

Melec



5-PHASE STEPPING MOTOR Instructions Manual (For designers' use)

USER'S MANUAL

Please ensure to read and understand this Instructions Manual before using the product. Please keep this Instructions Manual at hand so that it is always available for reference.

Introduction

This Instructions Manual describes the safe and proper method of handling "5-phase Stepping Motor" with emphasis on the specifications, assuming that our readers are engaged in designing of control devices incorporating stepping motors.

Please ensure to read and understand this Instructions Manual before using the product.

Please keep this Instructions Manual at hand so that it is always available for reference.

Descriptions in this manual on safety matters:

This product must be operated and used properly.

Otherwise, or when it is operated and used erroneously, unforeseen accidents may occur, causing physical injuries or property damages.

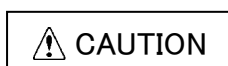
Majority of these accidents can be avoided if you are well informed of hazardous circumstances in advance.

Consequently, this instructions manual describes all the hazardous and dangerous circumstances and situations which can be foreseen and anticipated as well as necessary precautions.

All the above descriptions are being titled by the following symbol-marks and signal-words, namely:



Represents warnings ignorance of which can cause accidents involving fatal or serious physical injuries.



Represents cautions ignorance of which can cause accidents involving minor physical injuries or property damages.

Introduction

Descriptions in this manual on safety matters:

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The main parts which revised by this manual

1. Safety

1 – 1. Safety Precautions

 **WARNING**

- (1) This product is not designed or manufactured for application for equipment requiring high level of reliability such as equipment related to nuclear energy, aeronautics-related equipment, automobiles, ships, medical appliances directly handling the human body and equipment that might seriously affect properties.
- (2) Do not use or keep the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, fine particles, soot, steam, or exposed to radiation or direct sunshine. Doing so may cause injury or fire.
- (3) Do not transport, move, install the product, perform connections or inspections when the power is on. Doing so may cause electric shock, injury or fire.
- (4) Only qualified personnel are allowed to transport, move, install the product, perform connections or inspections. Failure to do so may cause injury or fire.
- (5) Connect the cables securely according to the wiring diagram in order to prevent fire. Moreover, do not forcibly bend, pull or pinch the cable. Failure to do so may cause injury or fire.

 **CAUTION**

- (6) Do not touch the motor during operation or immediately after stopping. Doing so may cause burn on the skin due to overheating of the motor.
- (7) Ensure to use this product according to the method specified in the Instructions Manual and within the specifications.
- (8) Depending on the operational conditions, the stepping motor may step out when it is on holding-state or driving-state. In particular, the load in transport may fall if the motor steps out on the vertical drive (such as the Z-axis). Start operation after test run for deliberate confirmation of operation.
- (9) Provide fail-safe measures so that the entire system may operate in a safe mode even in cases of the external power supply failure, disconnection of the signal line, or any failure on the motor.

2. Overview

2-1. Kind of motors

In our company, 5-phase stepping motor is prepared.
 It is possible to use it by combining with driver of our company for 5-phase stepping motor.



2-2. Motor and driver combination

The combination with the following driver is a typical example.
 Refer to each driver's instruction manual for the torque characteristic.

Outside Dimensions	Model name *1	Maximum Holding Torque (N·m)	Current (A/phase)	Maker	Combination example with driver of MELEC Inc.						
					ADB-5F30v1	ADB-5F40	GDB-5F30v1	GDB-5F40	GD-5410	GD-5510-01	GD-5610
□20mm	TS3682N1 (N11)	0.013	0.35	TAMAGAWA	○	—	○	—	—	—	—
	TS3682N2 (N12)	0.024	0.35	SEIKI	○	—	○	—	—	—	—
□24mm	TS3664N1E2 (N11E2)	0.018	0.75	CO., LTD.	○	—	○	—	—	—	—
	TS3664N2E4 (N12E4)	0.028	0.75		○	—	○	—	—	—	—
□28mm	SH5281-7211 *2	0.041	0.75	SANYO	○	○	○	○	—	—	—
	SH5285-7211 *2	0.078	0.75	DENKI	○	○	○	○	—	—	—
□42mm	103F5505-7241 (7211)	0.13	0.75	CO., LTD.	○	○	○	○	○	○	—
	103F5505-8241 (8211)	0.13	1.4		—	○	—	○	○	○	—
	103F5508-7241 (7211)	0.18	0.75		○	○	○	○	○	○	—
	103F5508-8241 (8211)	0.18	1.4		—	○	—	○	○	○	—
	103F5510-7241 (7211)	0.245	0.75		○	○	○	○	○	○	—
	103F5510-8241 (8211)	0.25	1.4		—	○	—	○	○	○	—
□60mm	103F7851-8241 (8211)	0.55	1.4		—	○	—	○	○	○	—
	103F7852-8241 (8211)	0.87	1.4		—	○	—	○	○	○	—
	103F7853-8241 (8211)	1.67	1.4		—	○	—	○	○	○	—
	SF5601-9251 *3	0.5	2.8		—	—	—	—	—	—	○
	SF5602-9251 *3	0.83	2.8		—	—	—	—	—	—	○
	SF5603-9251 *3	1.55	2.8		—	—	—	—	—	—	○

*1 In parentheses, it is both axis type.

*2 Both axis type only.

*3 Single axis type only.

3. Specifications

R1

3-1. Specifications list

(1) SANYO DENKI CO., LTD.

Outside Dimensions	Model name *1	Maximum Holding Torque (N·m)	Rotor Inertia (Kg. m ²)	Current (A/phase)	D. C Resistance (Ω ±10%)	Step Angle (°)	Weight (kg)	Length (mm)	Allowable Radial Load (N) *2	Allowable Thrust Load (N)
□28mm	SH5281-7211 *3	0.041	10x10 ⁻⁷	0.75	1.05	0.72	0.11	32	42	3
	SH5285-7211 *3	0.078	16x10 ⁻⁷	0.75	1.15	0.72	0.2	51.5	49	3
□42mm	103F5505-7241 (7211)	0.13	30x10 ⁻⁷	0.75	1.8	0.72	0.24	34	35	10
	103F5505-8241 (8211)	0.13	30x10 ⁻⁷	1.4	0.55	0.72	0.24	34	35	10
	103F5508-7241 (7211)	0.18	53x10 ⁻⁷	0.75	1.7	0.72	0.3	40	35	10
	103F5508-8241 (8211)	0.18	53x10 ⁻⁷	1.4	0.63	0.72	0.3	40	35	10
	103F5510-7241 (7211)	0.245	65x10 ⁻⁷	0.75	2.3	0.72	0.39	49	35	10
	103F5510-8241 (8211)	0.25	65x10 ⁻⁷	1.4	0.8	0.72	0.39	49	35	10
□60mm	103F7851-8241 (8211)	0.55	275x10 ⁻⁷	1.4	0.74	0.72	0.62	46.5	104	15
	103F7852-8241 (8211)	0.87	400x10 ⁻⁷	1.4	0.89	0.72	0.78	55	104	15
	103F7853-8241 (8211)	1.67	840x10 ⁻⁷	1.4	1.5	0.72	1.4	87.5	85	20
	SF5601-9251 *4	0.5	200x10 ⁻⁷	2.8	0.3	0.72	0.62	49	102	20
	SF5602-9251 *4	0.83	310x10 ⁻⁷	2.8	0.37	0.72	0.8	60	97	20
	SF5603-9251 *4	1.55	600x10 ⁻⁷	2.8	0.57	0.72	1.27	89	85	20

*1 In parentheses, it is both axis type.

*2 Load point: Position of 1/3 from the top of motor's output shaft.

*3 Both axis type only.

*4 Single axis type only.

(2) TAMAGAWA SEIKI CO., LTD.

Outside Dimensions	Model name *1	Maximum Holding Torque (N·m)	Rotor Inertia (Kg. m ²)	Current (A/phase)	D. C Resistance (Ω ±10%)	Step Angle (°)	Weight (kg)	Length (mm)	Allowable Radial Load (N) *2	Allowable Thrust Load (N)
□20mm	TS3682N1 (N11)	0.013	1.9x10 ⁻⁷	0.35	4.9	0.72	0.05	30	18.5	2.9
	TS3682N2 (N12)	0.024	4.0x10 ⁻⁷	0.35	9.1	0.72	0.085	46.5	18.5	2.9
□24mm	TS3664N1E2 (N11E2)	0.018	4.2x10 ⁻⁷	0.75	0.88	0.72	0.07	30.5	28.5	4.9
	TS3664N2E4 (N12E4)	0.028	8.3x10 ⁻⁷	0.75	1.36	0.72	0.12	46.5	28.5	4.9

*1 In parentheses, it is both axis type.

*2 Load point: Position of 1/3 from the top of motor's output shaft.

3-2. General specifications

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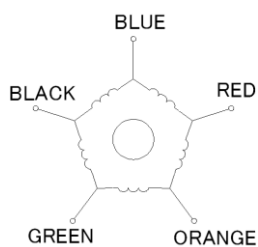
(1) SANYO DENKI CO., LTD.

Item	Specification
Class of Insulation	Class B (+130°C)
Withstand Voltage	□28 AC500V 50/60Hz, for one minute
	□42, □60 AC1500V 50/60Hz, for one minute
Insulation Resistance	DC500V 100MΩ or more
Operating Ambient Temperature	-10°C~+50°C
Operating Ambient Humidity	20%~90%RH (no condensation allowed)
Motor surface temperature	100°C or less

(2) TAMAGAWA SEIKI CO., LTD.

Item	Specification
Class of Insulation	Class B (+130°C)
Withstand Voltage	AC500V 50/60Hz, for one minute
Insulation Resistance	DC500V 100MΩ or more
Operating Ambient Temperature	-20°C~+50°C
Operating Ambient Humidity	5%~95%RH (no condensation allowed)
Motor surface temperature	90°C or less

3-3. Wiring diagram /Direction of rotation



The direction of the rotation sees from installation face and is clockwise (CW).

		ENERGIZE ORDER									
		1	2	3	4	5	6	7	8	9	10
Lead color	BLUE			+	+	+			-	-	-
	RED	-	-			+	+	+			-
	ORANGE		-	-	-			+	+	+	
	GREEN	+			-	-	-			+	+
	BLACK	+	+	+			-	-	-		

• Please refer to each driver's instruction manual for details of the connection.

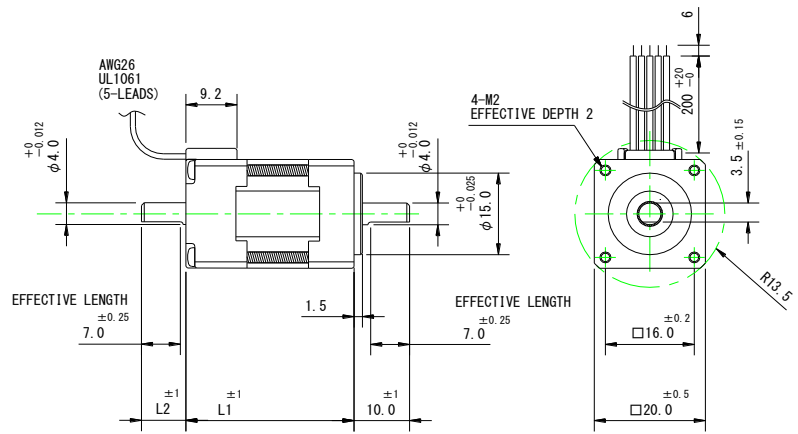
3 - 4. Dimensions

R1

□20mm

型名	L1	L2
TS3682N1	30	-
TS3682N11	30	8
TS3682N2	46.5	-
TS3682N12	46.5	8

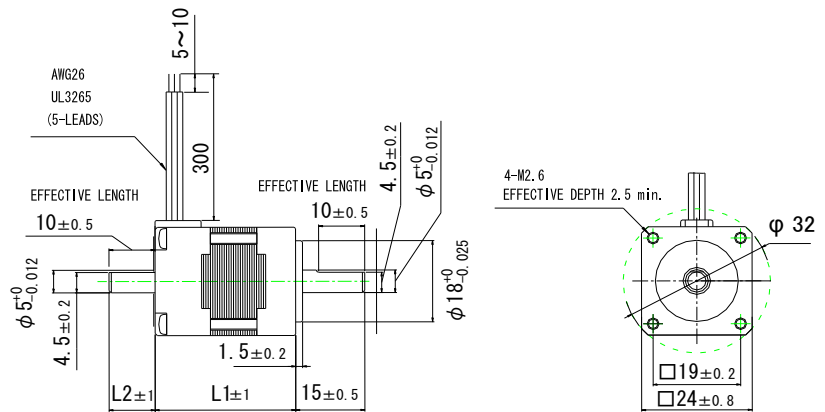
(Unit : mm)



□24mm

型名	L1	L2
TS3664N1E2	30.5	-
TS3664N11E2	30.5	10
TS3664N2E4	46.5	-
TS3664N12E4	46.5	10

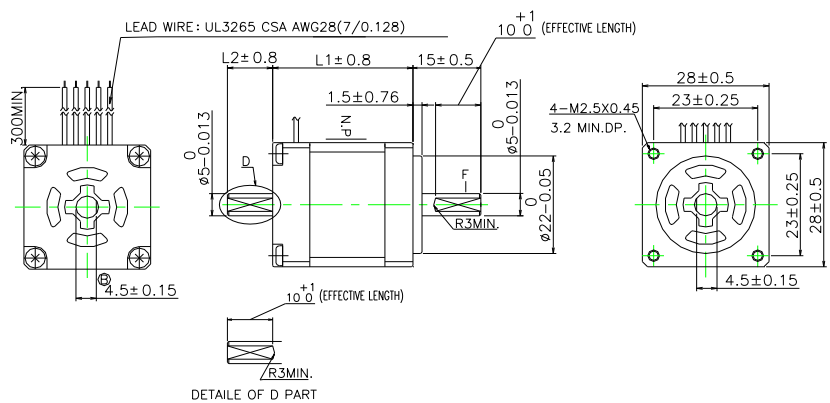
(Unit : mm)



□28mm

型名	L1	L2
SH5281-7211	32	10
SH5285-7211	51.5	10

(Unit : mm)



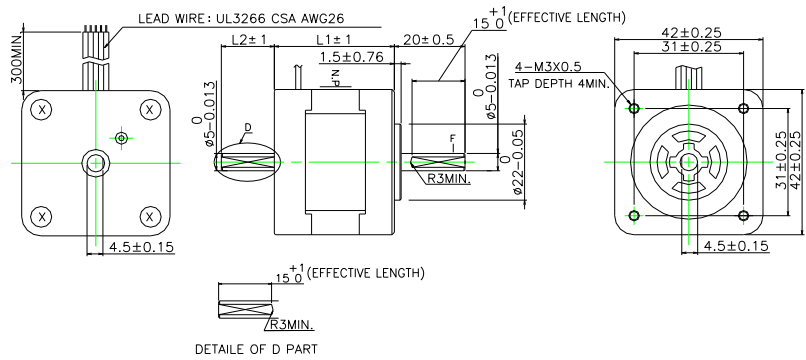
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R1

□42mm

型名	L1	L2
103F5505-7241	34	-
103F5505-7211	34	15
103F5505-8241	34	-
103F5505-8211	34	15
103F5508-7241	40	-
103F5508-7211	40	15
103F5508-8241	40	-
103F5508-8211	40	15
103F5510-7241	49	-
103F5510-7211	49	15
103F5510-8241	49	-
103F5510-8211	49	15

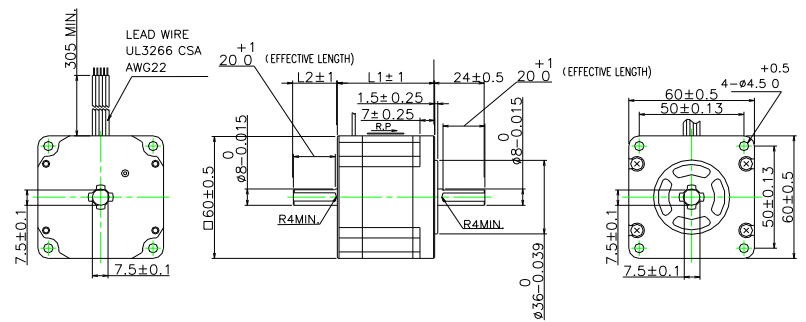
(Unit : mm)



□60mm

型名	L1	L2
103F7851-8241	46.5	-
103F7851-8211	46.5	21
103F7852-8241	55	-
103F7852-8211	55	21
103F7853-8241	87.5	-
103F7853-8211	87.5	21

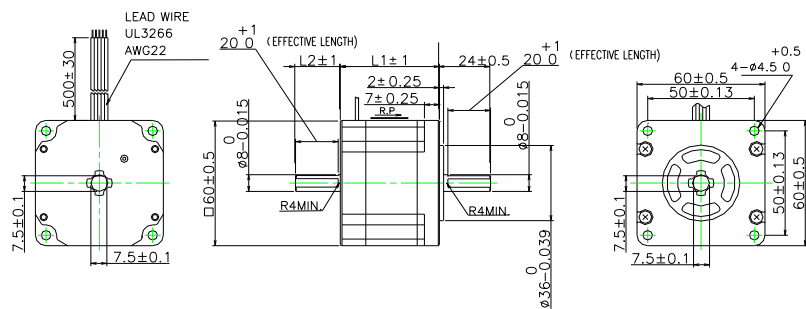
(Unit : mm)



□60mm

型名	L1	L2
SF5601-9251	49	-
SF5602-9251	60	-
SF5603-9251	89	-

(Unit : mm)



The main parts which revised by this manual

Parts	Content
P5, P6, P8, P9 P7	【R1】 • Deletion and addition of motor • Withstand voltage of □28

Technical Service

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This Operating Manual is subject to change without prior notice
for the purpose of product improvement.

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