BKA30D-XX Double Shaft Stepper Motor

Description

The BKA30D-XX Double Shaft Stepper Motor is a patented design with a reduction ratio of 180/1. Its innovation is based on the BKA30-xx model. The BKA30D can drive two pointers independently. The benefits include a dial space saving opening a window for new concept designs. Applications include dashboards and digital indicator equipment to transfer digital signals to an analog display.

The BKA30D-XX Double Shaftstepper motor requires two logic pulse signals to drive, and can operate under pulses of 3.5V~10V. The minimum step angle of the output shaft can reach 1/12 degree. Can be driven in either step-by-step or micro step mode.

Features:

--High Resolution: 1/3° resolution per partial step, 1/12° resolution per micro step

--Low Consumption: mean operation current 18 mA

--Small Dimensions: 59.5 x 31.5 x 8.9 mm

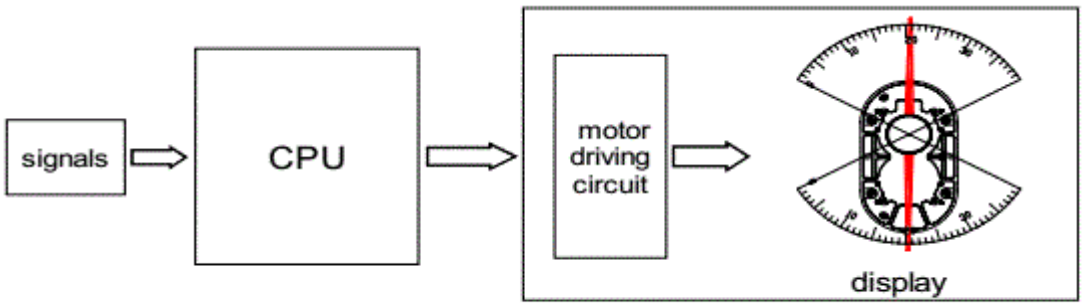
--Large Operation Temperature Range: -40~105 ℃

--Large Running Speed Range: 0~600°/s

--High Reliability: Qualified for automotive applications

--Silent & Longevous: lubricative and high intensity material for gears,When two motors are running simultaneously, the noise level is as low as 45dB (A).

Typical Application:



perfect combination of digital accuracy and analog facility

Fig-1

Electronics and Mechanical Characteristics

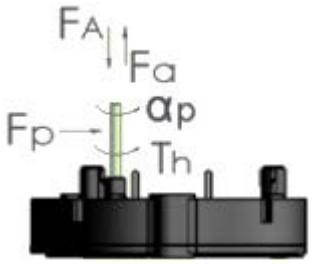
Parameter		Sym.	Test Conditions	Min.	Type	Max.	Units
Operating Temperature		Ta		-40		105	℃
Coil Resistance		Rb		260	280	300	Ω
Operating Current		Im	fz=200Hz			20	mA
Magnetic Saturation Voltage		Ubs				9	V
Start-Stop Frequency		fss	JL=2E-7Kg/m*2			200	Hz
Maximum Driving Frequency		fm	JL=2E-7Kg/m*2			600	Hz
Dynamic Torque	Outer shaft	M200	fz=200Hz	0.7	0.8		mN.m
	Internal shaft			1.05	1.2		mN.m
	Outer shaft	M400	fz=400Hz	0.5	0.6		mN.m
	Internal shaft			0.75	0.9		mN.m
Static Torque	Outer shaft	Ms	Ub=5V	3.5	4		mN.m
	Internal shaft			3.5	4		mN.m
Axial Push-on Force on shaft	Outer shaft	F_A				60	N
	Internal shaft					180	N
Axial Pull-off Force on shaft	Outer shaft	Fa				60	N
	Internal shaft					70	N
Radial Force on shaft	Outer shaft	Fp				5	N
	Internal shaft					13	N
Holding Torque on shaft	Outer shaft	Th		110			mN.m
	Internal shaft			100			mN.m
Imposed Acceleration		αp				1000	Rad/s2
Angle of Rotation	Outer shaft	β				320	Degree
	Internal shaft					270	Degree
Noise Lever		SPL	fz=400Hz		40	50	dB(A)
Backlash		σ			0.7	1.2	Degree
Tamb=25℃,Ub=5V;unless otherwise specified							

Table-2

Absolute Maximum Ratings

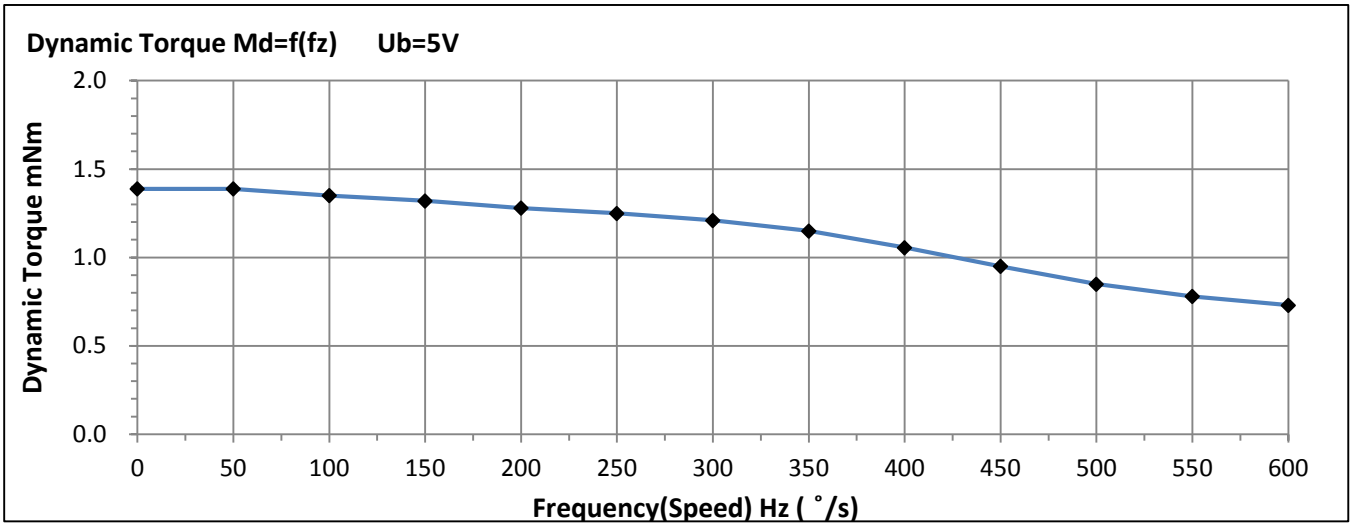
Parameter	Symbol	Value
Driving Voltage	Ub	10V
ESD Tolerance	UESD	10,000V
EMI Tolerance(1KHz, AM80%, 100KHz-2GHz)	E	80V/m
Solder Temperature	Ts	260℃

Table-3

Typical Performance Characteristics

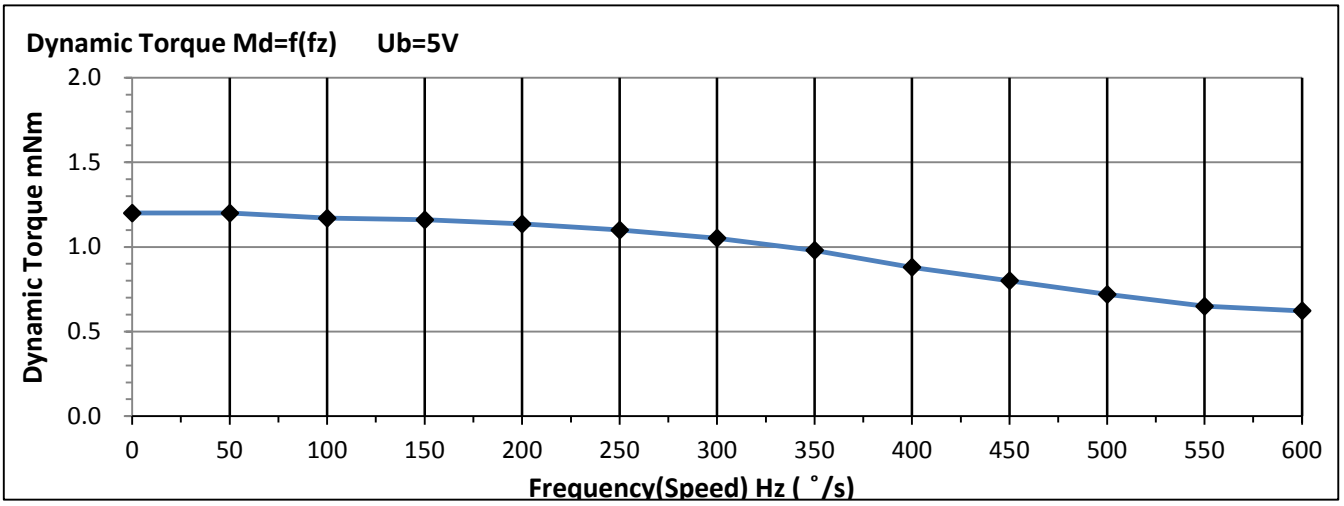
Internal shaft

Fig-3-1



Outer shaft

Fig-3-2



Motor Mounting:

The BKA30D series motor has 8 pins that can be directly soldered to the PCB board. If working in a highly vibrating environment, it is recommended to install 4 ST2.0 screws for fixation.

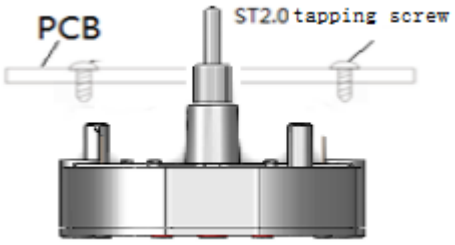


Fig.6

--As a general rule, screws are unnecessary and should be avoided as much as possible, both for cost and process capability reasons. The motor has a robust design but normal care should be taken that excessive force do not deform the housing, especially when assemble the pointer, in this case we suggest to add an additional support on the bottom of the motor during pointer

assembly process against the push force on the pointer shaft.

Mounting Load on Pointer Shaft

The load mounting on the pointer shaft, such as a pointer, gear, etc. is usually in a pressing operation. When using this technique, care should be taken that the force do not exceed those given in the specification (see Table2).

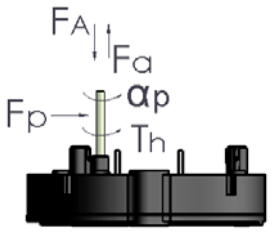


Fig.9

Functional Description

General

-- The BKA30D series stepper motor consists of two independent motor parts and a gear transmission chain part. The built-in three-stage gear transmission chain has a reduction ratio of 180/1, which enables a full step drive signal, that is, a rotor rotation of 180 degrees, to ultimately be reflected as an output shaft rotation of 1 degree.

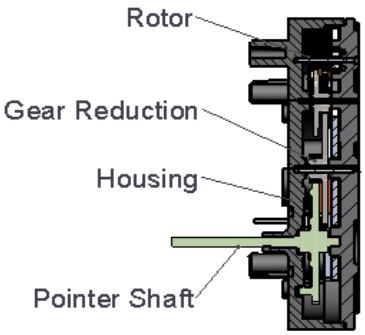


Fig.10

--As mentioned earlier, a partial step is an angular rotation of 1/3° of the motor shaft or an angular rotation of 60° of the rotor. The motor also can be driven directly by micro step, and a micro step is an angular rotation of 1/12° of the motor shaft or an angular rotation of 15° of the rotor (see Fig.11). The micro stepping allows a continuous smooth movement of a pointer if the motor is used as a pointer driver.

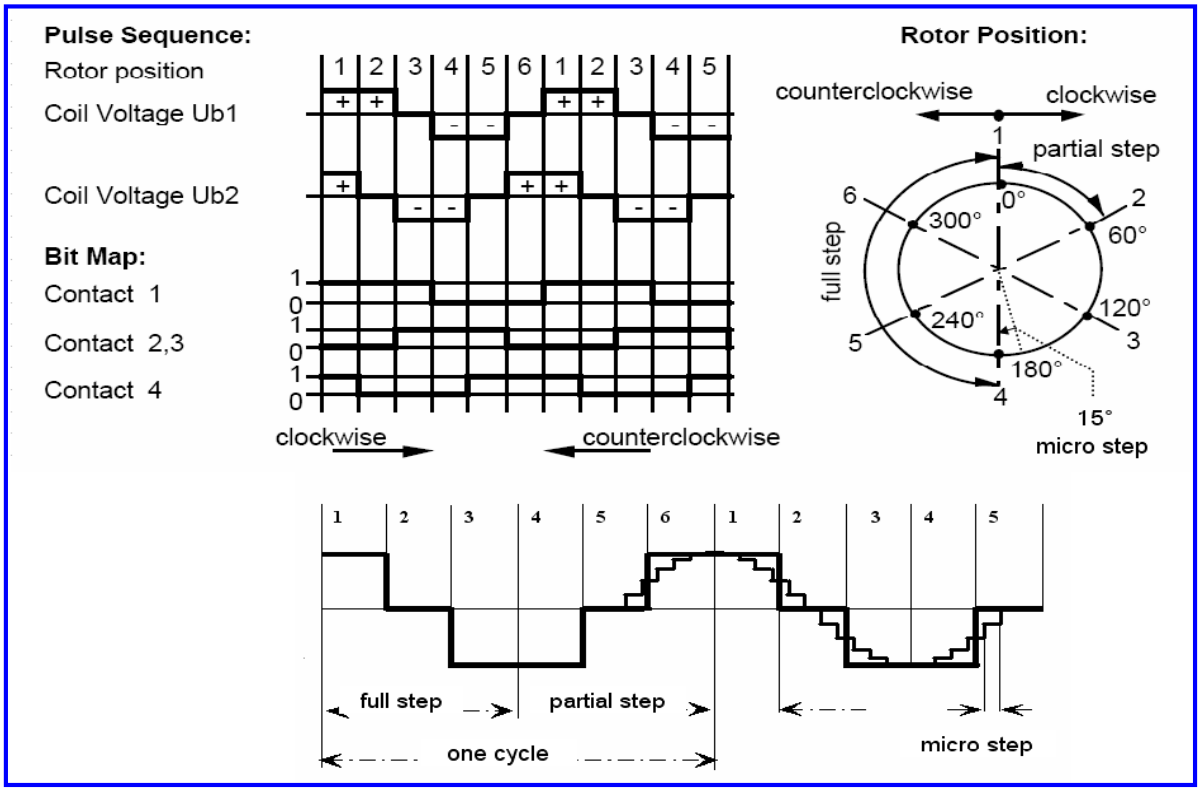


Fig.11

Driving Diagram

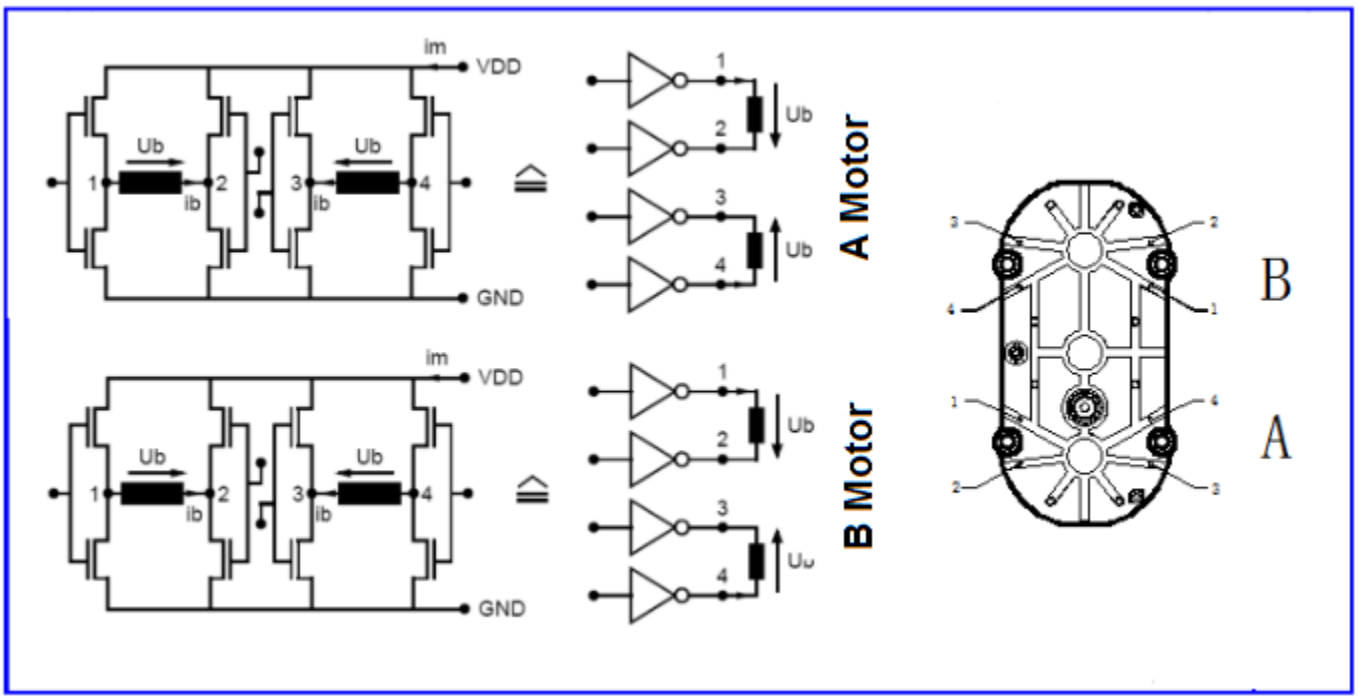


Fig.12

Noise Lever

Test Configuration

1. reflection free room
2. microphone
3. sonometer
4. motor under test
5. reflection free cube
6. control unit in micro step mode (1/12° / step)

Test Conditions

- temperature	T_{amb}	:	25	°C
- measurement distance	Lm	:	4	cm
- measurement range		:	20 – 20k	Hz
- measurement time	tm	:	4	s
- angular speed max	ω	:	600	°/s
- ambient noise max		:	20	dBA
- motor without load.				

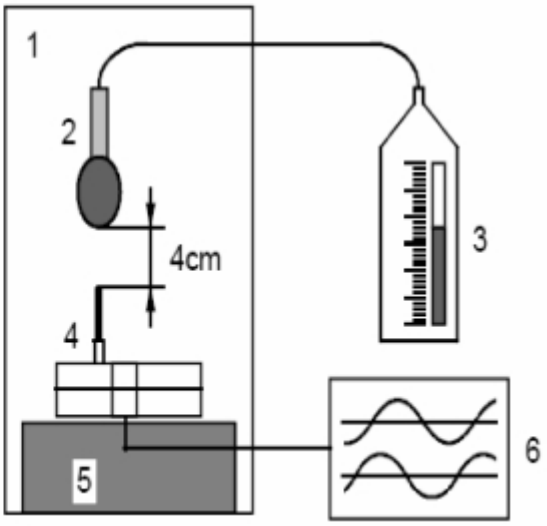


Fig.13

Typical Noise performance

The Fig.14 shows a typical curve of two motors running simultaneously::

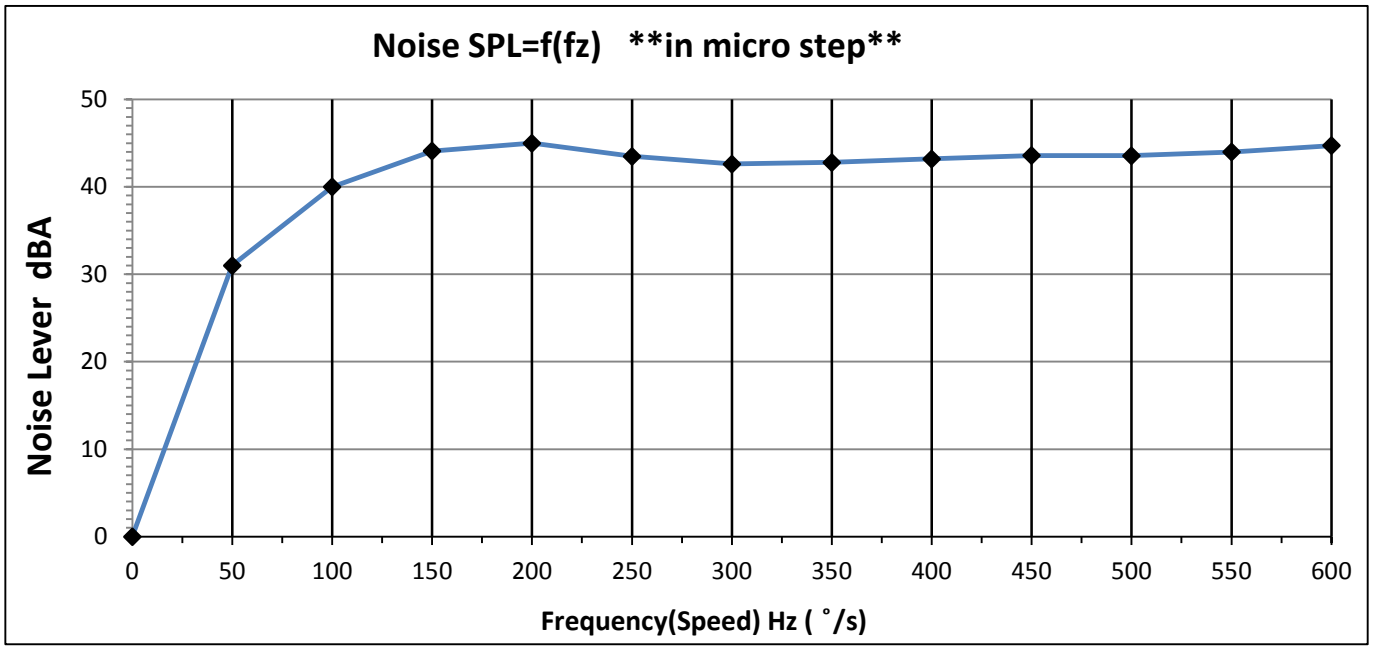


Fig.14

Start-Stop frequency

The Fig.15 show the relation of Start-Stop Frequency (fss) & the inertia of the pointer load (Jp)

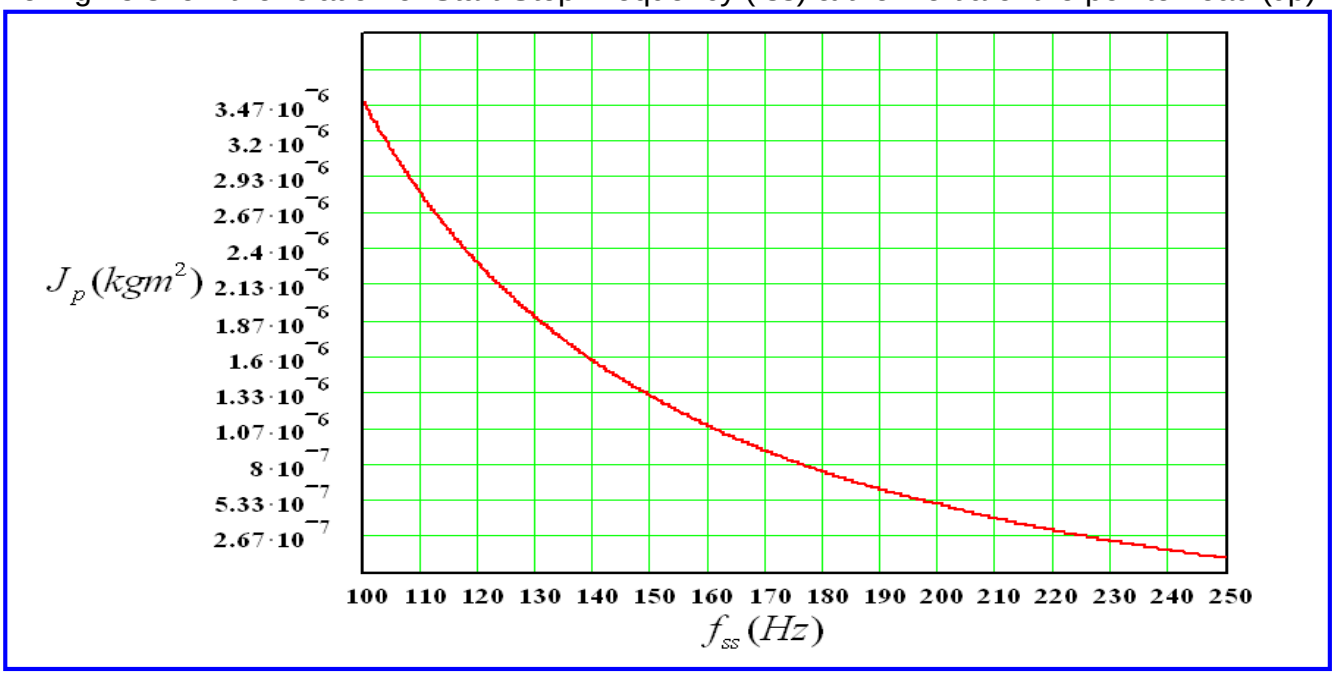


Fig.15

Frequency Acceleration

The Fig.16 show the acceleration of the pointer shaft (α)@ different running frequency, and if the motor is running at frequency f**o**, the maximal frequency of next step can be given is f**i** as specified in the Fig.17

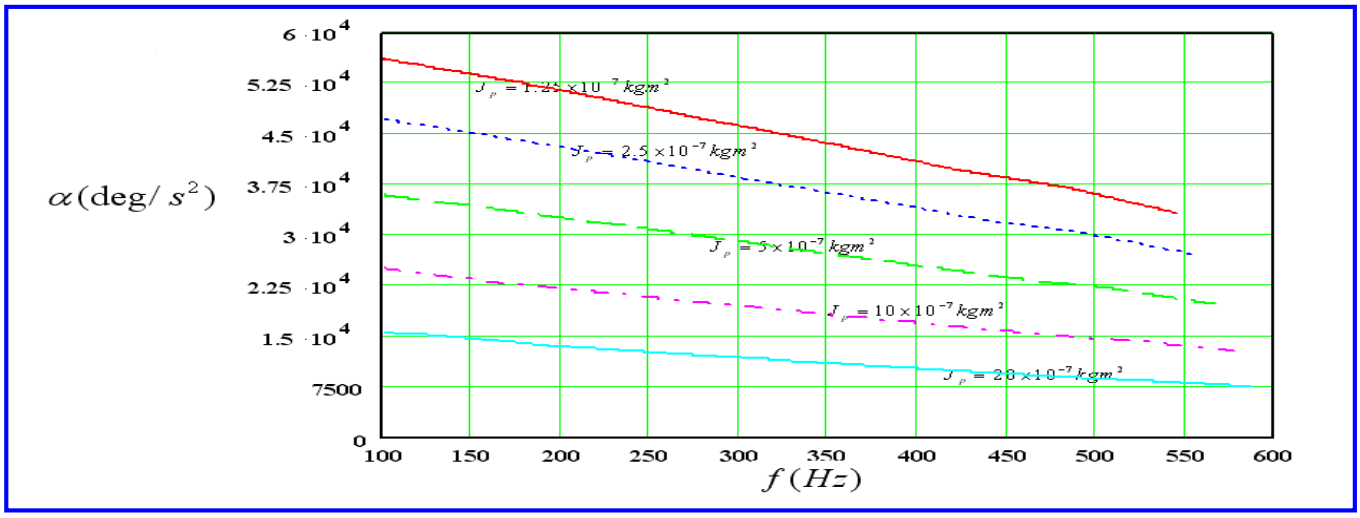


Fig.16

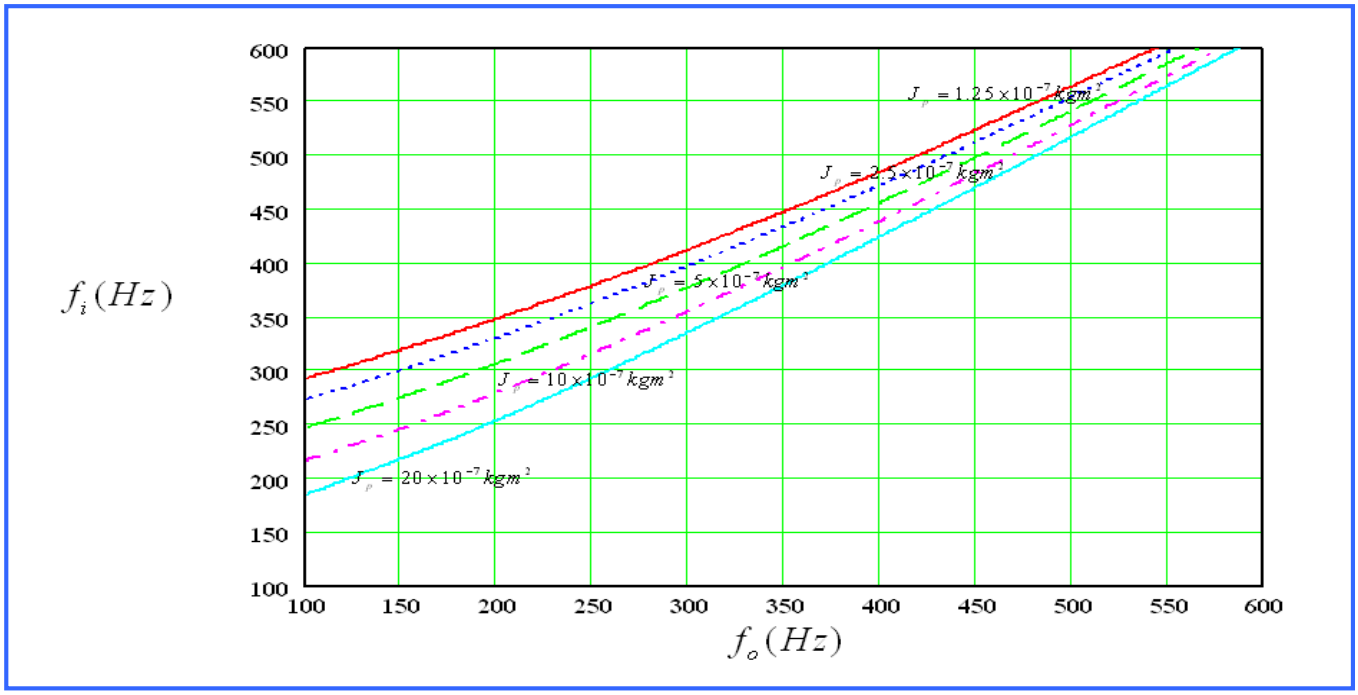


Fig.17

Reliability Test Conditions

Indicator Normal Load

--mass : 2.5g
--inertia : 2E-7Kgm*2
--unbalance : 0.01mNm

Temperature Cycle

--Low temperature: -40℃±2℃
--High temperature: +105℃±2℃
--Dwell time: see Fig.18
--6hrs/per cycle, running for 50cycles,
Total 300hours
--Status: running@0~600Hz sweep
--Quantity of samples: 20pcs
-Reference standard: IEC60068-2-14:1984

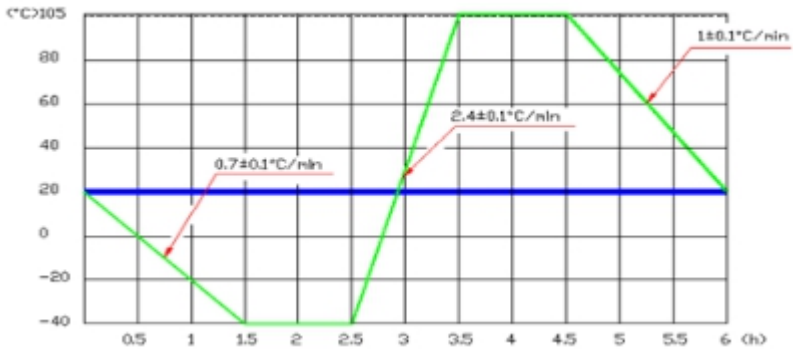


Fig.18

Thermal Shock

--Low temperature: -40℃±2℃
--High temperature: +105℃±2℃
--Dwell time: half an hour for each
--Transfer time: Within 30s
--Cycles: 100, total 100hours
--Status: non-running
--Reference standard: IEC60068-2-14:1984

Longevity

--Temperature: 105℃±2℃
--Storage time: 1000hours
--Status: running@600Hz
--Quantity of samples: 10pcs
--Reference standard: GB/T 2689.1-1981

High Temperature Storage

--Temperature: 105℃±2℃
--Storage time: 72hours
--Status: non-running
--Quantity of samples: 10pcs
--Reference standard: IEC60068-2-2:1974

Low Temperature Storage

--Temperature: -40℃±2℃
--Storage time: 72hours
--Status: running@ non-running
--Quantity of samples: 10pcs
--Reference standard: IEC60068-2-1:1990

Humidity Storage

--Temperature: 80℃±2℃
--Humidity: 85±2% RH
--Storage time: 168hours
--Status: non-running
--Quantity of samples: 20pcs
--reference standard: IEC68-2-67:1995

Mechanical Shock

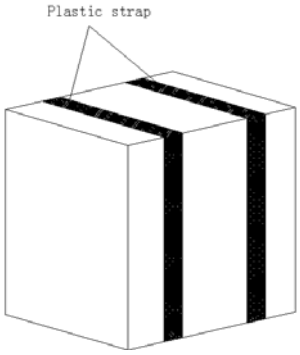
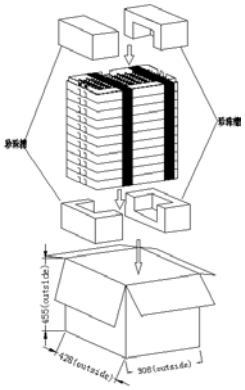
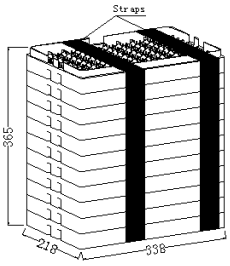
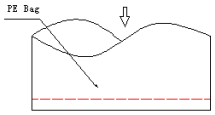
--Shock model: vibration
--Pulse waveform: sine
--Peak of acceleration: 50g/11ms
--Shock times: 5
--Shock direction: axial/radial
--Status: non-running
--Quantity of samples: 10pcs
--Reference standard: IEC68-2-27:1987

Mechanical Vibration

--Pulse waveform: sine
--Frequency: 5~200Hz, logarithm sweep
--Sweep Speed: 3 Oct/Min
--Acceleration: 6g
--Amplitude: 13.2mm
--Vibration direction: axial/radial
--Vibration time: 22hours/each direction
-- Status: running@0~600Hz sweep
--Quantity of samples: 20pcs

--Reference standard: IEC68-2-6:1982

Package Information

Weight :Staccks 1x9410g = 9410g Plastic strap 2x15g = 30g Total = 9440g	
Mster-carton for 300 Pcs Motor: Material : carboard 710g/m^2 Weight :Master-carton 1x930g = 930g PE bag 1 x105g = 105g Stacks 1x8115g = 8115g EPE 4x65g = 260g Total = 9410g	
Stack for 300 Pcs Motor Material : 11Trays (including Cover)strapped together with plastic band Weight :Tray+Motors 10x777g = 7770g Cover tray 1 x315g = 315g Plastic straps 2x15g = 30g Total = 8115g	 
Tray for 30Pcs Stepper Motor Material : PP(Nat) Weight :Tray 1x360g = 315g Motor 30x15.4g = 462g Total = 777g