

HYBRID STEPPING MOTORS & DRIVERS

2 Phase KH Series

3 Phase KT/KR Series



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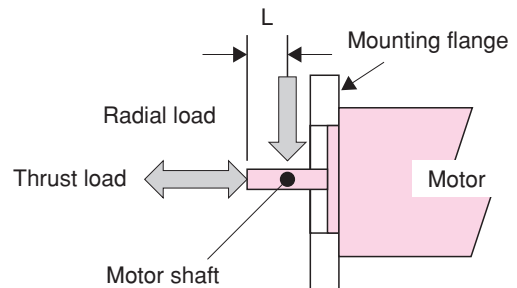
3-Phase Stepping Motor Driver

SERVEX FTD	60
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Max. Allowable Load / Runout for motor shaft

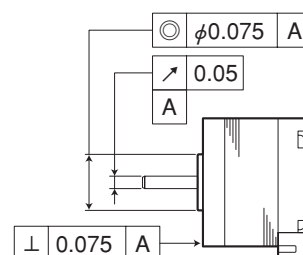
Load for motor shaft

Type	Thrust load	Radial load	
		Load	L
KH39	14.7N·m (1.5kgf)	19.6N·m (2.0kgf)	10mm
KH42			
KT35			
KT42			
KR42			
KH56	40N·m (4.1kgf)	70N·m (7.1kgf)	10mm
KT60			



Shaft run out

Shaft run out	0.05T.I.R. (mm) *
Concentricity between shaft and mounting circle	0.075T.I.R. (mm) *
Perpendicularity between shaft and mounting face	0.075T.I.R. (mm) *



* T.I.R. (Total Indicator Reading)

2-Phase Hybrid Stepping Motors & Drivers

Product Number Code

Stepping motors

KH 42 H M 2 - 901

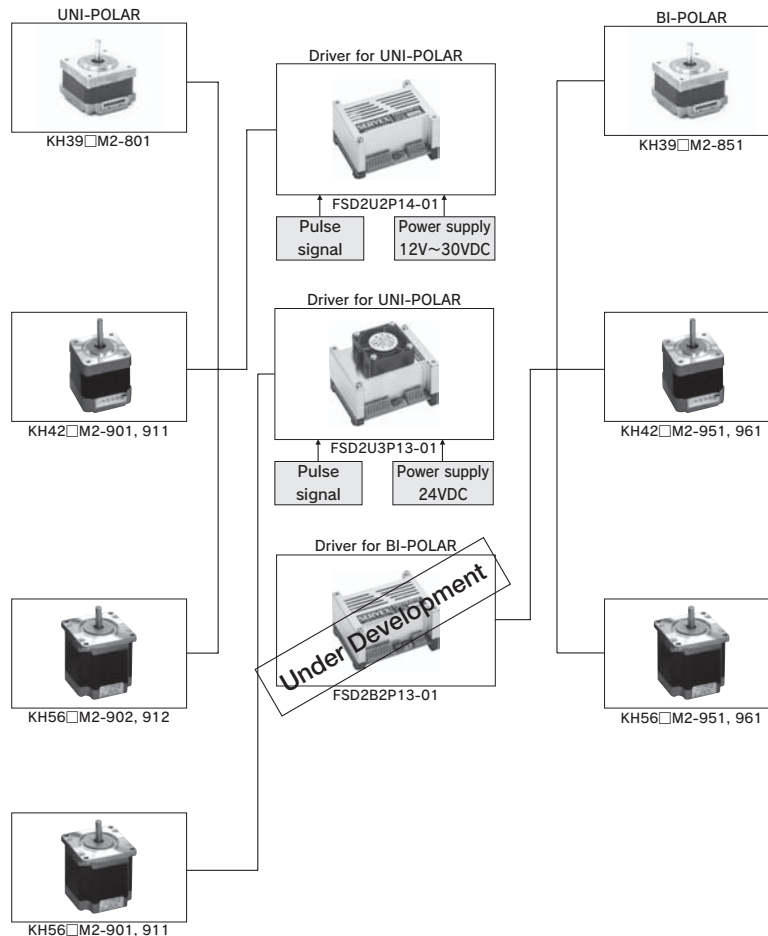
- Winding specifications
- Step angle(degree)
 - 06 : 0.6
 - 1 : 1.2
 - 2 : 1.8
 - 4 : 3.75
- Motor Type
 - M : HB Type
- Motor length(mm)
 - E : 20.8 J : 40~42
 - F : 27 K : 50~54
 - G : 31 Q : 76
 - H : 34
- Mounting size(mm)
- Series name
 - KH Series : 2Ph Stepping motors

Drivers

FSD 2 U 2 P 14 - 01

- Accessories
(Connector of lead wires)
with 01 : with cable
without 01 : without cable
- Serial number
- Supply voltage
 - P : DC
- Output current
 - 2 : 2A
 - 3 : 3A
- Drive systems
 - 2U : 2Ph Unipolar
 - 2B : 2Ph Bipolar
- Series name
 - FSD Series
 - 2Ph Type(KH Series model)

System Configuration



■ 2 - PHASE STEPPING MOTORS

1. Unipolar type Stepping angle = 1.8 deg./step Vcc = 24 V

Standard size		Holding Torque		Winding Resistance	Current	Voltage	Inductance	Model	Driver	Page		
mm	inch	mN·m	oz·in	Ω/phase	A/phase	V	mH/phase					
39 sq.x	20.8	1.54 sq.x	0.82	59	8.3	14	0.4	5.6	6.4	KH39EM2-801	○	4
	27		1.06	88	13.0	15	0.42	6.3	8.5	KH39FM2-801	○	6
	31		1.22	127	18.0	13.6	0.47	6.4	9.8	KH39GM2-801	○	8
42 sq.x	34	1.65 sq.x	1.34	140	20	3.4	0.9	3.06	2.4	KH42HM2-901, 911	○	10
						9.6	0.58	5.57	6.0	-902, 912	-	
						14.7	0.46	6.76	9.3	-903, 913	-	
	40		2.85	1.2	3.42	2.5	KH42JM2-901, 911	○	12			
			5.5	0.88	4.4	5.1	-902, 912	-				
50	1.97	340	48	3.1	1.2	3.72	3.1	KH42KM2-901, 911	○	14		
56 sq.x	42	2.2 sq.x	1.65	422	60	0.58	3.0	1.74	0.61	KH56JM2-901, 911	◇	16
						1.39	2.0	2.78	1.8	-902, 912	○	
						4.9	1.0	4.9	6.68	-903, 913	-	
	54		0.77	3.0	2.3	1.04	KH56KM2-901, 911	◇	18			
			1.79	2.0	3.6	3.0	-902, 912	○				
	76		2.99	1324	187	6.71	1.0	6.71	9.36	-903, 913	-	20
						1.18	3.0	3.54	2.4	KH56QM2-901, 911	◇	
2.73		2.0				5.46	5.4	-902, 912	○			
				9.9	1.0	9.9	21.6	-903, 913	-			

Note; Driver model FSD2U2P14-01 is applicable to the motors with ○.

Note; Driver model FSD2U3P13-01 is applicable to the motors with ◇.

2. Bipolar type Stepping angle = 1.8 deg./step Vcc = 24 V

Standard size		Holding Torque		Winding Resistance	Current	Voltage	Inductance	Model	Driver	Page		
mm	inch	mN·m	oz·in	Ω/phase	A/phase	V	mH/phase					
39 sq.x	20.8	1.54 sq.x	0.82	78	11	6.0	0.6	3.6	5.5	KH39EM2-851	○	4
	27		1.06	118	17	6.0	0.67	4.0	6.8	KH39FM2-851	○	6
	31		1.22	157	22	7.0	0.65	4.6	9.8	KH39GM2-851	○	8
42 sq.x	34	1.65 sq.x	1.34	197	28	3.1	1.0	3.1	4.3	KH42HM2-951, 961	○	10
	40		1.58	314	44	5.4	0.85	4.59	9.3	KH42JM2-951, 961	○	12
	50		1.97	403	57	2.3	1.2	2.76	4.0	KH42KM2-951, 961	○	14
56 sq.x	42	2.2 sq.x	1.65	490	69	0.98	2.0	1.96	2.27	KH56JM2-951, 961	○	16
	54		2.13	932	132	1.32	2.0	2.4	3.19	KH56KM2-951, 961	○	18
	76		2.99	1373	194	2.0	2.0	4.0	7.35	KH56QM2-951, 961	○	20

Note; Driver model FSD2B2P13-01 is applicable to the motors with ○.

■ 2 - Phase Drivers

Applicable motors type	Standard size		Power supply	OUTPUT current A	Step angle	Model	Page
	mm	inch					
Uni-poler	57×73×42	2.25×2.88×1.65	12-30V DC	0.33-2.0	1/1, 1/2, 1/4	FSD2U2P14-01	22
Uni-poler	57×73×56	2.25×2.88×2.21	24V DC	0.5-3.0	1/1, 1/2, 1/4	FSD2U3P13-01	24
Bi-poler					1/1, 1/2, 1/4	FSD2B2P13-01	26

2-Phase Hybrid Stepping Motor

1.8°

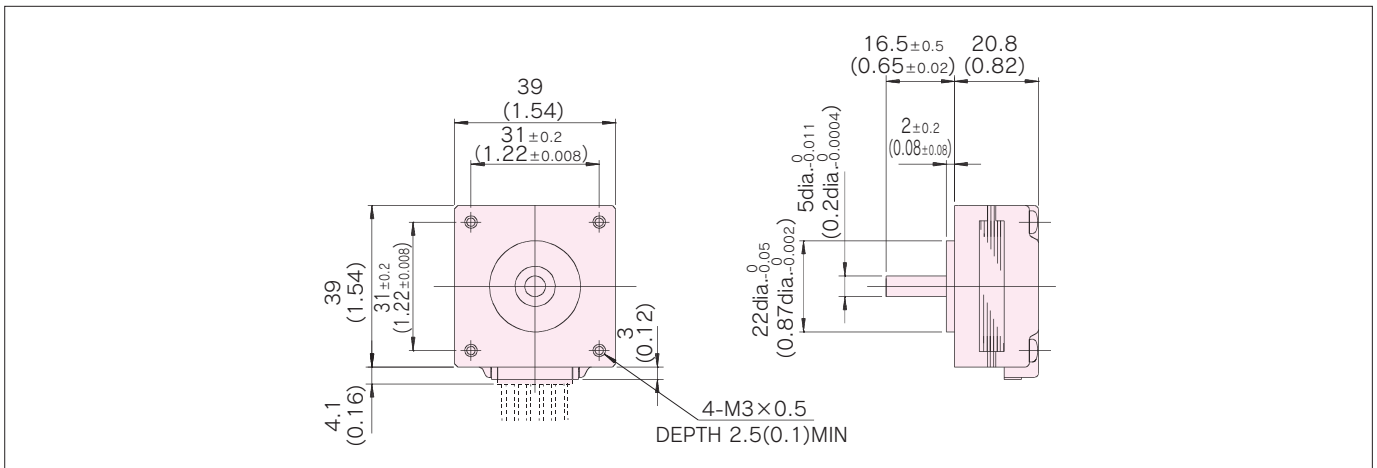
KH39 series

HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL	UNIT	KH39EM2	
		-801	-851
SHAFT	————	SINGLE	
DRIVE METHOD	————	UNI-POLAR	BI-POLAR
NUMBER OF PHASES	————	2	2
STEP ANGLE	deg./step	1.8	1.8
VOLTAGE	V	5.6	3.6
CURRENT	A/PHASE	0.4	0.6
RESISTANCE	Ω/PHASE	14.0	6.0
INDUCTANCE	mH/PHASE	6.4	5.5
HOLDING TORQUE	mN·m	59	78
	oz·in	8.3	11
DETENT TORQUE	mN·m	7.8	7.8
	oz·in	1.1	1.1
ROTOR INERTIA	g·cm ²	14	14
	oz·in ²	0.08	0.08
WEIGHT	g	110	110
	lb	0.24	0.24
INSULATION CLASS	————	E EQUIVALENT (120°C 248° F) (UL VALUE : CLASS B-130°C)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP.RANGE	°C	0 to 50	
ALLOWABLE TEMP.RISE	K	70	

DIMENSIONS unit = mm (inch)

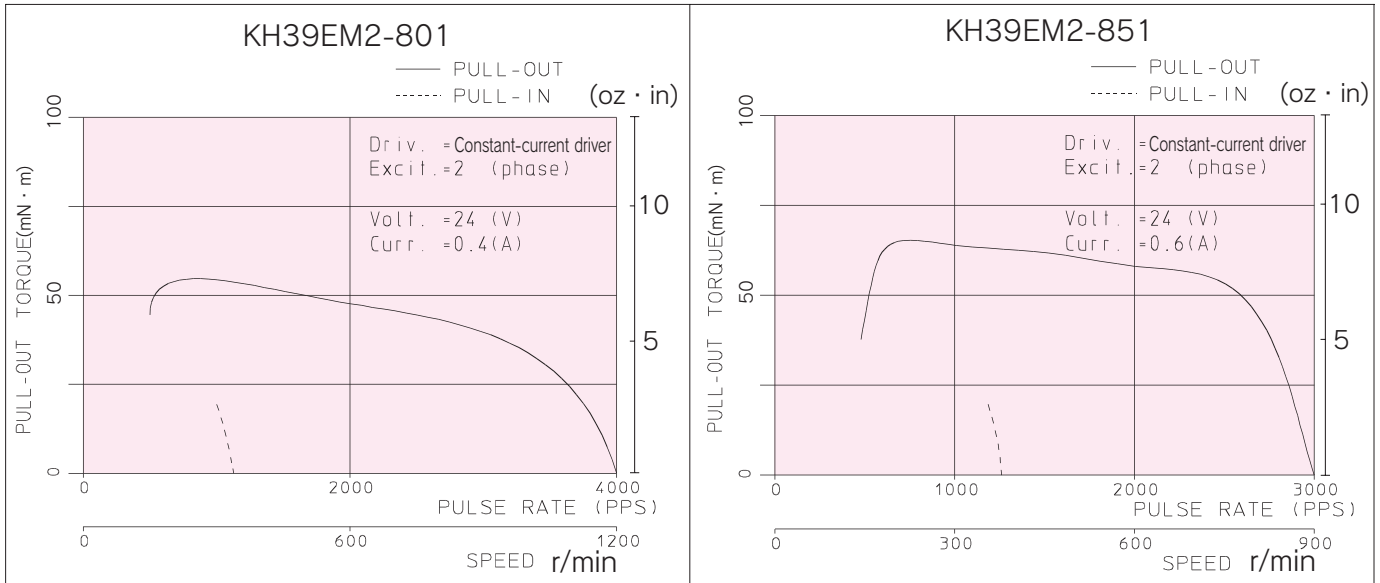




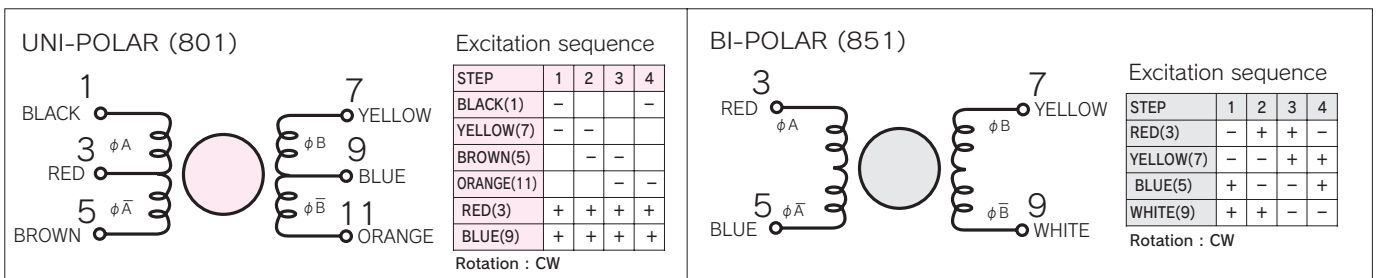
Features

1. High torque
Output is 1.3 times as high as conventional products.
2. Low noise -7dB(A) quieter than conventional products.

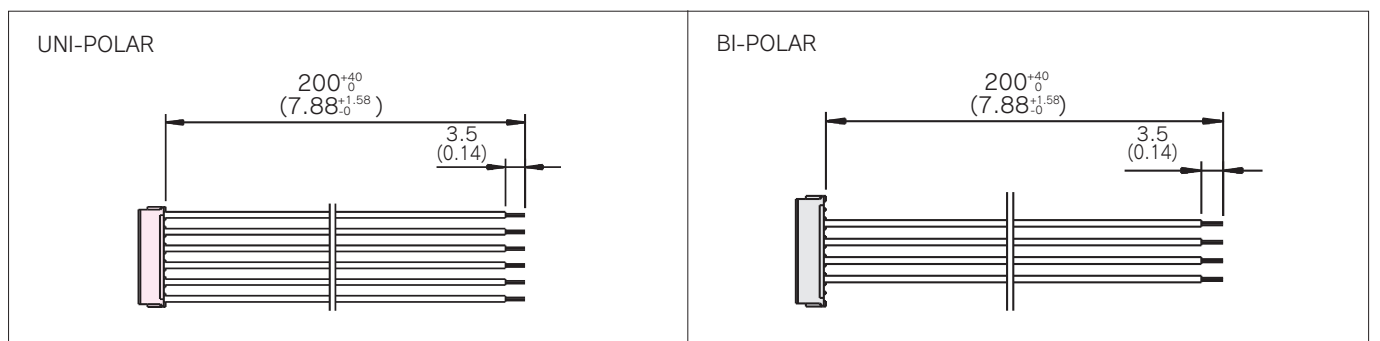
■ TORQUE CHARACTERISTICS VS PULSE RATE



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit=mm (inch)



2-Phase Hybrid Stepping Motor

1.8°

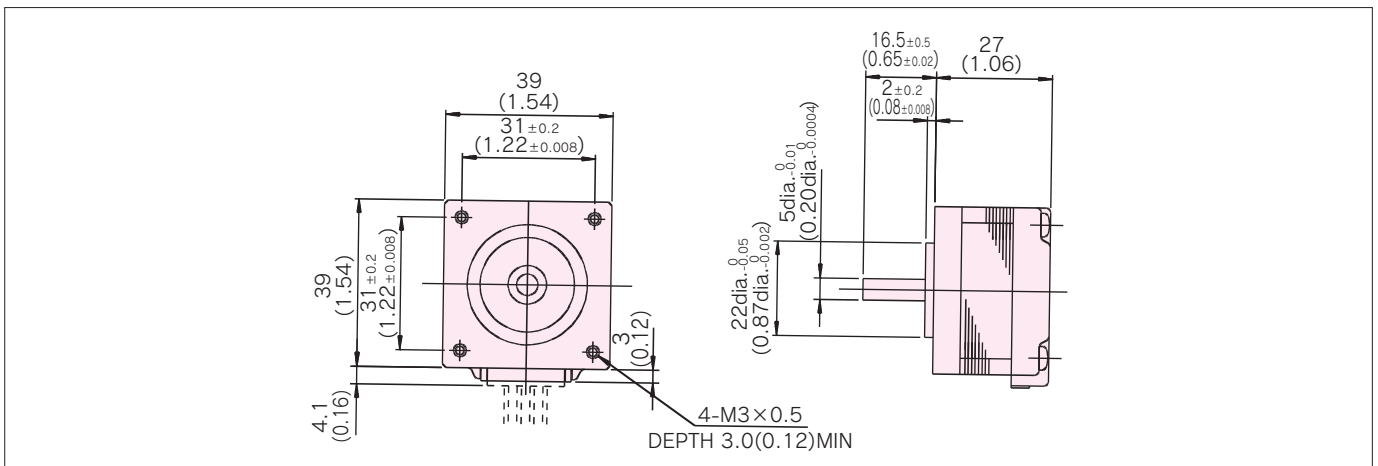
KH39 series

HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL	UNIT	KH39FM2	
		-801	-851
DRIVE METHOD	————	UNI-POLAR	BI-POLAR
NUMBER OF PHASES	————	2	2
STEP ANGLE	deg./step	1.8	1.8
VOLTAGE	V	6.3	4
CURRENT	A/PHASE	0.42	0.67
RESISTANCE	Ω/PHASE	15.0	6.0
INDUCTANCE	mH/PHASE	8.5	6.8
HOLDING TORQUE	mN·m	88	118
	oz · in	13	17
DETENT TORQUE	mN·m	9.8	9.8
	oz · in	1.4	1.4
ROTOR INERTIA	g · cm ²	19	19
	oz · in ²	0.10	0.10
WEIGHT	g	160	160
	lb	0.35	0.35
INSULATION CLASS	————	E EQUIVALENT (120°C 248° F) (UL VALUE : CLASS B-130°C)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP.RANGE	℃	0 to 50	
ALLOWABLE TEMP.RISE	K	70	

DIMENSIONS unit = mm (inch)

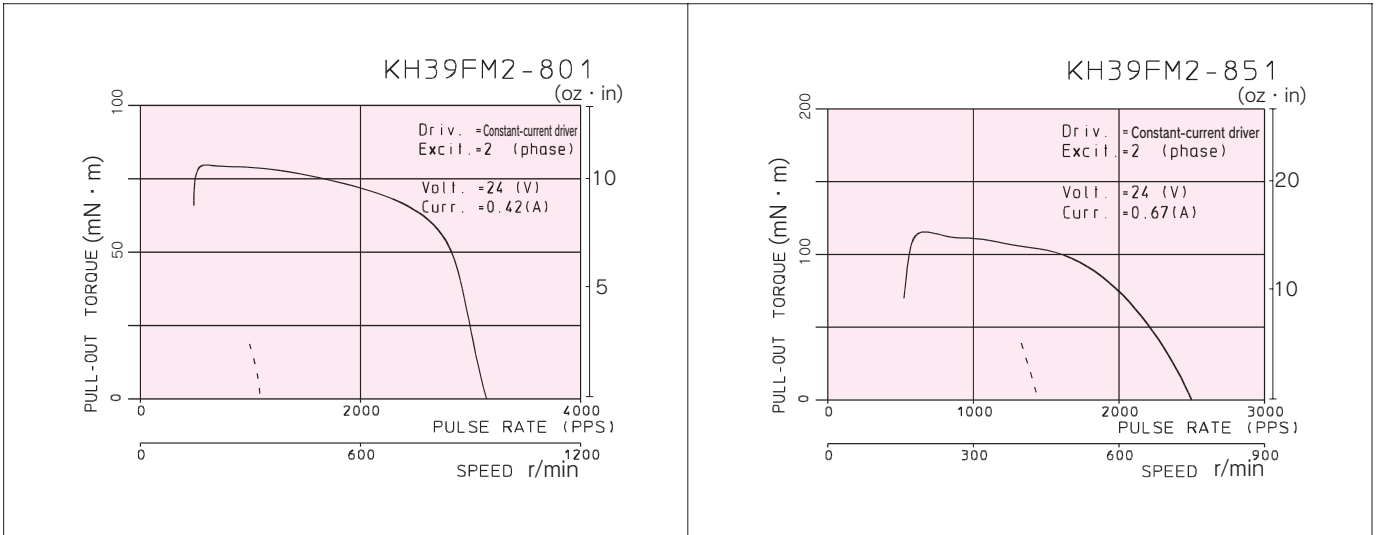




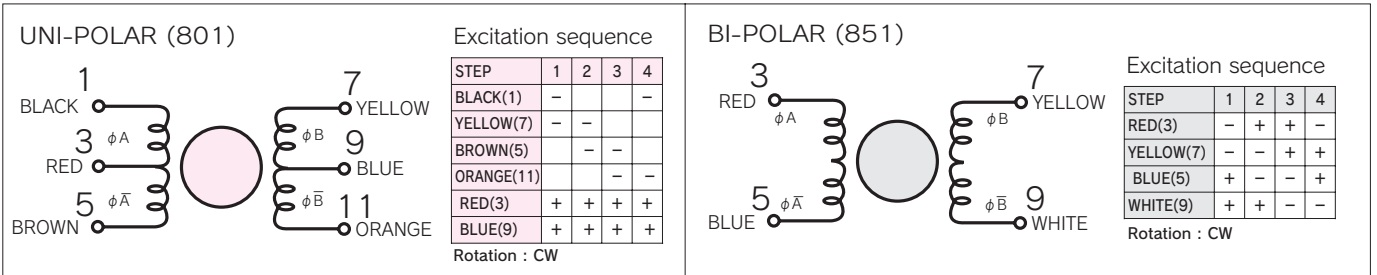
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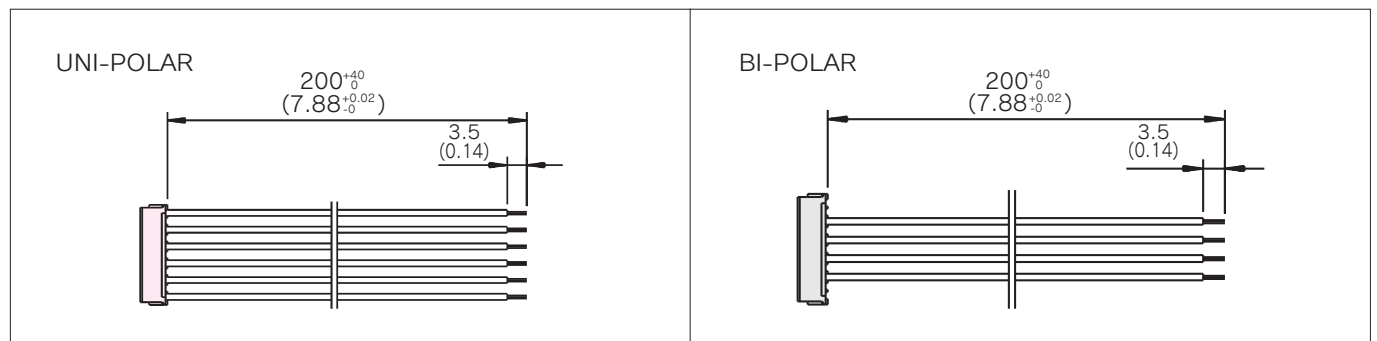
■ TORQUE CHARACTERISTICS vs. PULSE RATE



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit = mm (inch)



2-Phase Hybrid Stepping Motor

1.8°

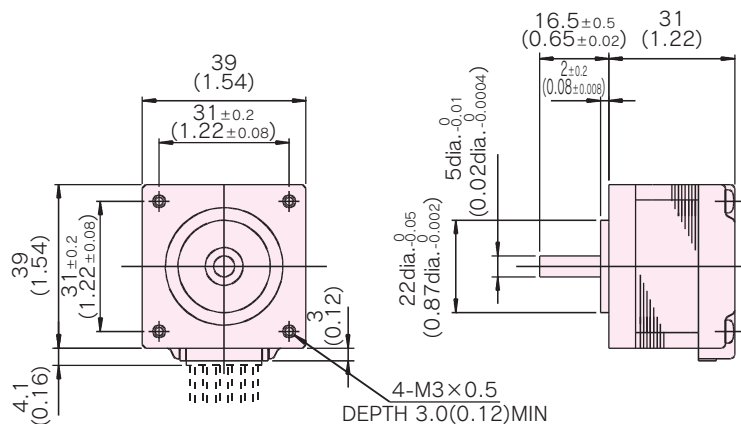
KH39 series

HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL	UNIT	KH39GM2	
		-801	-851
DRIVE METHOD	————	UNI-POLAR	BI-POLAR
NUMBER OF PHASES	————	2	2
STEP ANGLE	deg./step	1.8	1.8
VOLTAGE	V	6.4	4.6
CURRENT	A/PHASE	0.47	0.65
RESISTANCE	Ω/PHASE	13.6	7.0
INDUCTANCE	mH/PHASE	9.8	9.8
HOLDING TORQUE	mN·m	127	157
	oz · in	18	22
DETENT TORQUE	mN·m	11.8	11.8
	oz · in	1.7	1.7
ROTOR INERTIA	g · cm ²	27	27
	oz · in ²	0.15	0.15
WEIGHT	g	240	240
	lb	0.53	0.53
INSULATION CLASS	————	E EQUIVALENT (120°C 248° F) (UL VALUE : CLASS B-130°C)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP.RANGE	℃	0 to 50	
ALLOWABLE TEMP.RISE	K	70	

DIMENSIONS unit = mm (inch)

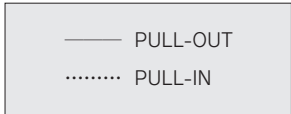
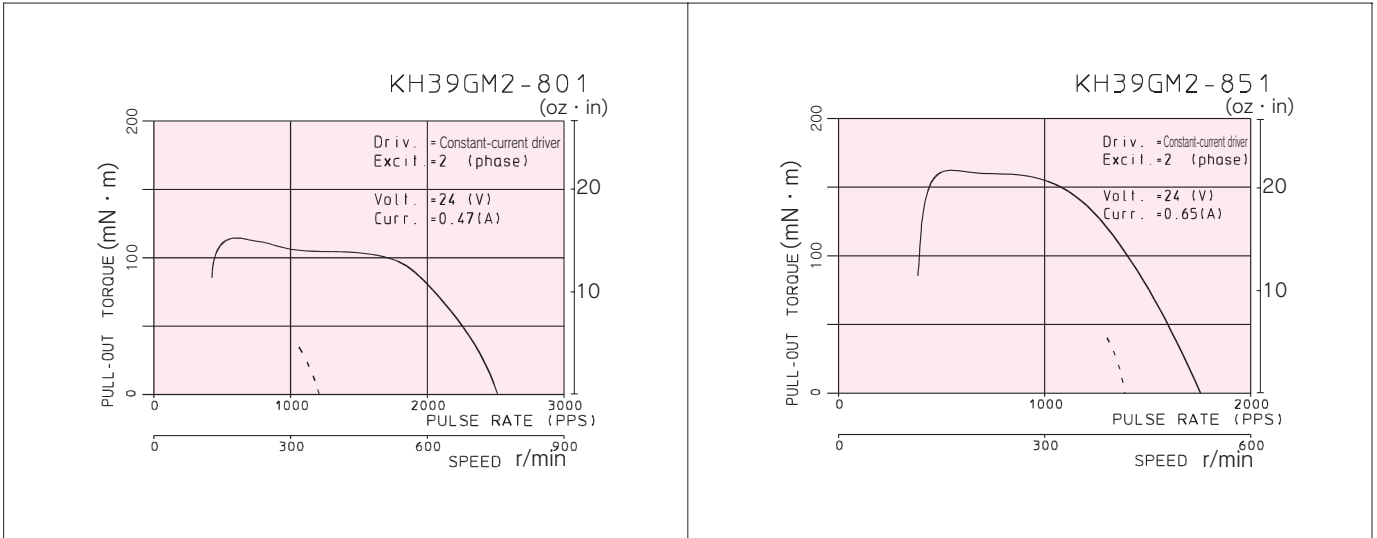




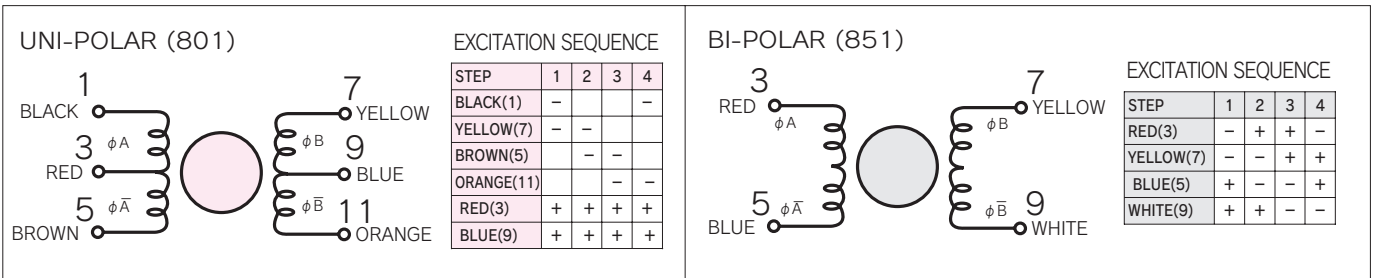
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Output is 1.3 times as high as conventional products.
2. Low noise -7dB(A) quieter than conventional products.

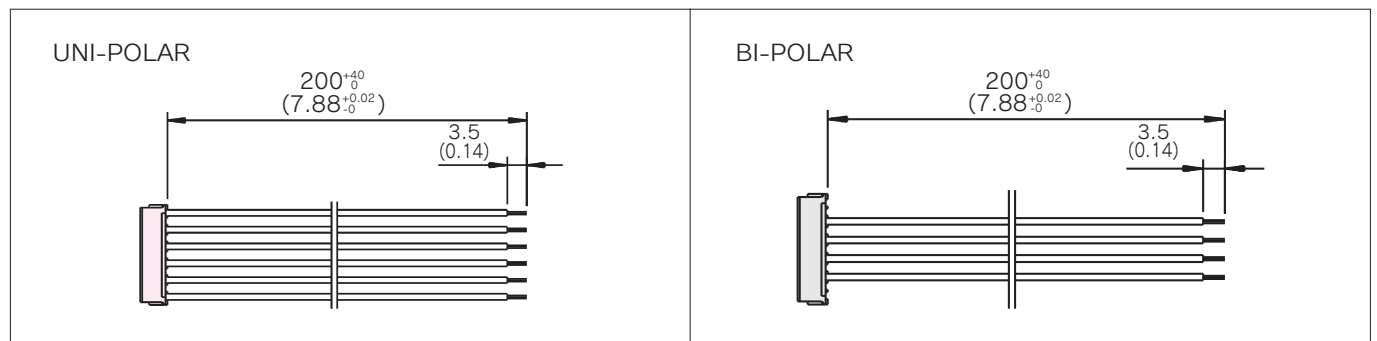
■ TORQUE CHARACTERISTICS vs. PULSE RATE



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit = mm (inch)



2-Phase Hybrid Stepping Motor

1.8°

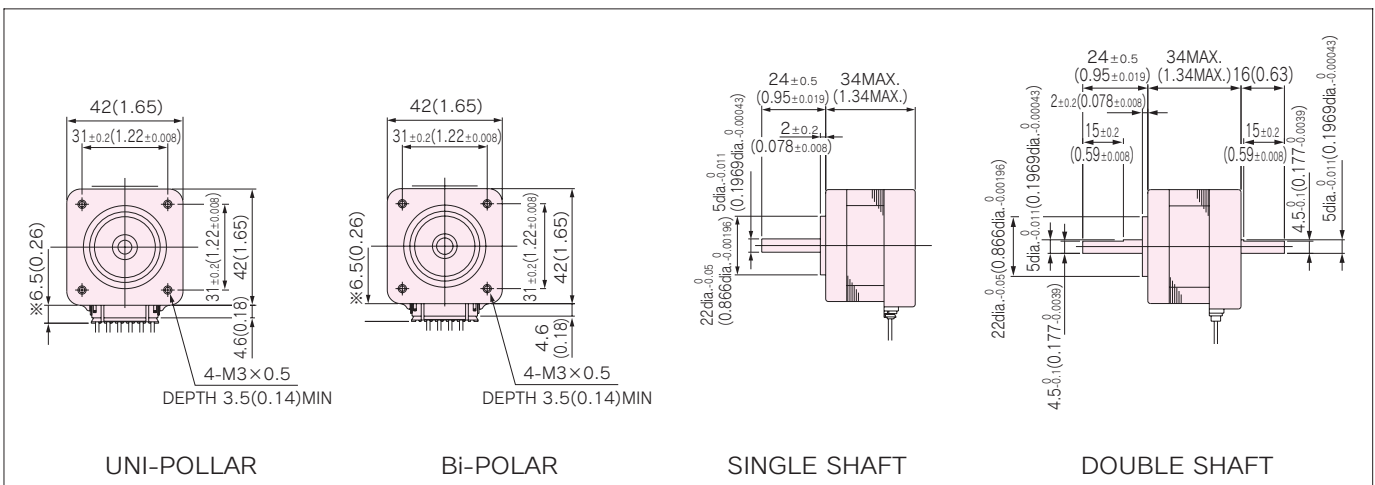
KH42 series

HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL	KH42HM2				
	SINGLE SHAFT	-901	-902	-903	-951
	DOUBLE SHAFT	-911	-912	-913	-961
DRIVE METHOD	————	UNI-POLAR			BI-POLAR
NUMBER OF PHASES	————	2			2
STEP ANGLE	deg./step	1.8			1.8
VOLTAGE	V	3.06	5.57	6.76	3.10
CURRENT	A/PHASE	0.9	0.58	0.46	1.0
WINDING RESISTANCE	Ω/PHASE	3.4	9.6	14.7	3.1
INDUCTANCE	mH/PHASE	2.4	6.0	9.3	4.3
HOLDING TORQUE	mN · m	140	140	140	197
	oz · in	20	20	20	20
DETENT TORQUE	mN · m	11.8	11.8	11.8	11.8
	oz · in	1.7	1.7	1.7	2.1
ROTOR INERTIA	g · cm ²	38	38	38	38
	oz · in ²	0.21	0.21	0.21	0.21
WEIGHTS	g	200	200	200	200
	lb	0.44	0.44	0.44	0.57
INSULATION CLASS	————	JIS Class E (120°C 248° F) (UL VALUE : CLASS B-130°C 266° F)			
INSULATION RESISTANCE	————	500VDC 100MΩmin.			
DIELECTRIC STRENGTH	————	500VAC 50HZ 1 min.			
OPERATING TEMP. RANGE	°C	0 to 50			
ALLOWABLE TEMP.RISE	K	70			

DIMENSIONS unit = mm (inch)





Features

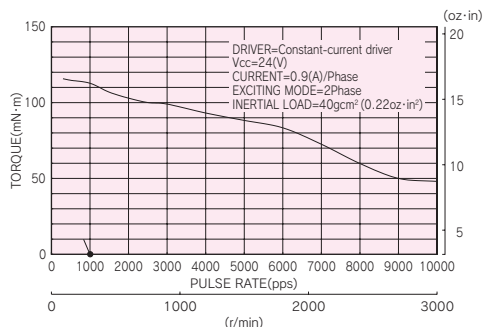
- Improved Dynamic Torque
(1.2 times torque of our previous model is generated at 300 r/min, on model : KH42JM2-901)
- Lowered Vibration & Noise Level
(by increased stiffness of body construction)
- Improved Efficiency
(1.1 times of our previous model, by high grade materials.)

■ TORQUE CHARACTERISTICS vs. PULSE RATE

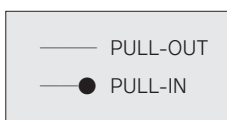
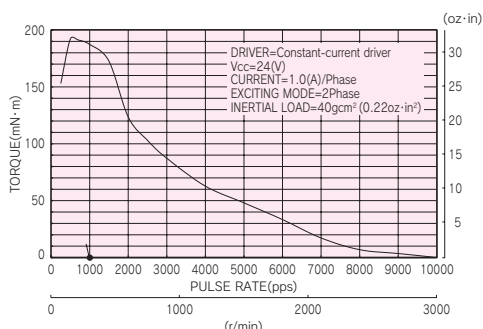
UNI-POLAR

BI-POLAR

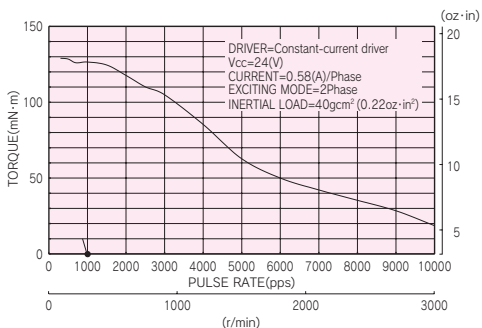
KH42HM2-901, 911



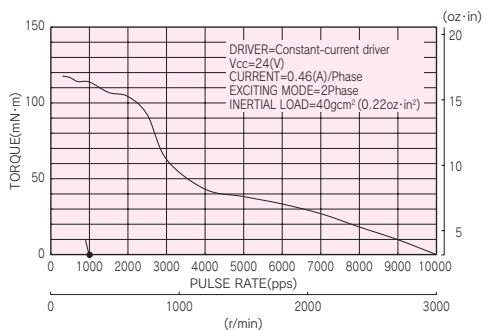
KH42HM2-951, 961



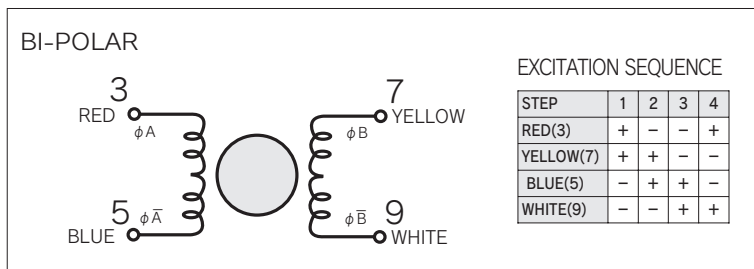
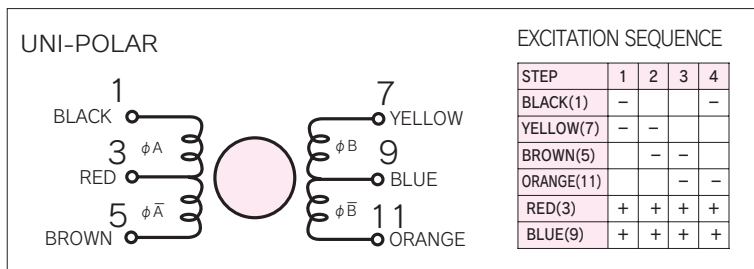
KH42HM2-902, 912



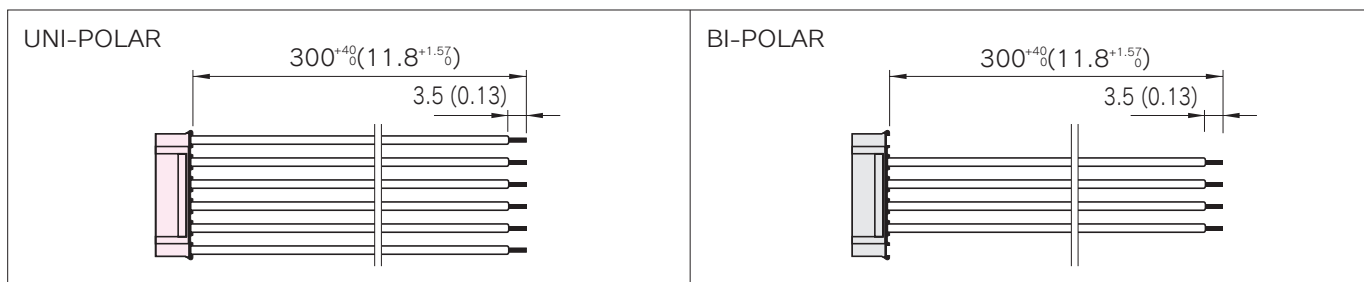
KH42HM2-903, 913



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit = mm (inch)



2-Phase Hybrid Stepping Motor

1.8°

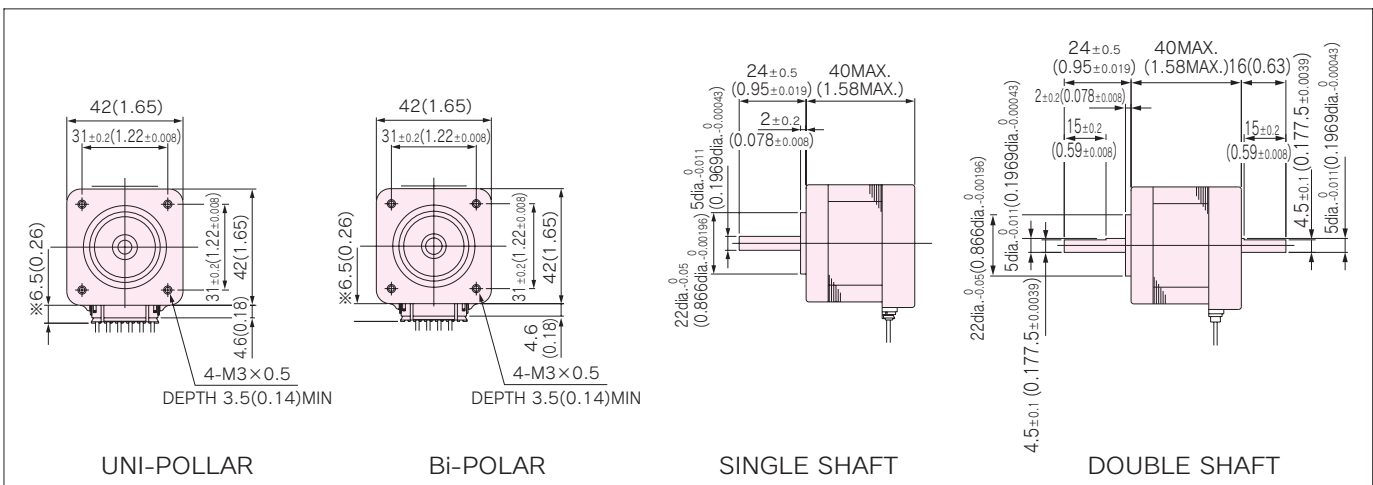
KH42 series

HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL	KH42JM2				
	SINGLE SHAFT	-901	-902	-903	-951
	DOUBLE SHAFT	-911	-912	-913	-961
DRIVE METHOD	————	UNI-POLAR			BI-POLAR
NUMBER OF PHASES	————	2			2
STEP ANGLE	deg./step	1.8			1.8
VOLTAGE	V	3.42	4.4	9.25	4.59
CURRENT	A/PHASE	1.2	0.88	0.5	0.85
WINDING RESISTANCE	Ω/PHASE	2.85	5.5	18.5	5.4
INDUCTANCE	mH/PHASE	2.5	5.1	16.3	9.3
HOLDING TORQUE	mN · m	236	236	236	314
	oz · in	33	33	33	44
DETENT TORQUE	mN · m	14.7	14.7	14.7	14.7
	oz · in	2.1	2.1	2.1	2.1
ROTOR INERTIA	g · cm ²	56	56	56	56
	oz · in ²	0.3	0.3	0.3	0.3
WEIGHTS	g	260	260	260	260
	lb	0.57	0.57	0.57	0.57
INSULATION CLASS	————	JIS Class E (120°C 248° F) (UL VALUE : CLASS B-130°C 266° F)			
INSULATION RESISTANCE	————	500VDC 100MΩmin.			
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.			
OPERATING TEMP. RANGE	°C	0 to 50			
ALLOWABLE TEMP. RISE	K	70			

DIMENSIONS unit = mm (inch)





Features

- Improved Dynamic Torque
(1.2 times torque of our previous model is generated at 300 r/min, on model : KH42JM2-901)
- Lowered Vibration & Noise Level
(by increased stiffness of body construction)
- Improved Efficiency
(1.1 times of our previous model, by high grade materials.)

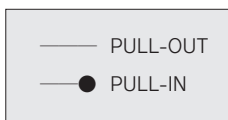
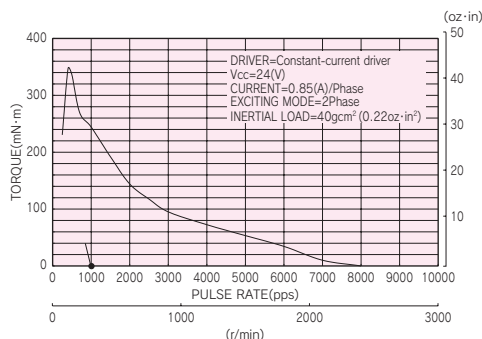
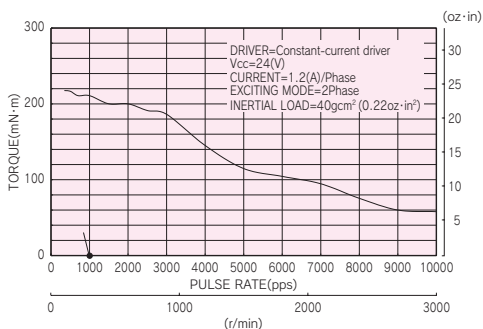
■ TORQUE CHARACTERISTICS vs. PULSE RATE

UNI-POLAR

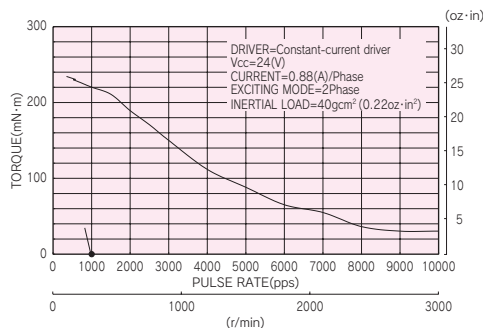
BI-POLAR

KH42JM2-901, 911

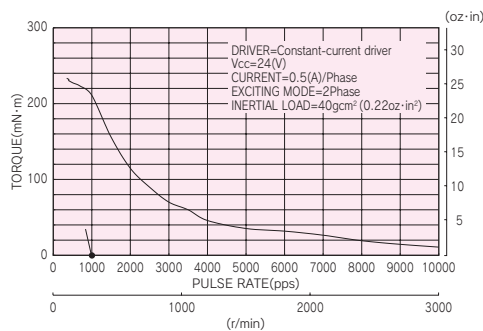
KH42JM2-951, 961



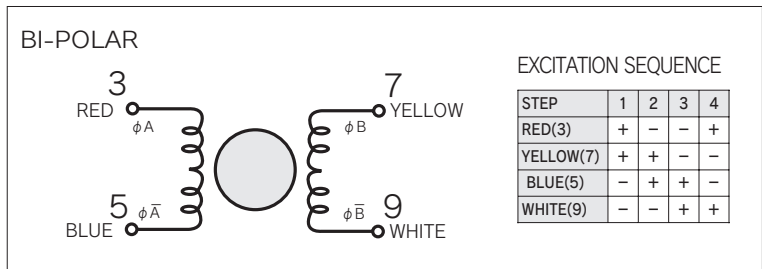
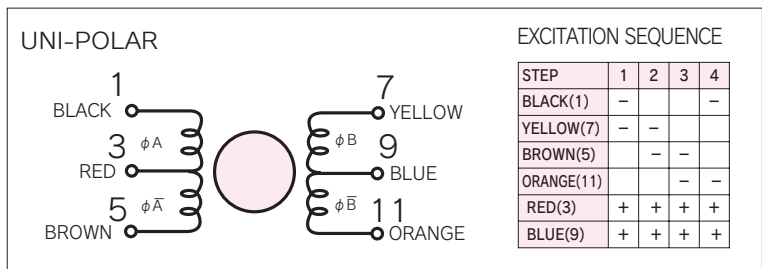
KH42JM2-902, 912



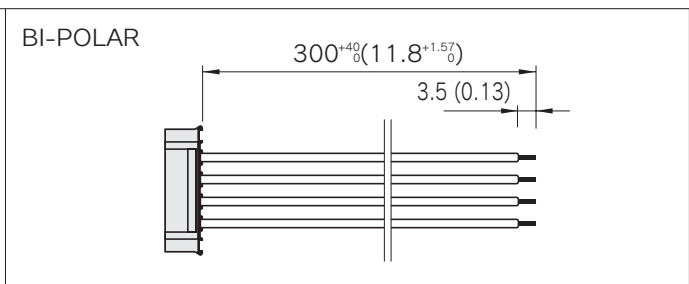
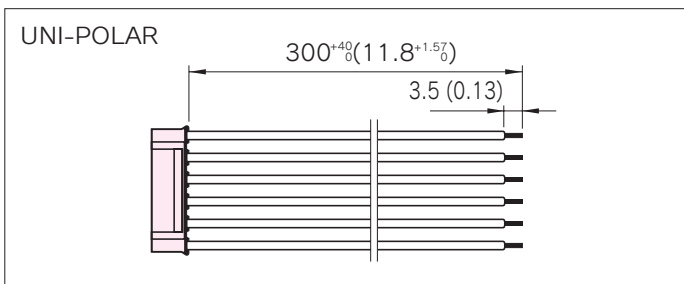
KH42JM2-903, 913



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit = mm (inch)



2-Phase Hybrid Stepping Motor

1.8°

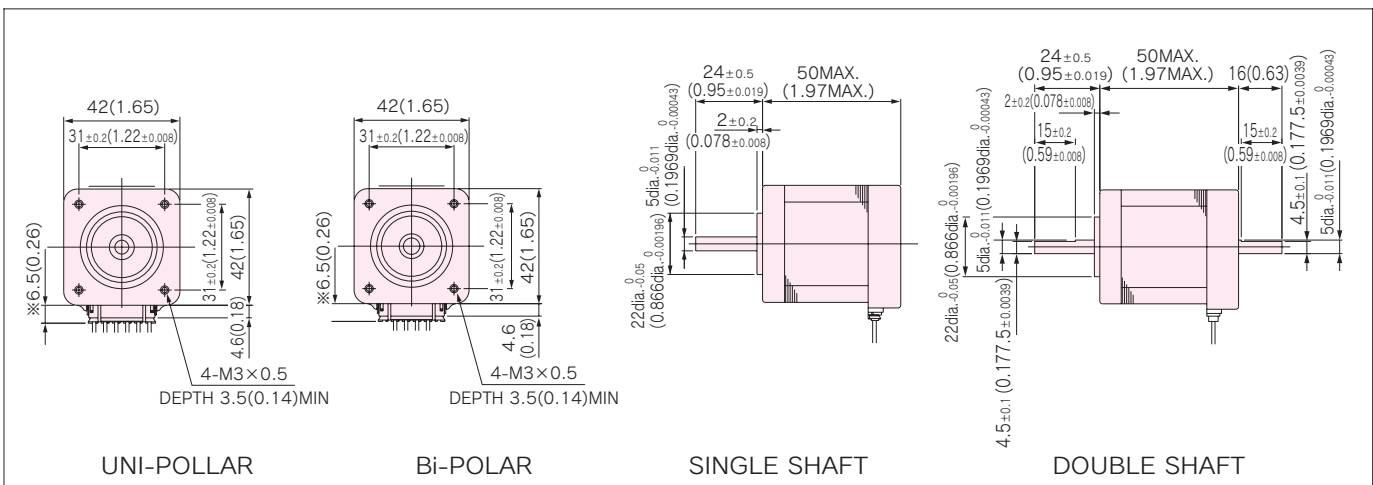
KH42 series

HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL	KH42KM2		
	SINGLE SHAFT	-901	-951
	DOUBLE SHAFT	-911	-961
DRIVE METHOD	————	UNI-POLAR	BI-POLAR
NUMBER OF PHASES	————	2	2
STEP ANGLE	deg./step	1.8	1.8
VOLTAGE	V	3.72	2.76
CURRENT	A/PHASE	1.2	1.2
WINDING RESISTANCE	Ω/PHASE	3.1	2.3
INDUCTANCE	mH/PHASE	3.1	4.0
HOLDING TORQUE	mN · m	340	403
	oz · in	48	57
DETENT TORQUE	mN · m	19.6	19.6
	oz · in	2.8	2.8
ROTOR INERTIA	g · cm ²	85	85
	oz · in ²	0.46	0.46
WEIGHTS	g	360	360
	lb	0.79	0.79
INSULATION CLASS	————	JIS Class E (120°C 248° F) (UL VALUE : CLASS B-130°C 266° F)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP. RANGE	°C	0 to 50	
ALLOWABLE TEMP. RISE	K	70	

DIMENSIONS unit = mm (inch)





Features

- Improved Dynamic Torque
(1.2 times torque of our previous model is generated at 300 r/min, on model : KH42JM2-901)
- Lowered Vibration & Noise Level
(by increased stiffness of body construction)
- Improved Efficiency
(1.1 times of our previous model, by high grade materials.)

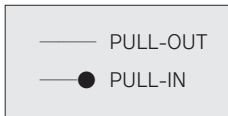
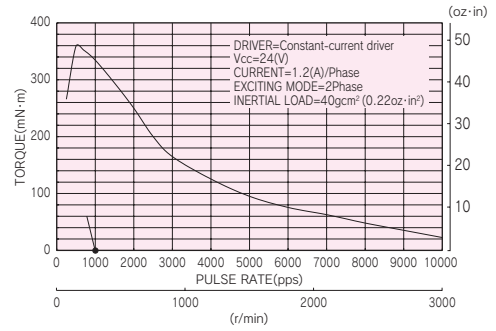
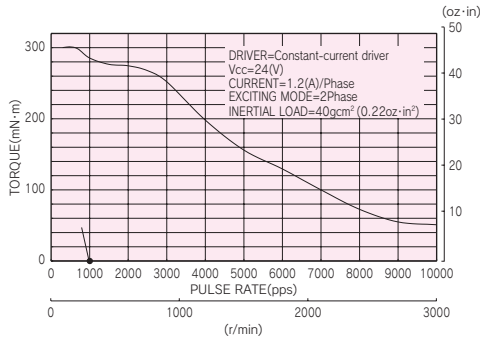
■ TORQUE CHARACTERISTICS vs. PULSE RATE

UNI-POLAR

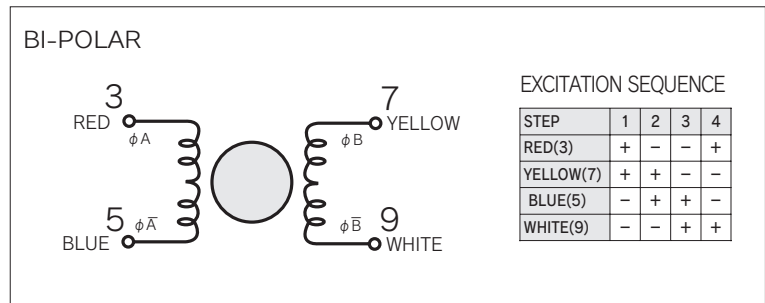
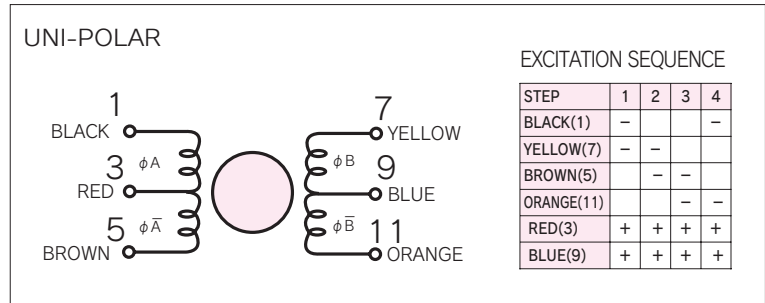
BI-POLAR

KH42KM2-901, 911

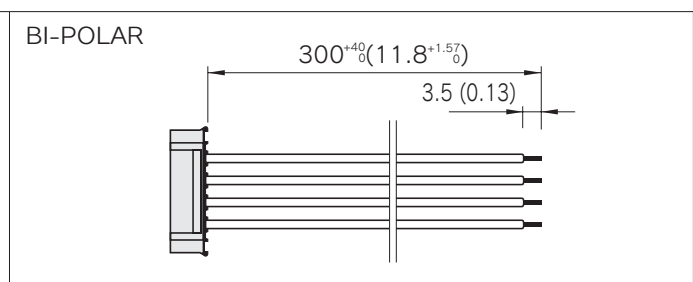
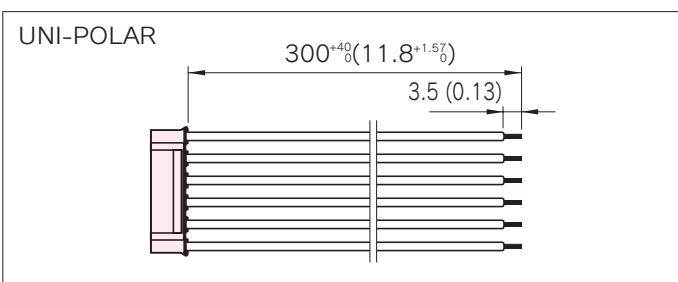
KH42KM2-951, 961



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit = mm (inch)



2-Phase Hybrid Stepping Motor

1.8°

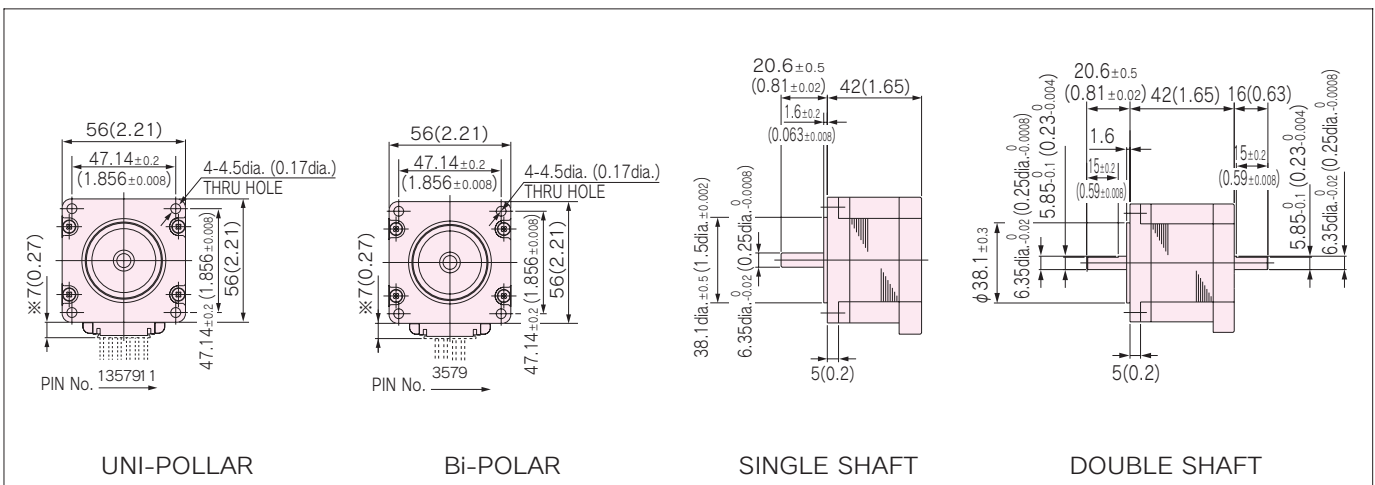
KH56 series

HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL		KH56JM2				
		SINGLE SHAFT	-901	-902	-903	-951
		DOUBLE SHAFT	-911	-912	-913	-961
DRIVE METHOD	————	UNI-POLAR			BI-POLAR	
NUMBER OF PHASES	————	2			2	
STEP ANGLE	deg./step	1.8			1.8	
VOLTAGE	V	1.68	2.78	4.9	1.96	
CURRENT	A/PHASE	3.0	2.0	1.0	2.0	
WINDING RESISTANCE	Ω/PHASE	0.58	1.39	4.9	0.98	
INDUCTANCE	mH/PHASE	0.61	1.8	6.68	2.27	
HOLDING TORQUE	mN · m	422	422	422	490	
	oz · in	60	60	60	69	
DETENT TORQUE	mN · m	25	25	25	25	
	oz · in	3.5	3.5	3.5	3.5	
ROTOR INERTIA	g · cm ²	115	115	115	115	
	oz · in ²	0.62	0.62	0.62	0.62	
WEIGHTS	g	400	400	400	400	
	lb	0.88	0.88	0.88	0.88	
INSULATION CLASS	————	JIS Class E (120°C 248° F) (UL VALUE : CLASS B 130°C 266° F)				
INSULATION RESISTANCE	————	500VDC 100MΩmin.				
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.				
OPERATING TEMP. RANGE	°C	0 to 50				
ALLOWABLE TEMP. RISE	K	70				

DIMENSIONS unit = mm (inch)





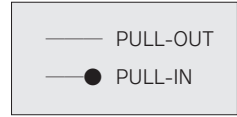
Features

- Stronger torque generated in higher speed zone (KH56KM2-901 generates 1.2 times torque of our previous model at 1200 r/min. speed)
- Lowered Vibration by increased stiffness of body construction (lowered by 10% than our previous model)
- Improved Efficiency (1.1 times of our previous model, by high grade materials)

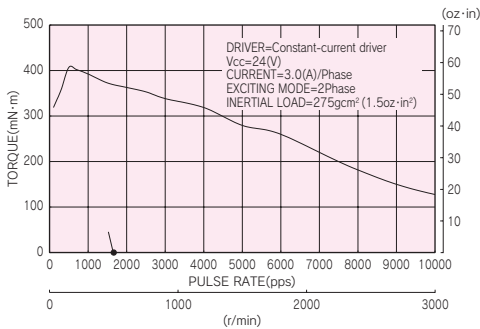
■ TORQUE CHARACTERISTICS vs. PULSE RATE

UNI-POLAR

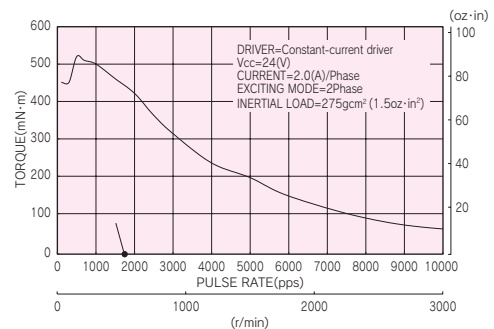
BI-POLAR



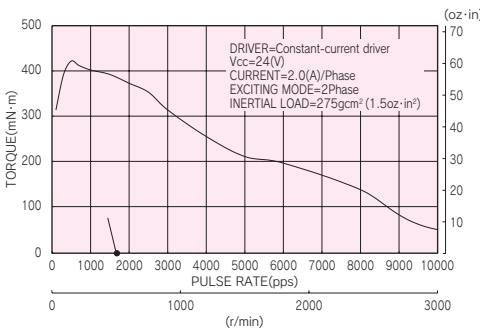
KH56JM2-901, 911



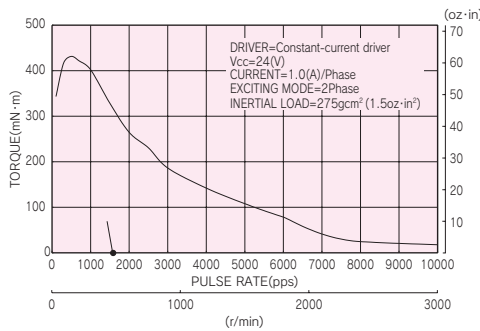
KH56JM2-951, 961



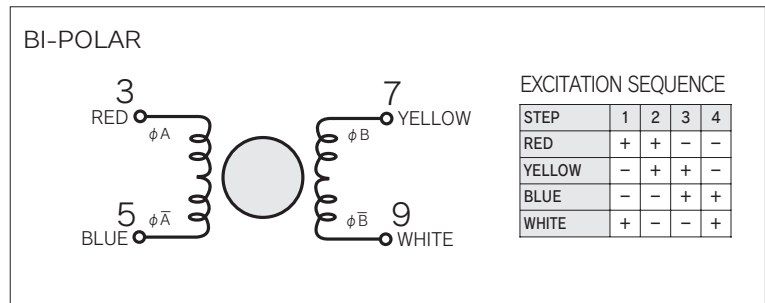
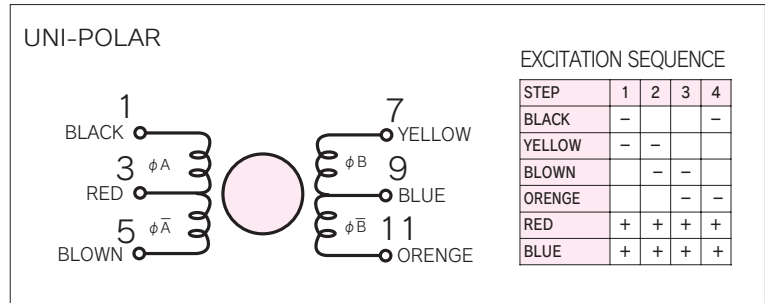
KH56JM2-902, 912



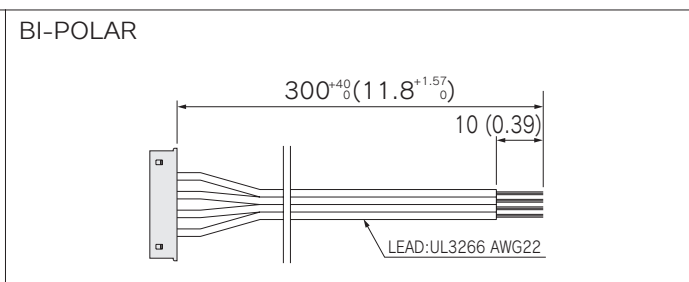
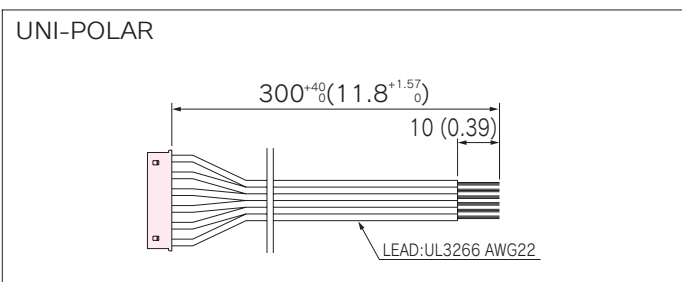
KH56JM2-903, 913



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit = mm (inch)



2-Phase Hybrid Stepping Motor

1.8°

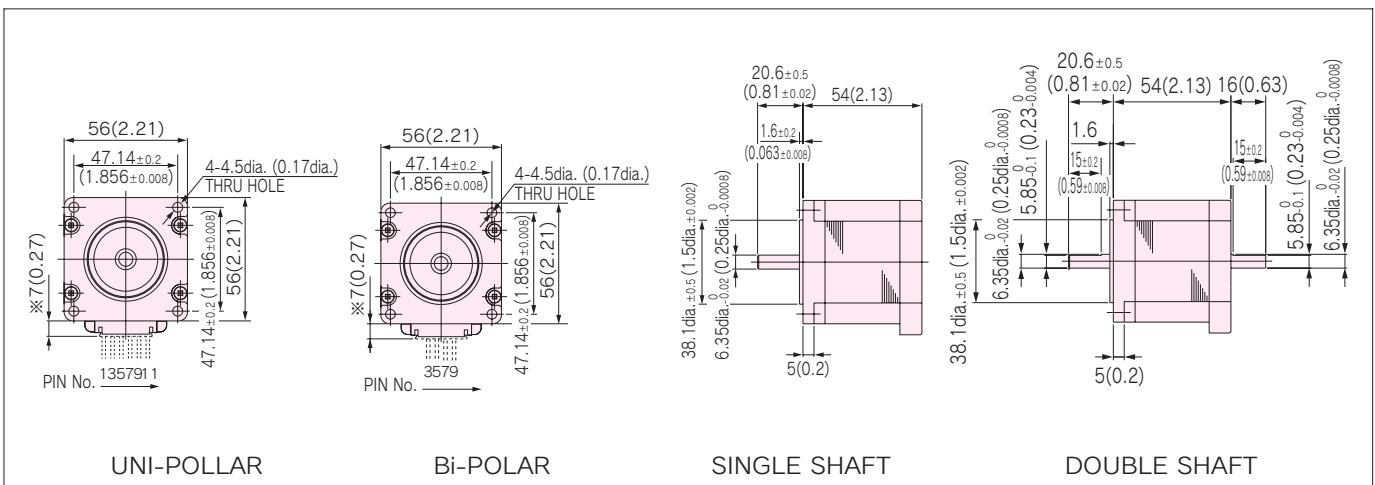
KH56 series

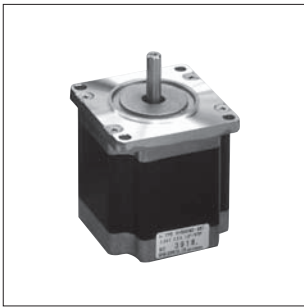
HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL		KH56KM2				
		SINGLE SHAFT	-901	-902	-903	-951
		DOUBLE SHAFT	-911	-912	-913	-961
DRIVE METHOD	————	UNI-POLAR			BI-POLAR	
NUMBER OF PHASES	————	2			2	
STEP ANGLE	deg./step	1.8			1.8	
VOLTAGE	V	2.3	3.6	6.71	2.4	
CURRENT	A/PHASE	3.0	2.0	1.0	2.0	
WINDING RESISTANCE	Ω/PHASE	0.77	1.79	6.71	1.32	
INDUCTANCE	mH/PHASE	1.04	3.0	9.36	3.19	
HOLDING TORQUE	mN · m	834	834	834	932	
	oz · in	118	118	118	132	
DETENT TORQUE	mN · m	37	37	37	37	
	oz · in	5.2	5.2	5.2	5.2	
ROTOR INERTIA	g · cm ²	188	188	188	188	
	oz · in ²	1.0	1.0	1.0	1.0	
WEIGHTS	g	650	650	650	650	
	lb	1.4	1.4	1.4	1.4	
INSULATION CLASS	————	JIS Class E (120°C 248° F) (UL VALUE : CLASS B 130°C 266° F)				
INSULATION RESISTANCE	————	500VDC 100MΩmin.				
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.				
OPERATING TEMP. RANGE	°C	0 to 50				
ALLOWABLE TEMP. RISE	K	70				

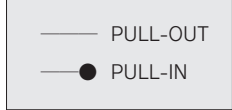
DIMENSIONS unit = mm (inch)





Features

- Stronger torque generated in higher speed zone (KH56KM2-901 generates 1.2 times torque of our previous model at 1200 r/min. speed)
- Lowered Vibration by increased stiffness of body construction (lowered by 10% than our previous model)
- Improved Efficiency (1.1 times of our previous model, by high grade materials)

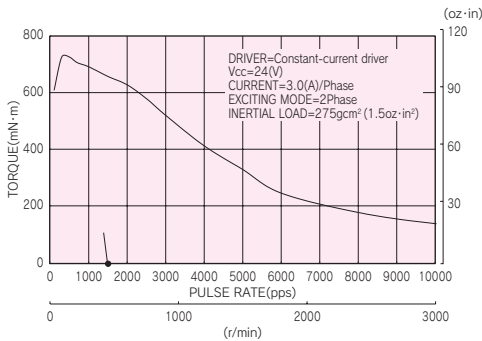


■ TORQUE CHARACTERISTICS vs. PULSE RATE

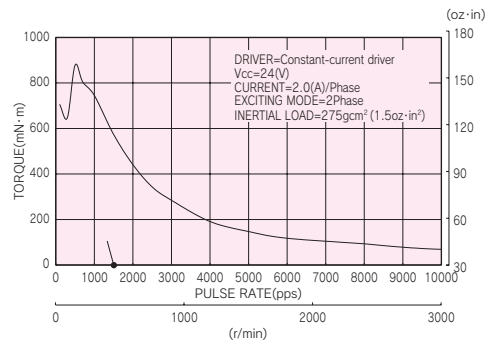
UNI-POLAR

BI-POLAR

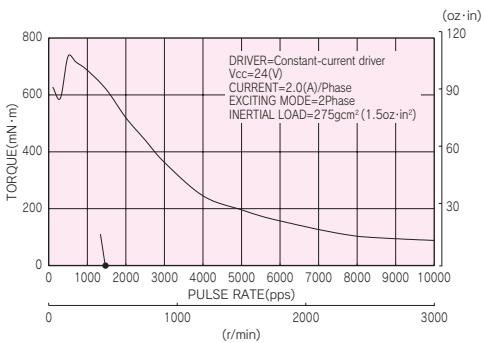
KH56KM2-901, 911



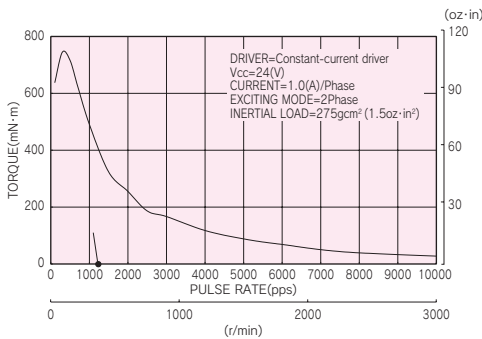
KH56KM2-951, 961



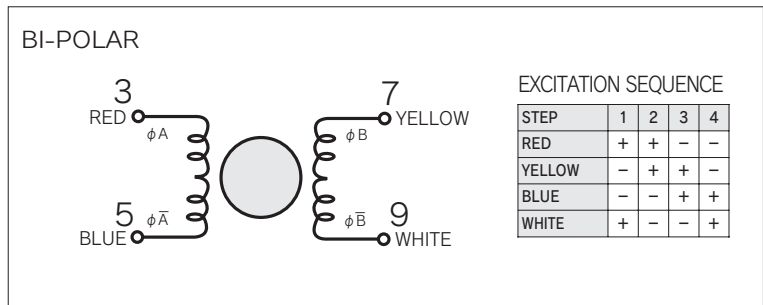
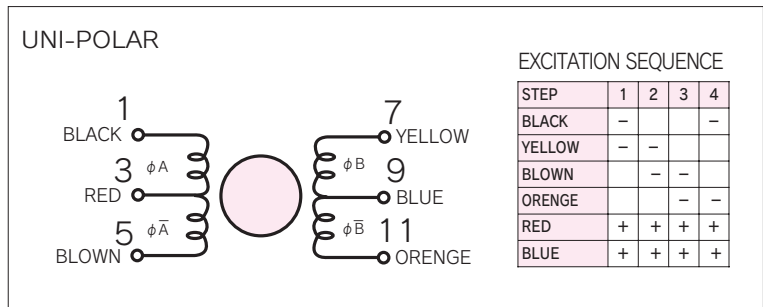
KH56KM2-902, 912



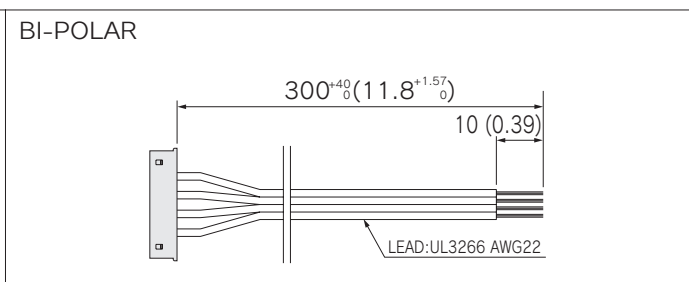
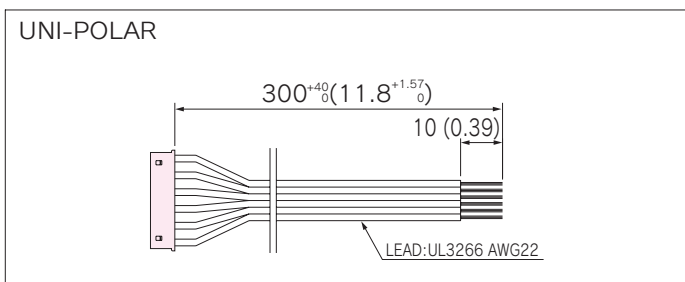
KH56KM2-903, 913



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit = mm (inch)



2-Phase Hybrid Stepping Motor

1.8°

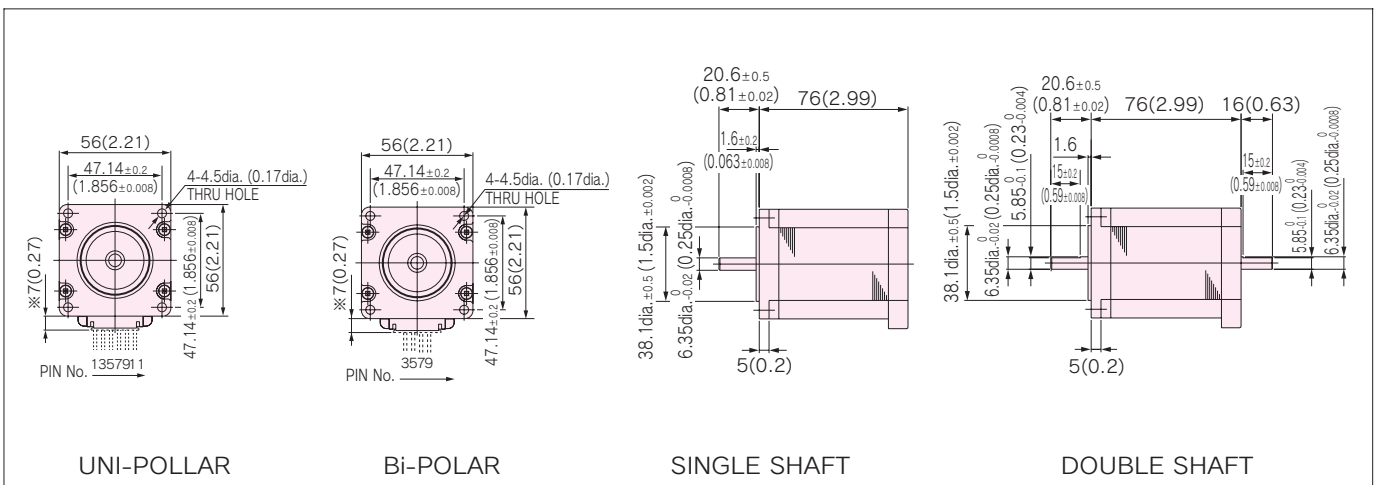
KH56 series

HIGH TORQUE, LOW VIBRATION AND LOW NOISE

STANDARD SPECIFICATIONS

MODEL		KH56QM2				
		SINGLE SHAFT	-901	-902	-903	-951
		DOUBLE SHAFT	-911	-912	-913	-961
DRIVE METHOD	—	UNI-POLAR			BI-POLAR	
NUMBER OF PHASES	—	2			2	
STEP ANGLE	deg./step	1.8			1.8	
VOLTAGE	V	3.54	5.46	9.9	4.0	
CURRENT	A/PHASE	3.0	2.0	1.0	2.0	
WINDING RESISTANCE	Ω/PHASE	1.18	2.73	9.9	2.0	
INDUCTANCE	mH/PHASE	2.4	5.4	21.6	7.35	
HOLDING TORQUE	mN · m	1324	1324	1324	1373	
	oz · in	187	187	187	194	
DETENT TORQUE	mN · m	69	69	69	69	
	oz · in	9.8	9.8	9.8	9.8	
ROTOR INERTIA	g · cm ²	269	269	269	269	
	oz · in ²	1.47	1.47	1.47	1.47	
WEIGHTS	kg	1.0	1.0	1.0	1.0	
	lb	2.2	2.2	2.2	2.2	
INSULATION CLASS	—	JIS Class E (120°C 248° F) (UL VALUE : CLASS B 130°C 266° F)				
INSULATION RESISTANCE	—	500VDC 100MΩmin.				
DIELECTRIC STRENGTH	—	500VAC 50HZ 1min.				
OPERATING TEMP. RANGE	°C	0 to 50				
ALLOWABLE TEMP. RISE	K	70				

DIMENSIONS unit = mm (inch)





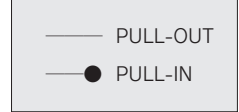
Features

- Stronger torque generated in higher speed zone (KH56KM2-901 generates 1.2 times torque of our previous model at 1200 r/min. speed)
- Lowered Vibration by increased stiffness of body construction (lowered by 10% than our previous model)
- Improved Efficiency (1.1 times of our previous model, by high grade materials)

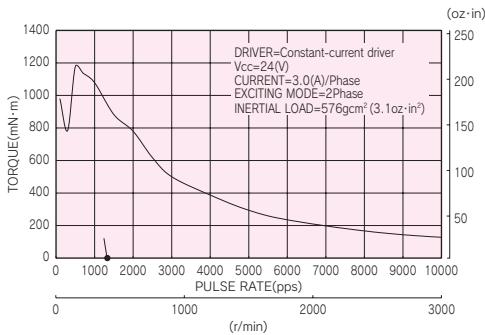
■ TORQUE CHARACTERISTICS vs. PULSE RATE

UNI-POLAR

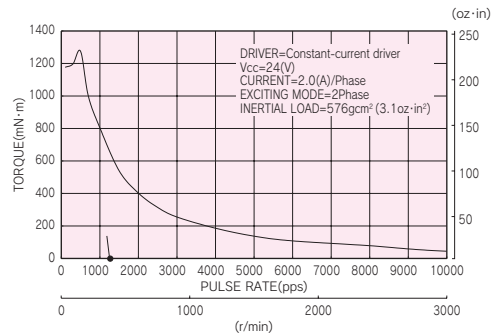
BI-POLAR



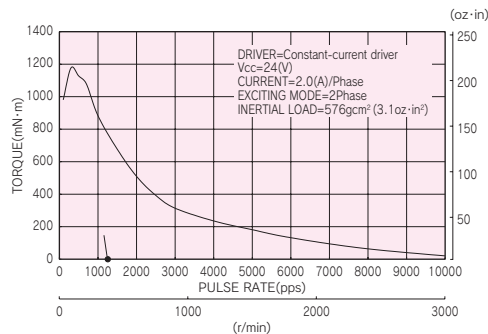
KH56QM2-901, 911



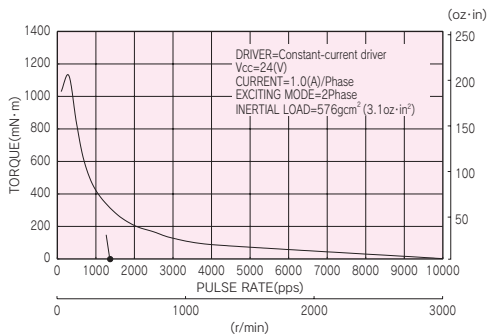
KH56QM2-951, 961



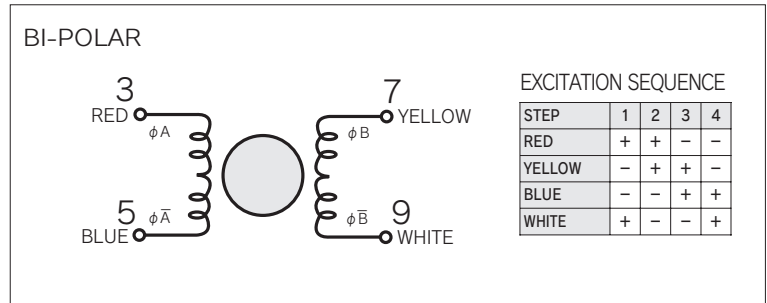
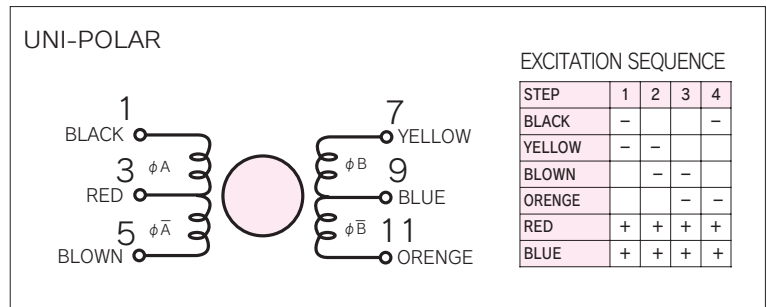
KH56QM2-902, 912



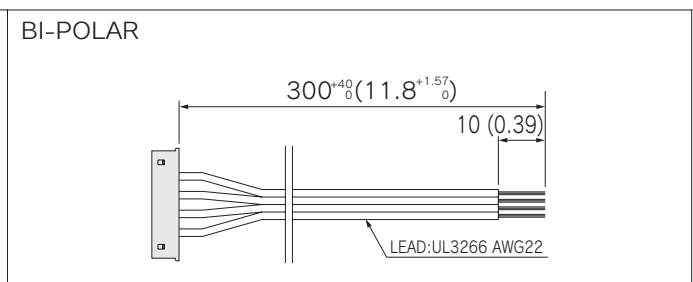
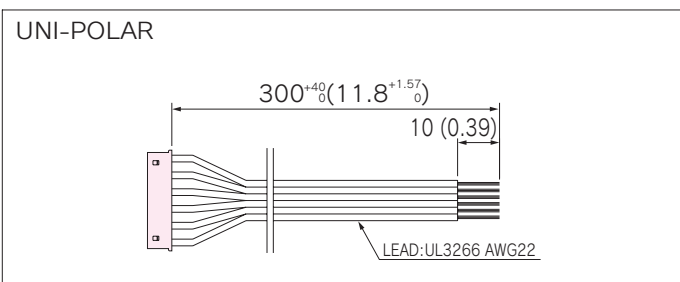
KH56QM2-903, 913



■ CONNECTION DIAGRAMS



■ CONNECTION CABLE TO MOTOR unit = mm (inch)



2-Phase Hybrid Stepping Motor Driver

**HIGH TORQUE, SILENT ROTATION
SERVEX FSD2U2P14-01 DC24V**

Features

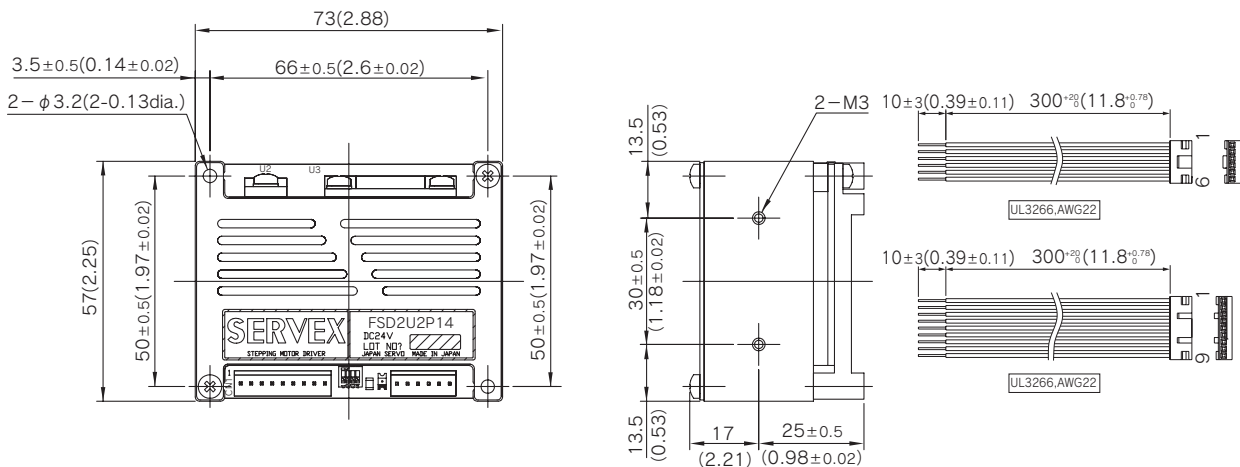
1. Ultra-compact driver measuring a mere 2.2 x 2.9 x 1.7 inches.
2. Uni-polar constant current driver.
3. Micro-stepping feature may be used to be selected from any one of 1/1 (full-step), 1/2 (micro-step), and 1/4 (micro-step) settings.
4. Through the use of 3-bit external signals, electric current settings may be specified to any one of 8 different setting from 0.33-2A/phase.
5. Input commands may be selected from either direction-of-rotation separate serial pulse signals or a combination of directional signals and pulse signals.

Applicable motors

See page 3

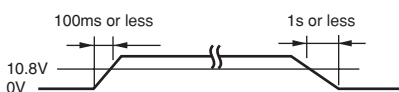


Dimensions Unit = mm (inch)



Power supply specifications

Motor Power supply voltage(VM) : 10.8V~33.0V



Motor output current; About 2A max.(different depending on the drive parameters of the motor being used)

Connector specifications

	FSD2U2P14-01 side	User side		Maker
	Maker Model	Applicable Housing	Applicable terminal(real)	
CN3	IL-G-9P-S3T2-SA	IL-G-9S-S3C2-SA	IL-G-C2-SC-10000	J.A.E
CN2	IL-G-6P-S3T2-SA	IL-G-6S-S3C2-SA	IL-G-C2-SC-10000	J.A.E

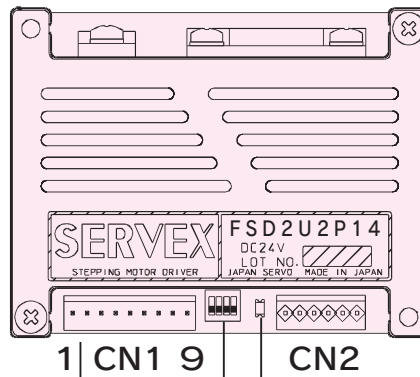
Required operating environment conditions

	In operation	At rest	Comments
Ambient temperature (°C)	0~+50	-20~60	
Ambient humidity(%)	35~85	35~85	Non condensation

Functions, Setting and Connections

Connector No.	Terminal No.	Name	Function
CN1	1	VM	Motor power supply 12-30Vdc
	2	P.GND	Power grounding
	3	CW	The CW direction drive pulse or the step command pulse (Switch No.1)
	4	CCW	The CCW direction drive pulse or the direction signal (Switch No.1)
		Motor current (A)	0.33 0.57 0.81 0.19 1.28 1.52 1.76 2.00
	7	C0	H L H L H L H L
	6	C1	H H L L H H L L
	5	C2	H H H H L L L L
		Motor current saving mode (A)	0.25 0.39 0.51 0.70 0.81 0.98 1.12 1.29
8	HOFF	Motor on/off (Hi : off)	
9	GND	Signal Grounding	

Connector No.	Terminal No.	Name	Function
CN2	1	A	To Motor phase A
	2	A.COM	To Motor phase A common line
	3	\bar{A}	To Motor phase \bar{A}
	4	B	To Motor phase B
	5	B.COM	To Motor phase B common line
	6	\bar{B}	To Motor phase \bar{B}



Power supply input display LED

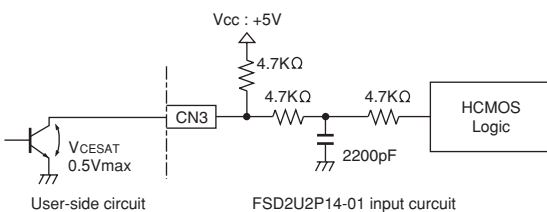
Switch No.	Name	Function	Switch Settings	
			OFF	ON
1	SEL	Drive pulse format	CW/CCW pulse	Step pulse/direction signal
2	SAVE	Automatic power saving	saving	not saving
3	MS0	Step angle	See below table	
4	MS1			

Setting of step angle (changing on power is not available.)

	MS0	ON	OFF	ON	OFF
MS1	ON	ON	ON	OFF	OFF
Division of step angle	1/2	1/1	1/4	1/2	

Input circuit

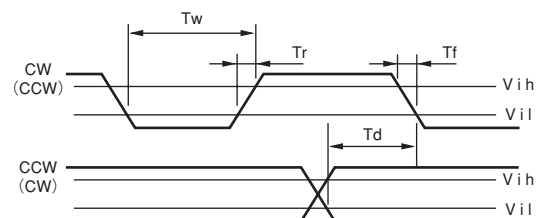
CW, CCW, C0, C1, C2, HOFF



Input signal specifications

Item	Signal	Specification	
		MIN	MAX
High level input voltage	Vih(V)	3.5	5.3
Low level input voltage	Vil(V)	0.0	0.8
Rise time	Tr(μs)	—	25
Fall time	Tf(μs)	—	15
Input pulse range	Twl(μs)	18	—
Direction of rotation change timing	Td(μs)	10	—

Note)Specified the voltage waveform between the user circuit ground and the FSD2U2P14-01 terminal



2-Phase Hybrid Stepping Motor Driver

HIGH TORQUE, SILENT ROTATION
SERVEX FSD2U3P13-01 DC24V

Features

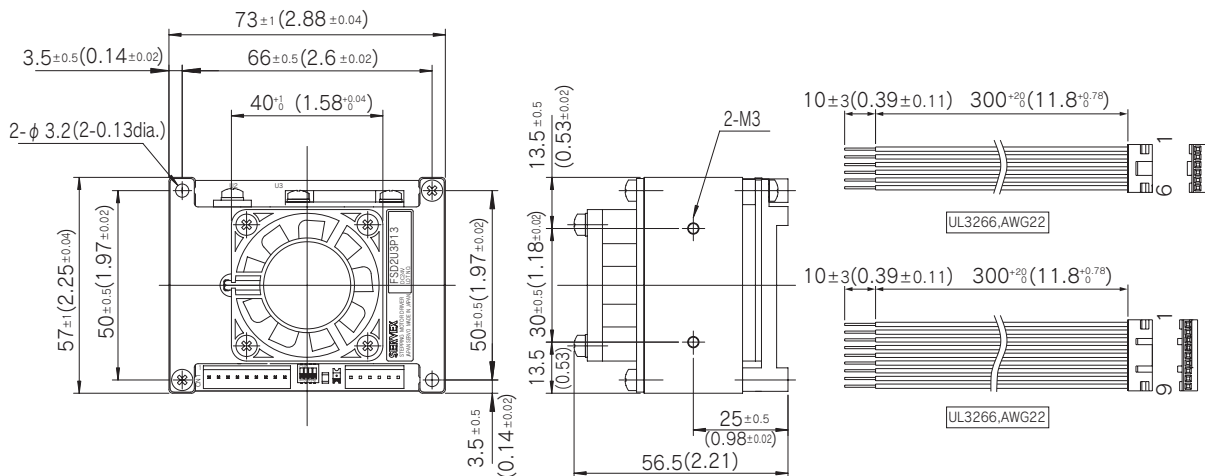
1. The high current (3 A MAX) small FSD driver.
2. Uni-polar constant current driver.
3. Micro-stepping feature may be used to be selected from any one of 1/1 (full-step), 1/2 (micro-step), and 1/4 (micro-step) settings.
4. Through the use of 3-bit external signals, electric current settings may be specified to any one of 8 different setting from 0.50-3A/phase.
5. Input commands may be selected from either of direction-of-rotation separate serial pulse signals or a combination of directional signals and pulse signals.

Applicable motors

See page 3

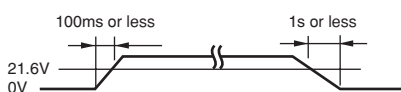


Dimensions Unit = mm (inch)



Power supply specifications

Motor Power supply voltage(VM) : 21.6V~26.4V



Motor output current; About 2A max.(different depending on the drive parameters of the motor being used)

Connector specifications

	FSD2U2P12-01 side	User side		Maker
	Maker Model	Applicable Housing	Applicable terminal(real)	
CN3	IL-G-9P-S3T2-SA	IL-G-9S-S3C2-SA	IL-G-C2-SC-10000	J.A.E
CN2	IL-G-6P-S3T2-SA	IL-G-6S-S3C2-SA	IL-G-C2-SC-10000	J.A.E

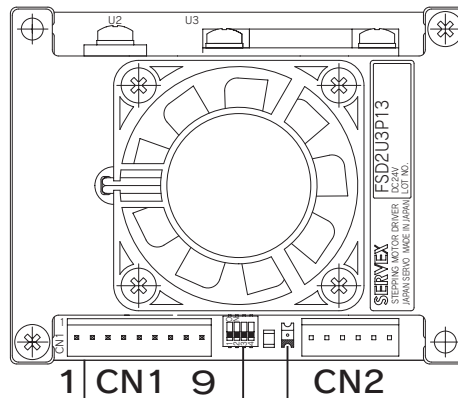
Required operating environment conditions

	In operation	At rest	Comments
Ambient temperature (°C)	0~+50	-20~60	
Ambient humidity(%)	35~85	35~85	Non condensation

Functions, Setting and Connections

Connector No.	Terminal No.	Name	Function
CN1	1	VM	Motor power supply 24VDC
	2	P.GND	Power grounding
	3	CW	The CW direction drive pulse or the step command pulse (Switch No.1)
	4	CCW	The CCW direction drive pulse or the direction signal (Switch No.1)
		Motor current (A)	0.50 0.88 1.24 1.60 1.90 2.35 2.68 3.00
	7	C0	H L H L H L H L
	6	C1	H H L L L H H L L
	5	C2	H H H H L L L L
		Motor current saving mode (A)	0.38 0.60 0.86 1.05 1.30 1.50 1.72 1.96
8	HOFF	Motor on/off (Hi : off)	
9	GND	Signal Grounding	

Connector No.	Terminal No.	Name	Function
CN2	1	A	To Motor phase A
	2	A.COM	To Motor phase A common line
	3	\bar{A}	To Motor phase \bar{A}
	4	B	To Motor phase B
	5	B.COM	To Motor phase B common line
	6	\bar{B}	To Motor phase \bar{B}



Power supply input display LED

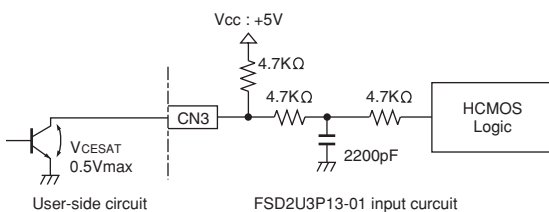
Switch No.	Name	Function	Switch Settings	
			OFF	ON
1	SEL	Drive pulse format	CW/CCW pulse	Step pulse/direction signal
2	SAVE	Automatic power saving	saving	not saving
3	MS0	Step angle	See below table	
4	MS1			

Setting of step angle (changing on power is not available.)

	MS0	ON	OFF	ON	OFF
MS1	ON	ON	OFF	OFF	OFF
Division of step angle	1/2	1/1	1/4	1/2	

Input circuit

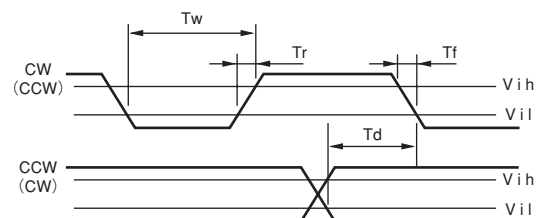
CW, CCW, C0, C1, C2, HOFF



Input signal specifications

Item	Signal	Specification	
		MIN	MAX
High level input voltage	Vih(V)	3.5	5.3
Low level input voltage	Vil(V)	0.0	0.8
Rise time	Tr(μs)	—	25
Fall time	Tf(μs)	—	15
Input pulse range	Twl(μs)	18	—
Direction of rotation change timing	Td(μs)	10	—

Note) Specified the voltage waveform between the user circuit ground and the FSD2U3P13-01 terminal



2-Phase Hybrid Stepping Motor Driver

HIGH TORQUE, SILENT ROTATION
SERVEX FSD2B2P13-01 DC24V

Features

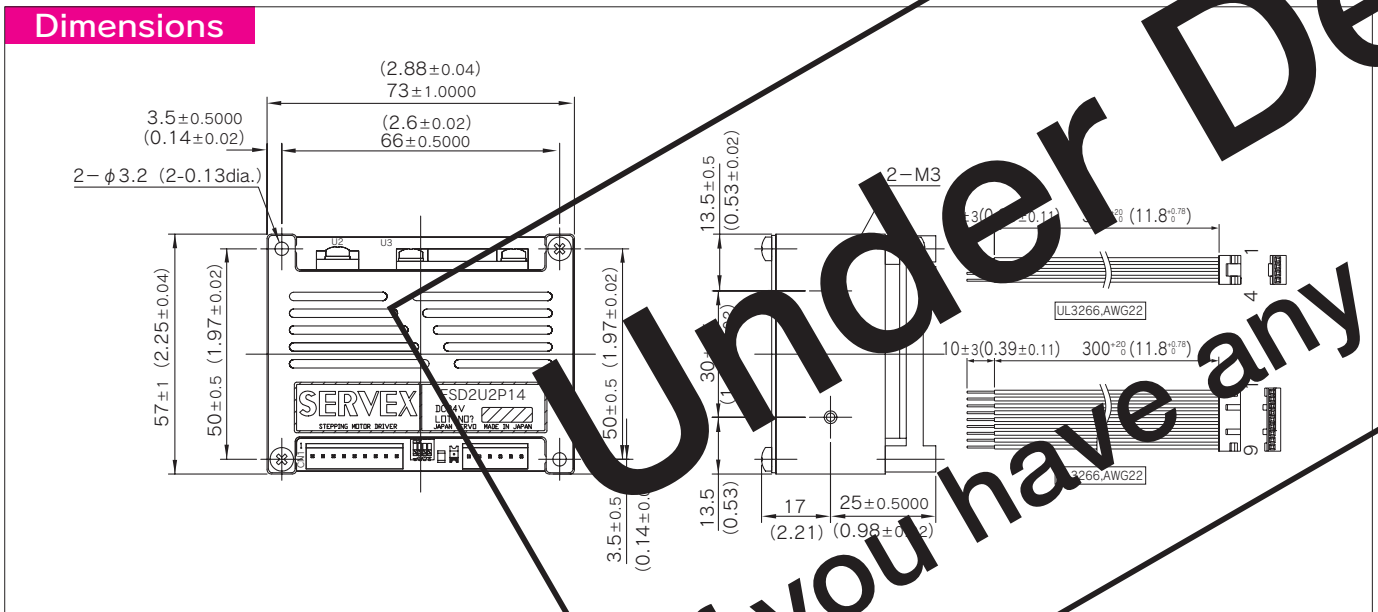
1. Ultra-compact driver measuring a mere 2.2 x 2.9 x 1.7 inches.
2. Bi-polar constant current driver.
3. Micro-stepping feature may be used to be selected from any one of 1/1 (full-step), 1/2 (micro-step), and 1/4 (micro-step) settings.
4. Through the use of 3-bit external signals, electric current settings may be specified to any one of 8 different setting from 0.41-2A/phase.
5. Input commands may be selected from either direction-of-rotation separate serial

Applicable motors

See page 3

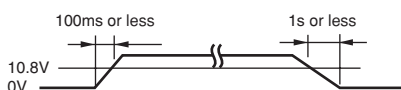


Dimensions



Power supply specifications

Motor Power supply voltage(VM) : 10.8V~33.0V



Motor output current; About 2A max.(different depending on the drive parameters of the motor being used)

Connector specifications

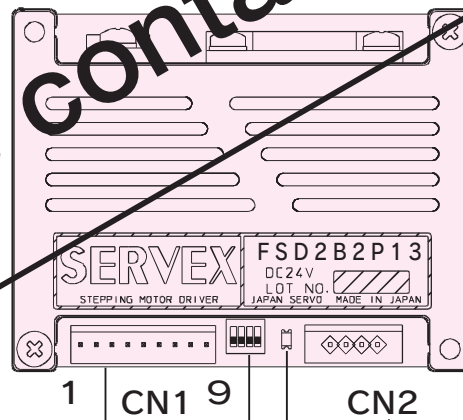
	FSD2B2P13-01 side	User side		Maker
	Maker Model	Applicable Housing	Applicable terminal(real)	
CN3	IL-G-9P-S3T2-SA	IL-G-9S-S3C2-SA	IL-G-C2-SC-10000	J.A.E
CN2	IL-G-4P-S3T2-SA	IL-G-4S-S3C2-SA	IL-G-C2-SC-10000	J.A.E

Required operating environment conditions

	In operation	At rest	Comments
Ambient temperature (°C)	0~+50	-20~60	
Ambient humidity(%)	35~85	35~85	Non condensation

Functions, Setting and Connections

Connector Name	Pin No.	Signal Name	Function	Connector Name	Pin No.	Signal Name	Function				
CN1	1	VM	Motor power supply (to be connected to 12-30V power supply)	CN2	1	A	Motor current(A)				
	2	P.GND	Motor power supply GND		2	\bar{A}	Motor current(\bar{A})				
	3	CW	CW directional drive pulse and serial pulse signal		3	B	Motor current(B)				
	4	CCW	CCW directional drive pulse and direction-of-rotation signal input		4	\bar{B}	Motor current(\bar{B})				
			Motor current (A)	0.41	0.64	0.86	1.09	1.32	1.55	1.77	2.00
	7	C0	H	L	H	L	H	L	H	L	
	8	C1	H	H	L	L	H	L	H	L	
	5	C2	H	H	H	L	L	L	L	L	
			Current(A)(save)	0.25	0.39	0.50	0.64	0.77	0.98	1.12	1.29
8	H.OFF	H. off (used to stop power to motor)									
9	S.GND	Signal ground									



Power supply input display LED

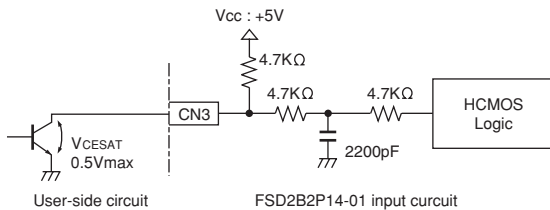
Switch No.	Name	Function	Switch Settings	
			OFF	ON
1	SEL	Drive pulse format	CW/CCW pulse	Step pulse/direction signal
2	SAVE	Automatic power saving	saving	not saving
3	MS0	Step angle	See below table	
4	MS1			

Setting of step angle (changing on power is not available.)

	MS0	ON	OFF	ON	OFF
MS1	ON	ON	OFF	OFF	OFF
Division of step angle	1/2	1/1	1/4	1/2	

Input circuit

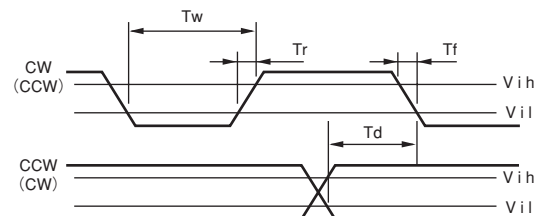
CW, CCW, C0, C1, C2, H. OFF



Input signal specifications

Item	Signal	Specification	
		MIN	MAX
High level input voltage	Vih(V)	3.5	5.3
Low level input voltage	Vil(V)	0.0	0.8
Rise time	Tr(μs)	-	25
Fall time	Tf(μs)	-	15
Input pulse range	Twl(μs)	18	-
Direction of rotation change timing	Td(μs)	10	-

Note) Specified the voltage waveform between the user circuit ground and the FSD2B2P13-01 terminal



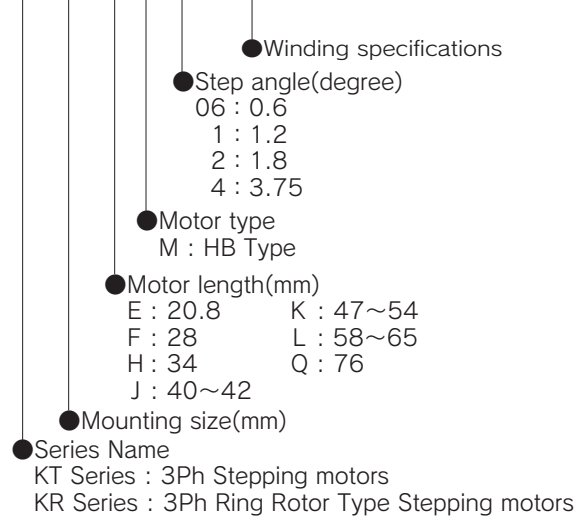
3-Phase Hybrid Stepping Motors & Drivers

HIGH TORQUE, SILENT ROTATION

Product Number Code

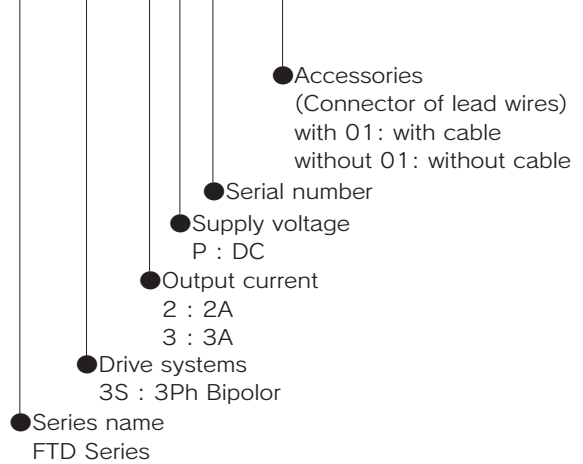
Stepping Motors

KT 42 H M 06 - 551



Drivers

FTD 3 S 2 P 22 - 01



3 - PHASE STEPPING MOTORS

1. Low speed high torque type $V_{cc} = 24 V$

Step angle deg./step	Standard size		Holding Torque		Winding Resistance		Current	Voltage	Inductance	Model	Driver		Page												
	mm	inch	mN·m	oz·in	$\Omega/2\text{phase}$	A/2phase	V	mH/2phase																	
0.6	42 sq.x	1.65 sq.x	21	0.8	45	6.4	5.9	0.9	5.3	3.1	KT42EM06-551	-	-	34											
			34	1.34	90	12.7	1.2	2.4	2.88	0.8	KT42HM06-551	<input type="radio"/>	<input type="checkbox"/>												
			40	1.58	180	25.5	1.3	2.4	3.12	1.3	KT42JM06-551	<input type="radio"/>	<input type="checkbox"/>												
			48	1.89	200	28.3	2.0	2.3	4.6	1.4	KT42KM06-551	<input type="radio"/>	<input type="checkbox"/>												
	60 sq.x	2.36 sq.x	47	1.85	300	42	0.55	3.8	2.09	1.0	KT60KM06-751	-	-	44											
					500	69	0.55	3.8	2.09	1.0	KT60KM06-551	-	-												
			58	2.29	600	83	600	83	0.73	3.8	2.77	1.8	KT60LM06-751	-	-	46									
							900	125	0.73	3.8	2.77	1.7	KT60LM06-551	-	-										
					900	125	0.73	3.8	2.77	1.7	2.2	2.2	4.84	5.7	-752		<input type="radio"/>	<input type="checkbox"/>							
											2.2	2.2	4.84	5.6	-552		-	<input type="checkbox"/>							
											35 sq.x	28	1.38 sq.x	1.10	59		8.3	39.0	0.3	11.7	26.0	KT35FM1-552	<input type="radio"/>	-	32
											42 sq.x	1.65 sq.x	21	0.8	70		9.9	5.9	0.9	5.3	2.6	KT42EM1-551	-	-	36
34	1.34	140	19.8	1.1	2.4	2.6	0.5	KT42HM1-551	<input type="radio"/>	<input type="checkbox"/>															
40	1.58	210	29.7	1.2	2.4	2.88	0.8	KT42JM1-551	<input type="radio"/>	<input type="checkbox"/>															
48	1.89	280	39.6	1.5	2.4	3.6	1.0	KT42KM1-551	<input type="radio"/>	<input type="checkbox"/>															
1.2	50 sq.x	1.97 sq.x	51	2.02	440	62.3	1.3	3.0	3.9	1.6	KT50KM1-551	-	<input type="checkbox"/>	40											
			65	2.56	580	82.1	1.6	3.0	4.8	1.6	KT50LM1-551	-	<input type="checkbox"/>												
	56 sq.x	2.21 sq.x	52	2.04	690	97.4	1.4	3.0	4.2	1.4	KT56KM1-551	-	<input type="checkbox"/>	42											
			76	2.98	1100	156	1.7	3.0	5.1	1.7	KT56QM1-551	-	<input type="checkbox"/>												
	60sq.x	2.36 sq.x	47	1.85	320	45.3	0.55	3.8	2.09	0.8	KT60KM1-551	-	-	48											
					47	1.85	320	45.3	1.6	2.2	3.52	2.5	-552		<input type="radio"/>	<input type="checkbox"/>									
			58	2.29	600	85	0.73	3.8	2.77	1.0	KT60LM1-551	-	-	50											
					600	85	2.2	2.2	4.84	3.3	-552	<input type="radio"/>	<input type="checkbox"/>												
86 dia.x	3.38dia.x	61	2.40	2000	278	1.8	3.0	5.4	18.0	KT60RM1-551	-	<input type="checkbox"/>	52												
		95	3.74	4000	556	2.8	2.5	7.0	36.6	KT86LM1-551	-	<input type="checkbox"/>	54												
		95	3.74	4000	556	2.8	2.5	7.0	36.6	KT86SM1-551	-	<input type="checkbox"/>													
3.75	42 sq.x	1.65 sq.x	20	0.79	70	18	6.6	0.8	5.28	5.7	KT42EM4-551	-	-	38											
											34	1.34	130		18	3.4	1.3	4.42	4.7	KT42HM4-551	<input type="radio"/>	-			
			40	1.58	180	25	4.3	1.2	5.16	8.7	8.8	0.8	7.04		12.3	-552	-	-							
											4.3	1.2	5.16		8.7	KT42JM4-551	<input type="radio"/>	-							
											11.0	0.8	8.8		22.0	-552	-	-							

Note-1; Driver model FTD3S2P22-01 is applicable to the motors with . The MAX output current is 2 A/phase.

Note-2; Driver model FTD3S3P17-01 is applicable to the motors with .

2. High speed steady torque type $V_{cc} = 24 V$

Step angle deg./step	Standard size		Holding Torque		Winding Resistance		Current	Voltage	Inductance	Model	Driver		Page					
	mm	inch	mN·m	oz·in	$\Omega/2\text{phase}$	A/2phase	V	mH/2phase										
3.75	42 sq.x	1.65 sq.x	34	1.34	49	6.9	1.4	2.0	2.8	1.7	KR42HM4-551	<input type="radio"/>	<input type="checkbox"/>	56				
							3.4	1.3	4.42	4.0	-552	<input type="radio"/>	-					
			40	1.58	88	12.5	1.75	2.0	3.5	2.1	KT42JM4-551	<input type="radio"/>	<input type="checkbox"/>	58				
							4.3	1.2	5.16	8.7	-552	<input type="radio"/>	-					
							48	1.89	118	16.7	1.4	2.5	3.5	1.7	KT42KM4-551	-	<input type="checkbox"/>	60
											5.0	1.3	6.5	7.7	-552	<input type="radio"/>	-	

Note-1; Driver model FTD3S2P22-01 is applicable to the motors with .

Note-2; Driver model FTD3S3P17-01 is applicable to the motors with .

3 - Phase Drivers

Standard size		Power supply	OUTPUT current A	Step angle	Model	Page
mm	inch					
57×73×42	2.25×2.88×1.65	12-24V DC	1.0-2.0	1/1, 1/2, 1/4, 1/8	FTD3S2P22-01	62
70×134×35	2.76×5.28×1.38	24V DC 5V DC	1.5-3.0	1/1, 1/2, 1/4, 1/8	FTD3S3P17-01	64

3-Phase Hybrid Stepping Motor Driver

HIGH TORQUE, SILENT ROTATION

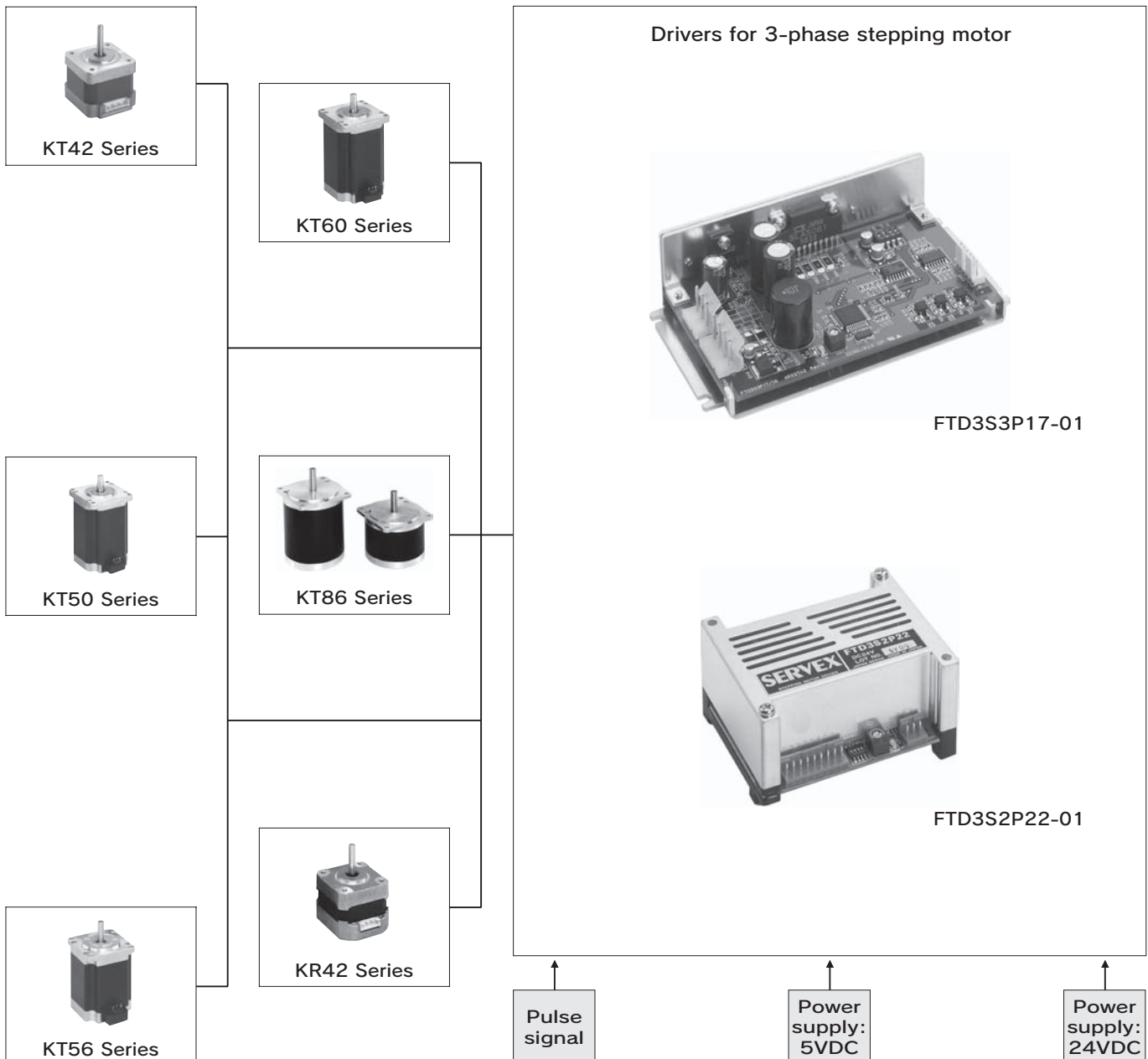
Features

1. Drive circuit is simplified because the motor is driven with star wiring connection.
2. High torque is obtained at low speed with the micro-step driver.
3. Ultra-low vibration and low noise achieved with our micro-step driver.
4. The step angle of 1/1, 1/2, 1/4, and 1/8 may be chosen using our micro-step driver.

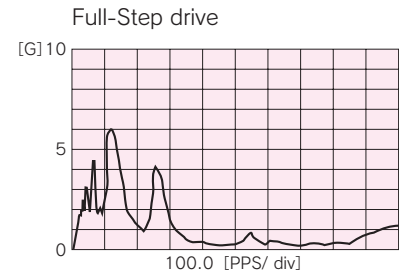
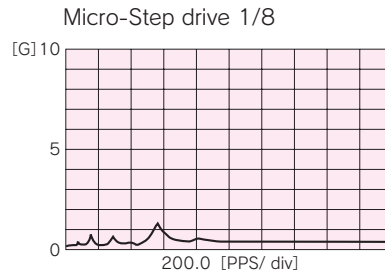
Applications

Suitable as controlled driving source in scientific or high precision industrial equipment such as OA equipment, measuring equipment, medical treatment equipment, physics and chemistry equipment, optical equipment, semiconductor processing equipment, and other precision machinery.

System Configuration



Vibration Comparison



Advantage

Constant current driver

With the fixed current drive method, a voltage sufficiently higher than the specified voltage, of the motor, is finely sliced in the switching circuit than applied to the motor coil. The current is maintained at a constant level whether the motor is rotating at low or high speed. With this method the output torque during high speed rotation is greatly improved with power consumption minimized.

Micro-step driver

With the micro-step drive method, the mechanically determined step angle (3.75° , 1.2° or 0.60°) is divided by an electronic circuit and the motor is gradually rotated by a fine angle. The conventional excitation method makes a rotor rotates by a fixed angle by turning the magnetizing phase on and off through an input pulse. On the other hand, with the micro-step driving method, the current of one phase of the magnetizing phase can be gradually increased while the current of other phase is decreased thereby further dividing the step angle of the motor and making rotation even smoother.

THE FTD3S3P17 driver, the FTD3S2P22 enable to set to step divisions of 1/4 and 1/8. Micro stepping drive is effective to reduce mechanical driving noise particularly when divisions not exceeding 1/8.

Rectangular wave drive

- 2-phase excitation (full-step)
This is then or mal 2-phase excitation method. Torque is large and damping characteristics are excellent.

	Noise level	Vibration	Torque		High speed capability
			Low speed	High speed	
Micro-step drive	○	○	○	△	△
Rectangular wave drive	△	△	○	○	○

3-Phase Hybrid Stepping Motor

1.2°

KT35 series *TRISYN*

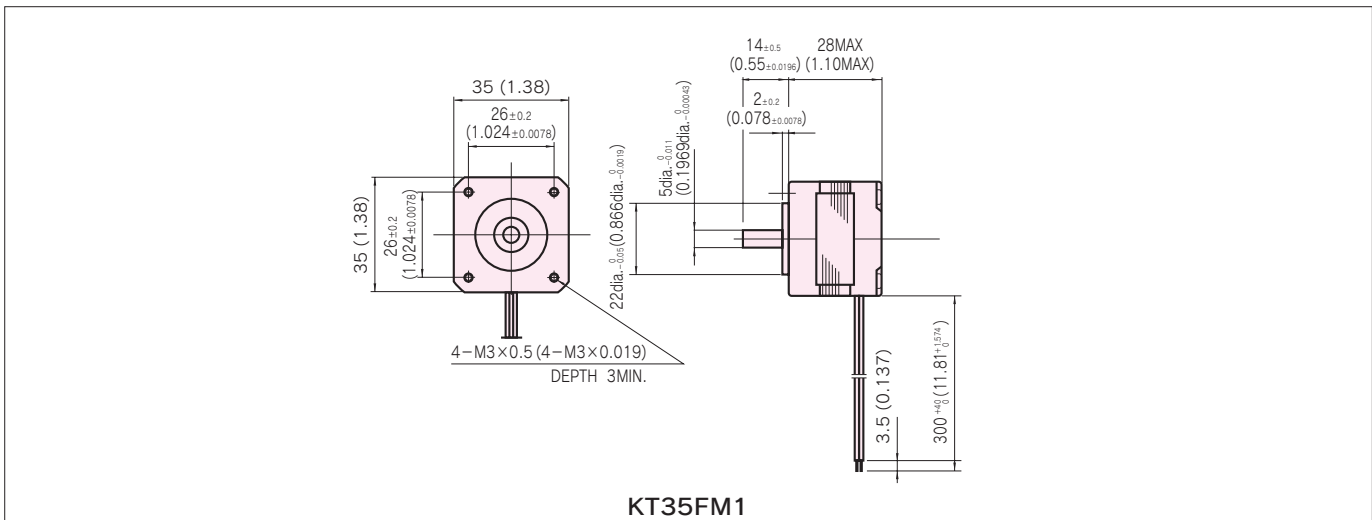
HIGH TORQUE, SILENT ROTATION

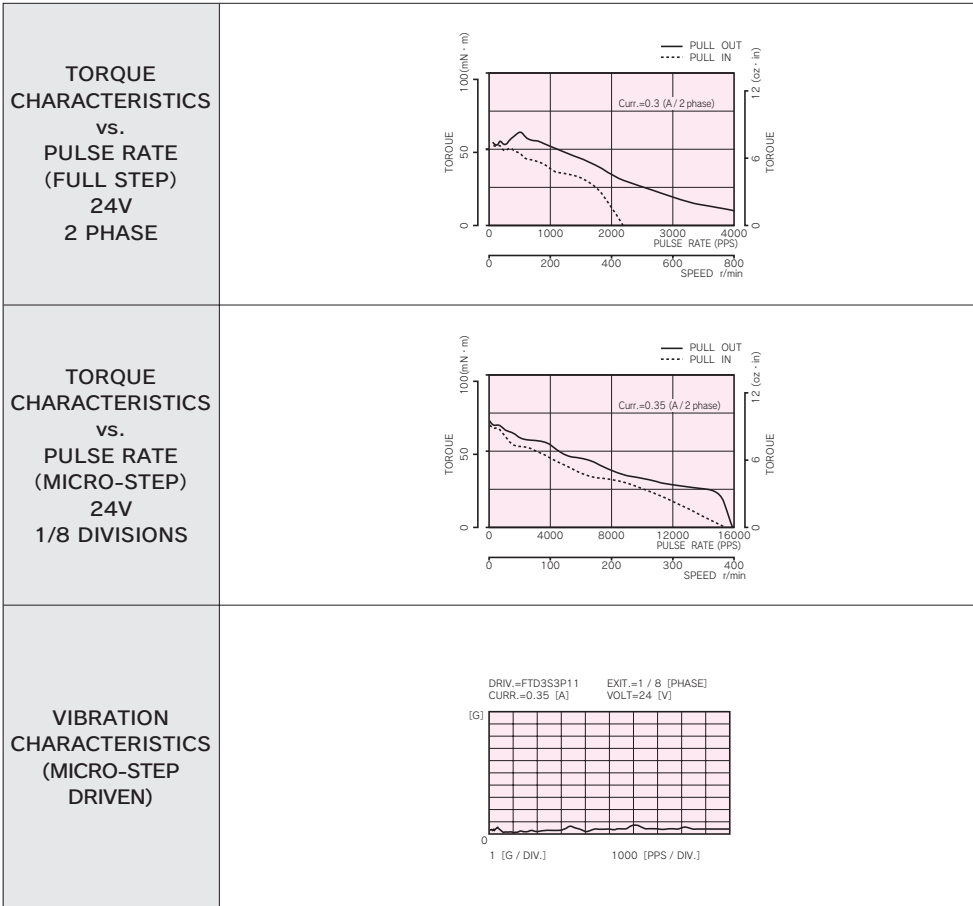
STANDARD SPECIFICATIONS

MODEL	UNIT	KT35FM1
		-552
DRIVE METHOD	————	BI-POLAR
NUMBER OF PHASES	————	3
STEP ANGLE	deg./step	1.2
VOLTAGE	V	10.8
CURRENT	A/2-PHASE	0.3
WINDING RESISTANCE	Ω/2-PHASE	36
INDUCTANCE	mH/2-PHASE	26
HOLDING TORQUE	mN · m	58.9
	oz · in	8.3
DETENT TORQUE	mN · m	9.8
	oz · in	1.4
ROTOR INERTIA	g · cm ²	8
	oz · in ²	0.044
WEIGHTS	g	110
	lb	0.24
INSULATION CLASS	————	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)
INSULATION RESISTANCE	————	500VDC 100MΩmin.
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.
OPERATING TEMP. RANGE	°C	0 to 50
ALLOWABLE TEMP. RISE	K	70

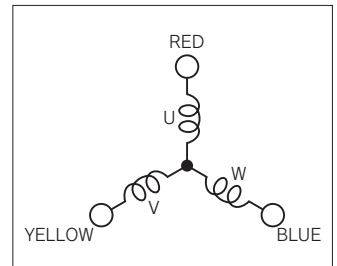


DIMENSIONS unit = mm (inch)





Connection Diagram



[EXCITATION SEQUENCE]

PHASE \ STEP	1	2	3	4	5	6
U相 (U PHASE)	+	-	-			+
V相 (V PHASE)	-	-		+	+	
W相 (W PHASE)		+	+		-	-

3-Phase Hybrid Stepping Motor

0.6°

KT42 series *TRISYN*

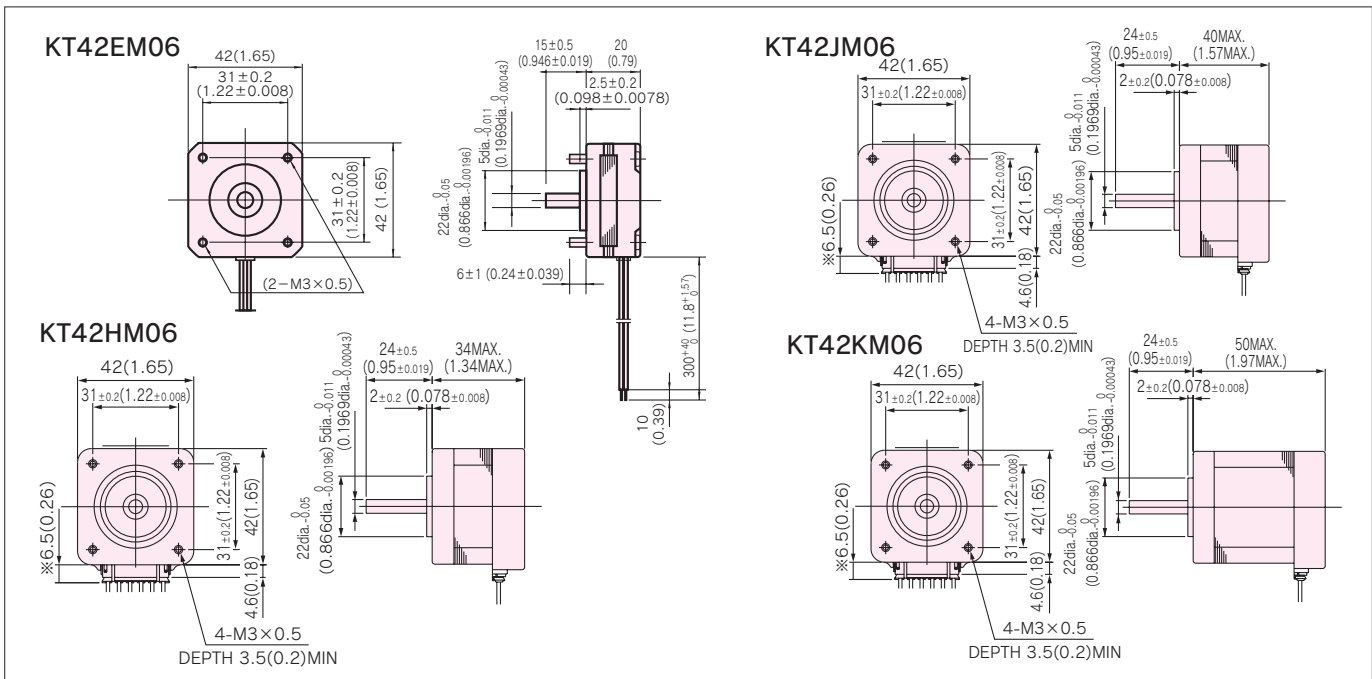
HIGH TORQUE, SILENT ROTATION

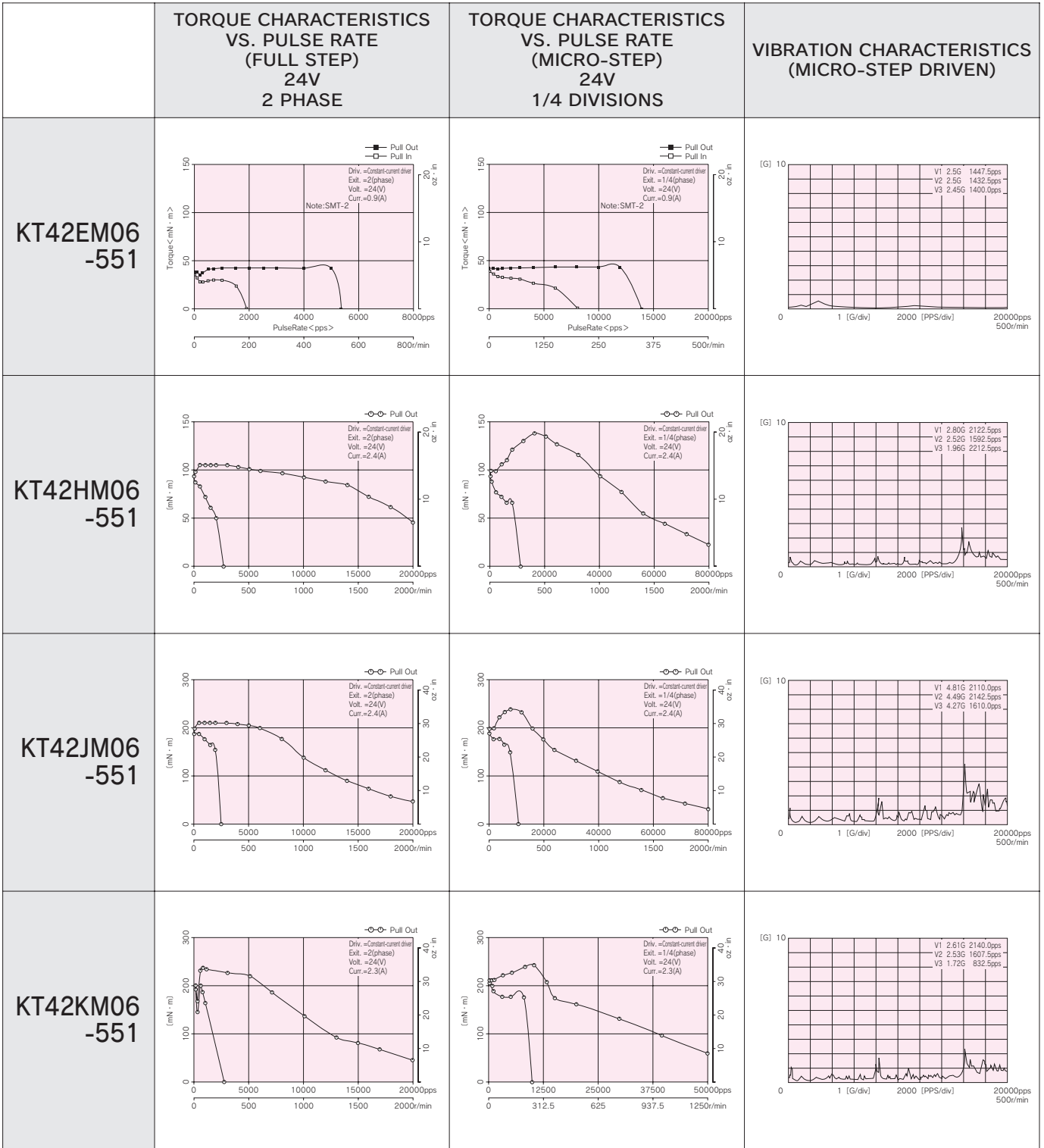
STANDARD SPECIFICATIONS

MODEL	UNIT	KT42EM06	KT42HM06	KT42JM06	KT42KM06
		-551	-551	-551	-551
DRIVE METHOD	—	BI-POLAR			
NUMBER OF PHASES	—	3			
STEP ANGLE	deg./step	0.6			
VOLTAGE	V	5.3	2.88	3.12	4.6
CURRENT	A/2-PHASE	0.9	2.4	2.4	2.3
WINDING RESISTANCE	Ω/2-PHASE	5.9	1.2	1.3	2.0
INDUCTANCE	mH/2-PHASE	3.1	0.8	1.3	1.4
HOLDING TORQUE	mN · m	45	90	180	200
	oz · in	6.4	12.7	25.5	28.3
DETENT TORQUE	mN · m	10	6	8	9
	oz · in	1.4	0.8	1.1	1.3
ROTOR INERTIA	g · cm ²	20	42	60	85
	oz · in ²	0.11	0.23	0.33	0.46
WEIGHTS	g	140	210	310	360
	lb	0.31	0.46	0.68	0.79
INSULATION CLASS	—	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)			
INSULATION RESISTANCE	—	500VDC 100MΩmin.			
DIELECTRIC STRENGTH	—	500VAC 50HZ 1 min.			
OPERATING TEMP. RANGE	°C	-10 to 50			
ALLOWABLE TEMP. RISE	K	70			

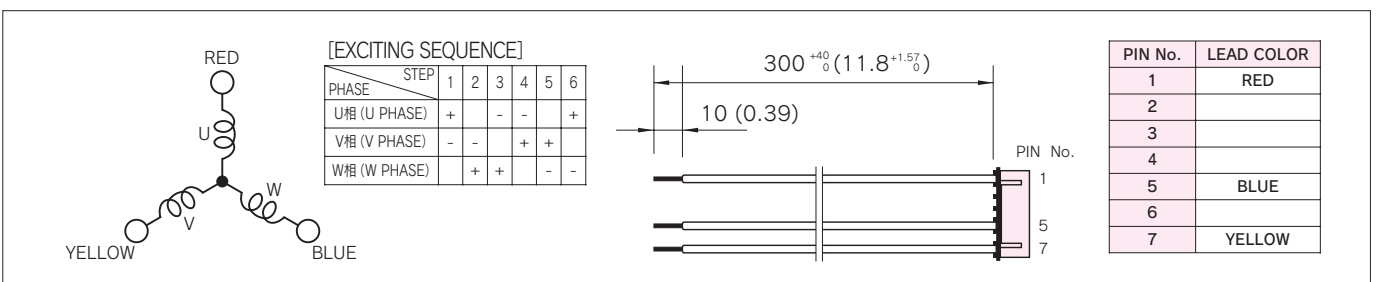


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch) (Except for KT42EM06-551)



3-Phase Hybrid Stepping Motor

1.2°

KT42 series TRISYN

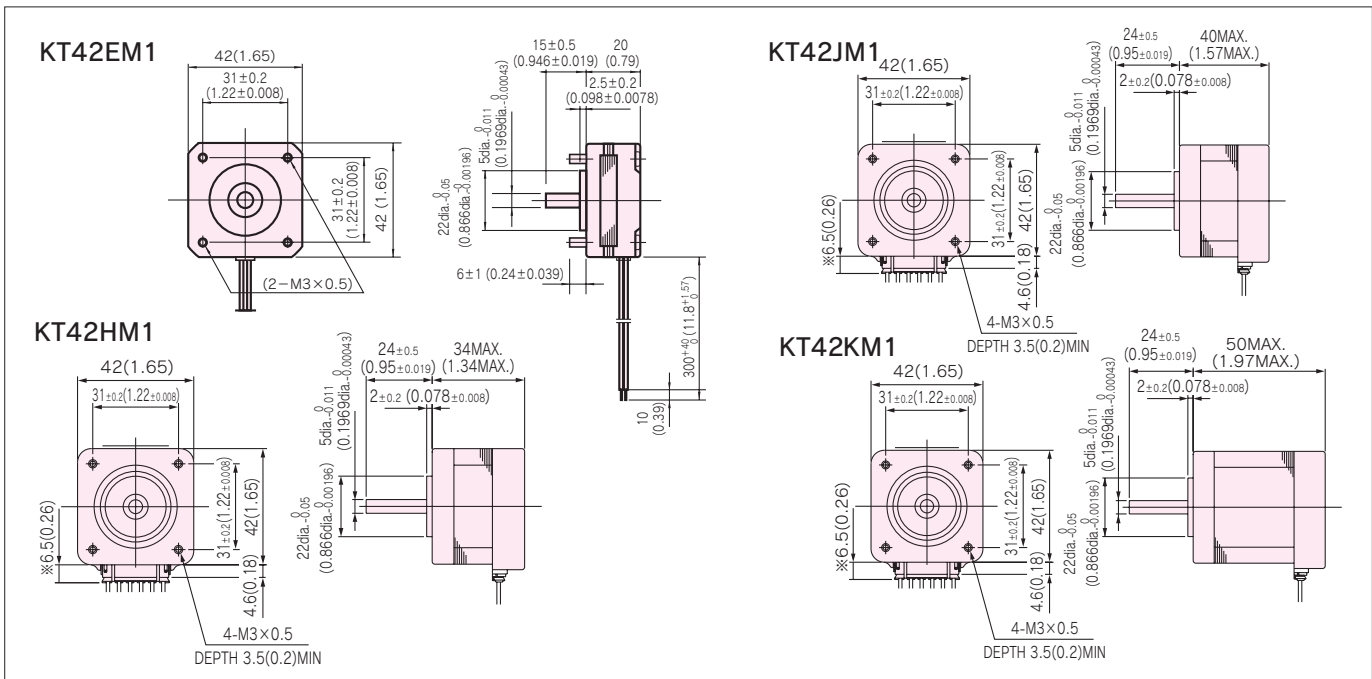
HIGH TORQUE, SILENT ROTATION

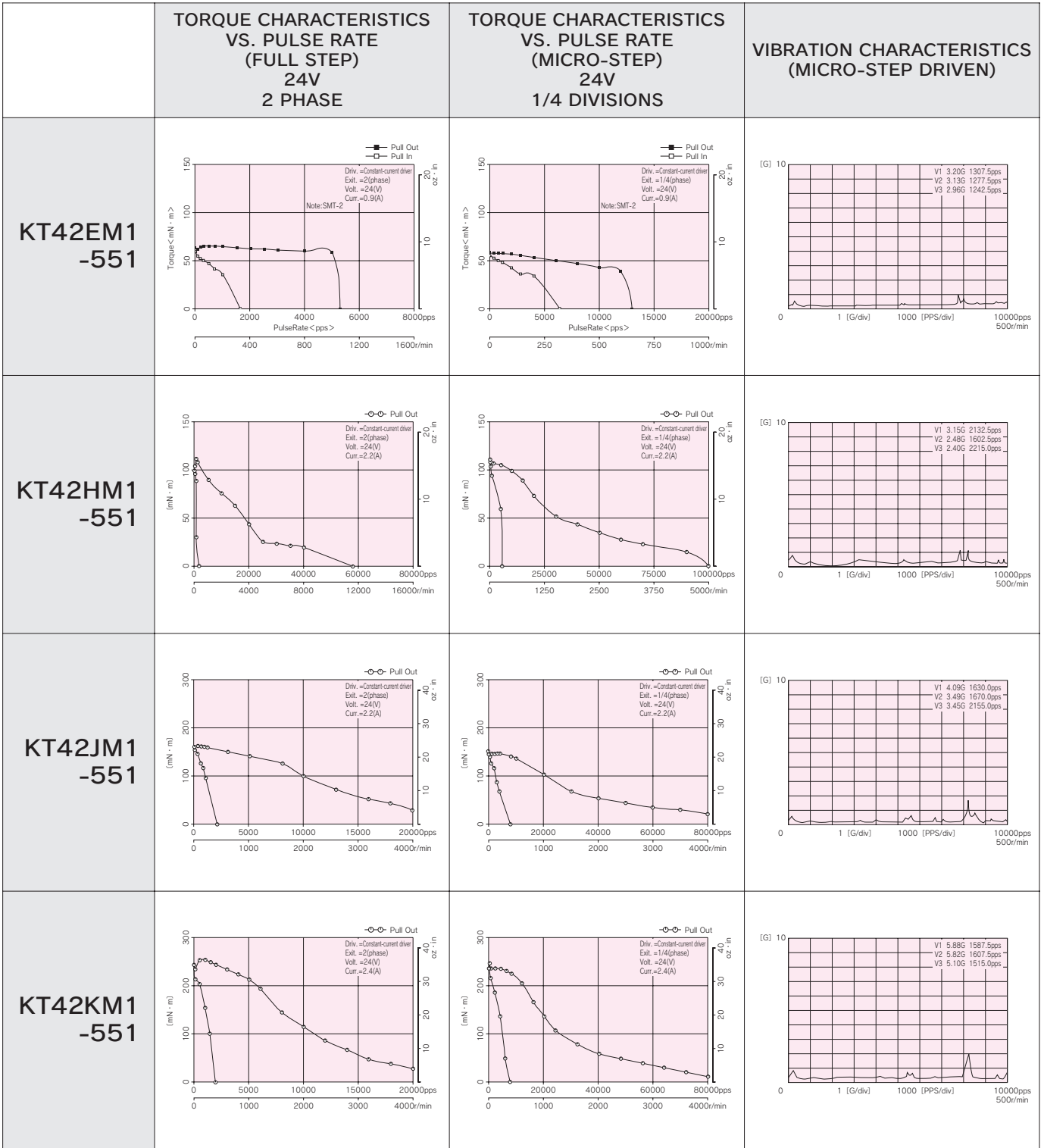
STANDARD SPECIFICATIONS

MODEL	UNIT	KT42EM1	KT42HM1	KT42JM1	KT42KM1
		-551	-551	-551	-551
DRIVE METHOD	—	BI-POLAR			
NUMBER OF PHASES	—	3			
STEP ANGLE	deg./step	1.2			
VOLTAGE	V	5.3	2.64	2.88	3.6
CURRENT	A/2-PHASE	0.9	2.4	2.4	2.4
WINDING RESISTANCE	Ω/2-PHASE	5.9	1.1	1.2	1.5
INDUCTANCE	mH/2-PHASE	2.6	0.5	0.8	1.0
HOLDING TORQUE	mN · m	70	140	210	280
	oz · in	9.9	19.8	29.7	39.6
DETENT TORQUE	mN · m	10	10	12	16
	oz · in	1.4	1.4	1.7	2.3
ROTOR INERTIA	g · cm ²	20	42	60	85
	oz · in ²	0.11	0.23	0.33	0.46
WEIGHTS	g	140	210	310	360
	lb	0.31	0.46	0.68	0.79
INSULATION CLASS	—	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)			
INSULATION RESISTANCE	—	500VDC 100MΩmin.			
DIELECTRIC STRENGTH	—	500VAC 50HZ 1 min.			
OPERATING TEMP. RANGE	°C	-10 to 50			
ALLOWABLE TEMP. RISE	K	70			

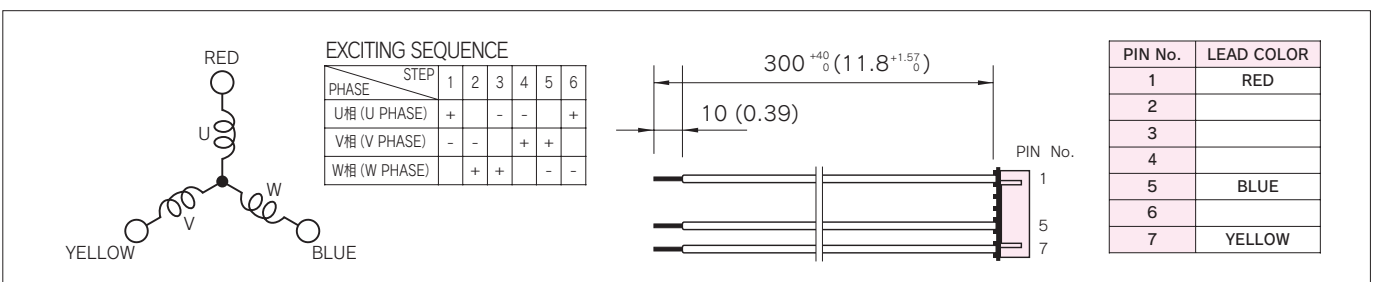


DIMENSIONS unit = mm (inch)





CONNECTION CABLE TO MOTOR unit = mm (inch) (Except for KT42EM1-551)



3-Phase Hybrid Stepping Motor

3.75°

KT42 series TRISYN

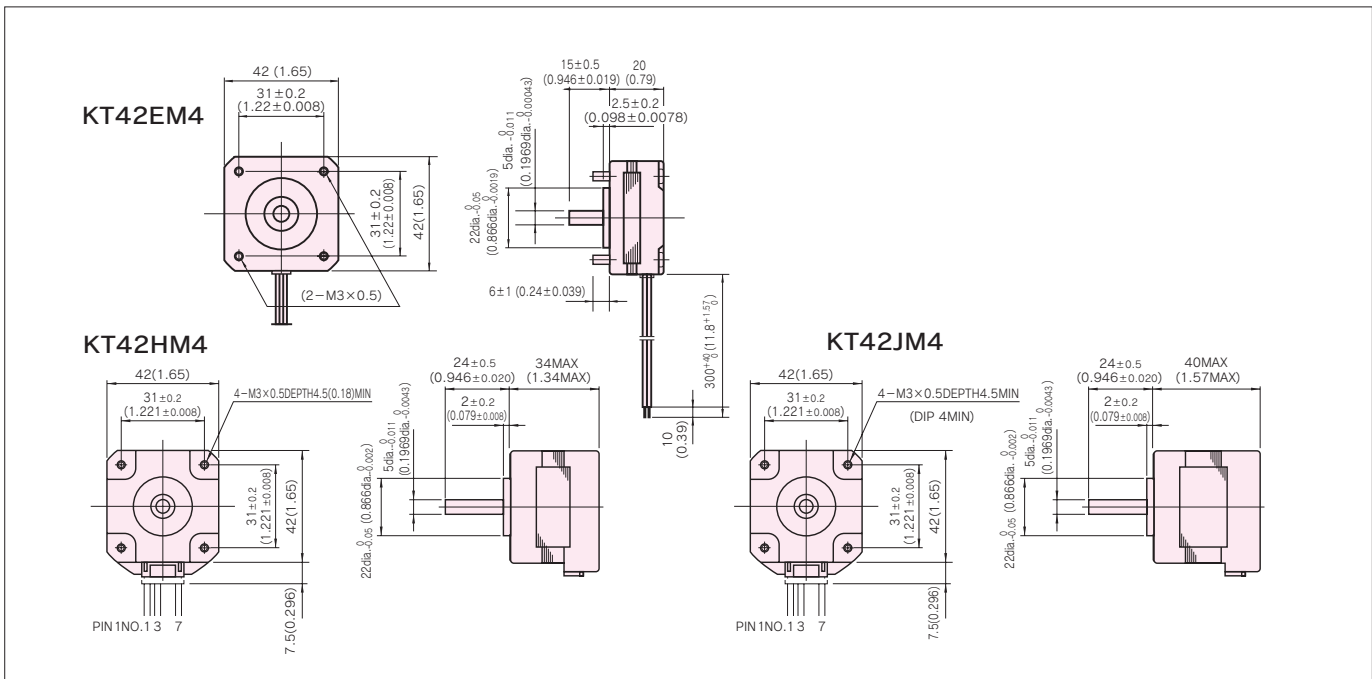
HIGH TORQUE, SILENT ROTATION

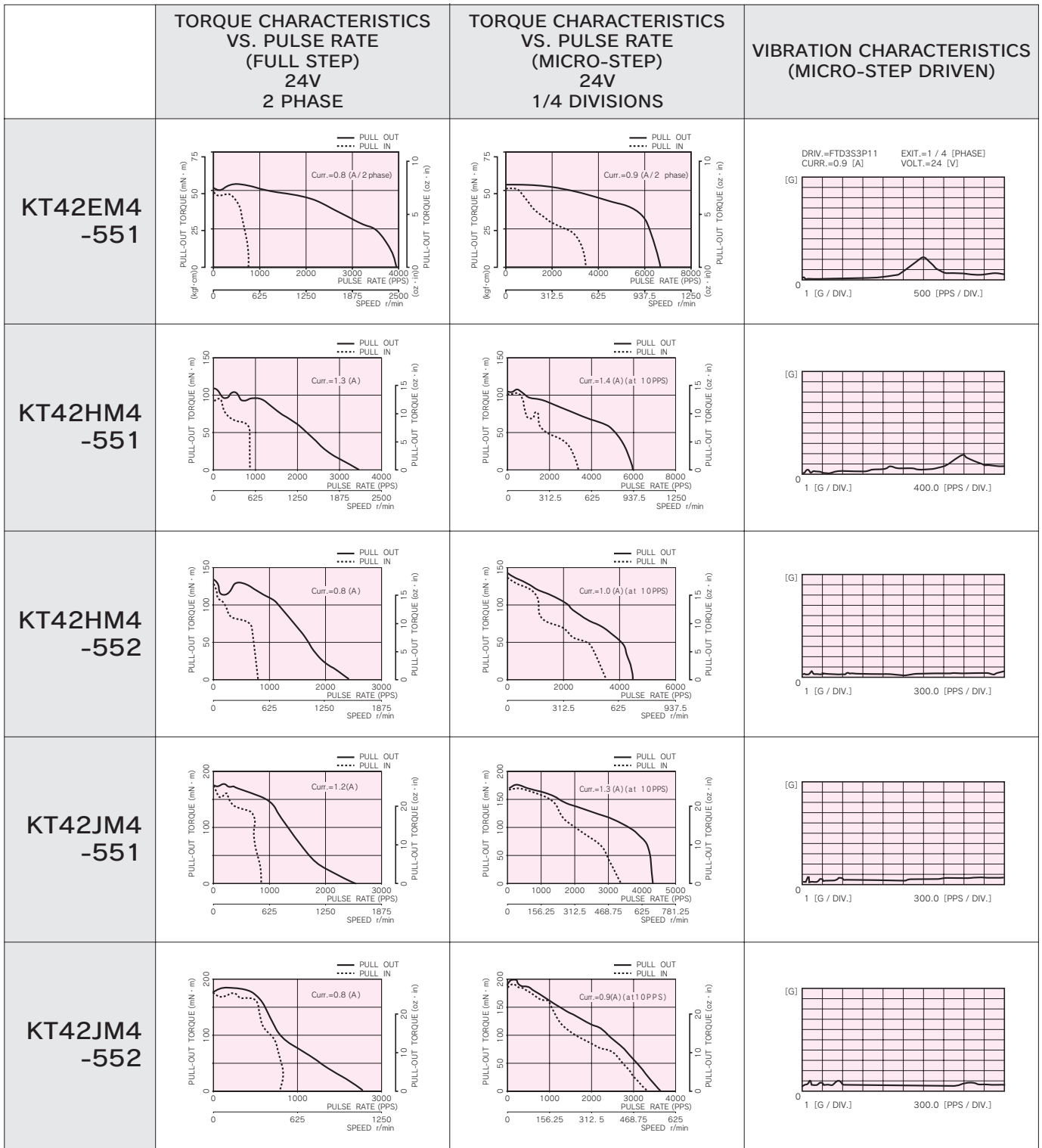
STANDARD SPECIFICATIONS

MODEL	UNIT	KT42EM4		KT42HM4		KT42JM4	
		-551	-551	-552	-551	-552	
DRIVE METHOD	—	BI-POLAR					
NUMBER OF PHASES	—	3					
STEP ANGLE	deg./step	3.75					
VOLTAGE	V	5.28	4.42	7.04	5.16	8.8	
CURRENT	A/2-PHASE	0.8	1.3	0.8	1.2	0.8	
WINDING RESISTANCE	Ω/2-PHASE	6.6	3.4	8.8	4.3	11.0	
INDUCTANCE	mH/2-PHASE	5.7	4.7	12.3	8.7	22.0	
HOLDING TORQUE	mN · m	70	130	130	180	180	
	oz · in	9.7	18	18	25	25	
DETENT TORQUE	mN · m	8.8	14.7	14.7	19.6	19.6	
	oz · in	1.3	2.1	2.1	2.8	2.8	
ROTOR INERTIA	g · cm ²	20	38	38	60	60	
	oz · in ²	0.11	0.21	0.21	0.33	0.33	
WEIGHTS	g	140	210	210	240	240	
	lb	0.31	0.46	0.46	0.53	0.53	
INSULATION CLASS	—	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)					
INSULATION RESISTANCE	—	500VDC 100MΩmin.					
DIELECTRIC STRENGTH	—	500VAC 50HZ 1 min.					
OPERATING TEMP. RANGE	°C	0 to 50					
ALLOWABLE TEMP. RISE	K	70					

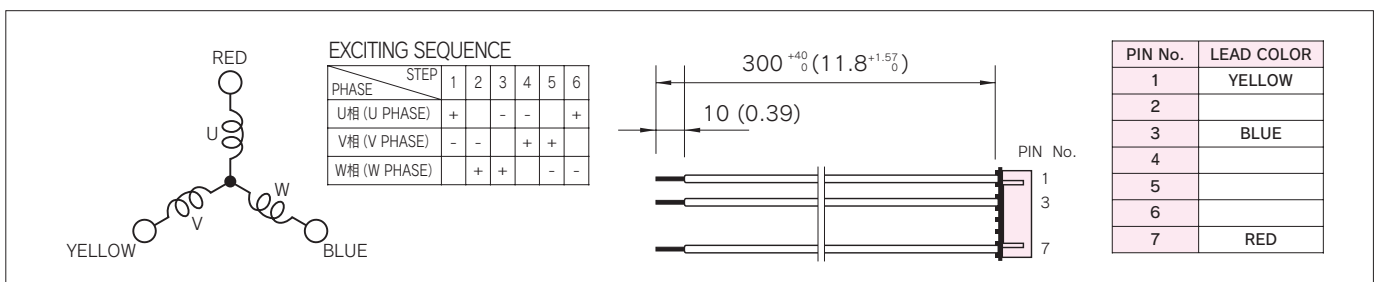


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch) (Except for KT42EM4-551)



3-Phase Hybrid Stepping Motor

1.2°

KT50 series TRISYN

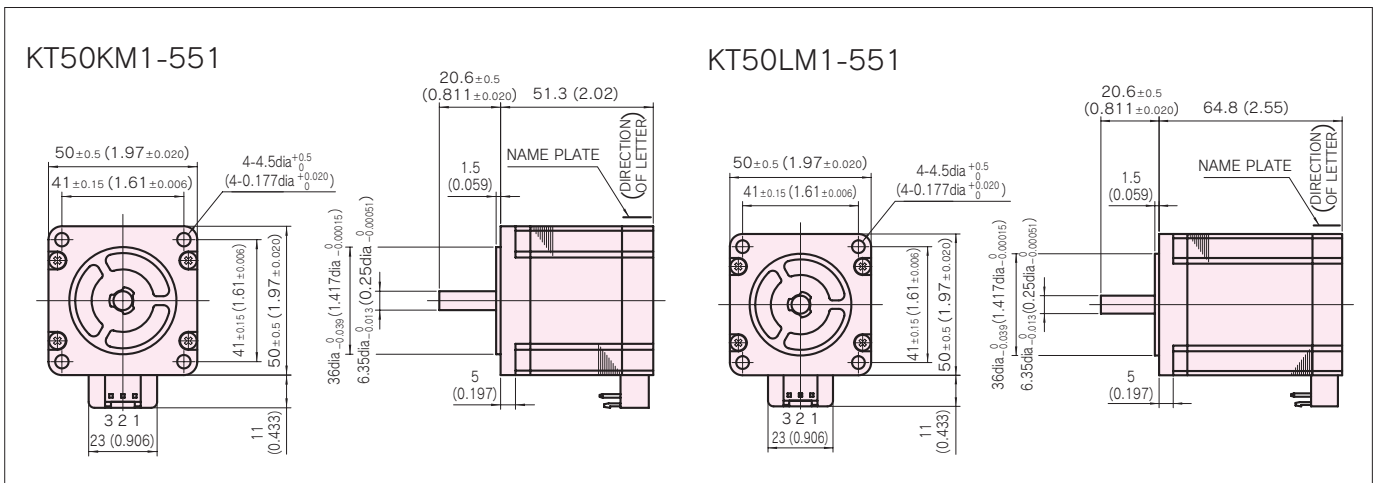
HIGH TORQUE, SILENT ROTATION

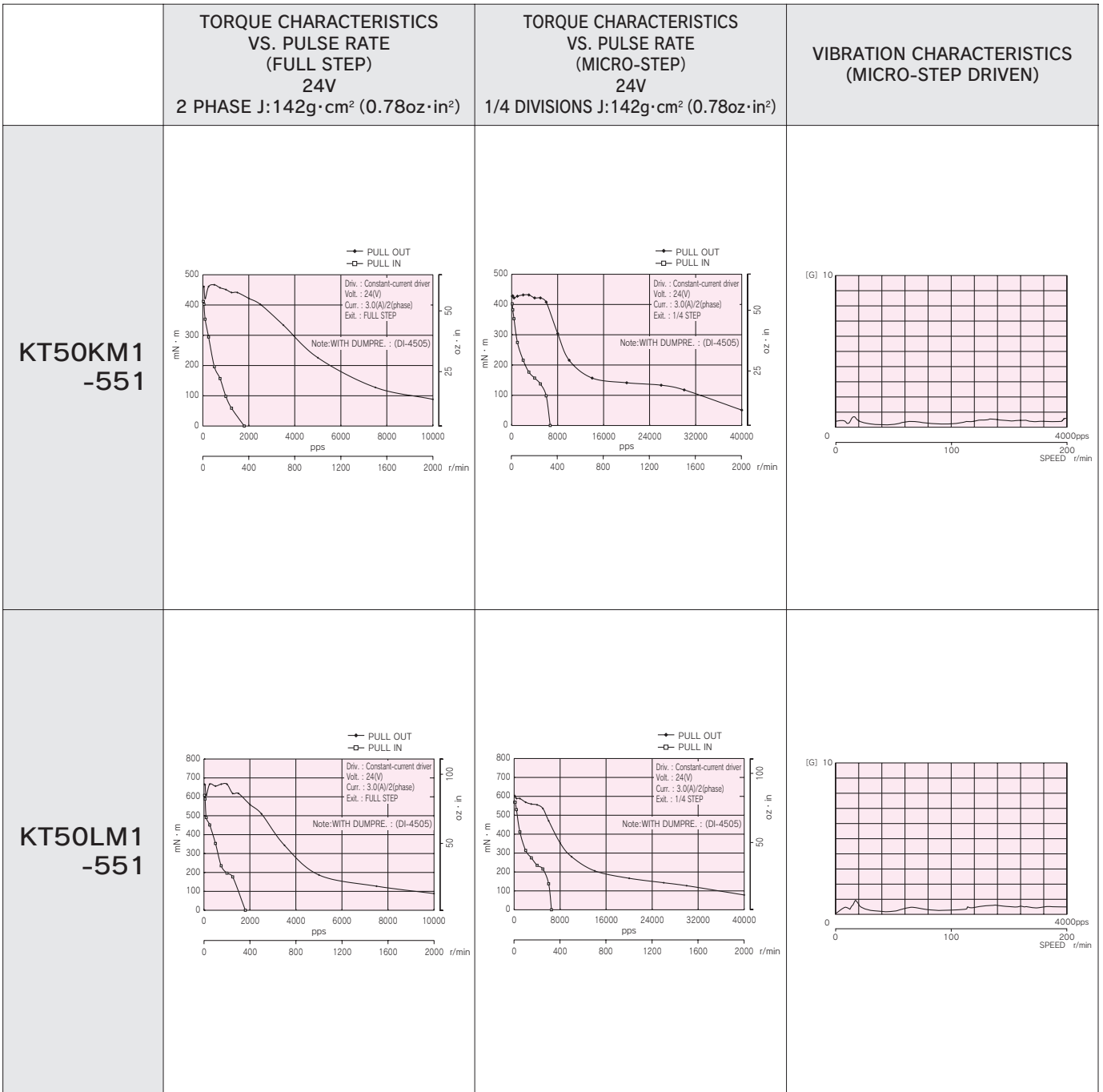
STANDARD SPECIFICATIONS

MODEL	UNIT	KT50KM1-551	KT50LM1-551
DRIVE METHOD	————	BI-POLAR	
NUMBER OF PHASES	————	3	
STEP ANGLE	deg./step	1.2	
VOLTAGE	V	3.9	4.8
CURRENT	A/2-PHASE	3.0	3.0
WINDING RESISTANCE	Ω/2-PHASE	1.3	1.6
INDUCTANCE	mH/2-PHASE	1.6	1.6
HOLDING TORQUE	mN · m	440	580
	oz · in	62.3	82.1
DETENT TORQUE	mN · m	30	40
	oz · in	4.2	5.7
ROTOR INERTIA	g · cm ²	120	170
	oz · in ²	0.66	0.93
WEIGHTS	g	500	650
	lb	1.1	1.4
INSULATION CLASS	————	JIS Class B (30°C 266° F)(UL VALUE:CLASS B 130°C 266° F)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP. RANGE	°C	-10 to 50	
ALLOWABLE TEMP. RISE	K	80	

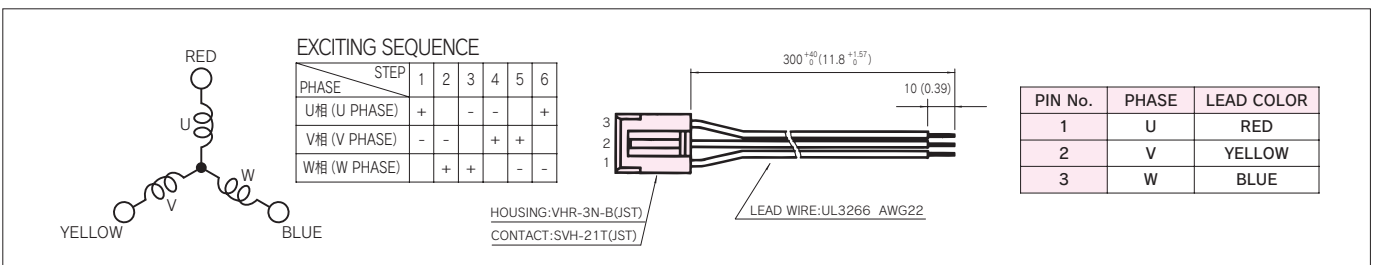


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch)



3-Phase Hybrid Stepping Motor

1.2°

KT56 series TRISYN

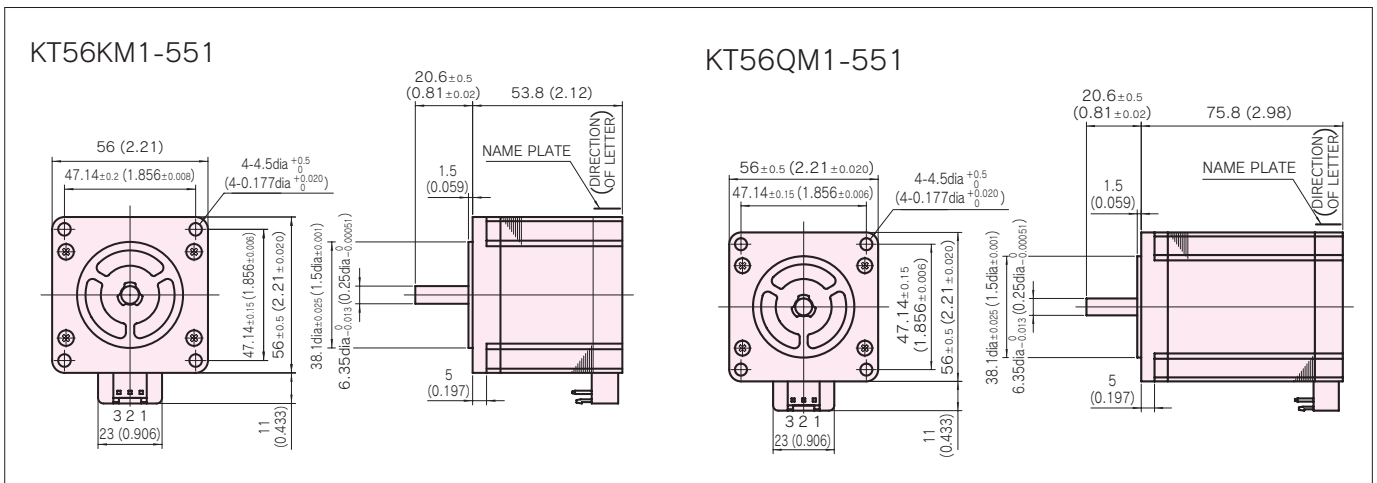
HIGH TORQUE, SILENT ROTATION

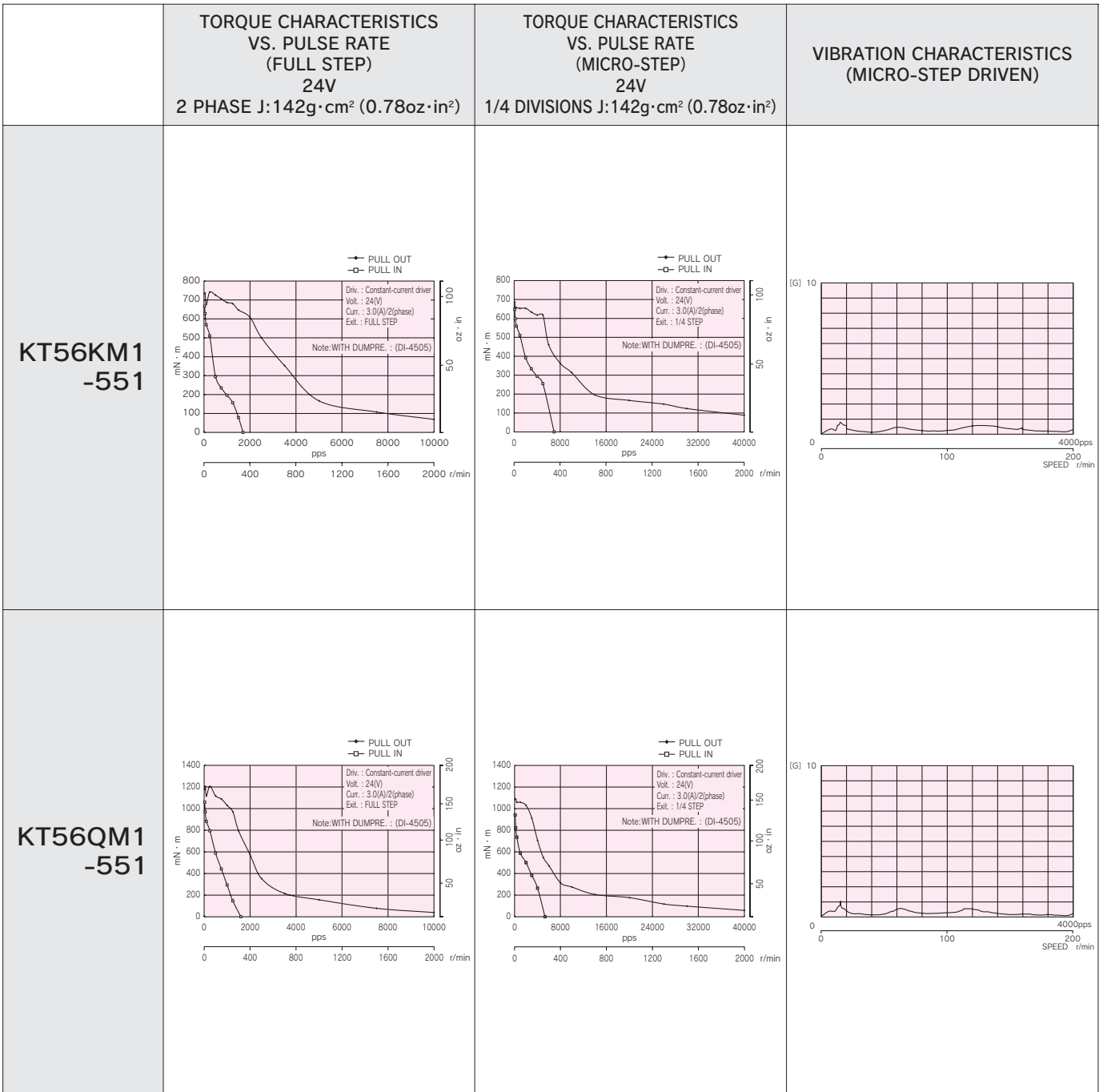
STANDARD SPECIFICATIONS

MODEL	UNIT	KT56KM1-551	KT56QM1-551
DRIVE METHOD	————	BI-POLAR	
NUMBER OF PHASES	————	3	
STEP ANGLE	deg./step	1.2	
VOLTAGE	V	4.2	5.1
CURRENT	A/2-PHASE	3.0	3.0
WINDING RESISTANCE	Ω/2-PHASE	1.4	1.7
INDUCTANCE	mH/2-PHASE	1.8	2.4
HOLDING TORQUE	mN · m	690	1100
	oz · in	97.7	155.7
DETENT TORQUE	mN · m	45	80
	oz · in	6.4	11.3
ROTOR INERTIA	g · cm ²	210	360
	oz · in ²	1.15	1.97
WEIGHTS	g	650	980
	lb	1.4	2.1
INSULATION CLASS	————	JIS Class B (130°C 266° F)(UL VALUE:CLASS B 130°C 266° F)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP. RANGE	°C	-10 to 50	
ALLOWABLE TEMP. RISE	K	80	

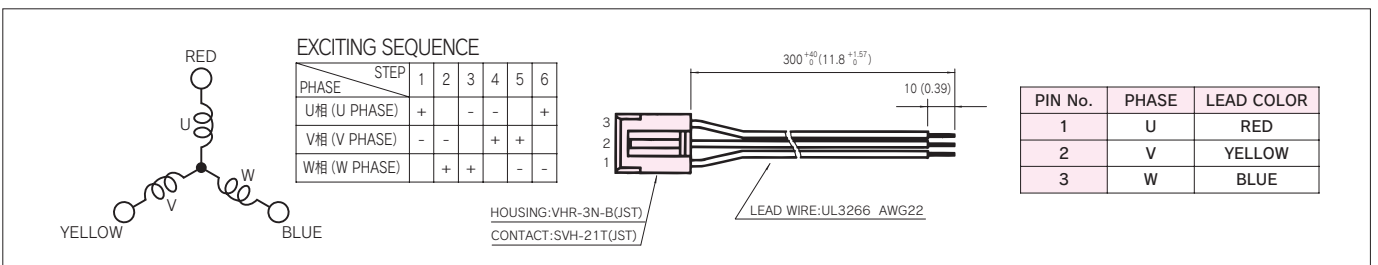


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch)



3-Phase Hybrid Stepping Motor

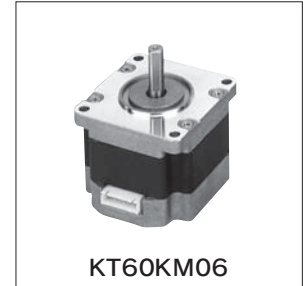
0.6°

KT60 series *TRISYN*

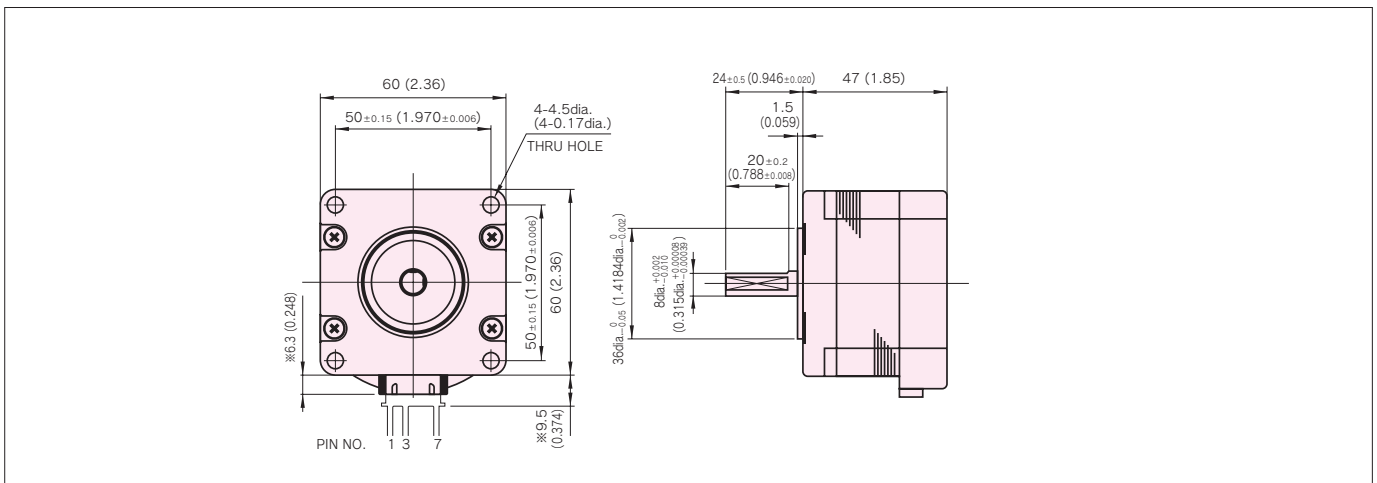
HIGH TORQUE, SILENT ROTATION

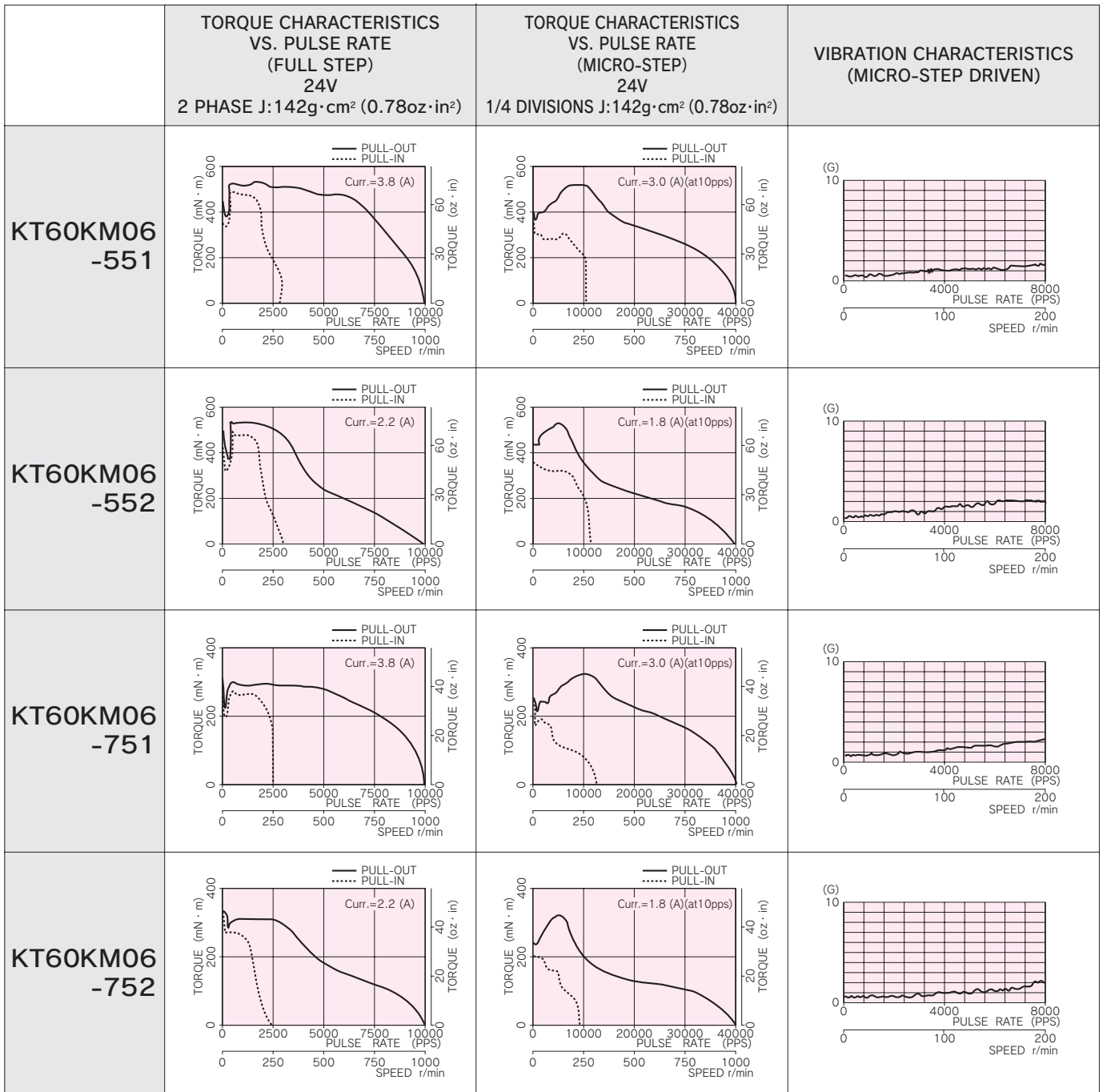
STANDARD SPECIFICATIONS

MODEL	UNIT	KT60KM06			
		-551	-552	-751	-752
DRIVE METHOD	————	BI-POLAR			
NUMBER OF PHASES	————	3			
STEP ANGLE	deg./step	0.6			
VOLTAGE	V	2.09	3.52	2.09	3.52
CURRENT	A/2-PHASE	3.8	2.2	3.8	2.2
WINDING RESISTANCE	Ω/2-PHASE	0.55	1.6	0.55	1.6
INDUCTANCE	mH/2-PHASE	1.0	3.0	1.0	3.1
HOLDING TORQUE	mN · m	442	442	246	246
	oz · in	62	62	35	35
DETENT TORQUE	mN · m	20	20	10	10
	oz · in	2.8	2.8	1.4	1.4
ROTOR INERTIA	g · cm ²	170	170	170	170
	oz · in ²	0.93	0.93	0.93	0.93
WEIGHTS	g	550	550	550	550
	lb	1.2	1.2	1.2	1.2
INSULATION CLASS	————	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)			
INSULATION RESISTANCE	————	500VDC 100MΩmin.			
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.			
OPERATING TEMP. RANGE	°C	0 to 50			
ALLOWABLE TEMP. RISE	K	70			

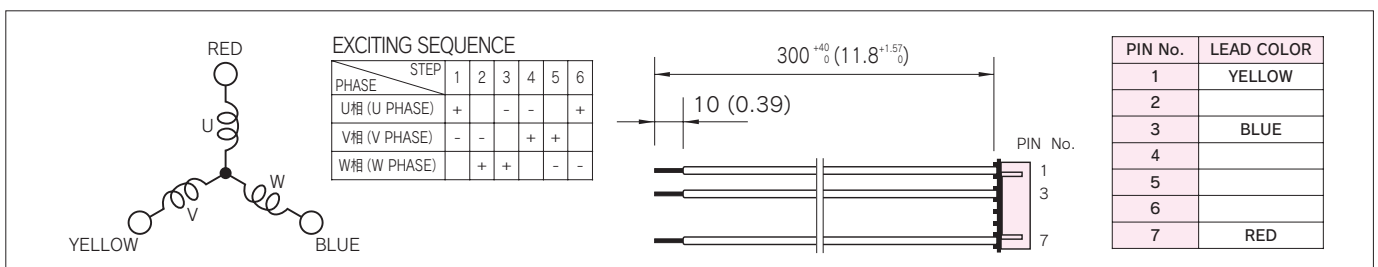


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch)



3-Phase Hybrid Stepping Motor

0.6°

KT60 series *TRISYN*

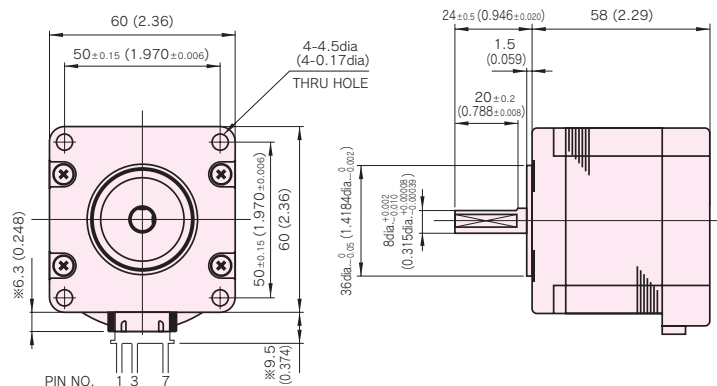
HIGH TORQUE, SILENT ROTATION

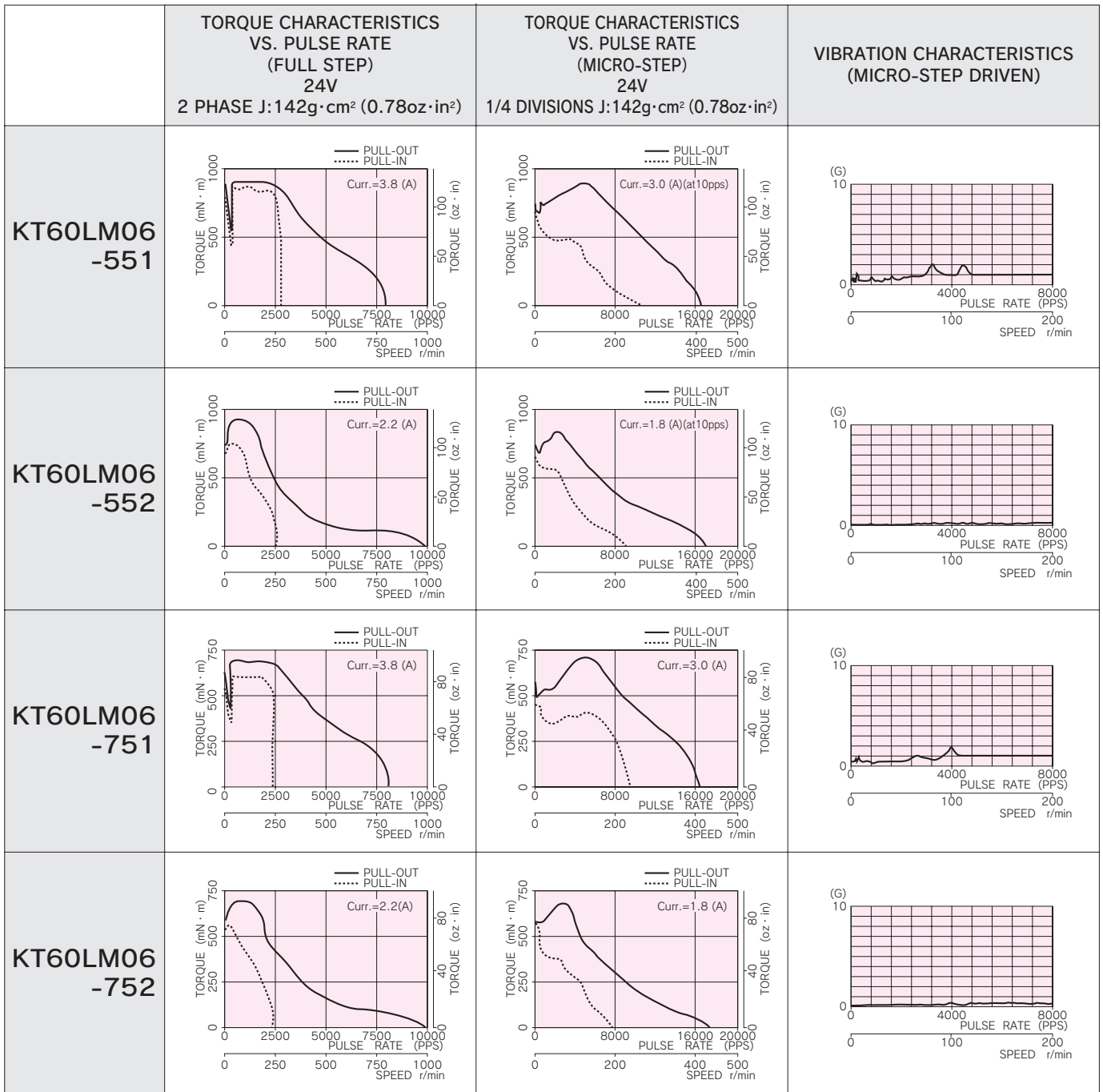
STANDARD SPECIFICATIONS

MODEL	UNIT	KT60LM06			
		-551	-552	-751	-752
DRIVE METHOD	————	BI-POLAR			
NUMBER OF PHASES	————	3			
STEP ANGLE	deg./step	0.6			
VOLTAGE	V	2.77	4.84	2.77	4.84
CURRENT	A/2-PHASE	3.8	2.2	3.8	2.2
WINDING RESISTANCE	Ω/2-PHASE	0.73	2.2	0.73	2.2
INDUCTANCE	mH/2-PHASE	1.7	5.6	1.8	5.7
HOLDING TORQUE	mN · m	785	785	589	589
	oz · in	111	111	83	83
DETENT TORQUE	mN · m	25	25	15	15
	oz · in	3.5	3.5	2.1	2.1
ROTOR INERTIA	g · cm ²	265	265	265	265
	oz · in ²	1.45	1.45	1.45	1.45
WEIGHTS	g	720	720	720	720
	lb	1.6	1.6	1.6	1.6
INSULATION CLASS	————	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)			
INSULATION RESISTANCE	————	500VDC 100MΩmin.			
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.			
OPERATING TEMP. RANGE	°C	0 to 50			
ALLOWABLE TEMP. RISE	K	70			

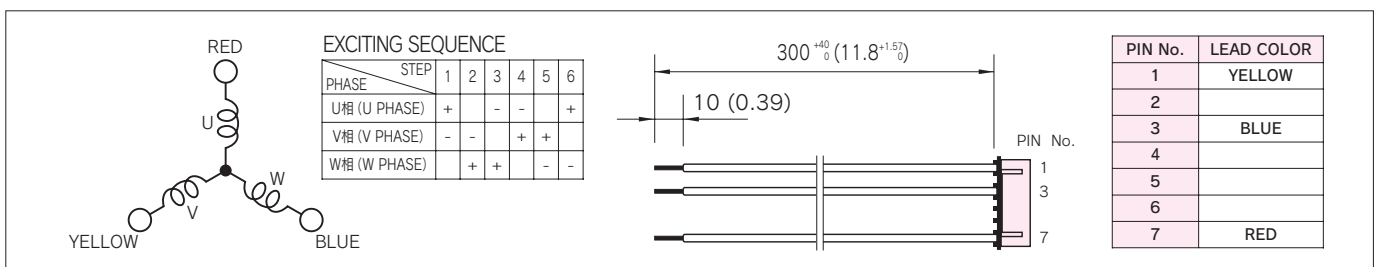


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch)



3-Phase Hybrid Stepping Motor

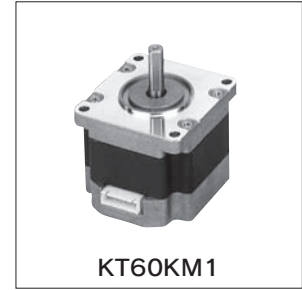
1.2°

KT60 series TRISYN

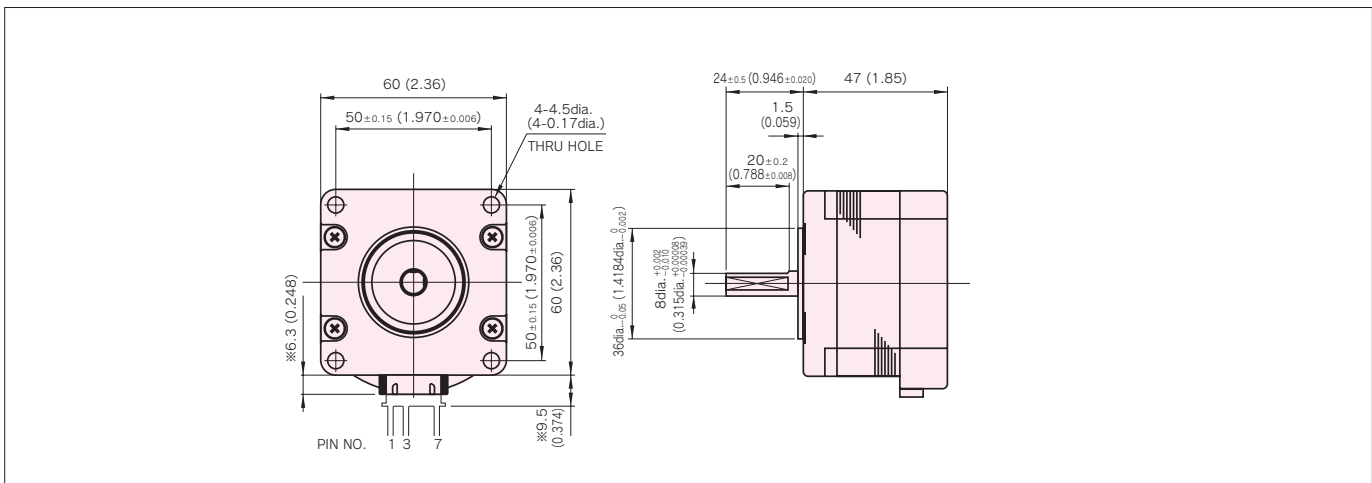
HIGH TORQUE, SILENT ROTATION

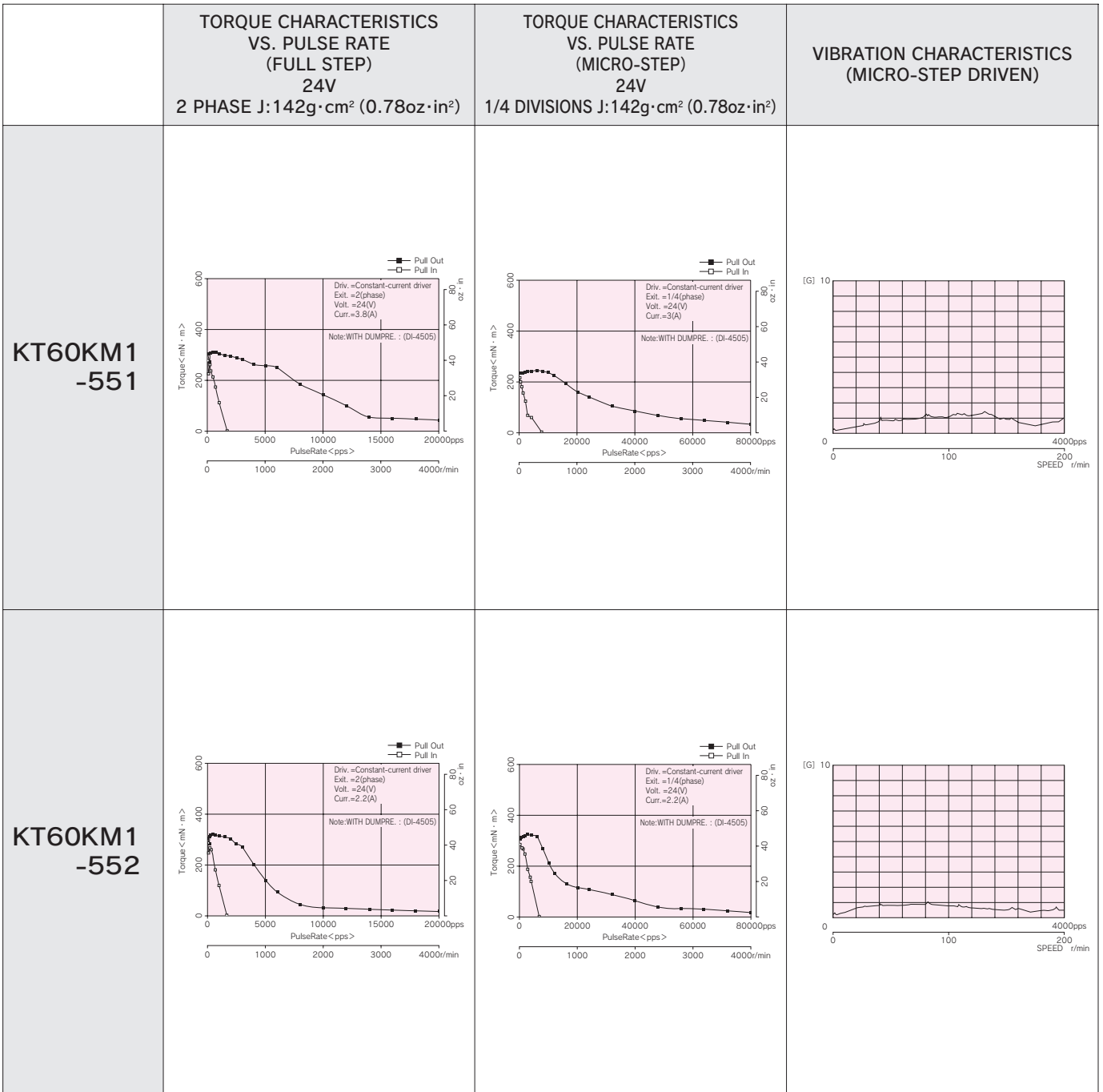
STANDARD SPECIFICATIONS

MODEL	UNIT	KT60KM1	
		-551	-552
DRIVE METHOD	————	BI-POLAR	
NUMBER OF PHASES	————	3	
STEP ANGLE	deg./step	1.2	
VOLTAGE	V	2.09	3.52
CURRENT	A/2-PHASE	3.8	2.2
WINDING RESISTANCE	Ω/2-PHASE	0.55	1.6
INDUCTANCE	mH/2-PHASE	0.8	2.5
HOLDING TORQUE	mN · m	320	320
	oz · in	45.3	45.3
DETENT TORQUE	mN · m	18	18
	oz · in	2.6	2.6
ROTOR INERTIA	g · cm ²	170	170
	oz · in ²	0.93	0.93
WEIGHTS	g	550	550
	lb	1.2	1.2
INSULATION CLASS	————	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP. RANGE	°C	0 to 50	
ALLOWABLE TEMP. RISE	K	70	

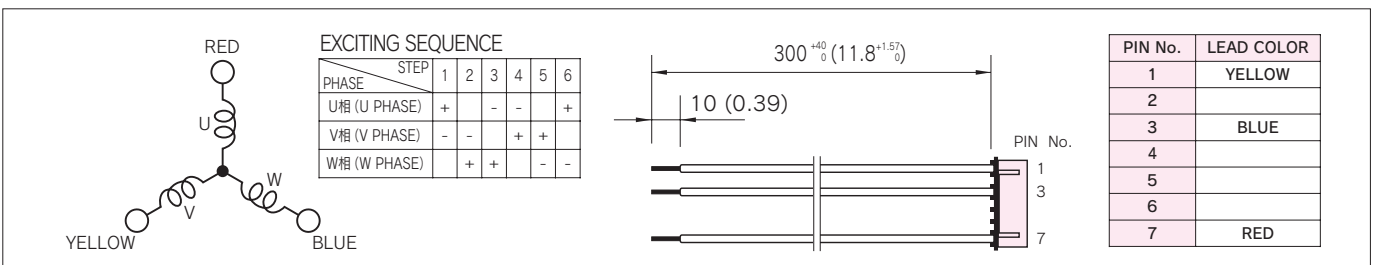


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch)



3-Phase Hybrid Stepping Motor

1.2°

KT60 series TRISYN

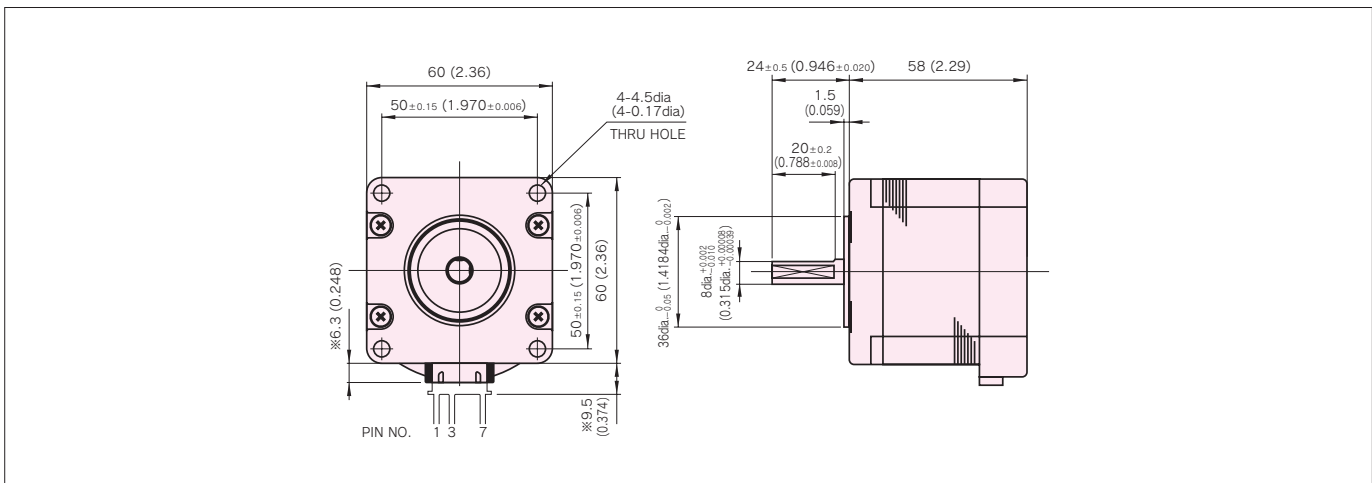
HIGH TORQUE, SILENT ROTATION

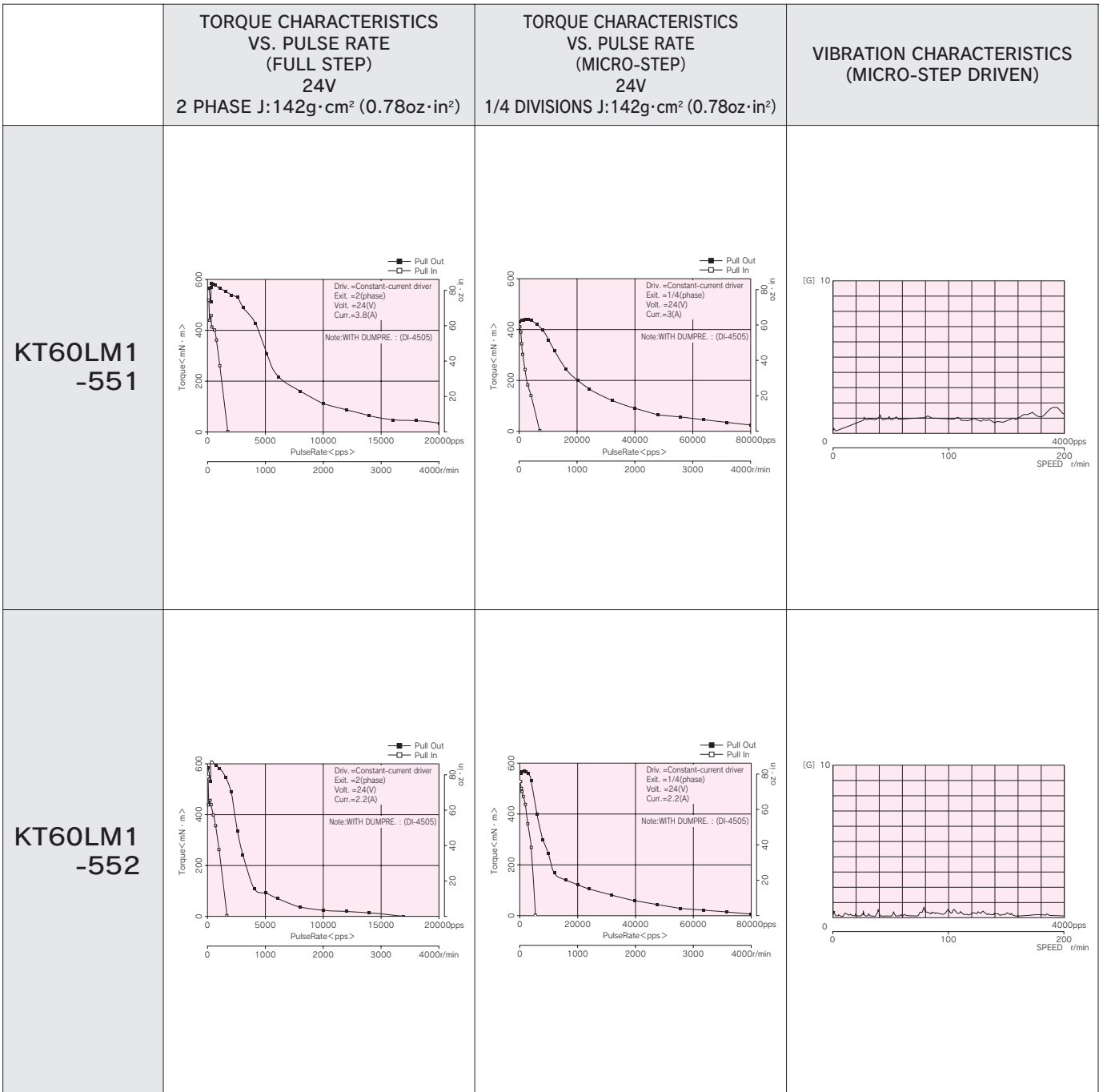
STANDARD SPECIFICATIONS

MODEL	UNIT	KT60LM1	
		-551	-552
DRIVE METHOD	————	BI-POLAR	
NUMBER OF PHASES	————	3	
STEP ANGLE	deg./step	1.2	
VOLTAGE	V	2.77	4.84
CURRENT	A/2-PHASE	3.8	2.2
WINDING RESISTANCE	Ω/2-PHASE	0.73	2.2
INDUCTANCE	mH/2-PHASE	1.0	3.3
HOLDING TORQUE	mN · m	600	600
	oz · in	85	85
DETENT TORQUE	mN · m	35	35
	oz · in	5	5
ROTOR INERTIA	g · cm ²	265	265
	oz · in ²	1.45	1.45
WEIGHTS	g	720	720
	lb	1.6	1.6
INSULATION CLASS	————	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP. RANGE	°C	0 to 50	
ALLOWABLE TEMP. RISE	K	70	

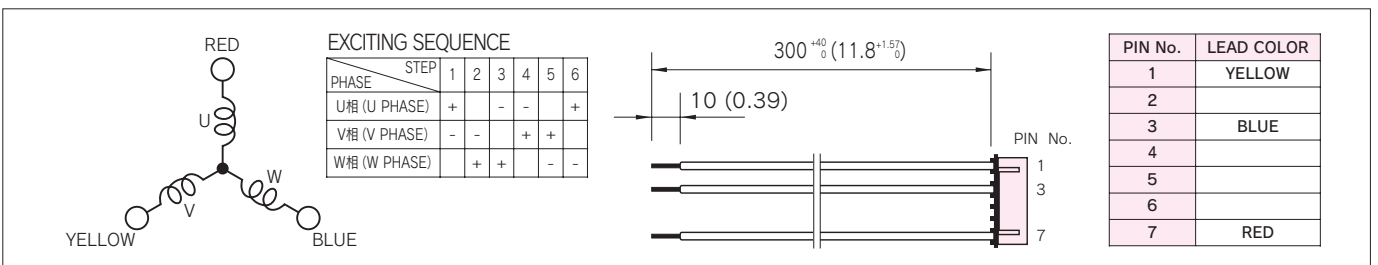


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch)



3-Phase Hybrid Stepping Motor

1.2°

KT60 series *TRISYN*

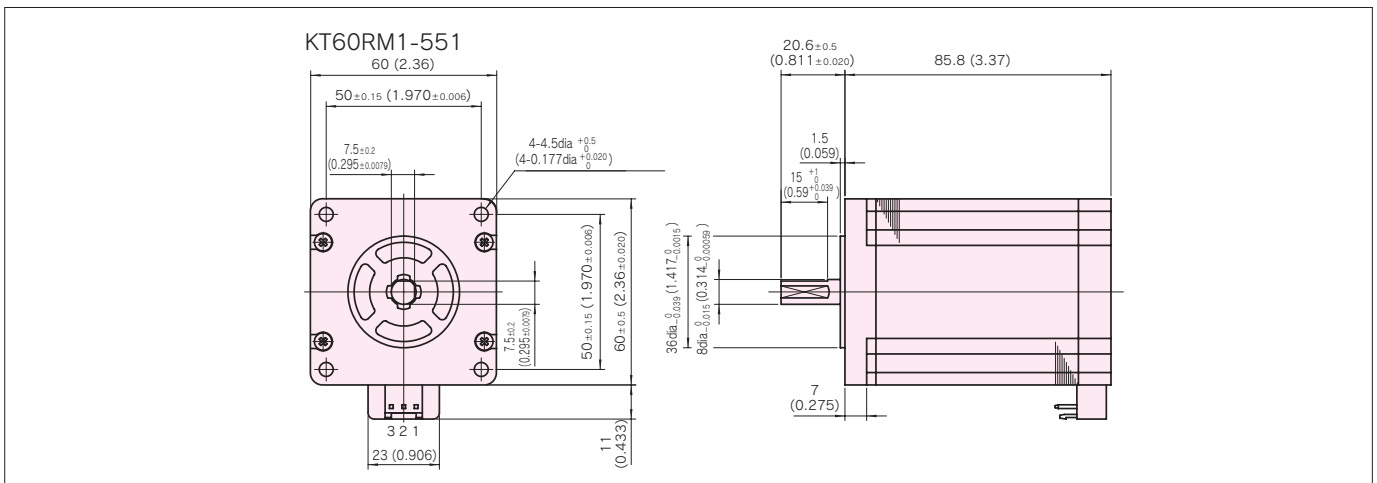
HIGH TORQUE, SILENT ROTATION

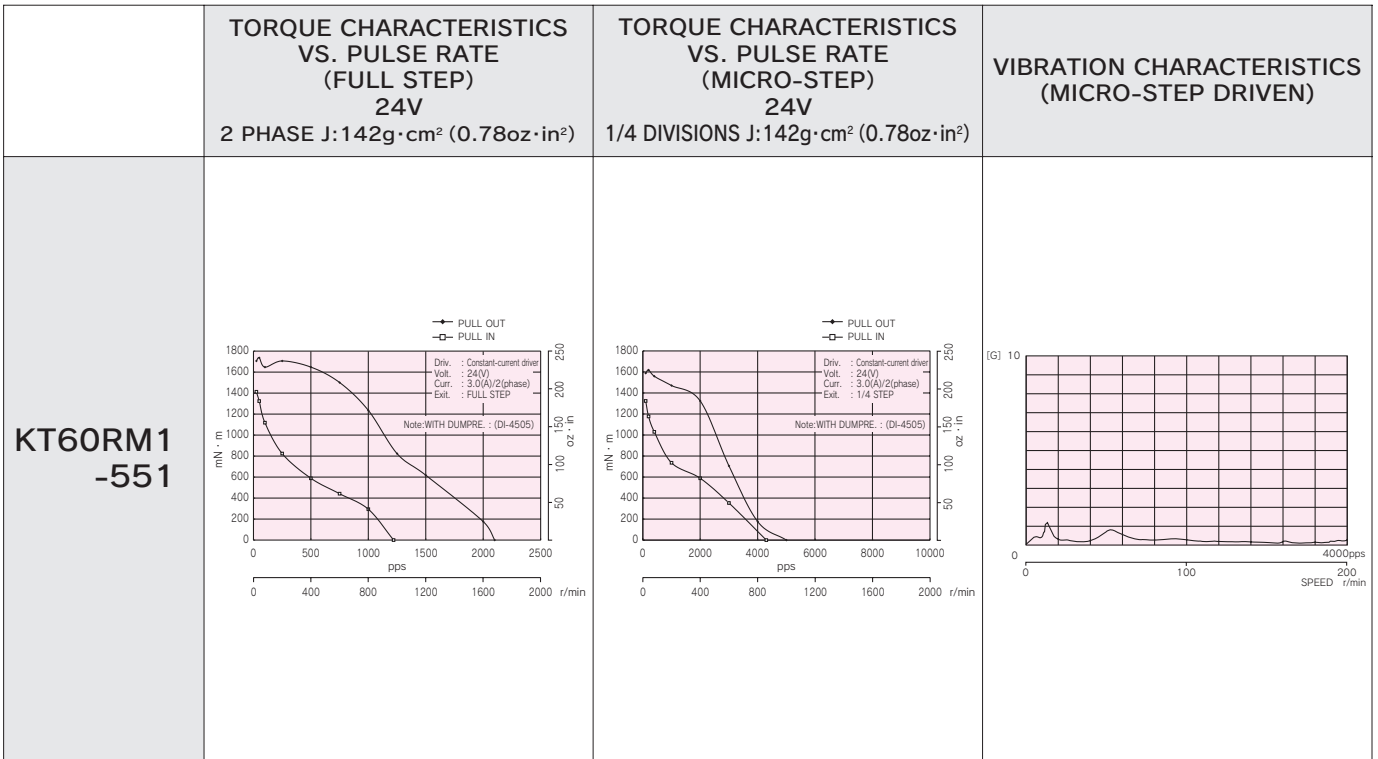
STANDARD SPECIFICATIONS

MODEL	UNIT	KT60RM1-551
		-551
DRIVE METHOD	————	BI-POLAR
NUMBER OF PHASES	————	3
STEP ANGLE	deg./step	1.2
VOLTAGE	V	6.0
CURRENT	A/2-PHASE	3.0
WINDING RESISTANCE	Ω/2-PHASE	2.0
INDUCTANCE	mH/2-PHASE	3.2
HOLDING TORQUE	mN · m	1680
	oz · in	238
DETENT TORQUE	mN · m	125
	oz · in	17.7
ROTOR INERTIA	g · cm ²	840
	oz · in ²	4.6
WEIGHTS	g	1340
	lb	3.0
INSULATION CLASS	————	JIS Class B (130°C 266° F)(UL VALUE:CLASS B 130°C 266° F)
INSULATION RESISTANCE	————	500VDC 100MΩmin.
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.
OPERATING TEMP. RANGE	°C	-10 to 50
ALLOWABLE TEMP. RISE	K	80

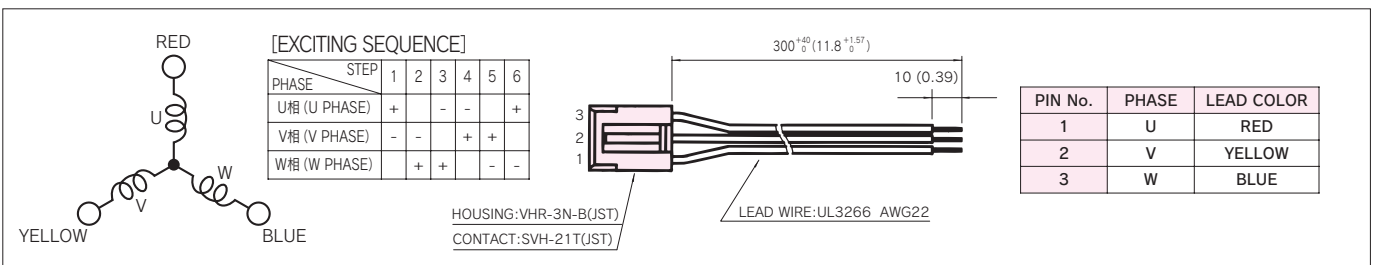


DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch)



3-Phase Hybrid Stepping Motor

1.2°

KT86 series *TRISYN*

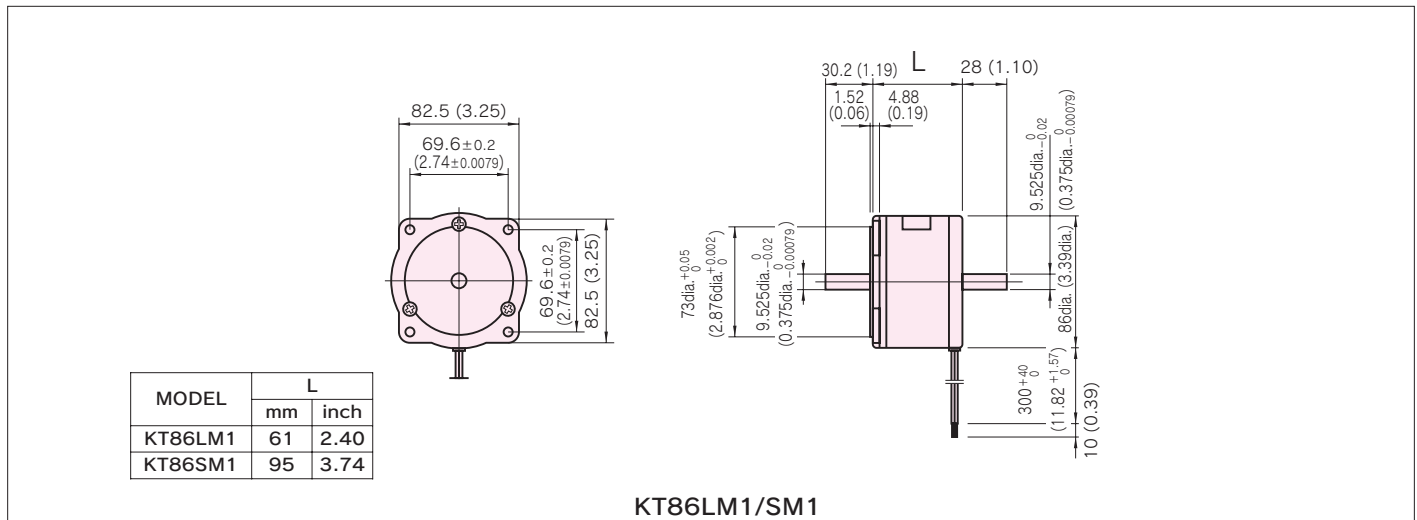
HIGH TORQUE, SILENT ROTATION

STANDARD SPECIFICATIONS

MODEL	UNIT	KT86LM1 -551(SINGLE SHAFT) -561(DOUBLE SHAFT)	KT86SM1 -551(SINGLE SHAFT) -561(DOUBLE SHAFT)
DRIVE METHOD	————	BI-POLAR	
NUMBER OF PHASES	————	3	
STEP ANGLE	deg./step	1.2	
VOLTAGE	V	5.4	7.0
CURRENT	A/2-PHASE	3	2.5
WINDING RESISTANCE	A/2-PHASE	1.8	2.8
INDUCTANCE	mH/2-PHASE	18	36.6
HOLDING TORQUE	N · m	2.0	4.0
	oz · in	278	556
DETENT TORQUE	N · m	0.1	0.2
	oz · in	13.9	27.8
ROTOR INERTIA	g · cm ²	670	1340
	oz · in ²	3.67	7.34
WEIGHTS	kg	1.6	2.1
	lb	3.52	4.63
INSULATION CLASS	————	JIS Class E (120°C 248° F) (UL VALUE: CLASS B 130°C 266° F)	
INSULATION RESISTANCE	————	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	————	500VAC 50HZ 1min.	
OPERATING TEMP. RANGE	°C	0 to 50	
ALLOWABLE TEMP. RISE	K	70	

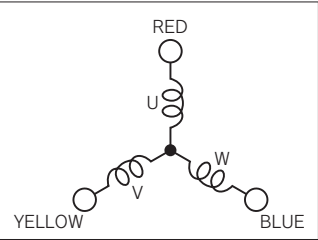


DIMENSIONS unit = mm (inch)



<p>TORQUE CHARACTERISTICS VS. PULSE RATE (FULL STEP) 24V</p> <p>KT86LM1</p>	
<p>TORQUE CHARACTERISTICS VS. PULSE RATE (MICRO-STEP) 24V 1/4 divisions</p> <p>KT86LM1</p>	
<p>VIBRATION CHARACTERISTICS (MICRO-STEP DRIVEN)</p> <p>KT86LM1</p>	
<p>TORQUE CHARACTERISTICS VS. PULSE RATE (FULL STEP) 24V</p> <p>KT86SM1</p>	
<p>TORQUE CHARACTERISTICS VS. PULSE RATE (MICRO-STEP) 24V 1/4 divisions</p> <p>KT86SM1</p>	
<p>VIBRATION CHARACTERISTICS (MICRO-STEP DRIVEN)</p> <p>KT86SM1</p>	

Connection Diagram



3-Phase Hybrid Stepping Motor

3.75°

KR42 series TRISYN

HIGH TORQUE, LOW VIBRATION AND LOW OPERATING NOISE

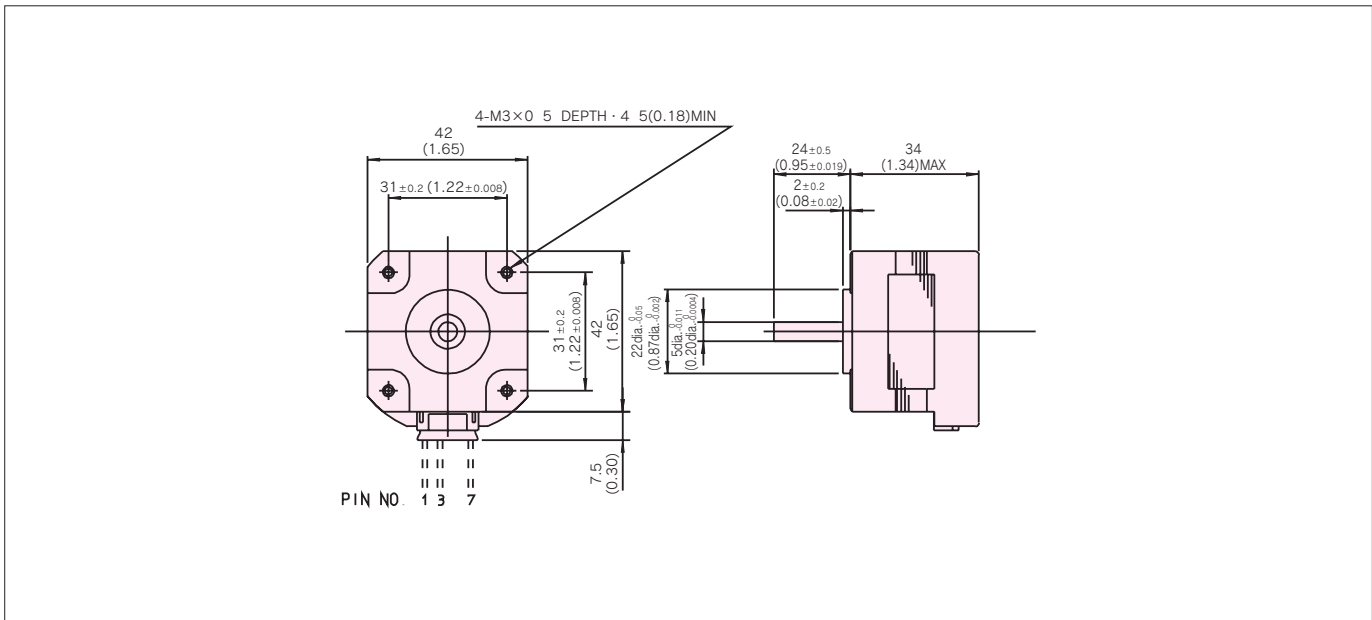
STANDARD SPECIFICATIONS

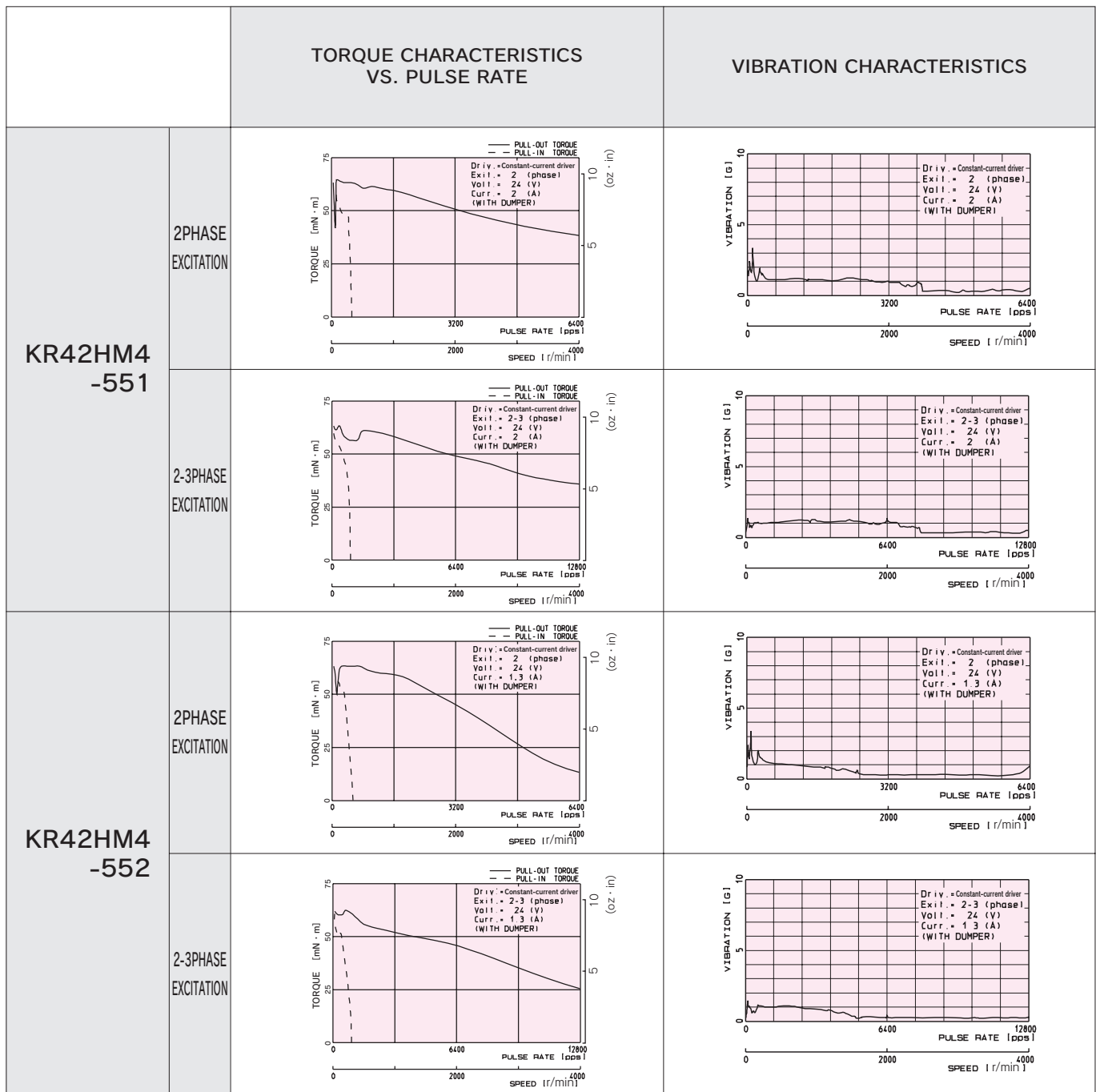
MODEL	UNIT	KR42HM4	
		-551	-552
NUMBER OF PHASES	—	3	
STEP ANGLE	deg./step	3.75	
VOLTAGE	V	2.8	4.4
CURRENT	A/2-PHASE	2	1.3
WINDING RESISTANCE	Ω/2-PHASE	1.4	3.4
INDUCTANCE	mH/2-PHASE	1.7	4.0
HOLDING TORQUE	mN · m	*1 58.9	*2 58.9
	oz · in	8.3	8.3
DETENT TORQUE	mN · m	5.9	5.9
	oz · in	0.8	0.8
ROTOR INERTIA	g · cm ²	31	31
	oz · in ²	0.17	0.17
WEIGHTS	g	210	210
	lb	0.46	0.46
INSULATION CLASS	—	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)	
INSULATION RESISTANCE	—	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	—	500VAC 50HZ 1 min.	
OPERATING TEMP. RANGE	°C	0 to 50	
ALLOWABLE TEMP. RISE	K	70	



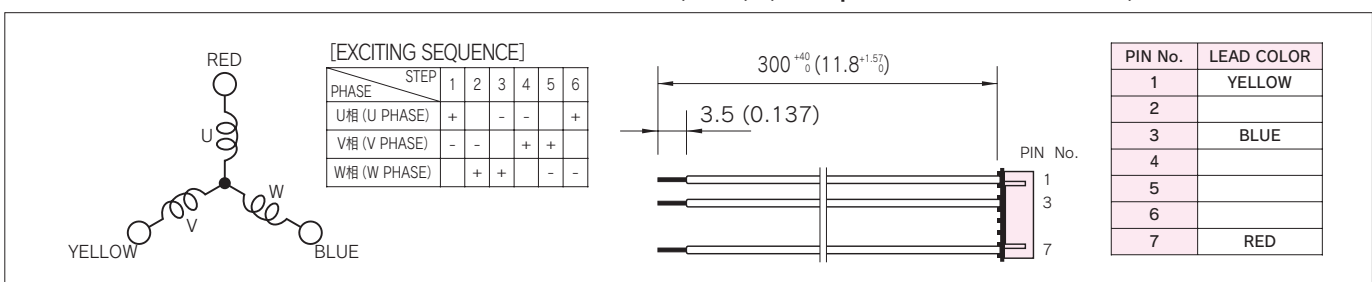
※ 1 : 2A/2-Phase
 ※ 2 : 1.3A/2-Phase

DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch) (Except for KT42EM4-551)



3-Phase Hybrid Stepping Motor

3.75°

KR42 series TRISYN

HIGH TORQUE, LOW VIBRATION AND LOW OPERATING NOISE

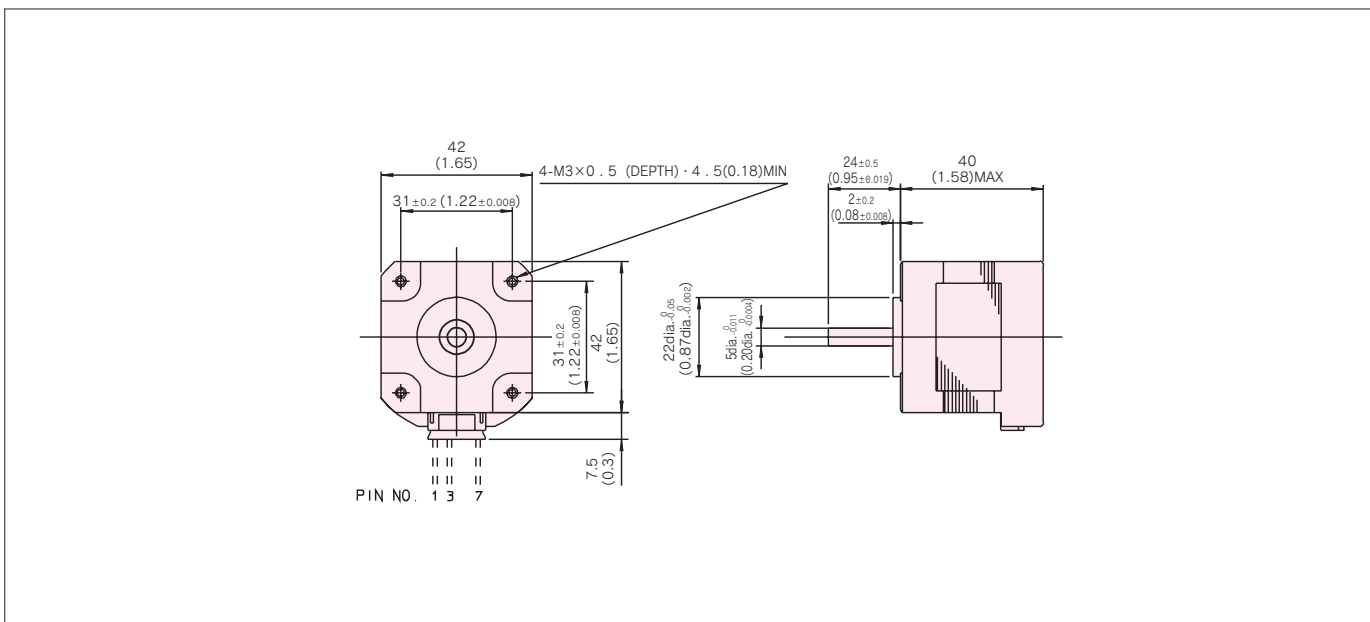
STANDARD SPECIFICATIONS

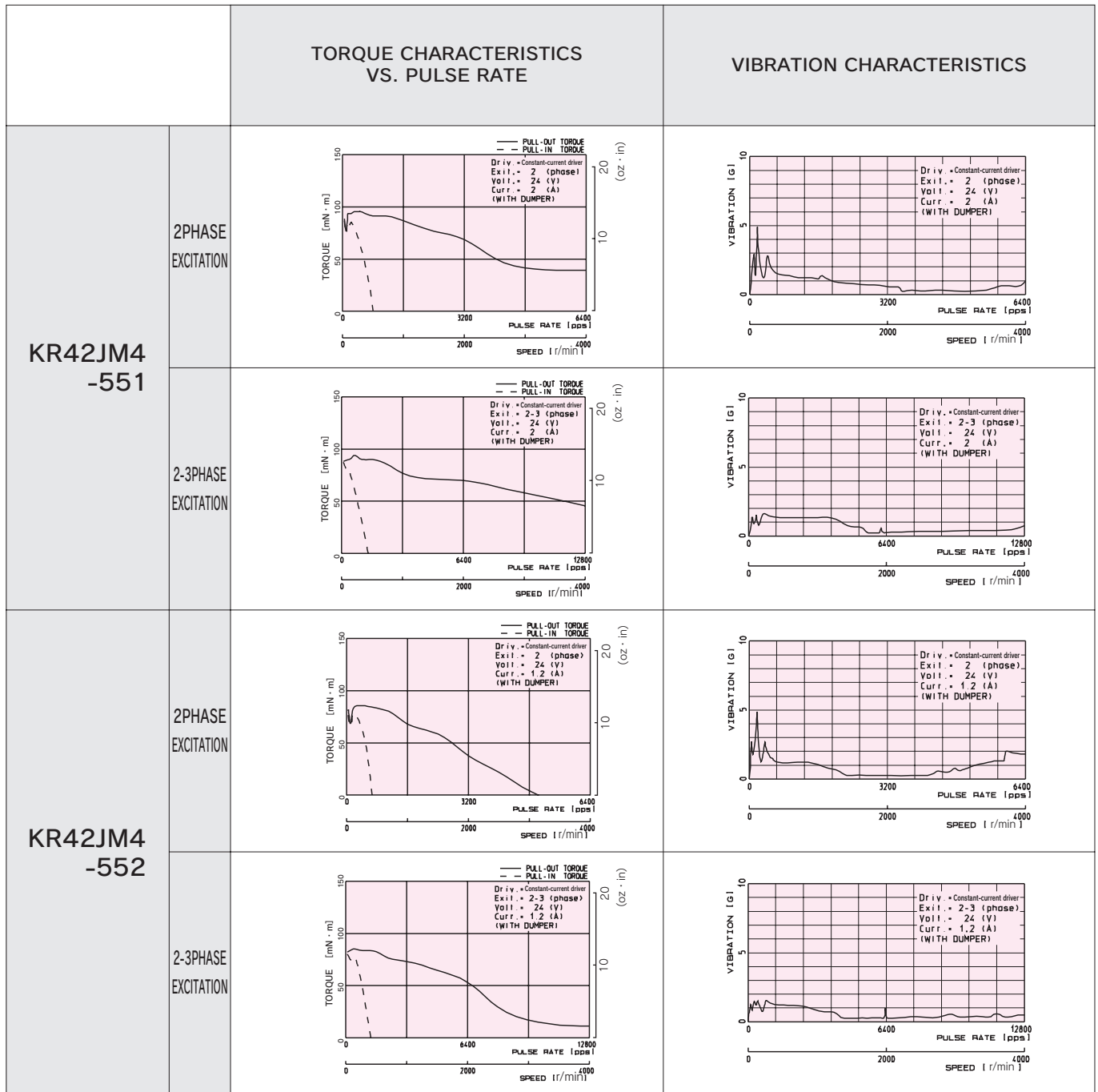
MODEL	UNIT	KR42JM4	
		-551	-552
NUMBER OF PHASES	—	3	
STEP ANGLE	deg./step	3.75	
VOLTAGE	V	3.5	5.2
CURRENT	A/2-PHASE	2	1.2
WINDING RESISTANCE	Ω /2-PHASE	1.75	0
INDUCTANCE	mH/2-PHASE	2.1	5.5
HOLDING TORQUE	mN · m	※1 98.1	※2 98.1
	oz · in	12.5	12.5
DETENT TORQUE	mN · m	9.8	9.8
	oz · in	1.4	1.4
ROTOR INERTIA	g · cm ²	45	45
	oz · in ²	0.25	0.25
WEIGHTS	g	240	240
	lb	0.53	0.53
INSULATION CLASS	—	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)	
INSULATION RESISTANCE	—	500VDC 100M Ω min.	
DIELECTRIC STRENGTH	—	500VAC 50HZ 1 min.	
OPERATING TEMP. RANGE	°C	0 to 50	
ALLOWABLE TEMP. RISE	K	70	



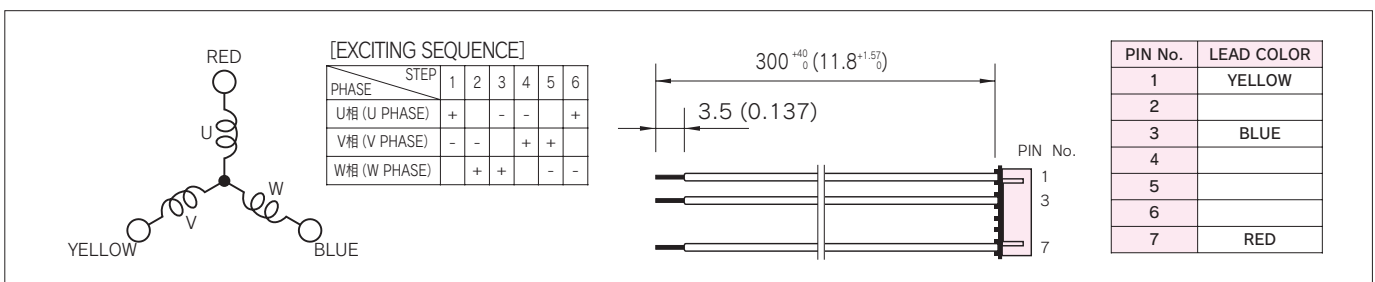
※ 1 : 2A/2-Phase
 ※ 2 : 1.3A/2-Phase

DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch) (Except for KT42EM4-551)



3-Phase Hybrid Stepping Motor

3.75°

KR42 series TRISYN

HIGH TORQUE, LOW VIBRATION AND LOW OPERATING NOISE

STANDARD SPECIFICATIONS

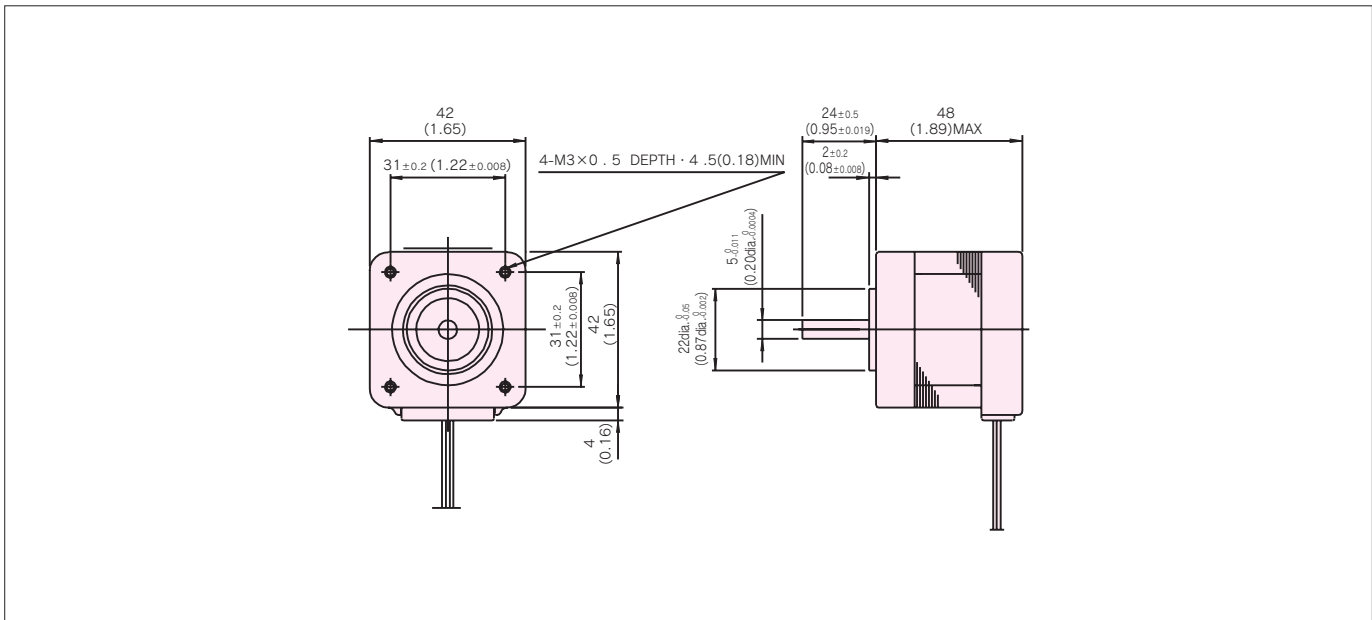
MODEL	UNIT	KR42KM4	
		-551	-552
NUMBER OF PHASES	—	3	
STEP ANGLE	deg./step	3.75	
VOLTAGE	V	3.5	6.5
CURRENT	A/2-PHASE	2.5	1.3
WINDING RESISTANCE	Ω/2-PHASE	1.40	5.0
INDUCTANCE	mH/2-PHASE	1.7	7.5
HOLDING TORQUE	mN · m	※1 118	※2 118
	oz · in	16.7	16.7
DETENT TORQUE	mN · m	9.8	9.8
	oz · in	1.4	1.4
ROTOR INERTIA	g · cm ²	57	57
	oz · in ²	0.31	0.31
WEIGHTS	g	350	
	lb	0.77	
INSULATION CLASS	—	JIS Class E (120°C 248° F)(UL VALUE:CLASS B 130°C 266° F)	
INSULATION RESISTANCE	—	500VDC 100MΩmin.	
DIELECTRIC STRENGTH	—	500VAC 50HZ 1 min.	
OPERATING TEMP. RANGE	°C	0 to 50	
ALLOWABLE TEMP. RISE	K	70	

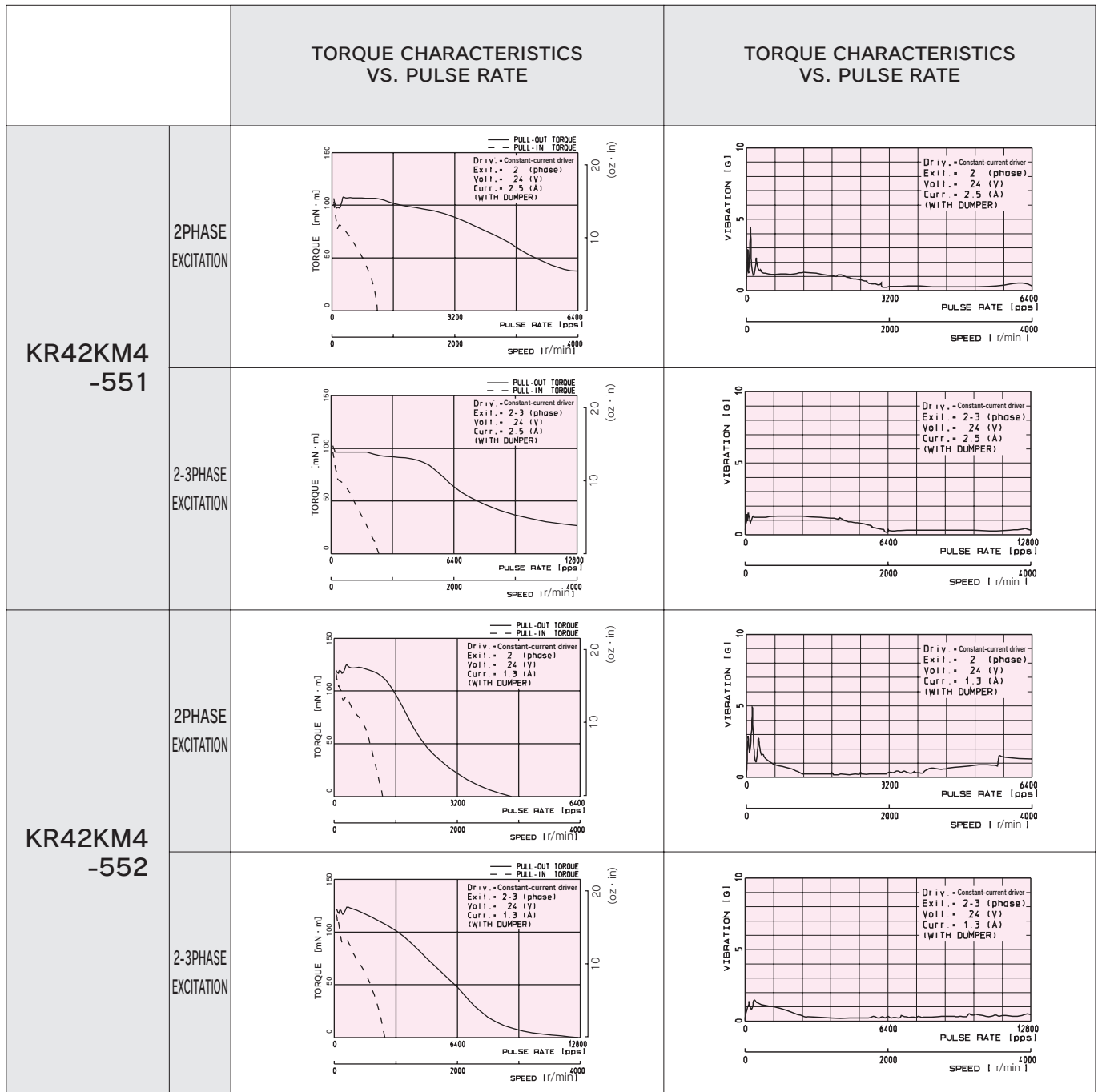
- ※ 1 : 2A/2-Phase
- ※ 2 : 1.3A/2-Phase



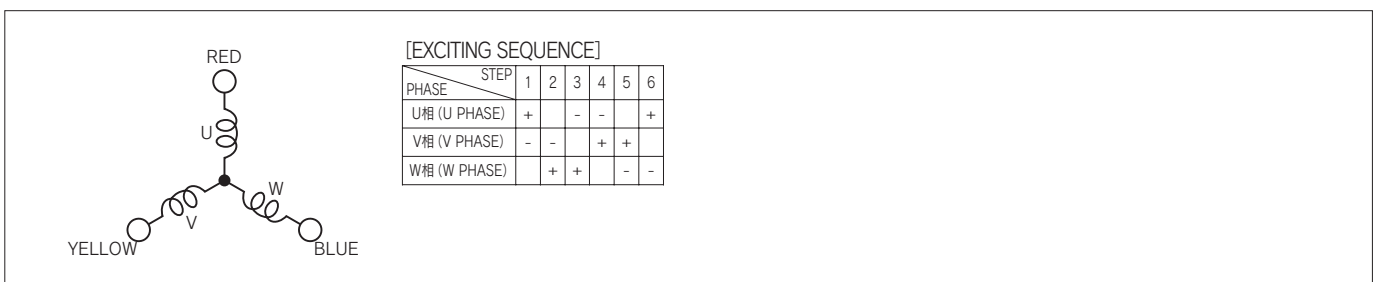
KR42KM4

DIMENSIONS unit = mm (inch)





■ CONNECTION CABLE TO MOTOR unit = mm (inch) (Except for KT42EM4-551)



3-Phase Hybrid Stepping Motor Driver

HIGH TORQUE, SILENT ROTATION

SERVEX FTD3S2P22-01 DC24V

Features

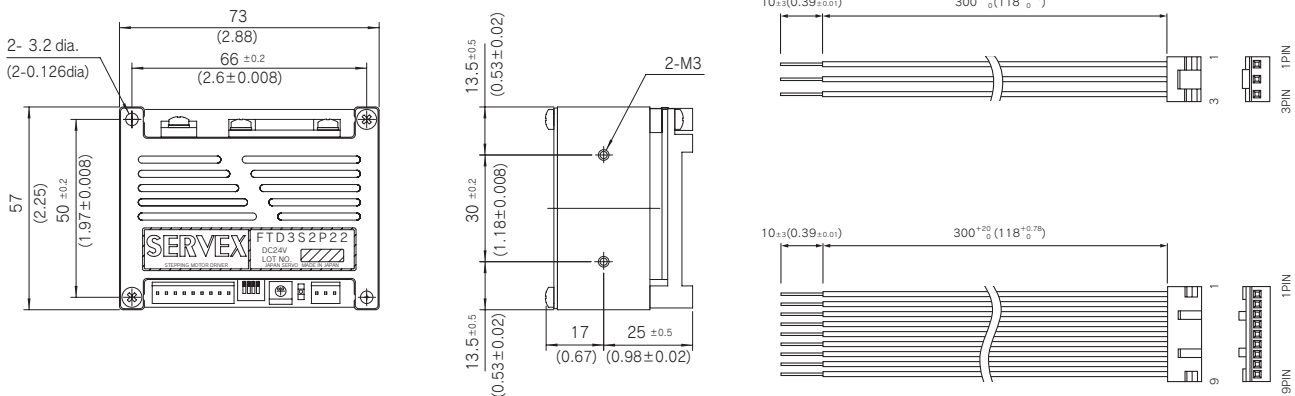
1. The micro step driver operates with low noise.
2. Step angles of 1/8, 1/4, 1/2 and 1/1 can be chosen.
3. High torque and high speed response achieved using constant current driver.
4. Input commands may be selected from either direction-of-rotation separate serial pulse signals or a combination of directional signals and pulse signals.
5. Reduced current (40 to 60%) function to prevent overheating during holding.

Applicable motors

See page 29



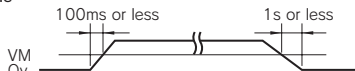
Dimensions Unit = mm(inch)



Power supply specifications

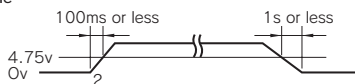
Motor power supply voltage (VM) : 10.8~26.4V

Start up time



Logic power supply voltage (5VDC): 5V ± 5%

Start up time



Motor output current; About 2A max. (different depending on the drive parameters of the motor being used)

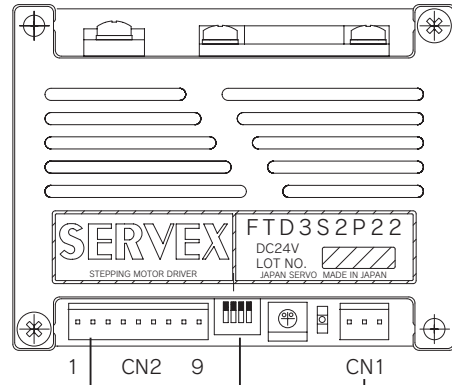
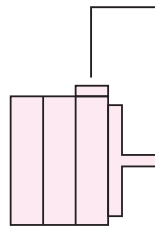
Connector specifications

	FTD3S2P11-01 side		User side	
	Model	Applicable housing	Applicable terminal (real)	Maker
CN ₂	IL-G-9P-S3T2-SA	IL-G-9S-S3C2-SA	IL-G-2C-SC-10000	J·A·E
CN ₁	IL-G-3P-S3T2-SA	IL-G-3S-S3C2-SA	IL-G-2C-SC-10000	J·A·E

Functions, Setting and Connections

Switch No.	Name	Function	Setting and operation				
			OFF	ON	ON	ON	
1	SEL	Drive pulse format	OFF	CW/CCW pulse input			
			ON	Serial pulse/rotational direction	CCW terminal= "H,"	Rotation in CCW direction	CCW terminal= "L,"
2	SAVE	Automatic power saving	OFF	ENABLE about 0.28 to 0.39 seconds after input pulses stop, the output current drops to 40-60%			
			ON	NOT ENABLE			
3	MS1	Micro step Number of divisions	Number of divisions	1/8	1/4	1/2	1/1
			MS1	ON	ON	OFF	OFF
			MS0	ON	OFF	ON	OFF
4	MS0						

Motor cable (attached)



Connector No.	Terminal No.	Name	Function
CN1	1	MOTOR W	To Motor phase - W
	2	MOTOR V	To Motor phase - V
	3	MOTOR U	To Motor phase - U

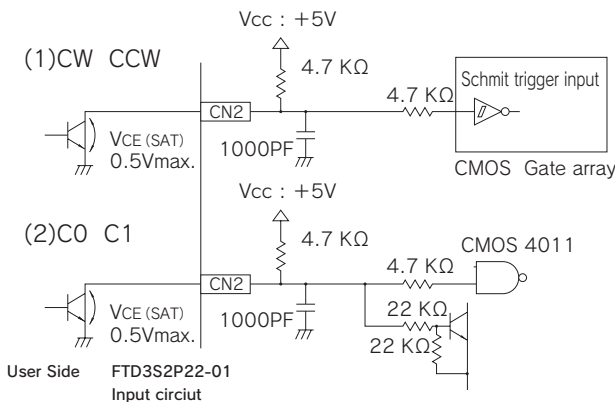
Power source connector

Connector No.	Terminal No.	Name	Function
CN2	1	VM	Motor power supply 12-24 Vdc
	2	COM	Motor power supply GND
	3	5VDC	Logic circuit power supply +5V
	4	GND	Logic circuit GND

Signal input connector

Connector No.	Terminal No.	Name	Function			
CN2	5	CW	The CW direction drive pulse or the serial pulse signal input			
	6	CCW	The CCW direction drive pulse or the direction signal input			
		Current%	120~150	100	50~80	0
	7	C0	L	L	H	H
	8	C1	L	H	L	H
	9	GND	Signal GND			

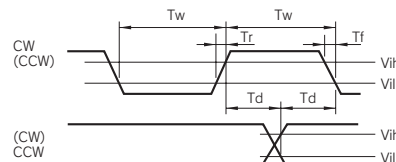
Input circuit



Input signal specifications

Item	Signal	Specification	
		MIN	MAX
High level input voltage	Vih (V)	4.0	Vcc+0.3
Low level input voltage	Vil (V)	-0.3	0.8
Rise time	Tr (μS)	2.0	9.5
Fall time	Tf (μS)	-	2.0
Input pulse range	Tw (μS)	10	-
Direction of rotation change timing	Twh (μS)	3.0	-

Note) Specified the voltage waveform between the user circuit ground and the FTD3S2P22-01 terminal.



3-Phase Hybrid Stepping Motor Driver

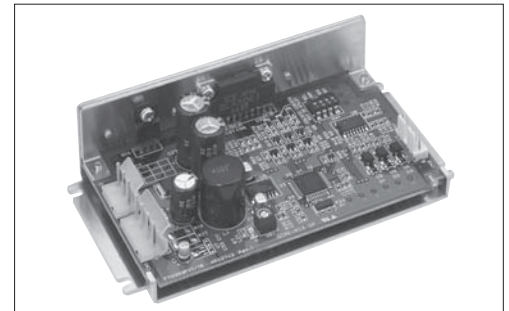
HIGH TORQUE, SILENT ROTATION
SERVEX FTD3S3P17-01 DC24V

Features

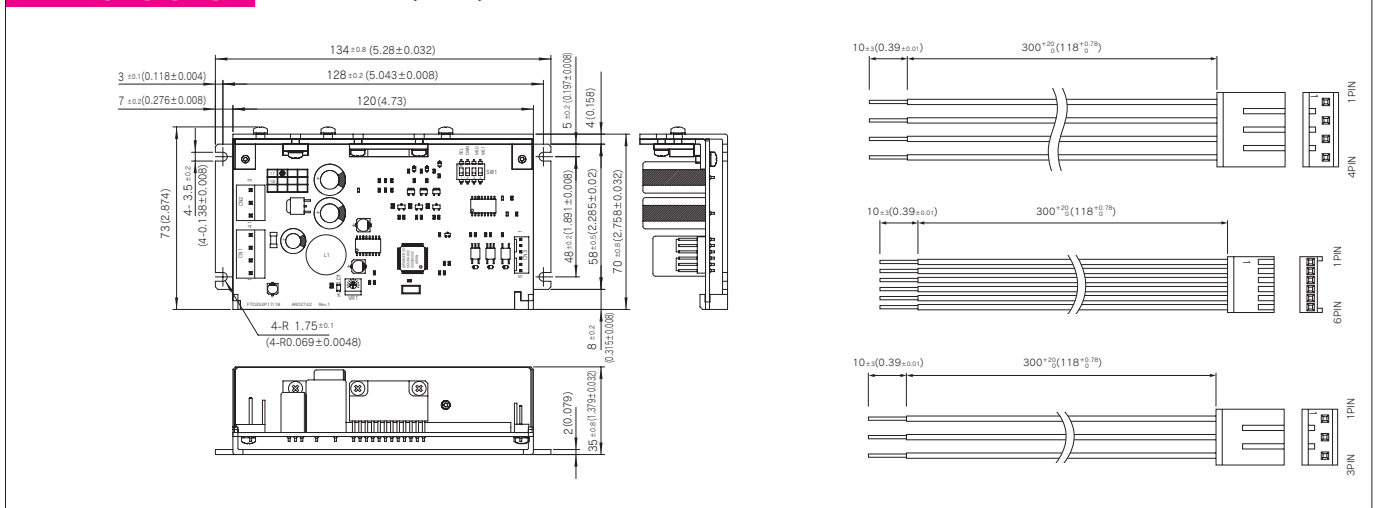
1. The micro step driver operates with low noise.
2. Step angles of 1/8, 1/4, 1/2 and 1/1 can be chosen.
3. High torque and high speed response achieved using constant current driver.
4. Input commands may be selected from either direction-of-rotation separate serial pulse signals or a combination of directional signals and pulse signals.
5. Reduced current (40 to 60%) function to prevent overheating during holding.

Applicable motors

See page 29



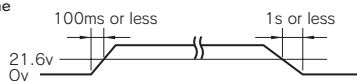
Dimensions Unit = mm(inch)



Power supply specifications

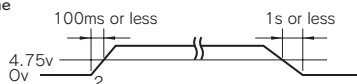
Motor power supply voltage(VM) : 21.6V~26.4V

Start up time



Logic power supply voltage(5VDC) : 5V±5%

Start up time



Motor output current; About 3A max.(different depending on the drive parameters of the motor being used)

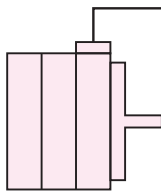
Connector specifications

	FTD3S3P17-01 side		User side		Maker
	Model	Applicable housing	Applicable terminal	(real)	
CN ₁	5281-04A	5258-04	5168T or 5168TL		Molex
CN ₂	5281-03A	5258-03	5168T or 5168TL		Molex
CN ₃	5045-06A	5051-06	5159T or 5159TL		Molex

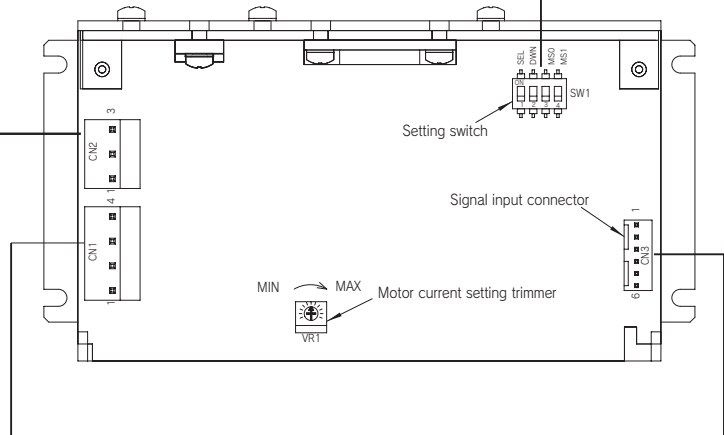
Functions, Setting and Connections

Switch No.	Name	Function	Setting and operation					
1	SEL	Pulse input direction	OFF	CW/CCW pulse input				
			ON	Serial pulse/rotational direction	CCW terminal= "H,"	Rotation in CCW direction	CCW terminal= "L,"	Rotation in CW direction
3	DWN	Selection of automatic motor current save function	OFF	ENABLE After the time set by To and T1 elapsed, motor output is reduced to 70% of the VR1.				
			ON	NOT ENABLE				
4	MS0	Setting for the number of microstep divisions	Number of divisions	1/8	1/4	1/2	1/1	
			MS0	ON	OFF	ON	OFF	
5	MS1	Setting for the number of microstep divisions	MS1	ON	ON	OFF	OFF	

Motor connector wire(accessory)



Connector No.	Terminal No.	Name	Function
CN2	1	MOTOR W	To be connected W phase of 3-phase motor
	2	MOTOR V	To be connected V phase of 3-phase motor
	3	MOTOR U	To be connected U phase of 3-phase motor



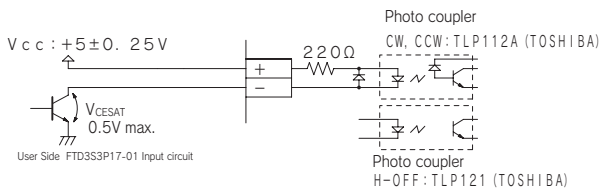
Power source connector

Connector No.	Terminal No.	Name	Function
CN1	1	5VDC	Logic circuit power supply +5V
	2	GND	Logic circuit GND
	3	VM	Motor power supply 24V
	4	COM	Motor power supply GND (connected to GND within board)

Signal input connector

Connector No.	Terminal No.	Name	Function
CN3	1	CW	CW direction drive pulse or serial pulse signal input
	2	GND	Ground for CW
	3	CCW	CCW direction drive pulse or direction signal input
	4	GND	Ground for CCW
	5	H.OFF	Motor output off(motor free)
	6	GND	Ground for H.OFF56

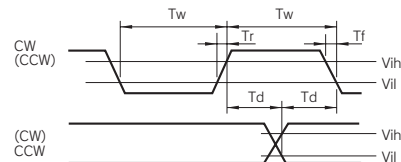
Input circuit



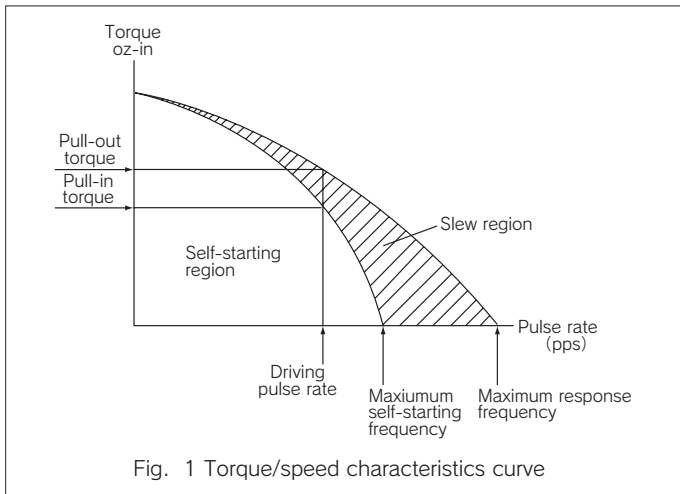
Input signal specifications

Item	Signal	Specification	
		MIN	MAX
High level input voltage	Vih(V)	4.0	Vcc
Low level input voltage	Vil(V)	0.0	0.5
Rise time	Tr(μs)	—	5.0
Fall time	Tf(μs)	—	5.0
Low level maintenance	Tw(μs)	10	—
High level maintenance	Twh(μs)	10	—

Note)Specified the voltage waveform between the user circuit ground and theFSD3S3P17-01terminal



Explanation of the Dynamic Torque Curve



Self-starting region

This is the region in which motors can be started and stopped instantaneously.

Pulse rate

The number of pulses in a unit of time, and is shown in the unit "pps" which means "pulses per second". The relation between pulse rate, speed (rpm) and angular velocity (rad/s) is given below.

$$\omega = \frac{\pi}{180} \theta_s \cdot P \rightarrow P = \frac{180}{\pi} \cdot \frac{\omega}{\theta_s}$$

$$N = \frac{1}{6} \theta_s \cdot P \rightarrow P = \frac{6N}{\theta_s}$$

where ω : Angular velocity (rad/s)
 θ_s : Step angle (deg.)
 N : Speed (rpm)
 P : Driving pulse rate (pps)

Maximum self-starting frequency (pps)

This is the maximum pulse rate in the self-starting region. Care must be taken, because it varies depending on the load inertia.

Slew region

In this region, driving is possible only by slow acceleration/slow deceleration control.

Maximum response frequency (pps)

This is the maximum pulse rate in the slew region.

Pull-in torque

This is the torque generated when started in the self-starting region. It is also called the "synchronization torque".

Pull-out torque

This is the torque generated when driven in the slew region.

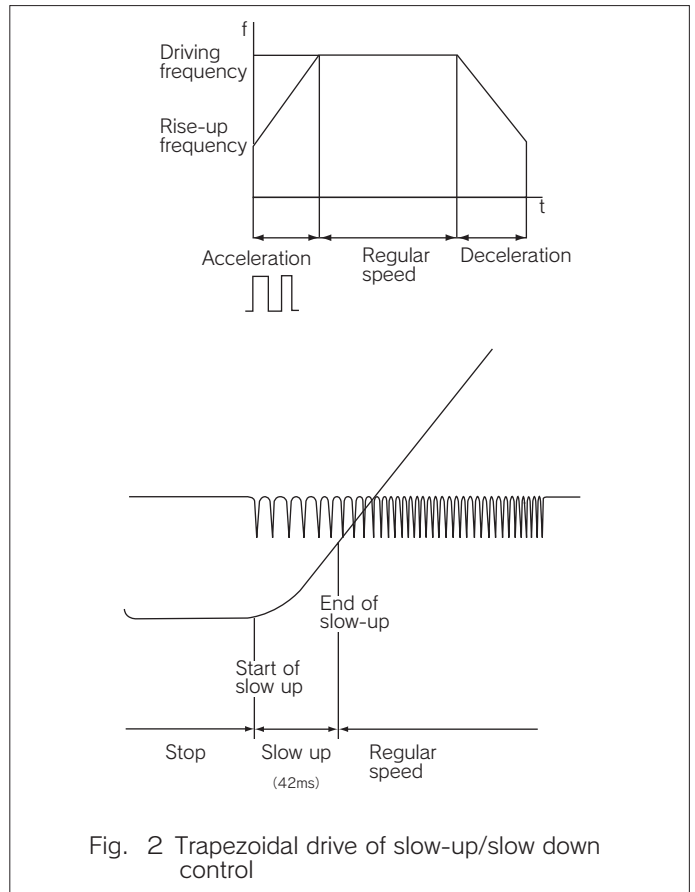
Pull-out

This means the motor is coming out of synchronized operation by being not able to follow the pulse signal from the pulse generator.

Over-loading is the general cause, but noise (Electric/ Electro-magnetic) is also a cause in some cases.

Slow acceleration/slow deceleration

This is a kind of control to raise or lower the pulse rate to drive stepping motors in the slew region so they exhibit their full capability. There are various methods but one example, called trapezoidal driving, is shown in Fig. 2.



Resonance phenomenon

When stepping motors are driven, torque decrease, miss-steps, vibration and other unfavorable phenomena may occur at some specific frequencies. This is called a "Resonance phenomenon", and is caused by the coincidence of intrinsic vibration frequency and input pulse frequency of the motor. It is experienced generally in the range of 100 to 200 pps. It is impossible to eliminate this resonance fully, but the defect can be reduced by changing the excitation mode or providing damper.

NOTE

A series of horizontal dashed lines for writing notes.

Japan Servo Co., Ltd.

Certified as Japan's first ISO14001 small motor manufacturer

Quality, environment and safety have always remained as top priorities in Japan Servo's business policy. Our Urizura (Ibaraki Prefecture) production facility for fans and water circulation pumps was first approved for ISO9001 in March 1994 by Lloyd's Register Quality. During the following year, the Kiryu (Gunma Prefecture) factory, centered on the production of a wide array of motors, was certified, along with the Hotaka (Nagano Prefecture) and Gunma (Gunma Prefecture) production affiliates. In 1997, another affiliate, Saitama Koki (Saitama Prefecture) became ISO9001 compliant. On the international forefront, Japan Servo Motors (S) Pte., Ltd. (Singapore) and P.T. Japan Servo Batam (Indonesia) have been ISO9002 since 1994.

As for meeting ISO14001 environmental standards, an environmental management committee was organized in 1996 to launch a company wide effort under the slogan, "Working together towards a clean environment in the future." Five fundamental principles center around the continual improvement of the environment :

- Scrap recycling and improved industrial waste treatment
- On-going sewage PH surveillance system
- Standardized motor parts for reusage
- Light-weight downsizing of products
- Design of high efficiency motors

Our policies, commitment and close adherence to these fundamental principles have contributed significantly to receiving ISO14001 safety approval for our Kiryu site, including the factory, laboratory, and Servo Techno System Co., Ltd. facility, following the audit by JACO, a Japanese environmental certification organization. We are proud of being the first Japanese small motor manufacturer to receive this level of qualification.

ATTESTATION	ATTESTATION BUSINESS OFFICE	NO.	ACQUISITION
ISO 9001	JAPAN SERVO KIRYU FACTORY	930231	Mar. 1994
	SERVO TECHNO SYSTEM CO., LTD Singapore	941887	Aug. 1995
	JAPAN SERVO MOTORS Singapore PTE, LTD. P.T. JAPAN SERVO BATAM	Q3741	Sep. 1994
	CHANGZHOU SERVO MOTORS CO., LTD	Q15719	Mar. 2002
ISO 14001	JAPAN SERVO CO., LTD. KIRYU FACTORY SERVO TECHNO SYSTEM CO., LTD	EC97J1191	Feb. 1998
	JAPAN SERVO MOTORS Singapore PTE, LTD. P.T. JAPAN SERVO BATAM	AJA03/6388	Mar. 2003
	CHANGZHOU SERVO MOTORS CO., LTD	CH03/0677	Jul. 2003

R & D, design engineering and manufacturing activities on precision small motors, sensors and their application systems in Kiryu Site including Kiryu Operation, Laboratory and Servo Techno System Co., Ltd.

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