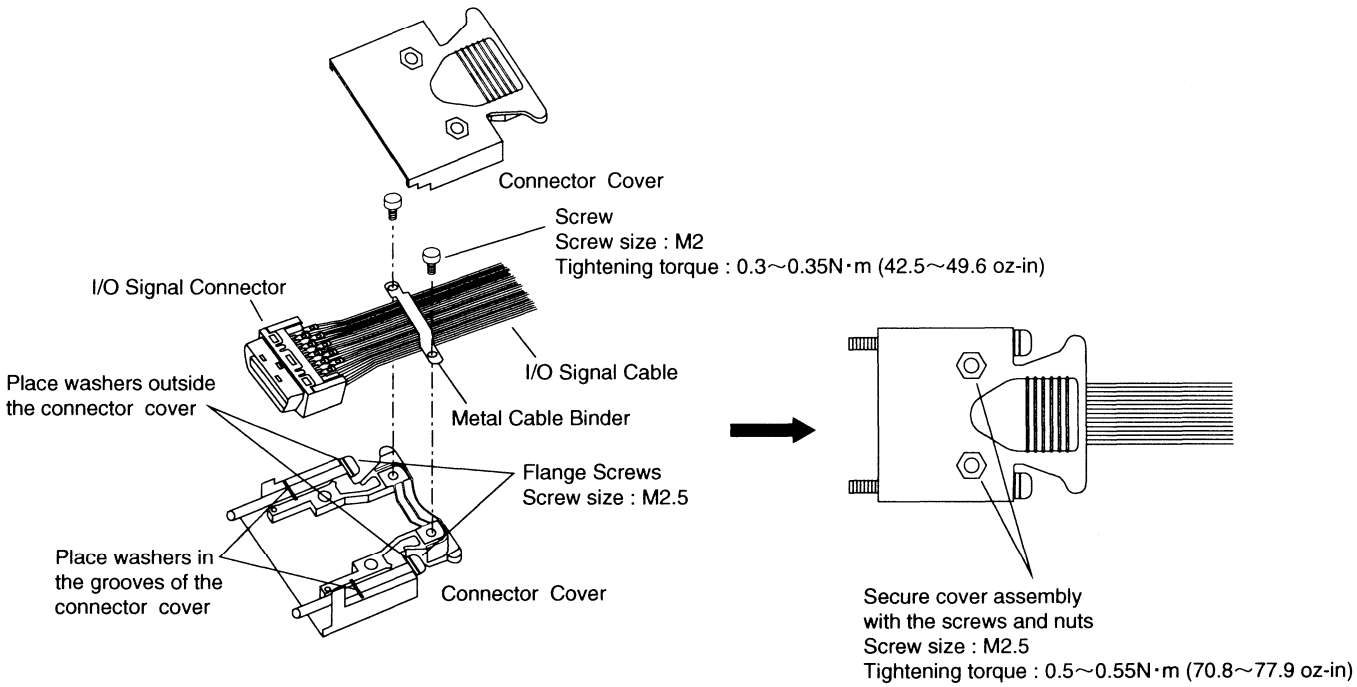
Equivalent Product
Connector : 10120-3000VE (Sumitomo 3M)
Connector cover : 10320-52A0-008 (Sumitomo 3M)

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

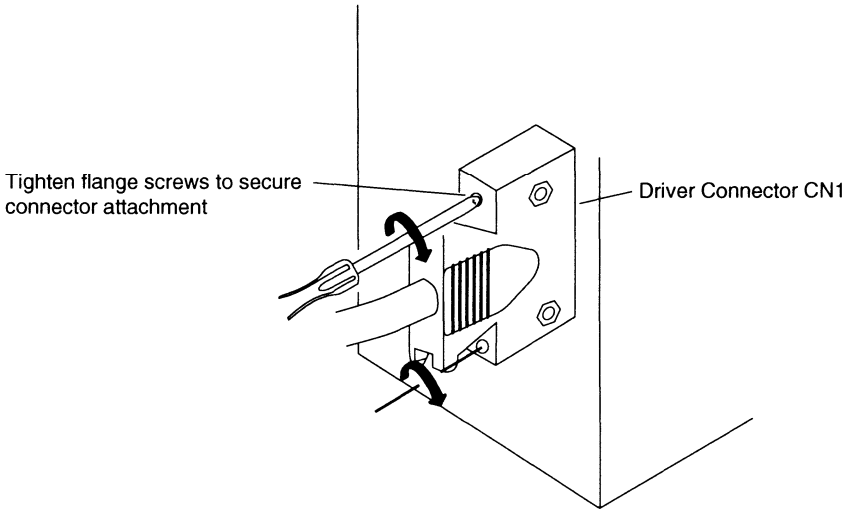
7.3 Connector Cover Assembly and Connection to the Driver

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.



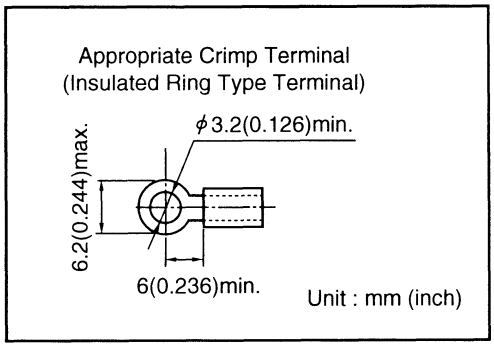
(2) Plug the I/O connector into driver connector CN1, then tighten the flange screws to secure the connector to the driver.
(Screw tightening torque: 0.3 ~ 0.35N·m (42.5 ~ 49.6oz-in))



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.

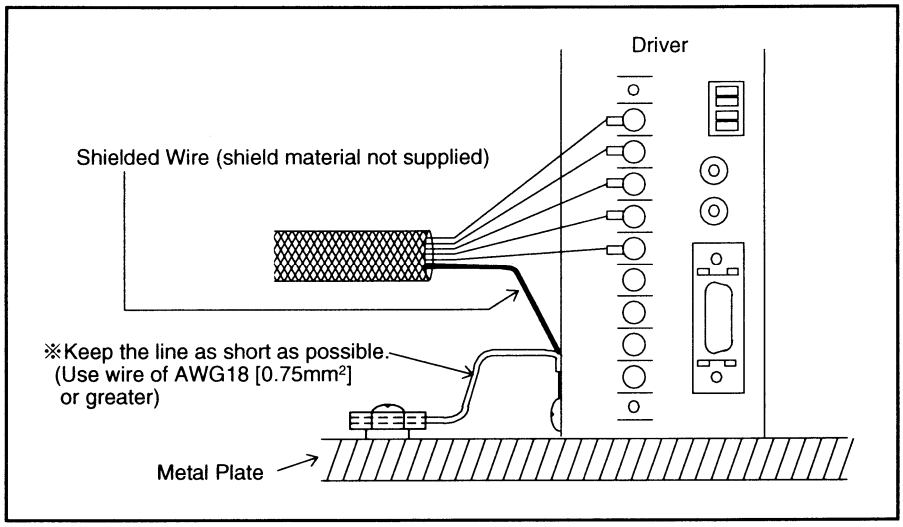
If electrical noise interference from the motor cable becomes a problem, shield the cable with conductive tape or wire mesh (not supplied).

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.

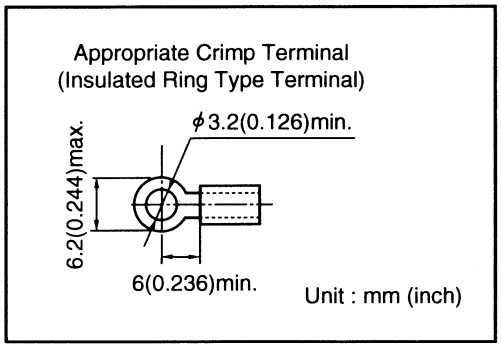
Use a power source which will supply sufficient input current.

The current value for input power as indicated in the specifications on pages 32 ~ 35 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.

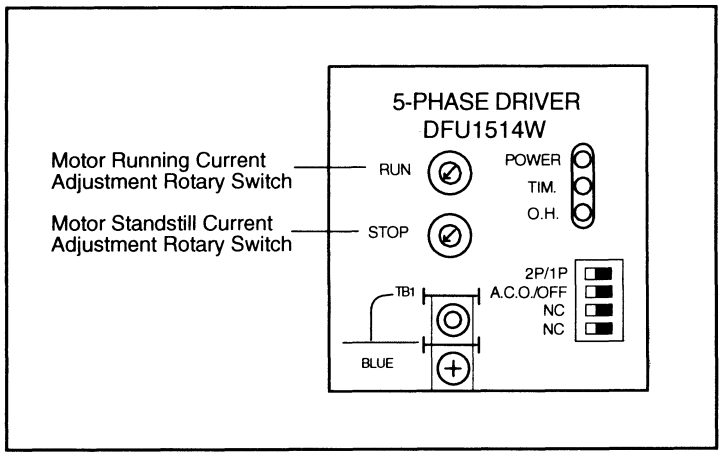
8. Motor Current Adjustment

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

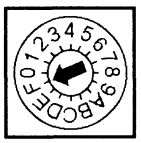
Driver Front Panel
DFU1514W



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)



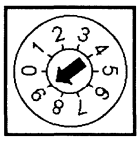
RUN Switch Settings	Running Current [A/phase]
	DFU1514W
0	0.47
1	0.53
2	0.59
3	0.65
4	0.71
5	0.78
6	0.84
7	0.90
8	0.96
9	1.03
A	1.09
B	1.15
C	1.21
D	1.28
E	1.34
F	1.40

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 [%]
	DFU1514W
0	21
1	21
2	23
3	27
4	30
5	34
6	38
7	41
8	45
9	49

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 100V-115V ± 15% 50/60Hz 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 24 ~ 27 (page 31) 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 27, 28). 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.	

PROBLEM	CHECK POINTS	MEASURES
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 ~ 16). 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.
	9. If the step angle is set to a small angle the motor may appear to be at rest during low speed operation.	Check for a change in shaft position over a period of time, or increase the size of the step angle.
	10. Is the input pulse width too short?	When a small step angle is set, a high pulse speed is required. As the pulse speed increases the pulse width decreases, and if the pulse width becomes too small the driver will not be able to respond. Increase the pulse width, or increase the size of the step angle and decrease the pulse frequency. Keep the length of the pulse width within the designated pulse specifications.
The motor rotates in the wrong direction.	11. In 2 pulse input mode (pulse input mode switch in 2P position) are the CW and CCW pulse signal lines connected backwards?	For gear ratios 1:3.6, 1:7.2, and 1:10, 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. For gear ratios 1:20 and 1:30, connect the CW pulse signal line to the CCW pulse/rotation direction signal input terminal, and connect the CCW pulse signal line to the CW pulse/ pulse signal input terminal.
	12. 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.	For gear ratios 1:3.6, 1:7.2, and 1:10, if the motor rotates in the counterclockwise direction at this time, the motor and driver are normal. Recheck the rotation direction signal. ("photocoupler ON" = clockwise, "photocoupler OFF" = counterclockwise) For gear ratios 1:20 and 1:30, if the motor rotates in the clockwise direction at this time, the motor and driver are normal. Recheck the rotation direction signal. ("photocoupler ON" = counterclockwise, "photocoupler OFF" = clockwise)
Motor rotation is erratic.	First check items 4, 5, and 6.	
Motor start up is unstable.	13. 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.

PROBLEM	CHECK POINTS	MEASURES
The motor rotates too far or not far enough.	14. 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.
	15. 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.	16. 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 24 ~ 27 (page 31) and take the necessary steps to prevent the overheat signal from being output.
	17. Is the starting pulse frequency too high?	Check this by decreasing the frequency.
	18. Is the acceleration/deceleration time too short?	Check this by increasing the acceleration/deceleration time.
	19. 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.	20. Is the output torque too high?	Try reducing the motor running current with the current adjustment rotary switch "RUN".
	21. Decrease the size of the step angle (increase the resolution) using the driver step resolution switches.	Reducing the size of the step angle will reduce vibration.
	22. 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.	23. 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℃ (221°F)). (Keep the temperature of the motor case below 75℃(167°F)) For other standards insulation is Class B (130℃(266°F)). (Keep the temperature of the motor case below 100℃ (212°F))
The overheat signal is output.	24. Is the driver ambient temperature 0℃ ~ +50℃(32°F ~ 122°F)?	If not, take the necessary steps to keep the ambient temperature within 0℃ ~ +50℃(32°F ~ 122°F).
	25. Is the driver located in an enclosed or poorly ventilated area?	Install the driver in a well ventilated area, or install a ventilation fan.
	26. Is the driver mounted to a metal surface?	If not, mount the driver to a metal surface or install a ventilation fan.
	27. 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.
The excitation timing signal is not output.	28. Is the step angle select signal input when the excitation timing signal is not output?	Input the step angle select signal when the excitation timing signal is output (refer to pages 19, 20).

10. Specifications

Model Number	single shaft / double shaft	UFK564AW-T3.6 / UFK564BW-T3.6	UFK564AW-T7.2 / UFK564BW-T7.2	UFK564AW-T10 / UFK564BW-T10
Maximum Holding Torque	N·m (lb-in)	1.25 (10.8)	2.5 (21.6)	3 (26.0)
Rotor Inertia	kg·m² (oz-in²)	175 × 10⁻⁷ (0.96)		
Rated Current	A / phase	1.4		
Basic Step Angle		0.2°	0.1°	0.072°
Gear Ratio		1:3.6	1:7.2	1:10
Permissible Torque	N·m (lb-in)	1.25 (10.8)	2.5 (21.6)	3 (26.0)
Permissible Thrust Load	N (lbs.)	40 (8.8)		
Permissible Overhung Load	N (lbs.)	100 (22.0)		
Backlash	minutes	35 (0.584°)	15 (0.25°)	15 (0.25°)
Permissible Speed Range (Gear Output Speed)		0 ~ 500r/min	0 ~ 250r/min	0 ~ 180r/min
Insulation Class		Class B (130℃ (266°F)) UL/CSA : Class A (105 ℃ (221°F))		
Power Source		Single phase 100-115V ± 15% 50/60Hz 5A		
Output Current	A / phase	1.4		
Excitation Mode		Microstep		
Input Signals: Input Signal Circuit		Photocoupler input, input resistance 220 Ω , input current 20mA max. (300 Ω , 15mA max. for pulse input) 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 : 1μsec 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 : 1μsec 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.		
Input Signals: • Step Angle Select Signal		When in the "photocoupler OFF" state the step angle set by DATA1 is selected. When in the "photocoupler ON" state the step angle set by DATA2 is selected. (The step angle can be set to 16 different resolutions.)		
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)		
Output Signals: • Overheat Signal		The signal is output when the internal temperature of the driver rises to above approximately 80℃ (176°F). (photocoupler : ON) The motor stops automatically if the automatic current off function is ON.		
Functions		Automatic current cutback, Automatic current off, Step resolution selection, Pulse input mode switch		
Indicators (LED)		Power input, Excitation timing signal output, Overheat signal output		
Cooling Method (Driver)		Convection		
Weight	Motor kg (lbs.)	0.95 (2.10)		
	Driver kg (lbs.)	0.85 (1.88)		
Insulation Resistance	Motor	100M Ω minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.		
	Driver	100M Ω 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 AC1.5kV 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℃ ~ +50℃ (14°F ~ 122°F)		
	Driver	0℃ ~ +50℃ (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.
- The direction of rotation of the motor itself is the same as the output shaft for gear ratios 1:3.6, 1:7.2, and 1:10, and opposite to the output shaft for gear ratios 1:20 and 1:30.

Model Number	single shaft / double shaft	UFK564AW-T20 / UFK564BW-T20	UFK564AW-T30 / UFK564BW-T30
Maximum Holding Torque	N·m (lb-in)	3.5 (30.3)	4.0 (34.7)
Rotor Inertia	kg·m² (oz-in²)	175 × 10^{-7} (0.96)	
Rated Current	A / phase	1.4	
Basic Step Angle		0.036°	0.024°
Gear Ratio		1:20	1:30
Permissible Torque	N·m (lb-in)	3.5 (30.3)	4.0 (34.7)
Permissible Thrust Load	N (lbs.)	40 (8.8)	
Permissible Overhung Load	N (lbs.)	100 (22.0)	
Backlash	minutes	10 (0.167°)	
Permissible Speed Range (Gear Output Speed)		0 ~ 90r/min	0 ~ 60r/min
Insulation Class		Class B (130℃ (266°F)) UL/CSA : Class A (105 ℃ (221°F))	
Power Source		Single phase 100-115V ± 15% 50/60Hz 5A	
Output Current	A / phase	1.4	
Excitation Mode		Microstep	
Input Signals: Input Signal Circuit		Photocoupler input, input resistance 220 Ω , input current 20mA max. (300 Ω , 15mA max. for pulse input) 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 : 1μsec 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 : 1μsec 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.	
Input Signals: • Step Angle Select Signal		When in the "photocoupler OFF" state the step angle set by DATA1 is selected. When in the "photocoupler ON" state the step angle set by DATA2 is selected. (The step angle can be set to 16 different resolutions.)	
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)	
Output Signals: • Overheat Signal		The signal is output when the internal temperature of the driver rises to above approximately 80℃ (176°F). (photocoupler : ON) The motor stops automatically if the automatic current off function is ON.	
Functions		Automatic current cutback, Automatic current off, Step resolution selection, Pulse input mode switch	
Indicators (LED)		Power input, Excitation timing signal output, Overheat signal output	
Cooling Method (Driver)		Convection	
Weight	Motor kg (lbs.)	0.95 (2.10)	
	Driver kg (lbs.)	0.85 (1.88)	
Insulation Resistance	Motor	100M Ω minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.	
	Driver	100M Ω 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 AC1.5kV 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℃ ~ +50℃ (14°F ~ 122°F)	
	Driver	0℃ ~ +50℃ (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.
- The direction of rotation of the motor itself is the same as the output shaft for gear ratios 1:3.6, 1:7.2, and 1:10, and opposite to the output shaft for gear ratios 1:20 and 1:30.

Model Number	single shaft / double shaft	UFK596AW-T3.6 / UFK596BW-T3.6	UFK596AW-T7.2 / UFK596BW-T7.2	UFK596AWT10 / UFK596BW-T10
Maximum Holding Torque	N·m (lb-in)	4.5 (39.0)	9 (78.1)	
Rotor Inertia	kg·m² (oz-in²)	1400 × 10^{-7} (7.65)		
Rated Current	A / phase	1.4		
Basic Step Angle		0.2°	0.1°	0.072°
Gear Ratio		1:3.6	1:7.2	1:10
Permissible Torque	N·m (lb-in)	4.5 (39.0)	9 (78.1)	
Permissible Thrust Load	N (lbs.)	100 (22.0)		
Permissible Overhung Load	N (lbs.)	300 (66.0)		
Backlash	minutes	25 (0.417°)	15 (0.25°)	
Permissible Speed Range (Gear Output Speed)		0 ~ 500r/min	0 ~ 250r/min	0 ~ 180r/min
Insulation Class		Class B (130℃ (266°F)) UL/CSA : Class A (105 ℃ (221°F))		
Power Source		Single phase 100-115V ± 15% 50/60Hz 5A		
Output Current	A / phase	1.4		
Excitation Mode		Microstep		
Input Signals — Input Signal Circuit		Photocoupler input, input resistance 220 Ω , input current 20mA max. (300 Ω , 15mA max. for pulse input) 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 : 1μsec 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 : 1μsec 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.		
Input Signals — • Step Angle Select Signal		When in the "photocoupler OFF" state the step angle set by DATA1 is selected. When in the "photocoupler ON" state the step angle set by DATA2 is selected. (The step angle can be set to 16 different resolutions.)		
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)		
Output Signals — • Overheat Signal		The signal is output when the internal temperature of the driver rises to above approximately 80℃ (176°F). (photocoupler : ON) The motor stops automatically if the automatic current off function is ON.		
Functions		Automatic current cutback, Automatic current off, Step resolution selection, Pulse input mode switch		
Indicators (LED)		Power input, Excitation timing signal output, Overheat signal output		
Cooling Method (Driver)		Convection		
Weight	Motor kg (lbs.)	2.85 (6.29)		
	Driver kg (lbs.)	0.85 (1.88)		
Insulation Resistance	Motor	100M Ω minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.		
	Driver	100M Ω 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 AC1.5kV 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℃ ~ +50℃ (14°F ~ 122°F)		
	Driver	0℃ ~ +50℃ (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.
- The direction of rotation of the motor itself is the same as the output shaft for gear ratios 1:3.6, 1:7.2, and 1:10, and opposite to the output shaft for gear ratios 1:20 and 1:30.

Model Number	single shaft / double shaft	UFK596AW-T20 / UFK596BW-T20	UFK596AW-T30 / UFK596BW-T30
Maximum Holding Torque	N·m (lb-in)	12 (104.1)	
Rotor Inertia	kg·m² (oz-in²)	1400 × 10^{-7} (7.65)	
Rated Current	A / phase	1.4	
Basic Step Angle		0.036 °	0.024 °
Gear Ratio		1:20	1:30
Permissible Torque	N·m (lb-in)	12 (104.1)	
Permissible Thrust Load	N (lbs.)	100 (22.0)	
Permissible Overhung Load	N (lbs.)	300 (66.0)	
Backlash	minutes	10 (0.167 °)	
Permissible Speed Range (Gear Output Speed)		0 ~ 90r/min	0 ~ 60r/min
Insulation Class		Class B (130℃ (266°F)) UL/CSA : Class A (105 ℃ (221°F))	
Power Source		Single phase 100-115V ± 15% 50/60Hz 5A	
Output Current	A / phase	1.4	
Excitation Mode		Microstep	
Input Signals: Input Signal Circuit		Photocoupler input, input resistance 220 Ω , input current 20mA max. (300 Ω , 15mA max. for pulse input) 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 : 1μsec 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 : 1μsec 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.	
Input Signals: • Step Angle Select Signal		When in the "photocoupler OFF" state the step angle set by DATA1 is selected. When in the "photocoupler ON" state the step angle set by DATA2 is selected. (The step angle can be set to 16 different resolutions.)	
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)	
Output Signals: • Overheat Signal		The signal is output when the internal temperature of the driver rises to above approximately 80℃ (176°F). (photocoupler : ON) The motor stops automatically if the automatic current off function is ON.	
Functions		Automatic current cutback, Automatic current off, Step resolution selection, Pulse input mode switch	
Indicators (LED)		Power input, Excitation timing signal output, Overheat signal output	
Cooling Method (Driver)		Convection	
Weight	Motor kg (lbs.)	2.85 (6.29)	
	Driver kg (lbs.)	0.85 (1.88)	
Insulation Resistance	Motor	100M Ω minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.	
	Driver	100M Ω 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 AC1.5kV 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℃ ~ +50℃ (14°F ~ 122°F)	
	Driver	0℃ ~ +50℃ (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.
- The direction of rotation of the motor itself is the same as the output shaft for gear ratios 1:3.6, 1:7.2, and 1:10, and opposite to the output shaft for gear ratios 1:20 and 1:30.

Stepping Motor

Model	single shaft	PK564AW-T3.6 PK564AW-T7.2 PK564AW-T10 PK564AW-T20 PK564AW-T30	PK596AW-T3.6 PK596AW-T7.2 PK596AW1-T10 PK596AW1-T20 PK596AW1-T30
	double shaft	PK564BW-T3.6 PK564BW-T7.2 PK564BW-T10 PK564BW-T20 PK564BW-T30	PK596BW-T3.6 PK596BW-T7.2 PK596BW1-T10 PK596BW1-T20 PK596BW1-T30
Degree of Protection		IP30	
Operation Environment	Ambient Temperature	-10 ~ +50 ℃ (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 ℃ (-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 ℃ (-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		DFU1514W
Degree of Protection		IP00
Operation Environment	Ambient Temperature	0 ~ +50 ℃ (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 ℃ (-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 ℃ (-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.123912-06] EN50178 [DEMKO Certificate No.123892-06]
Installation Conditions		Built-in type Class I equipment Overvoltage category : II Pollution degree : Class 2

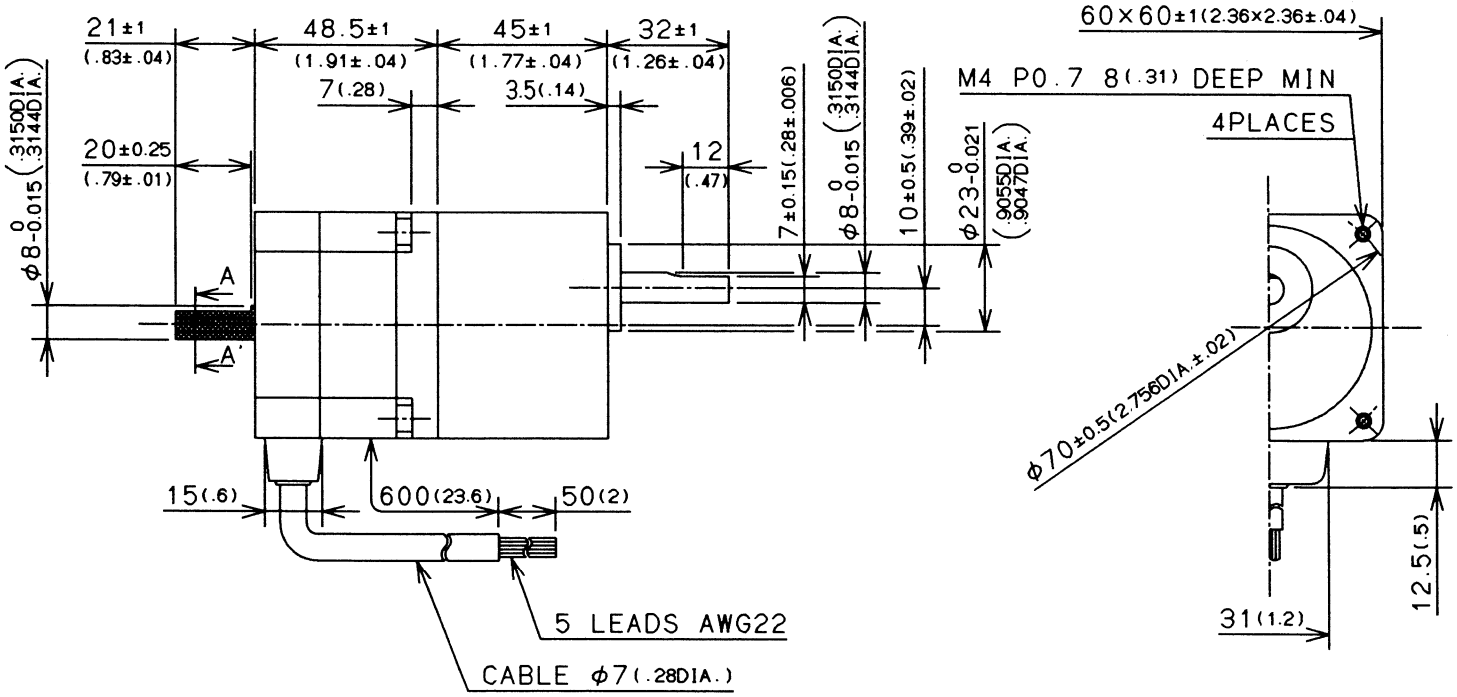
· Motors and driver are not measured individually for EMC. Perform the EMC test when products are incorporated into the final equipment.

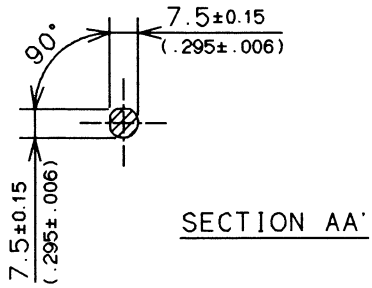
11. Dimensions

11.1 Motor

Unit : mm (inch)

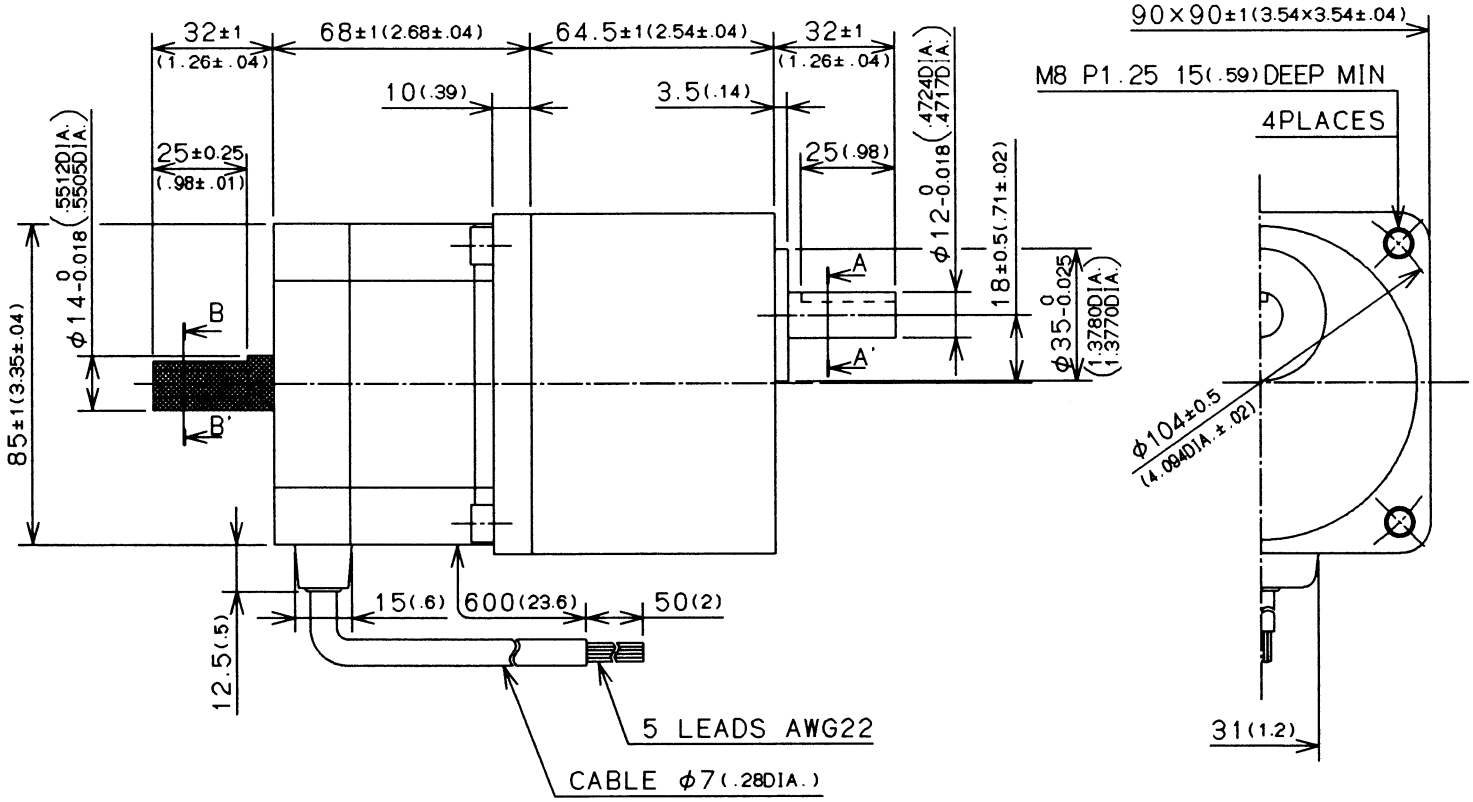
Models : PK564AW-T3.6, PK564BW-T3.6
PK564AW-T7.2, PK564BW-T7.2
PK564AW-T10, PK564BW-T10
PK564AW-T20, PK564BW-T20
PK564AW-T30, PK564BW-T30

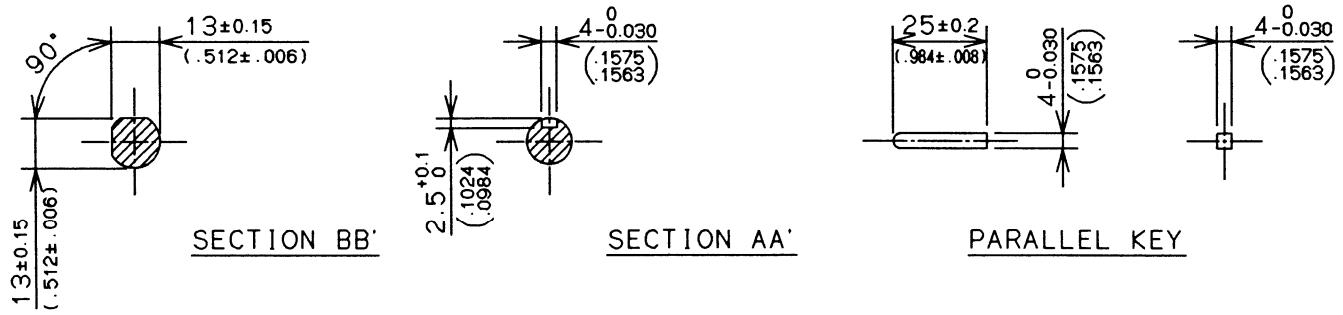




※ This is a dimensional drawing of the double shaft motor.
For the single shaft motor, there is no shaded area ▨.

Models : PK596AW-T3.6, PK596BW-T3.6
PK596AW-T7.2, PK596BW-T7.2
PK596AW1-T10, PK596BW1-T10
PK596AW1-T20, PK596BW1-T20
PK596AW1-T30, PK596BW1-T30

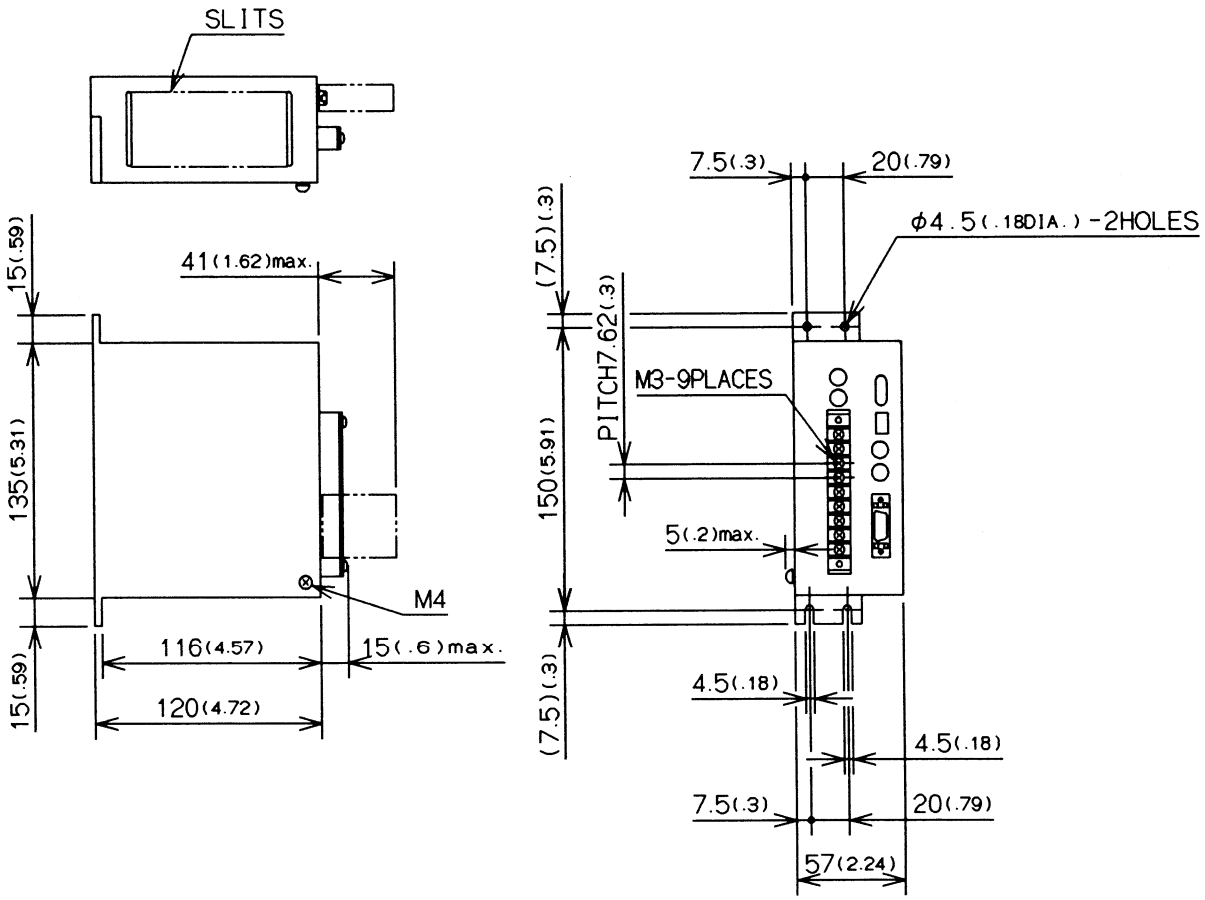




※ This is a dimensional drawing of the double shaft motor.
For the single shaft motor, there is no shaded area ▨.

11.2 Driver **Unit : mm (inch)**

Model : DFU1514W



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