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Operation Manual

5-phase Step Motor/Driver Package

NanoStep Series UFK

Thank you for purchasing this product.
Please read this instruction manual carefully before using your package.





Table of Contents

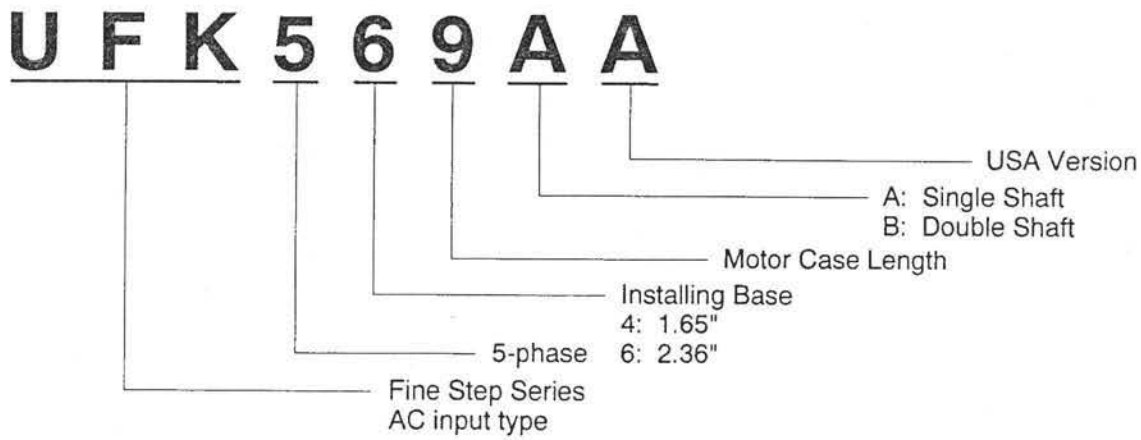
Package Information 2
Before Using the Unit.....3
Driver Functions.....4
Hook-up Diagram.....5
Using Input/Output Signals
(1) Pulse Input 7
(2) A.W. OFF (All Windings Off) Input 7
(3) RS (Step Angle Switching) Input 8
(4) TIMING (Excitation Timing) Output.....9
(5) O.HEAT (Overheat) Output 9
Using the Current Adjustment Switches .10
Using the Function Switches.....11
Installation
Installing the Motor.....13
Installing the Driver 14
Specifications.....15
Dimensions 16
Troubleshooting 18

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Package Information

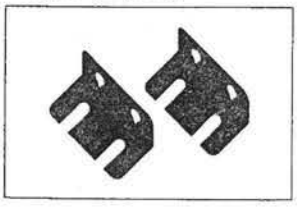
Unit Number	Motor Number	Driver Number
UFK543A(B)A	PK543A(B)UA	DFU1507A
UFK544A(B)A	PK544A(B)UA	
UFK545A(B)A	PK545A(B)UA	
UFK564A(B)A	PK564A(B)UA	DFU1514A
UFK566A(B)A	PK566A(B)UA	
UFK569A(B)A	PK569A(B)UA	

Part Number Information

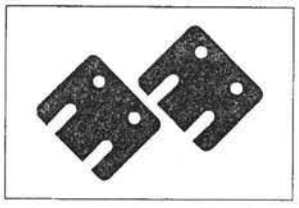


Driver mounting brackets are provided with product.

A type (2 pcs.)



B type (2 pcs.)



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Important Information to Know Before Using the Unit

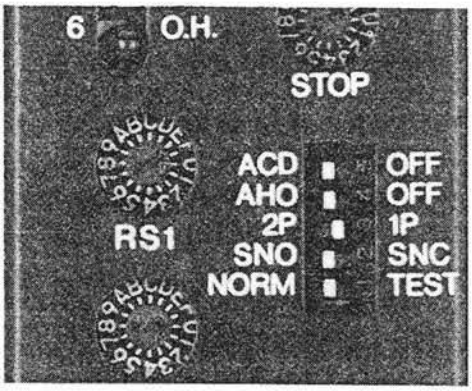
(1) Heating
The motor and driver may produce high heat under certain conditions. The motor temperature should not exceed 212°F (100°C) when measured at the outer housing of the motor installed to the equipment.

(2) Motor/driver combination
Use only the motor and driver combinations listed in this manual.

(3) Handling the motor
Do not attempt to take the motor apart or loosen any of the motor's assembly screws. Disassembling the unit will result in a significant reduction in performance and prevent the unit from functioning properly.

Preset Driver Settings
To help users set-up the UFK Series, the output current of the driver is preset at the factory to the rated value of the motor. The driver is preset to the following modes.

Function Switch



Automatic Current Down (ACD/OFF)
Set to ACD mode to decrease the output current to the motor when it is at rest resulting in lower heat generation & lower torque.

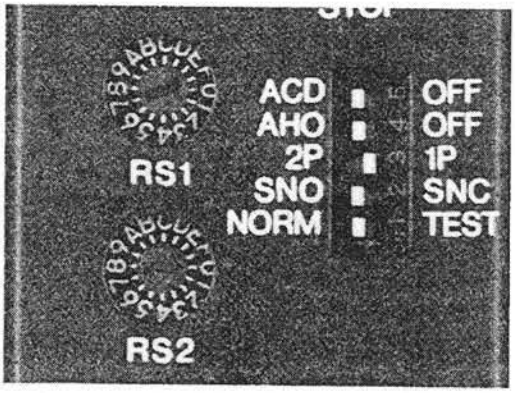
Auto Heat Off (AHO/OFF)
Set to AHO mode to cut the current to the motor if the driver overheats.

Pulse Input Mode (2P/1P)
Set to desired position.
1P: 1 pulse mode (STEP and Direction input)
2P: 2 pulse mode (CW and CCW input)

Overheat Output Logic (SNO/SNC)
Set to SNO so that photocopier turns ON (level L) when the overheat signal is output.

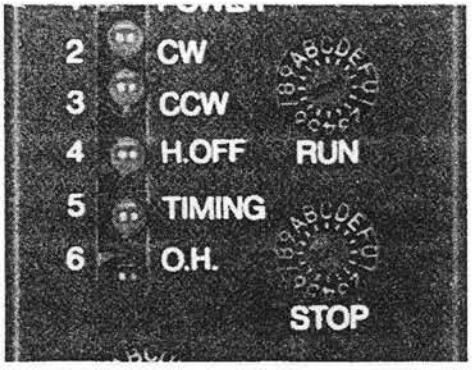
Self Test (NORM/TEST)
Set to NORM for normal operation.

Step Angle Switch



Step Angle Setting Switch (RS1, RS2)
Set to 0 sets the motor's standard step angle
RS1...(0)
RS2...(0)

Current Adjust Dial

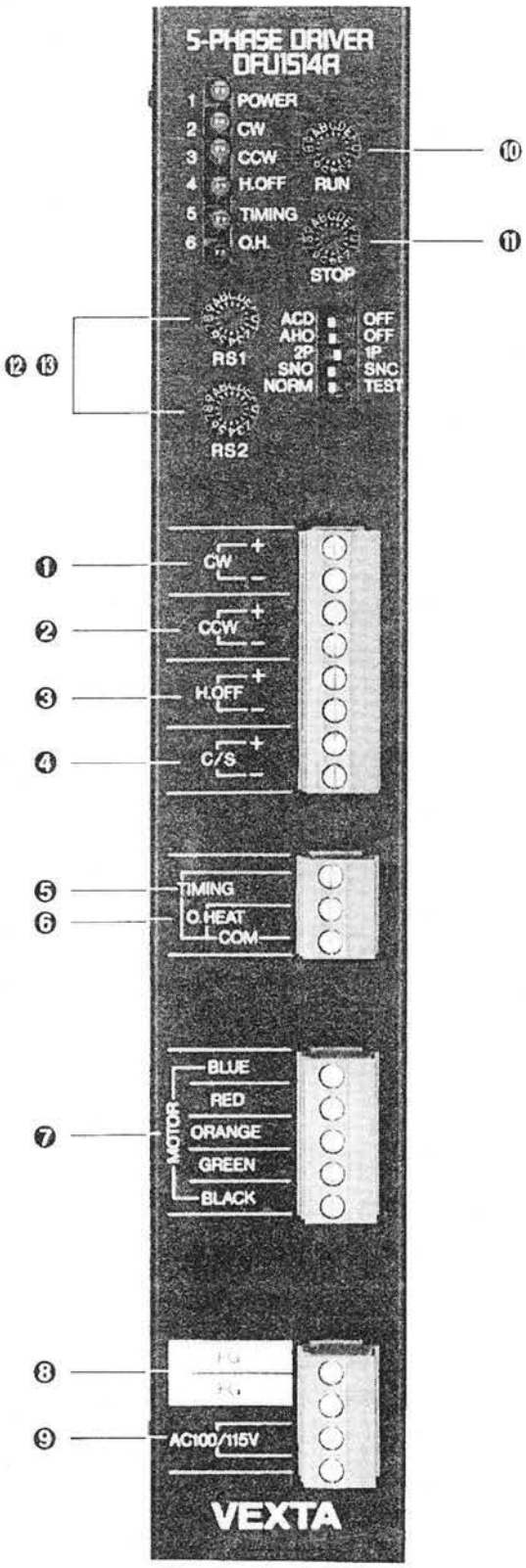


Motor Operation Current (RUN)
Set to F which outputs the rated current of the motor.

Motor Stop Current (STOP)
Set to 7 which outputs about half the current value set by the RUN switch.

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Driver Functions



❶ Pulse signal input terminal p.6
This is for the step input signal.

❷ Direction signal input terminal p.6
This is for the rotation direction input, commanding the CW direction when the level is "L", and commanding the CCW direction when the level is "H".

❸ All windings off signal input terminal p.6
This removes the current to the motor. With this input signal, the current to the motor is removed and the motor shaft can be rotated easily by an external force.

❹ RS1/2 - Resolution select switching input terminal p.7
With the "H" level input to the RS1/2 terminal, select the step angle set by the RS1 rotary switch. With a "L" level input, select the step angle set by the RS2 rotary switch. Do not change the resolution select level until the motor is at rest.

❺ Excitation timing signal output terminal p.8
This signal indicates that the excitation (i.e., the winding through which electric current is flowing) of the motor is in the initial setting determined by the driver.
Full step: 1 output occurs per 10-pulse input.

❻ Overheat signal output terminal p.8
This signal is output and the motor is stopped when the internal temperature of the driver rises abnormally. (This function can be cancelled by the auto heat off switch.)

❼ Motor connection terminals p.4
These are the output terminals for the motor. The colors of the motor leads must match the colors of the terminal.

❽ Frame ground terminal p.5
This terminal is connected to the driver. Make a one-point ground to the FG terminal on the controller. Also, connect the shield wire when a shielded cable is used.

❾ Power source connection terminal p.5
This terminal is connected to the single phase 110/115V AC ± 15% 50/60Hz power source.

❿ Motor operating current adjustment dial p.9
This dial adjusts the running current of the motor.

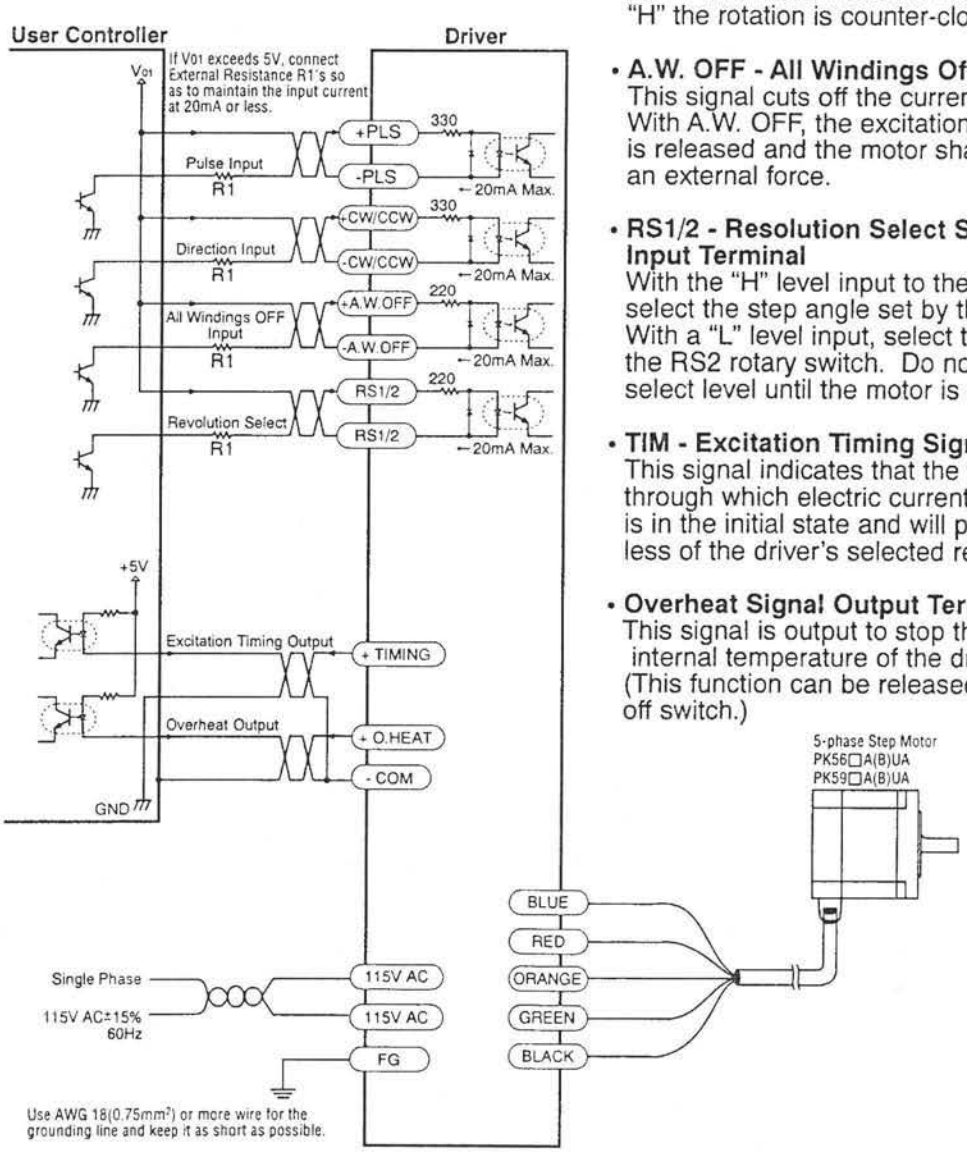
⓫ Motor stop current adjusting dial p.9
This dial adjusts the motor's resting current.

Setting the Step Angles (Resolution)

⓬ ⓭ Use these rotary switches to set the desired resolution from the 16 resolution levels available.

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Hook-Up Diagram



Terminal Information

- **PLS - Pulse Signal Input Terminal**
  This is the pulse input terminal.
- **CW/CCW - Direction Terminal**
  This controls the rotation direction input. At "L" the rotation is clockwise (CW) and at "H" the rotation is counter-clockwise (CCW).
- **A.W. OFF - All Windings Off Terminal**
  This signal cuts off the current to the motor. With A.W. OFF, the excitation of the motor windings is released and the motor shaft can be rotated by an external force.
- **RS1/2 - Resolution Select Switching Input Terminal**
  With the "H" level input to the RS1/2 terminal, select the step angle set by the RS1 rotary switch. With a "L" level input, select the step angle set by the RS2 rotary switch. Do not change the resolution select level until the motor is at rest.
- **TIM - Excitation Timing Signal Output Terminal**
  This signal indicates that the excitation (the winding through which electric current is flowing) of the motor is in the initial state and will pulse every 7.2° regardless of the driver's selected resolution.
- **Overheat Signal Output Terminal**
  This signal is output to stop the motor when the internal temperature of the driver rises abnormally. (This function can be released by the all windings off switch.)

Precautions for Wiring

1. Use 40" (1m) or less twisted-paired wire for the signal lines.
2. Use AWG 20 (0.5mm²) or larger wire for the motor leads and power source line, and use AWG 18 (0.75mm²) or larger for the grounding line.
3. Make a one-point grounding for the driver and external controller.
4. Be sure that the signal lines are 11.8" (30cm) or more from the power lines (power source line/motor line). Be sure not to have the signal lines and power lines placed in the same conduit or bundled together.
5. When using the crimped terminal for connecting to the driver, use the blade type terminal.

Be sure to use the open collector transistor (sink type) for the signal output section of the controller.

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Hook-Up Diagram

Power Source for the Driver

1. Use single-phase 115V AC, 60Hz for the power source voltage.

2. The power source input current requirements are:
   DFU1507 type: 0.8A Max.
   DFU1514 type: 1.1A Max.

Be sure that the power source meets the minimum required current specification. The value of the power source input current indicates the maximum input current value for the driver when a load is applied to the motor.

Note:
Insufficient power capacity decreases the motor's output torque and may possibly cause the following effects:

1. The motor does not rotate normally in high-speed operation due to insufficient torque.

2. The start and the stop time of the motor is delayed.

Frame Ground (FG) Terminal Information

Be sure to make a one-point grounding between the driver's (FG) terminal and the external controller's (pulse oscillator) FG terminal to prevent incorrect operation due to external noise.

- Use wire that is at least AWG 18, (0.75mm^2) thick or larger for the ground line. Keep the length as short as possible.

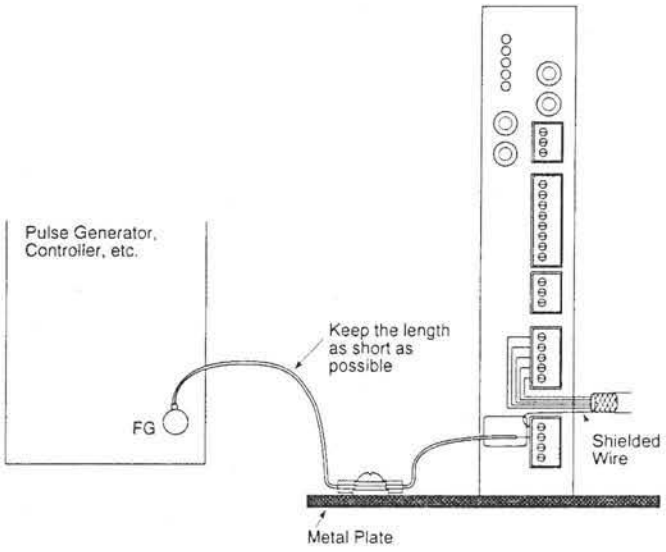
- If noise generated by the motor cable becomes a problem, shield the cable with conductive tape or wire mesh. Connect the shielded wire to the driver's FG terminal to ground the shielded wire.

Indicator Lamp for Power Source

When turning the power source ON make sure that the signal, motor and power source lines are properly connected and the self-test function switch is set to NORM (normal).

- POWER: lights when the power is turned on.
- TIMING: Lights when the excitation sequence of the motor is reset to Step (0), the initial state when the power is turned on.

Precaution:
Re-starting: Be sure to wait at least five seconds or more when turning ON the power source to the driver after turning it OFF. If the power is turned ON immediately after being turned OFF, the timing lamp does not light up and the excitation sequence of the motor is not reset to Step (0).

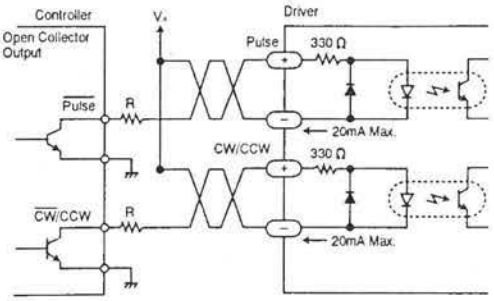


Caution:
Before turning the power ON to start the motor, make sure that the self-test function switch is set to NORM (normal). If the driver is energized with the switch set to "TEST," the motor immediately starts to rotate creating a dangerous condition.

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How to Use Input/Output Signals

1. Pulse Input



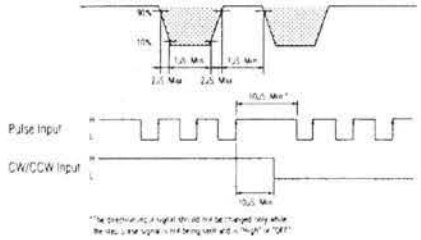
The external resistance is not needed when Vo is 5V. When the voltage exceeds 5V, connect the external resistance R to keep input current at 20mA or less.

■ Input circuit and sample connection

1. 1-pulse input mode
Pulse input-the motor operates one step at the trailing edge of the pulse when the negative logic pulse is input to the terminal. The direction of rotation is as follows: Direction of rotation input "L" (with the photocoupler ON) input indicates CW rotation and "H" (with the photocoupler OFF) indicates CCW rotation.

2. 2-pulse input mode
CW pulse input-the motor operates one step CW direction at the trailing edge of the pulse when the negative logic pulse is input to the PULSE terminal. (Not labeled on driver).
CCW pulse input-the motor operates one step CCW direction at the trailing edge of the pulse when the negative logic pulse is input to the CW/CCW terminal. (Not labeled on driver).

■ Pulse Signal Characteristics
Input Pulse Characteristics



Shaded area indicates the radiation of the photocoupler diode. The motor starts at the trailing edge, shown by the arrow.

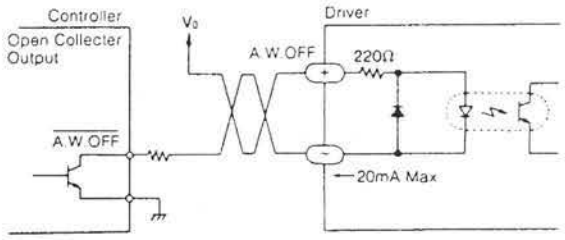
Pulse Signal Characteristics
1. Keep the pulse voltage at 4 to 5V for "H" and at 0 to 0.5V for "L".
2. Input pulses for a pulse width is 1μ sec. or more, the rise/drop time is 2μ sec. or less and pulse duty is 50% or less.
3. 10μ sec. or more is the standard interval time for switching from CW to CCW. Note that the interval time greatly varies according to the motor and load inertia moment.

Pulse Signal Input Precautions
1. Be sure to set the "H" level when the pulse signal is at rest. Setting to the "L" level will not activate the automatic current down function.

■ **1-pulse Input Mode**
1. Be sure to switch the direction of rotation with the pulse signal at rest at the "H" level.

■ **2-pulse Input Mode**
1. Do not input CW pulses and CCW pulses at the same time.
2. When the CW pulse signal or CCW pulse signal is at the "L" level, the input of pulses to the other will not rotate the motor normally.

2. A.W. Off (All Windings Off) Input

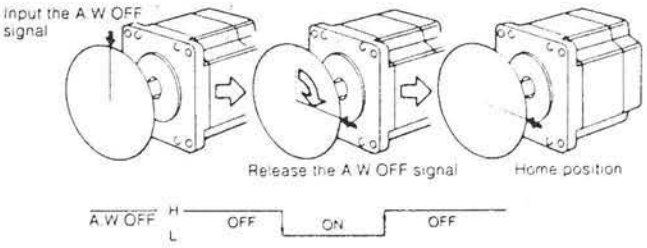


The external resistance is not needed for Vo = 5V. When the voltage exceeds 5V, connect the external resistance R to keep input current at 20mA or less.

1. If the A.W. OFF signal is at the "L" level (with the photocoupler ON), the current does not flow through the motor and the motor shaft can be turned manually. This function can be used when the motor shaft needs external rotation or manual positioning. Be sure to set to the "H" level when operating the motor. For regular use, no connections are necessary. The holding torque can be set in proportion to the motor stop current set by the STOP dial.

2. Turning the A.W. OFF signal OFF does not change the excitation sequence (phase) of the motor. When the motor shaft is turned manually with A.W. OFF input, the shaft may turn ± 3.6° from the shaft position when A.W. OFF is released.

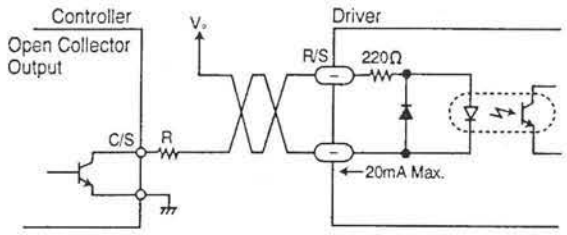
■ Manual Detection of the Home Position
When the home position is set manually, determine the position after the A.W. OFF signal is input, then release the A.W. OFF signal.



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R/S (Step Angle Switching) Input

Input circuit and sample connection



The external resistance is not needed when Vo is 5V. When the voltage exceeds 5V, connect the external resistance R to keep input current at 20mA or less.

You may preselect two resolutions from 16 available resolutions with the Step Angle Setting Switches RS1 and RS2. Your controller can select from one of these settings with the R/S input. This function is useful if low speed (high resolution) is needed as well as high speed (low resolution) for increased throughput.



Step Angle Setting Switch RS1

RS1



Step Angle Setting Switch RS2

RS2

Step Angle Settings

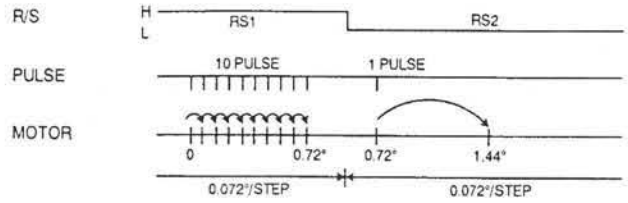
Resolution Select Switch RS1	RS2	Resolution (Steps/Rev)	Step Angle	Step Divide
0		500	0.72°	1/1
1		1,000	0.26°	1/2
2		1,250	0.288°	1/2.5
3		2,000	0.18°	1/4
4		2,500	0.144°	1/5
5		4,000	0.09°	1/8
6		5,000	0.072°	1/10
7		10,000	0.036°	1/20
8		12,500	0.0288°	1/25
9		20,000	0.018°	1/40
A		25,000	0.0144°	1/50
B		40,000	0.009°	1/80
C		50,000	0.0072°	1/100
D		62,500	0.00576°	1/125
E		100,000	0.0036°	1/200
F		125,000	0.0028°	1/250

Precautions

(1) Be sure to change step angle setting inputs only when the pulse signals are at rest. Switching while moving may cause a positional error of the motor.

(2) There is no positional error if the step angle setting is changed with the motor at rest.

Example: Changing the step angle from 0.072° to 0.72°.

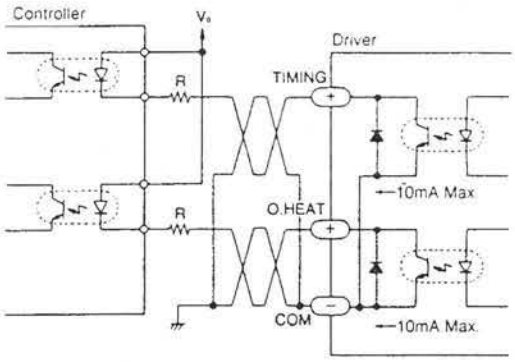


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Using the Current Adjustment Switch

4. Timing (Excitation Timing) Output

■ Output circuit and sample connection

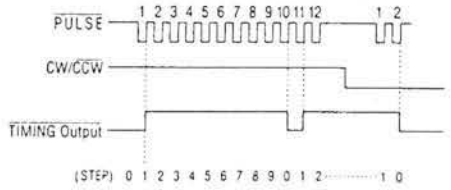


Keep voltage between 5V and 24V and current at 10mA or less.

1. The excitation timing signal indicates that the excitation of the motor is in the initial state (STEP). Use this signal to detect the home position accurately by matching the mechanical home position of the device and the excitation home position (STEP 0) of the motor.

2. The signal is output once each time the excitation sequence returns to (STEP) in synchronization with input pulses. The excitation sequence is designed to make one rotation as the motor shaft travels 7.2°. Output is as follows:
   0.72°/step: 1 output per 10 pulses
   .072°/step: 1 output per 100 pulses

The timing lamp on the front panel lights up during output.



When used as indicated in the sample connection, the level becomes "L" at STEP 0.

Notes:

1. When the power is turned ON, the excitation sequence is reset to STEP 0 and the timing lamp light up.

2. The timing lamp flashes quickly while the motor runs appearing continuously lit.

5. O.HEAT (Overheat) Output

■ Output circuit and sample connection

1. The O. HEAT signal is output to protect the driver against burnout when the internal temperature of the driver rises abnormally high due to high ambient temperature. The O.HEAT lamp on the front panel lights up when output.

2. When used as shown in the sample connection with the over heat output logic switch set to SNO, the level becomes "L" upon the output of the overheat signal. Switch to SNC to set to the "H" level.

3. If the AHO (Auto Heat Off) function is set, the output current to the motor drops to zero and the motor stops automatically.

4. When the overheat signal is output, check the operating conditions (ambient temperature, driver settings) and cool the driver.

5. The overheat signal automatically releases as the internal temperature of the driver drops. The O.HEAT signal returns to the "H" level and the O.HEAT indicator turns off.

Please be aware that the above return/release cannot be controlled by external signals or by restarting the system.

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Using the Current Adjustment Switch

• Motor Running Current

1. Use the motor operating current adjustment switch (RUN). The available range is from 0.2A/phase to 0.75A/phase (0.38A/phase to 1.4A/phase).

2. The current is set at 0.75A/phase (1.4A/phase) 0.75A/phase (DFU1507A), the rated current for the motor when shipped. When the operating current is reduced to lower the temperature rise of the motor/driver or to reduce vibration, the RUN switch readjusts the current. The table below shows operating current values corresponding to the RUN switch scale.

• Motor Stop Current (Automatic Current Down)

1. Use the motor stop current dial (STOP). The available range is 17 to 100% of the set run current.

2. The current is set to 56% when shipped. The STOP dial can be used to readjust the motor stop current to control the motor holding power. The table below shows the stop current decrease ratio corresponding to the STOP dial scale.

Running Current Value (Approximate Values) Corresponding to the RUN Switch Scale

[RUN] Dial Scale	Running Current [A / phase]	
	DFU1507A	DFU1514A
0	0.2	0.38
1	0.21	0.4
2	0.25	0.47
3	0.26	0.54
4	0.33	0.61
5	0.37	0.68
6	0.4	0.75
7	0.44	0.82
8	0.48	0.9
9	0.52	0.97
A	0.56	1.04
B	0.6	1.11
C	0.63	1.18
D	0.67	1.25
E	0.71	1.32
F	0.75	1.4

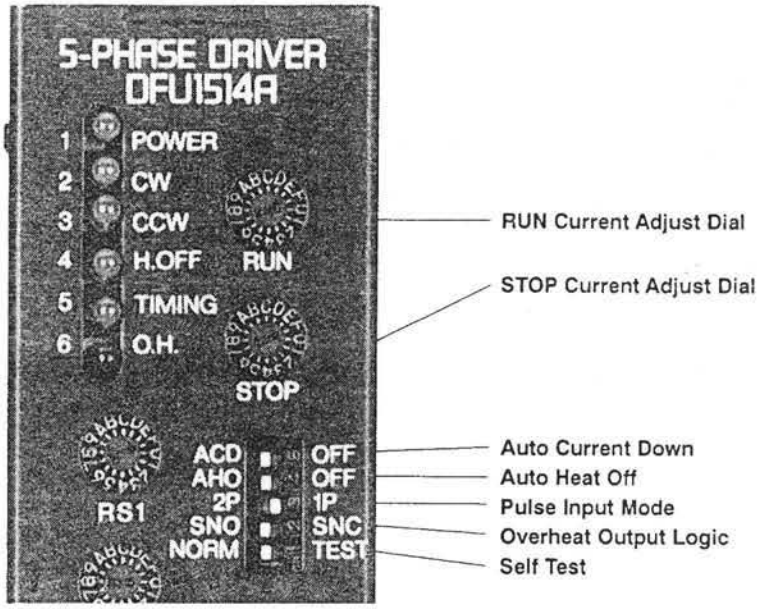
Stop Current Decrease Ratio (Approximate Values) Corresponding to the STOP Dial Scale

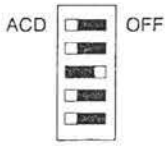
[STOP] Dial Scale	% of RUN Current	
	DFU1507A	DFU1514A
0	17	17
1	22	22
2	28	28
3	34	34
4	39	39
5	45	45
6	50	50
7	56	56
8	61	61
9	67	67
A	73	73
B	78	78
C	84	84
D	89	89
E	95	95
F	100	100

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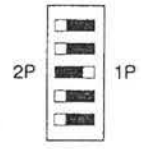
Using the Function Switches

The following function switches and current adjustment dials are used to change the factory-set driver settings.



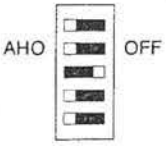


- **Auto Current Down**
  In this mode, the motor output current automatically decreases 0.1 seconds after the pulses stop to prevent the motor and driver from overheating. (See "motor stop current adjustment" for the current drop ratio). Set this switch to ACD for regular use or OFF to defeat.

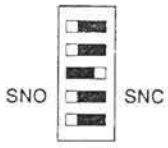


- **Pulse Input Modes**
  The driver is designed to be compatible with the following two pulse modes.

1. Two-pulse: turn the pulse input switch to 2P and the motor moves in response to CW and CCW pulses.
2. One-pulse: turn the pulse input switch to 1P and the motor moves in response to the pulse signal and rotation direction signal.



- **Auto Heat Off**
  This setting automatically cuts off the motor output current to stop the motor when the driver overheats. If the motor cannot be stopped automatically when it is overheating, set the switch to OFF. Be sure to stop the motor promptly when the overheat signal is output. When the overheat signal is output, turn the power source to the driver OFF. Check the operating conditions and cool the driver immediately.



- **Overheat Output Logic**
  Set this switch to SNO to turn the photocoupler ON when the overheat signal is output. This position turns the photocoupler OFF in normal operation.

  Set this switch to SNC to turn the photocoupler OFF when the overheat signals output. This position turns the photocoupler ON in normal operation.

  When the overheat signal is output, check the operating conditions (ambient temperature, driver settings) and cool the driver.

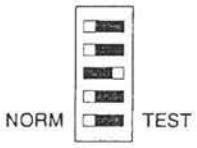
Major Causes for Overheating

1. The driver is installed in an enclosed place and heat radiation is insufficient or the internal temperature of the driver is rising due to high ambient temperatures.
2. The driver is used continuously at a pulse rate which makes the input current to the driver high. The input current to the driver greatly varies according to the size of the motor and pulse rates.

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Using the Function Switches

• **Self-test Function**
The self-test function uses the timer in the driver to check the driver, stepping motor and connections.

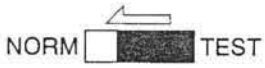


• **Pre-test Function**
This function energizes the driver after it is connected to the motor. Do not connect anything to the input/output lines.

• **Using the Self-test Function**
Set the self-test switch from NORM to TEST.
If the motor turns CW at approximately 3pps immediately after setting to TEST, the driver, motor and connections are normal. The motor will continue to rotate as long as the switch is set to TEST. If the motor rotation is irregular or CCW, turn the power OFF immediately and check the motor's connections.

When using the self-test function, be sure to check the timing lamp. If the step angle switch is at: 0.72%/step, the timing lamp lights up once every 10 steps. At 0.36°/step, the timing lamp lights up once every 20 steps.

• **Finishing the Self-Test Function**
Remove power to the unit and move the self-test switch back to NORM when the test is finished. The motor stops and the operation returns to normal.



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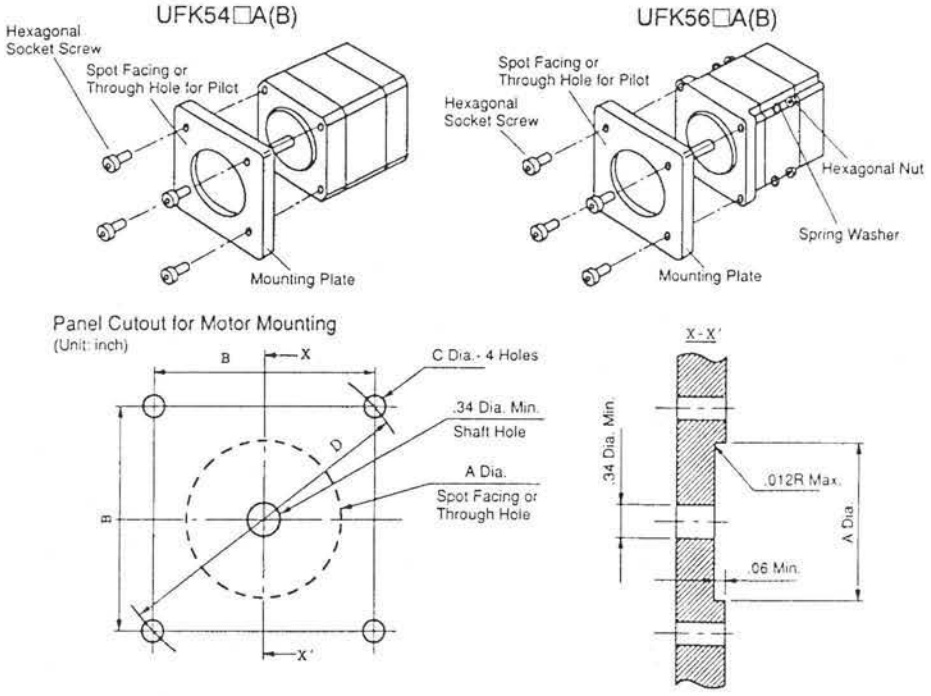
Installing The Motor

(1) Precautions for Installation (applies to both motor and driver)

1 Attach the motor securely to a metal plate with good thermal conductivity, such as iron and aluminum.
2 Avoid places with dust/oil mist, conductive salt, conductive powder or corrosive gas.
3 Avoid places where excessive vibration/shock may come into contact with the driver.
4 Be sure to keep a space of .98" (25mm) or more between the driver and other equipment/structures.
5 High frequency noise sources (high voltage cable, high voltage equipment, power equipment, etc.) near the driver may cause induction noise to enter input circuits, power source circuits, etc., creating erratic operation. Install the unit, including the power source lines and input/output signals lines, as far from noise sources as possible. If there is a possibility of interference by a noise source, check the wiring and take appropriate steps for preventing noise.
6 The driver cooling method is convection. Install in a well-ventilated location.
7 Use the unit at an ambient temperature between 32°F to 140°F (0°C to 40°C).
8 Keep conductive pieces (chips, pins, etc.) out of the driver.

(2) Installing the Motor

When installing the motor, refer to the following dimensions of the motor mounting holes below.



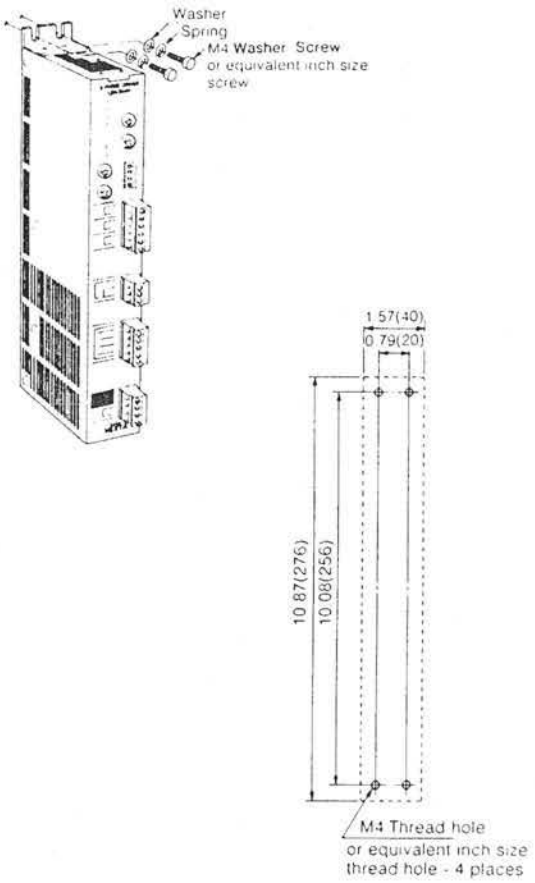
	Mounting Plate Thickness	A	B	C	D
UFK543A(B)A type	.08" Min.	.8674 Dia. .8662 Dia.	1.22 ± .004	.14 Dia.	1.72 ± .008
UFK544A(B)A type	.12" Min.	.8674 Dia. .8662 Dia.	1.22 ± .004	.14 Dia.	1.72 ± .008
UFK545A(B)A type	.16" Min.	.8674 Dia. .8662 Dia.	1.22 ± .004	.14 Dia.	1.72 ± .008
UFK56□A(B)A type	.20" ~ .40"	1.4189 Dia. 1.4173 Dia.	1.97 ± .014	.18 Dia.	2.78 ± .012

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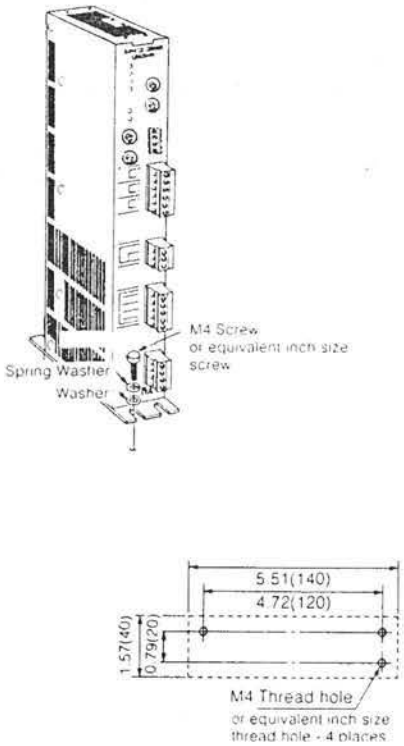
Installing The Driver

■ Dimensions of the Driver Mounting Holes Unit = inch (mm)

- **Using the A type mounting plate**



- **Using the B type mounting plate**



Installing the Driver

The driver by design radiates heat during operation. Use the driver in an upright position as shown. Use the mounting part labeled "A" for attaching the driver perpendicular to the device. Use the mounting part labeled "B" for attaching the driver parallel to the bottom of the device. Fasten the driver securely to a .08" (2mm) or more thick metal surface such as iron or aluminum with good thermal conductivity. When attaching the driver without the mounting parts provided, make sure that the length of the screws is not more than .16" (4mm) long.

Multi-Axis Operation

When using stepping motors on a multi-axis basis, leave at least .79" (20mm) or more between each driver and at least .98" (25mm) between the driver and other equipment to prevent the ambient temperature from rising too high due to other drivers. If the ambient temperature exceeds 122°F (50°C), cool the driver with a fan.

Installation Conditions

Use the driver in a location with these conditions:

1. Indoors
2. Ambient temperature: 50°F to 122°F (0°C to 50°C)
3. Ambient humidity: 85% or less, non-condensing
4. Avoid contact with corrosive gas and dust
5. Avoid contact with water and oil
6. If the driver is located in an enclosed place such as a control panel or near a heating unit, be sure to install ventilation holes to reduce the temperature rise of the driver.
7. If there is a strong electrical noise source (high-frequency welding machine, large electromagnetic switch, etc.) near the driver, use noise filters or rewire to minimize the effects from noise.
8. Keep conductive particles such as, burrs, pins and pieces of wire out of the driver.

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Specifications

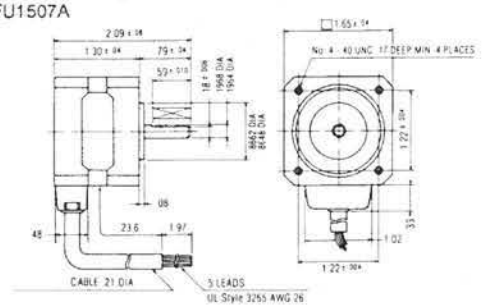
Unit Model		Single Shaft	UFK543AA	UFK544AA	UFK545AA	UFK564AA	UFK566AA	UFK569AA
		Double Shaft	UFK543BA	UFK544BA	UFK545BA	UFK564BA	UFK566BA	UFK569BA
MOTOR	Holding Torque①	oz-in (kgcm)	18.1 (1.3)	25.0 (1.8)	33.3 (2.4)	58.3 (4.2)	115 (8.3)	231 (16.6)
	Rotor Inertia	oz-in² (gcm²)	0.19 (35)	0.30 (54)	0.37 (68)	0.96 (175)	1.53 (280)	3.06 (560)
	Rated Current		0.75 A / phase			1.4 A / phase		
	Step Angle (Full)		0.72°					
	Insulation Class		Class B [266°F (130°C)]					
	Insulation Resistance		100M Ω or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500V DC.					
	Dielectric Strength		Under normal ambient temperature and humidity, sufficient to withstand 1.0kV at 60Hz applied between the windings and the frame for one minute following a period of continuous operation.					
DRIVER	Power Consumption		100/115V AC 50/60Hz			100/115V AC 50/60Hz		
	Output Current		0.17 ~ 0.75 A / phase			0.17 ~ 1.4 A / phase		
	Excitation mode:		Microstep					
	Input Signals • Input Signal Circuit		Photocoupler Input (optically isolated), Input Impedance: 220 Ω, Input Current 20mA max. H : 4 ~ 5V L : 0 ~ 0.5V (RS, A.W. OFF input impedance: 220 Ω)					
	Input Signals • Pulse Input		Step Command Input Pulse width: 1 μ sec. minimum, Pulse rise/pulse fall time 2 μ sec. maximum. Motor moves at pulse rising edge. (Negative logic pulse input)					
	Input Signals • Direction-of-Rotation Input		Directional Input Pulse width: 1 μ sec. minimum, Pulse rise/pulse fall time 2 μ sec. maximum. Motor moves at pulse rising edge. (Negative logic pulse input)					
	Input Signals • Resolution select input (RS 1/2)		At Level "H", a step angle will be selected between 0.72° and 0.00288° as preset by Step Angle Setting Switch RS1. At Level "L", a step angle will be selected between 0.72° and 0.00288° as preset by Step Angle Setting Switch RS2.					
	Input Signals • All Windings OFF Input		At H level, the current set by RUN potentiometer is supplied to the motor. At L level, the current to the motor is cut off and the shaft can be rotated by hand.					
	Output Signals • Output Signal Circuit		Photocoupler, Open-Collector Output External use condition: 24V DC maximum, 10mA Max.					
	Output Signals • Excitation-Timing Output		Signal is output every time the excitation sequence returns to step 0 (Photocoupler is ON) 0.72° /Step (Resolution 1): Signal is output every 10 pulses 0.072° /Step (Resolution 10): Signal is output every 100 pulses					
	Output Signals • Overheat Output		The overheat signal is output when the internal temperature of the driver rises abnormally (with the photocoupler ON or OFF. Automatic return available). The motor stops automatically by the all windings off function. The output logic of the photocoupler is based on the setting of the overheat output logic switch.					
	Function Switches		Automatic current-down, all windings off, self-test, pulse input switch, step angle switch, overheat output logic switch.					
	Display (LED)		Power source input, CW pulse input, CCW pulse input, all windings off input, excitation timing output, overheat output					
	Driver Cooling Method		Convection Cooling					
	Weight	Motor lbs (kg)	0.55 (0.25)	0.66 (0.3)	0.88 (0.4)	1.33 (0.6)	1.76 (0.8)	2.87 (1.3)
		Driver lbs (kg)	0.79 (0.26)					
	Insulation resistance	Motor	100M Ω or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500V DC.					
		Driver	The value is 100M Ω or more measured by a 500V DC megger for the case to power source input terminal, case to signal I/O terminal, power source input terminal to signal I/O terminal at normal temperature and humidity.					
	Dielectric Strength	Motor	Under normal ambient temperature and humidity, sufficient to withstand 1.0kV at 60Hz applied between the windings and the frame for one minute.					
		Driver	No abnormality is recognized when 1.0kV at 50Hz is applied for one minute upon the case to power source input terminal, case to signal I/O terminal, power source input terminal to signal I/O terminal at normal temperature and humidity.					
	Ambient temperature	Motor	+14°F~+122°F (-10°C+50°C)					
		Driver	+32°F~+122°F (0°C+50°C)					

① The value given for holding torque is the value operated by dedicated driver with rated current and 5-phase excitation.

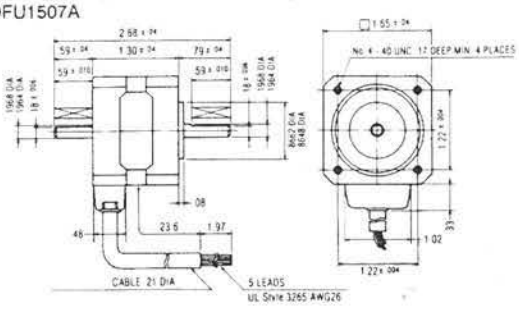
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Dimensions: Unit = Inch

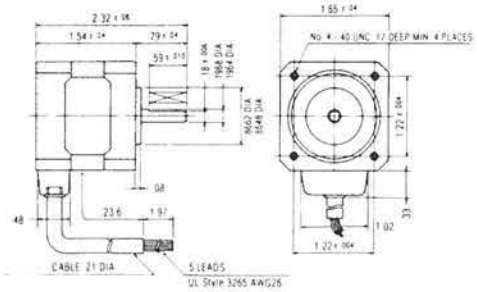
UFK543AA
Motor: PK543AUA Weight: 0.55 lbs (0.25kg)
Driver: DFU1507A



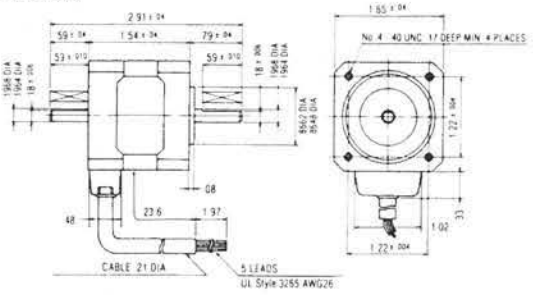
UFK543BA
Motor: PK543BUA Weight: 0.55 lbs (0.25kg)
Driver: DFU1507A



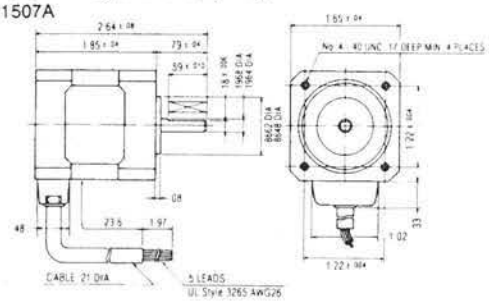
UFK544AA
Motor: PK544AUA Weight: 0.66 lbs (0.3kg)
Driver: DFU1507A



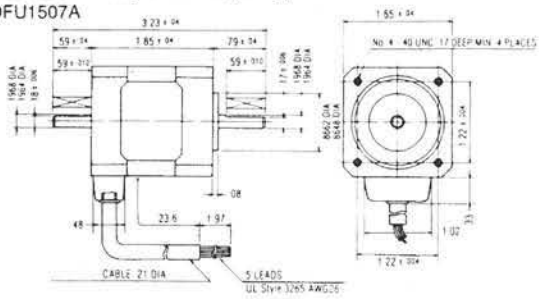
UFK544BA
Motor: PK544BUA Weight: 0.66 lbs (0.3kg)
Driver: DFU1507A



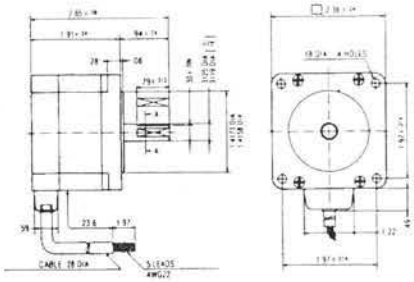
UFK545AA
Motor: PK545AUA Weight: 0.88 lbs (0.4kg)
Driver: DFU1507A



UFK545BA
Motor: PK545BUA Weight: 0.88 lbs (0.4kg)
Driver: DFU1507A



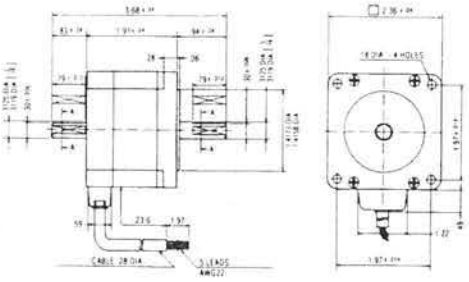
UFK564AA
Motor: PK564AUA Weight: 1.32 lbs (0.6kg)
Driver: DFU1514A



•Shaft Cross Section A-A'



UFK564BA
Motor: PK564BUA Weight: 1.32 lbs (0.6kg)
Driver: DFU1514A



•Shaft Cross Section A-A'

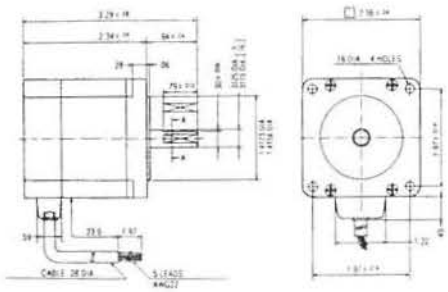


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Dimensions: Unit = Inch

UFK566AA

Motor: PK566AUA Weight: 1.76 lbs (0.8kg)
Driver: DFU1514A

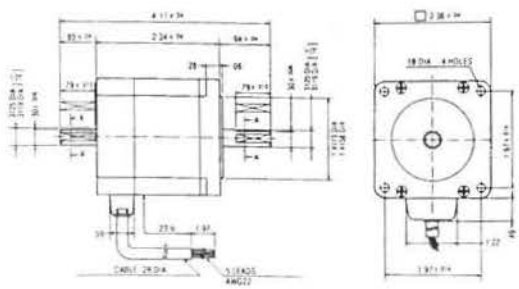


• Shaft Cross Section A-A'



UFK566BA

Motor: PK566BUA Weight: 1.76 lbs (0.8kg)
Driver: DFU1514A

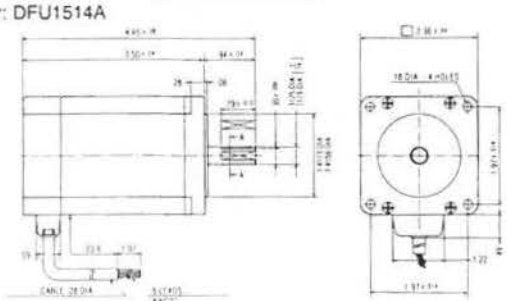


• Shaft Cross Section A-A'



UFK569AA

Motor: PK569AUA Weight: 2.86 lbs (1.3kg)
Driver: DFU1514A

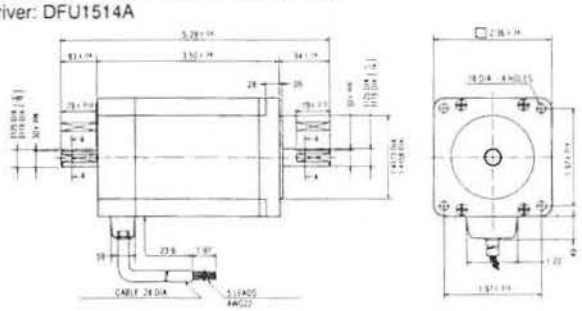


• Shaft Cross Section A-A'



UFK569BA

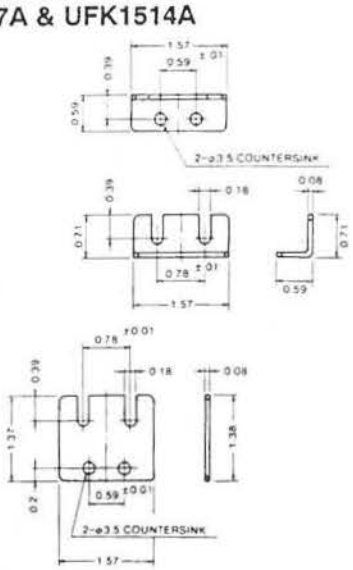
Motor: PK569BUA Weight: 2.86 lbs (1.3kg)
Driver: DFU1514A



• Shaft Cross Section A-A'



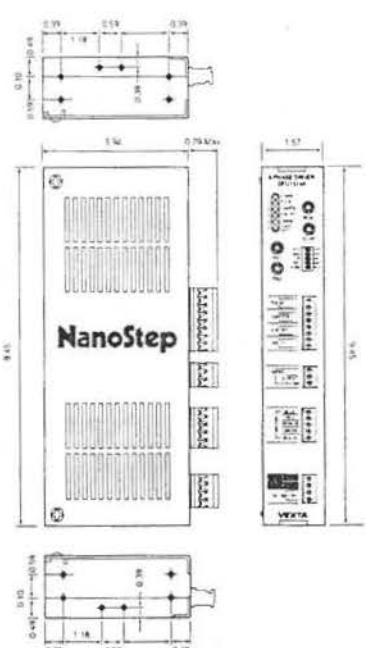
Mounting Hardware for UFK1507A & UFK1514A



Note:
All motors are also available without cable and strain relief lead wires.
Please contact our sales office for more information.

DRIVER

Driver: DFU1507A, DFU1514A
Weight: 2.2 lbs (1kg)



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Troubleshooting

If your stepping motor does not work properly, please refer to the chart below. If the problem persists, please call our Technical Support Line at (800) 468-3982. This line is available from 8:30am to 5:00pm Pacific Time. Our sales offices listed on the back of this manual can also assist you.

Problem	Conditions	Solution
The motor does not produce holding torque. The shaft turns easily by hand.	1. Is the power lamp on the driver ON? If it is ON, operation is normal.	If it is not ON, check the connection to the power source.
	2. Is the A.H.OFF lamp on the driver OFF?	When the A.W.OFF (output current off) signal is input, the A.W.OFF lamp lights up and the motor will not be excited.
	3. Is the A.H.OFF indicator on the driver OFF?	When the driver is overheated, the O.H. lamp light up. When the automatic hold-off switch is set to OFF, the motor will not be excited.
	4. Is the driver and motor connected securely?	Check the driver connection terminal panel. If the motor cord is extended, check the connections.
	5. Are the motor current adjustment switches (RUN/STOP) on the driver turned too low?	These switches adjust the output current to the motor. If they are too low, return them to the factory-set positions.
The motor does not rotate.	See 1-5	
The motor does not work even if pulse signals are input.	6. Does the pulse lamp on the driver light up when the pulse signal is input?	If the pulse lamp does not light up, check the connections, pulse signal voltage and wave-form.
	7. Is the pulse signal connected to the CW/CCW terminal in the 1-pulse input mode? (The pulse input mode switch is set to 1P).	Connect the pulse signal to the pulse terminal.
	8. Do the pulse lamps on the driver light up together in the 2-pulse input mode? (The pulse input mode switch is set at 2P).	If the other pulse input terminal is set to the "L" level when inputting the pulse signal, the motor cannot run. Please set it to the "H" level.
The motor rotates in the reverse direction of the CW/CCW pulse signals.	9. Try to input the pulse signal to the pulse terminal with nothing connected to the CW/CCW.	If the motor rotates CCW, the motor and driver are normal. Check the level of the rotation direction signal. ("L" for CW and "H" for CCW are normal.
	10. Are the CW and CCW pulse connections reversed in the 2-pulse input mode? (The pulse input mode switch is set to 2P).	Check the connections to make sure that the desired pulse is connected to the correct terminal.
The motor rotation is strange.	See #4, 5 and 6.	
The motor runs erratic when started.	11. Do the pulse and CW/CCW lamps light up at the same time in the 2-pulse mode? (The pulse input mode switch is set to P2).	When the two pulses are input together, the motor runs erratic.
	12. Is the load axis and shaft properly aligned? Is the load too heavy?	Re-tighten the coupling screws or conduct the self test without a load.

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Troubleshooting

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Problem	Conditions	Solution
The amount of movement is small.	13. Does the motor step angle required by the device and the actual motor step angle match?	Check the setting of the step angle switch on the driver.
The amount of movement is large.	14. Is the number of input pulses set suitable to the amount of movement of the motor?	Check the number of input pulses.
The motor gets out of synchronization during acceleration.	Check #3.	
	15. Is the starting pulse speed too high?	Decrease speed.
	16. Is the acceleration/deceleration time too short?	Increase the time.
	17. Is there excessive external noise present?	Check the operation of the motor without removing the possible sources of noise.
Strong vibration.	18. There may be too much allowance for the output torque of the motor.	Decrease the motor operating current.
	19. Is the pulse rate within the resonance range of the motor/system.	If vibration decreases by changing the pulse rate, resonance is the cause. Change the pulse rate or switch the step angle. Attach a Clean Damper if the motor has a dual axial shaft.
The motor gets hot.	20. The motor has been running too long. Is the temperature of the motor case less than 212°F (100°C)?	Decrease the operating time or allow more time for the motor to stop. Be sure to keep the temperature of the motor case less than 212°F (100°C).
The automatic current down does not activate.	21. Is the motor stop current adjustment switch (STOP) on the driver set to "F"?	Setting "F" does not decrease the current. Set the current to the optimum value referring to page 9.
	22. Is the pulse lamp OFF after the pulse signals are complete?	If the pulse signal is held at the "L" level, the lamp lights up and the motor current does not decrease. Be sure to restore to the "H" level. Set the automatic current down switch on the driver to ACD.
	23. Is the automatic current down function released?	Set the current down switch on the driver to ACD.

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WARRANTY AND LIMITATION OF LIABILITY

WARRANTY

Oriental Motor U.S.A. Corporation (the "Company") warrants to the first end user Buyer that the Products and Parts thereof, when shipped, will be free from defects in materials comprising the same and in the Company's workmanship. If any such defects exist or later appear, the Company shall undertake, at its sole expense, prompt remedial action as stated herein to correct the same; provided however, that the Company shall have no obligation or liability under this Warranty unless it shall have received written notice specifying such defect no later than one (1) year from the date of shipment. Remedial action under this Warranty shall require only that the Company, at its option, repair or modify the Products or Parts thereof, replace the same F.O.B. Torrance, California, or accept the return of the Products or Parts thereof by Buyer and refund the purchase price.

Products, or Parts thereof, manufactured by others are warranted hereunder only to the extent of such manufacturer's warranty to the Company.

Since after shipment, the Products and Parts thereof are under the sole control of Buyer, this Warranty is subject to, and shall be applicable only if, the following conditions are met:

a. The Company's instructions as to installation, operation and maintenance have been followed.
b. The Products and Parts thereof have been used under normal operating conditions or under such conditions as hereinbefore specified by the Company, or specified by the Buyer and agreed to in writing by the Company.
c. The Products and Parts thereof have been properly erected, installed, operated and maintained and have not been affected by misuse, neglect or accident;
d. The Buyer has not attempted or performed corrective work or change on the Products and/or Parts thereof without the Company's prior written consent as to the nature and expense thereof;
e. The Company shall have received notice of any defect no later than thirty (30) days after the Buyer first had knowledge of the same; and
f. Within the Warranty period and after prior authorization from the Company, the Products and/or Parts are shipped freight prepaid to the Company at 2580 West 237th Street, Torrance, California 90505-5217.

THE FOREGOING WARRANTY IS IN SUBSTITUTION FOR, AND IN LIEU OF, ANY AND ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF LIABILITY

THE COMPANY SHALL HAVE NO LIABILITY WHATSOEVER IN ANY EVENT FOR PAYMENT OF ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, DAMAGES FOR INJURY TO ANY PERSON OR PROPERTY. BY ACCEPTING THE PRODUCTS AND/OR PARTS THEREOF, THE FIRST END USER BUYER OR SUBSEQUENT USER AGREES THAT THE COMPANY SHALL NOT BE LIABLE FOR INDEMNIFICATION OR CONTRIBUTION (IN WHOLE OR IN PART) EITHER EXPRESSLY OR BY IMPLICATION.

IF FOR ANY REASON ANY OF THE FOREGOING PROVISIONS SHALL BE INEFFECTIVE, THE COMPANY'S LIABILITY FOR DAMAGES ARISING OUT OF ITS MANUFACTURE OR SALE OF ITS PRODUCTS OR PARTS, OR USE THEREOF, WHETHER SUCH LIABILITY IS BASED ON WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE, SHALL NOT IN ANY EVENT EXCEED THE FULL PURCHASE PRICE OR SUCH PRODUCTS AND PARTS THEREOF.

Any action against the Company based upon any liability or obligation arising hereunder or under any law applicable to the sale of its Products or Parts thereof, or the use thereof, must be commenced within one (1) year after the cause of such action arises.

Specifications subject to change without notice.

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