BKA 30-XX Series Stepper Motor

Description

--The **BKA 30-XX** series stepper motor was developed as indicator driver for dashboard instrumentation and other precise indicator applications. The motor can operate directly from a numerical, i.e. digital, driving signal to move and position a pointer to visualize any parameter required. A fine analogue representation of its value and its changes is made without the need for a digital to analogue conversion.

--The **BKA 30-XX** series stepper motor consist of a motor and gear train with a reduction ratio of 1/180. The motor is provided with big dynamic torque, low running noise and current consumption, strong structure and longevity.

--Each half revolution of the rotor, defined as a full step, is converted to a one degree rotation of the pointer shaft. The full step itself again is divided to three partial steps, i.e., a 360 degree rotation of the pointer shaft consist of 1080 partial steps (see Fig.11). Full steps can be carried out up to 600Hz resulting 600°/s angular speed of pointer shaft, this allow a large rotation speed range for indicator application.

Features

--High Resolution: 1/3° resolution per partial step, 1/12° resolution per micro step (see Fig.10)

--Low Consumption: mean operation current 15~20 mA

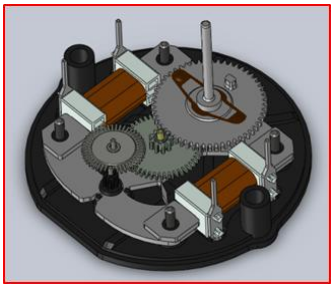
--Small Dimensions: Φ30 x 7.2 mm

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

--Large Running Speed Range: 0~600°/s

--Silent & Longevous: lubricative and high intensity material for gears

--High Reliability: Qualified for automotive applications



Motor Versions

This specification applies only to the following motor versions:

--- Rear Mounting: BKA30-R xx

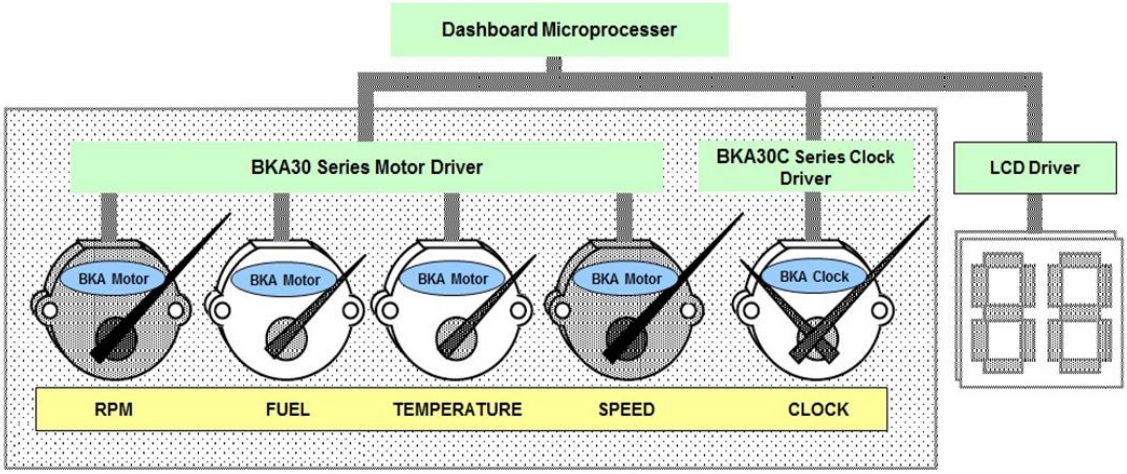
--- Front Mounting: BKA30-F xx

BKA BACTRIANUS MOTOR	BKA30-XX Series Stepper Motor **Specification**	BKA30-XX

Spec. / Model	Mounting	Diameter of output shaft (mm)	Height of output shaft (mm)	Cover boss diameter * height (mm)	Full container quantity (pcs)	Remark
BKA30-R4	Rear	Φ1.0	10.95	Φ2.0*2.5	1000	
BKA30-R5	Rear	Φ1.0	10.95	Φ2.3*2.5	1000	
BKA30-R5XY	Rear	Φ1.0	10.95	Φ2.3*2.5	1000	Super silent version
BKA30-R5SL	Rear	Φ1.0	16.30	Φ2.7*4.0	500	
BKA30-R5LY	Rear	Φ1.0	16.30	Φ2.7*4.0	500	Super silent version
BKA30-R5A	Rear	Φ1.0	10.95	Φ2.3*2.5	1000	Economic version
BKA30-R5AL	Rear	Φ1.0	16.30	Φ2.7*4.0	500	Economic version
BKA30-R6	Rear	Φ1.0	10.95	Φ4.2*5.8	1000	
BKA30-R6SL	Rear	Φ1.0	16.30	Φ4.2*5.8	500	
BKA30-R6A	Rear	Φ1.0	10.95	Φ4.2*5.8	1000	Economic version
BKA30-R6AL	Rear	Φ1.0	16.30	Φ4.2*5.8	500	Economic version
BKA30-R7T	Rear	Φ1.5	19.60	Φ4.2*5.8	500	
BKA30-R7TY	Rear	Φ1.5	19.60	Φ4.2*5.8	500	Super silent version
BKA30-R9S	Rear	Φ1.5	10.95	Φ4.2*4.0	1000	
BKA30-R9SY	Rear	Φ1.5	10.95	Φ4.2*4.0	1000	Super silent version
BKA30-F2	Front	Φ1.0	10.95	Φ2.3*2.5	1000	
BKA30-F3	Front	Φ1.0	10.95	Φ4.2*5.8	1000	
BKA30-F4	Front	Φ1.5	19.60	Φ4.2*5.8	500	

Table 1

Typical Application



BKA BACTRIANUS MOTOR	BKA30-XX Series Stepper Motor **Specification**	BKA30-XX

Fig. 1

Pin Connection

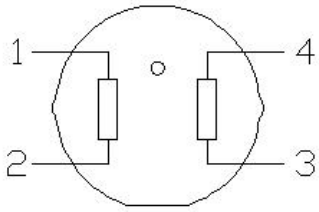
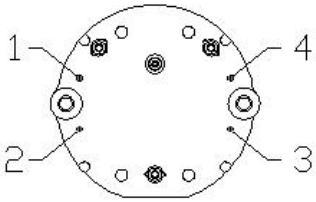
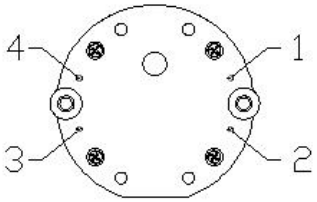
Graphic Symbol	BKA30-R xx	BKA30-F xx
		

Fig. 2

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		15	20	mA
Operating Voltage	Ub			5	9	V
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	M200	fz=200Hz	1.0	1.3	1.4	mNm
	M400	fz=400Hz	0.75	0.9	1.05	mNm
Static Torque	Ms	Ub=5V	3.5	4.0		mNm
Backlash	σ			0.7	1.0	Degree
Axial Push-on Force on shaft	FA	see Fig.9	100	120		N
Axial Pull-off Force on shaft	Fa		80	100		N
Radial Force on shaft	Fp		12	15		N
Imposed Acceleration	αp			1,000		Rad/s*2
Holding Torque on shaft	Th		90	120		mNm
Maximum Inertia of the load on shaft	Jm	see Table 4				Kgm*2
Noise Lever	SPL	@100° /sec		33		dB(A)
		@200° /sec		38		
		@400° /sec		40		
Angle of Rotation	β				320	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

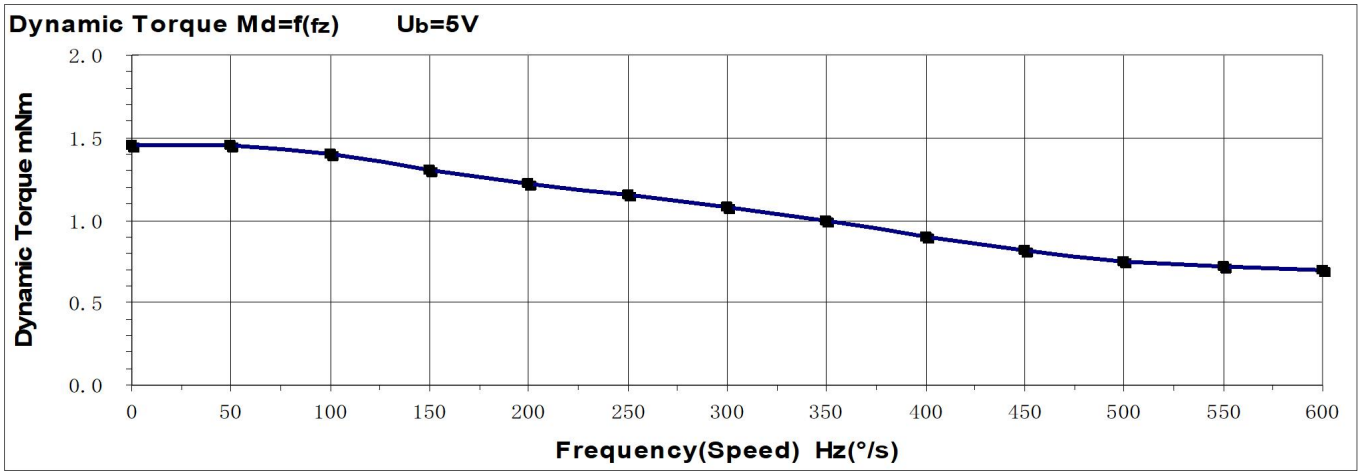


Fig. 3

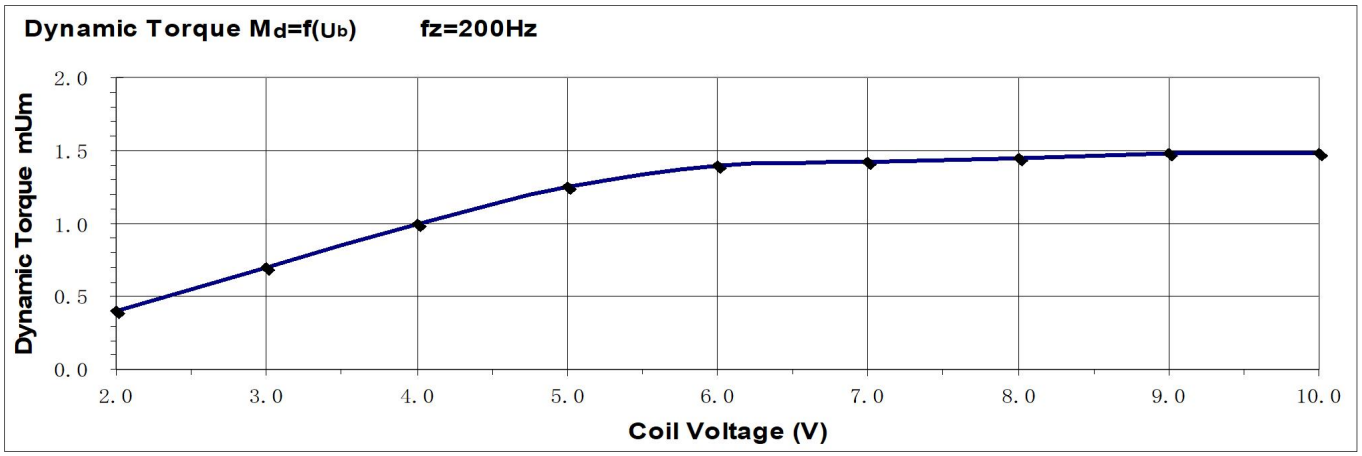


Fig.4

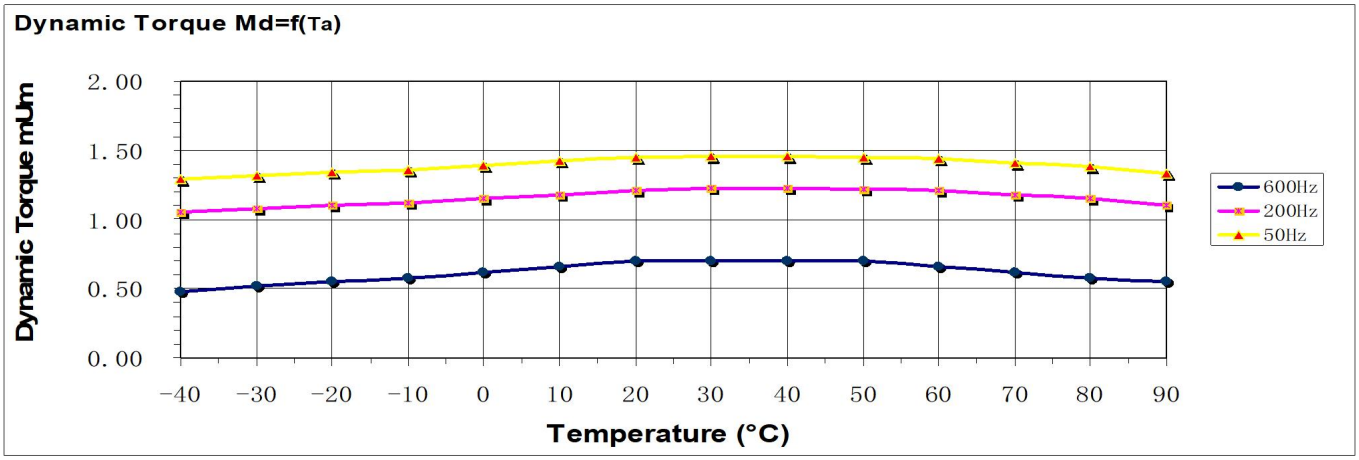


Fig.5

Mounting and Dimensions

Motor Mounting

--The **BKA30-XX** series stepper motor can be secured in place by a variety of methods. For all automotive applications even when the motor is exposed to very strong vibrations, the soldering of the contact pins is sufficient provided protection with mounting pegs are used, the mounting pegs have been developed to allow screw-free fixing in all applications.

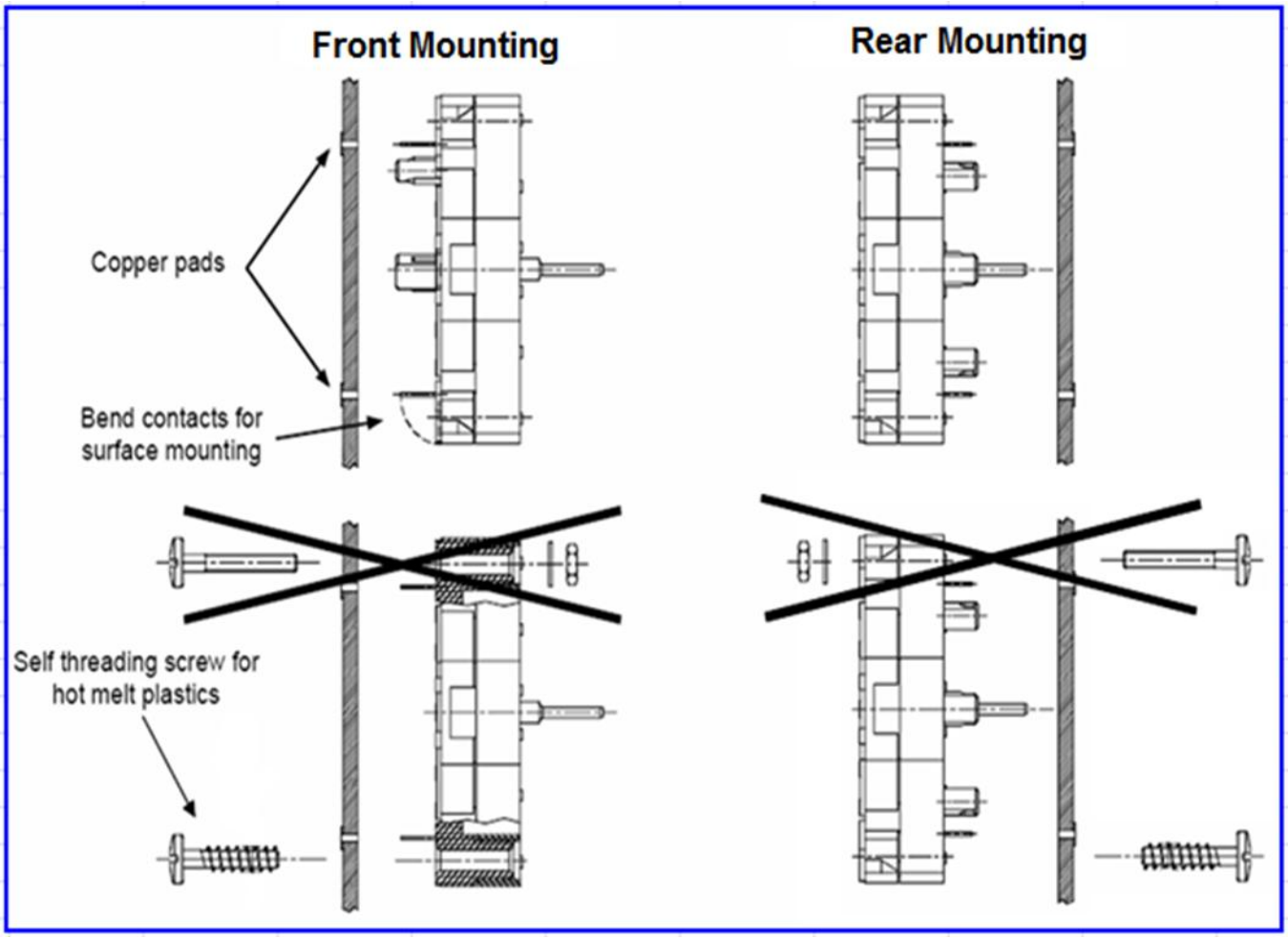


Fig.6

--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.

Dimensions

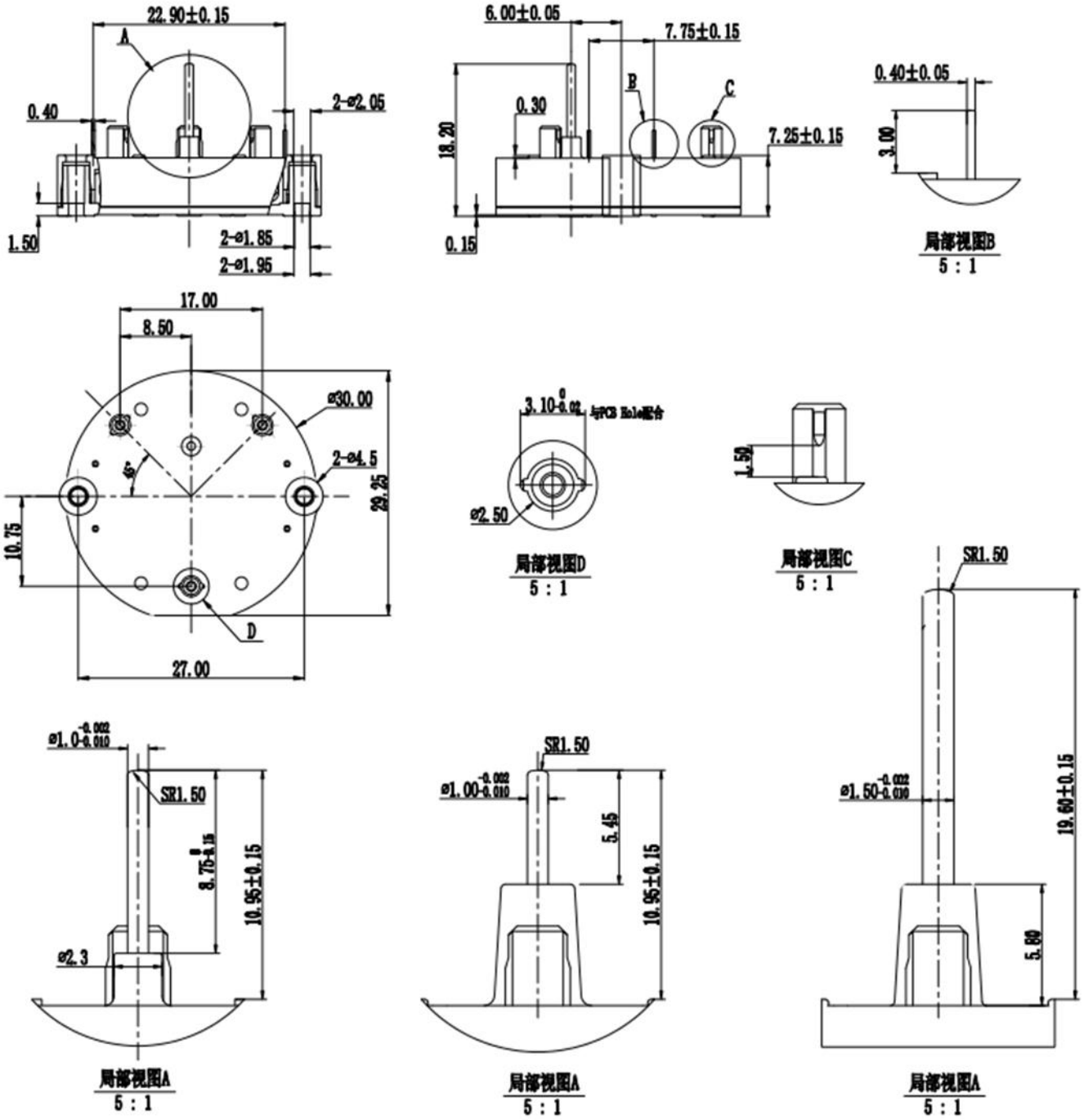

22.90±0.15
A
0.40
2-ø2.05
1.50
2-ø1.85
2-ø1.95
6.00±0.05
7.75±0.15
B
C
0.30
18.20
7.25±0.15
0.15
0.40±0.05
3.00
局部视图B
5 : 1
17.00
8.50
ø30.00
2-ø4.5
29.25
10.75
D
27.00
3.10
ø2.50
局部视图D
5 : 1
1.50
局部视图C
5 : 1
SR1.50
19.60±0.15
5.89
局部视图A
5 : 1
SR1.50
5.45
10.95±0.15
局部视图A
5 : 1
SR1.50
8.75
10.95±0.15
ø2.3
局部视图A
5 : 1

Fig.7

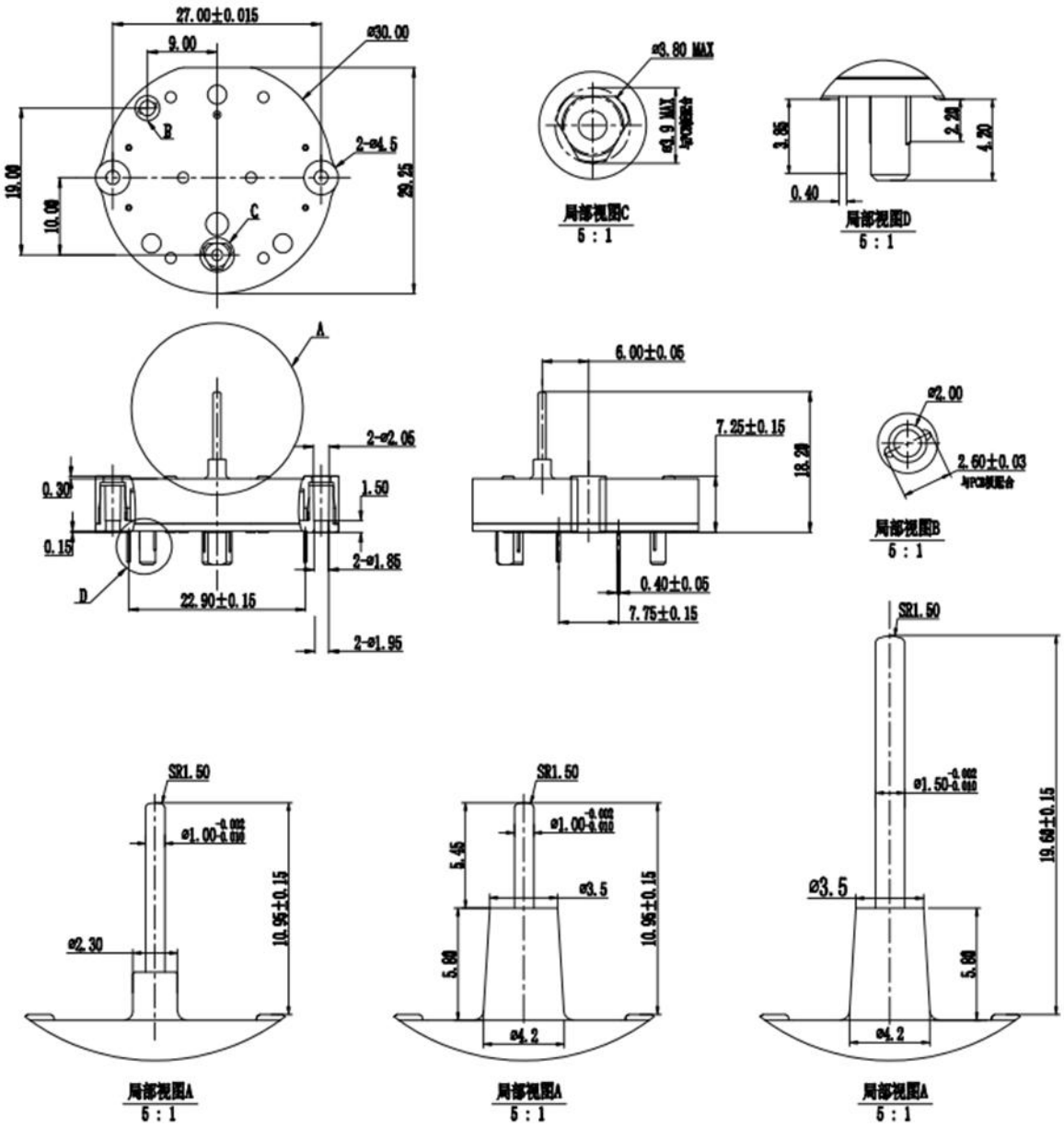
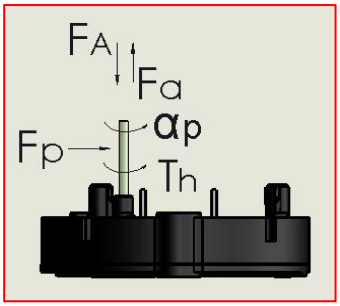


Fig.8

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 **BKA30-XX** series stepper motor consist of a motor and gear train. The integrated three step gear train reduces the rotation by a factor of 180 whereby a full step of driving pulse results in a one degree rotation of the pointer shaft.

--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.

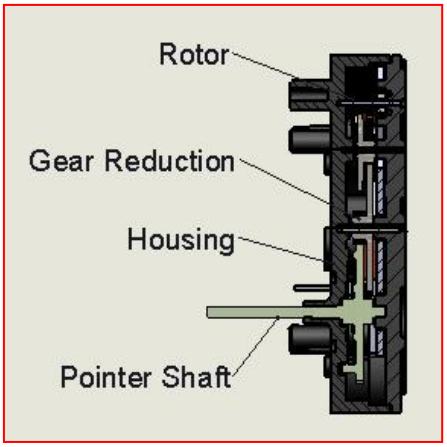


Fig.10

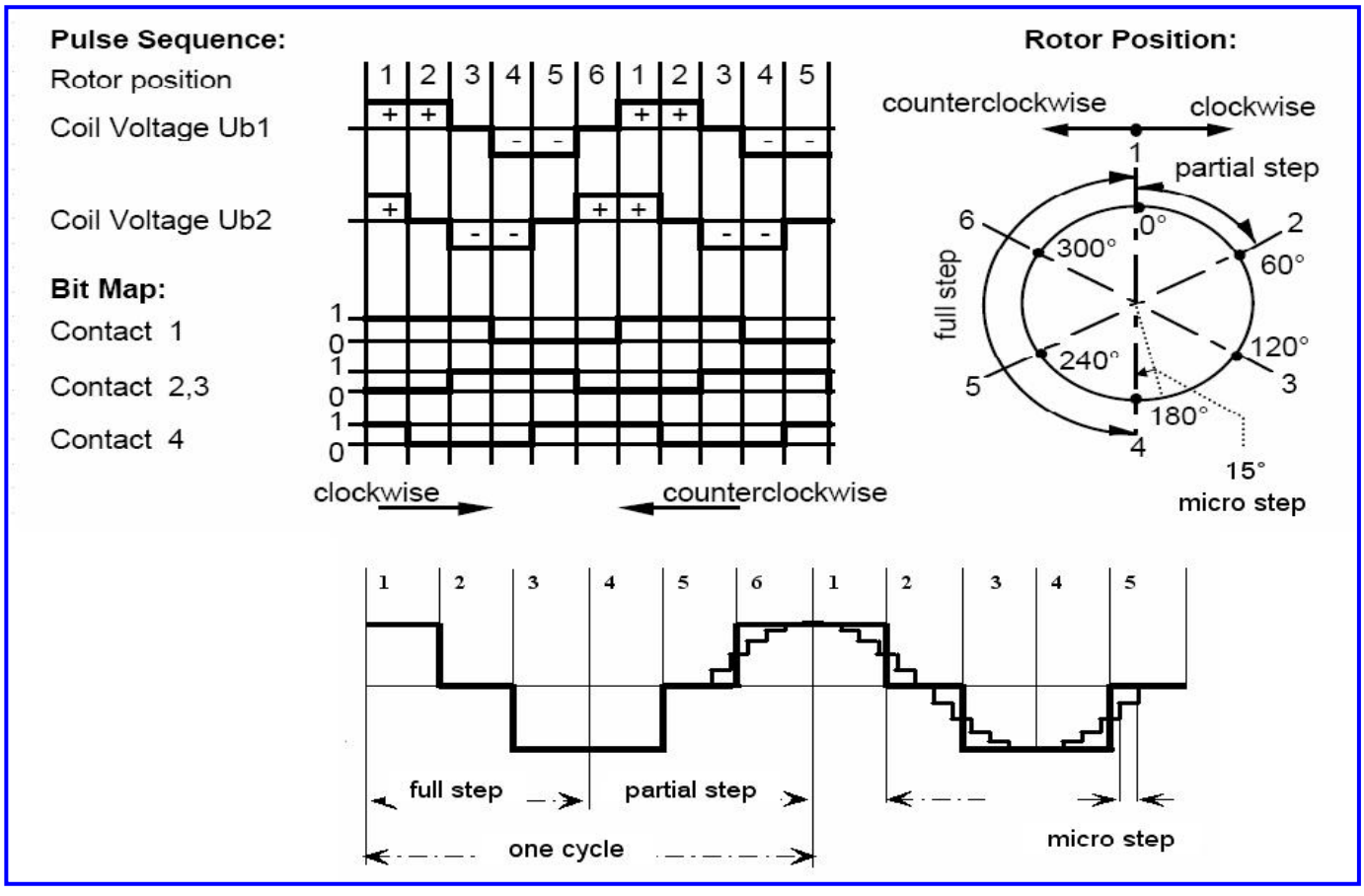


Fig.11

Driving Diagram

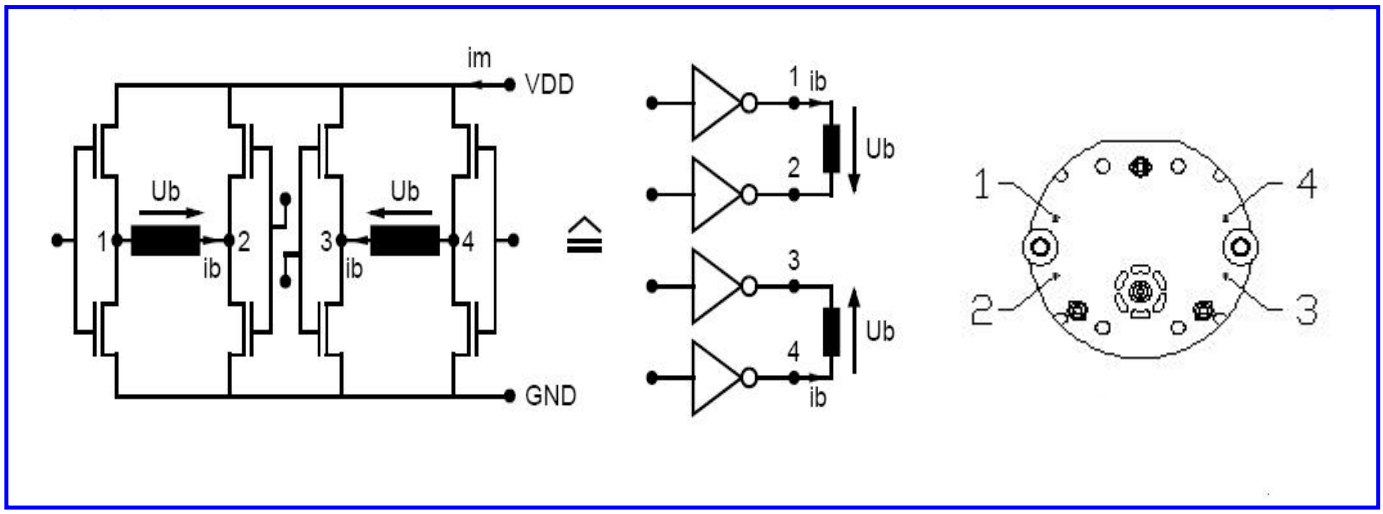
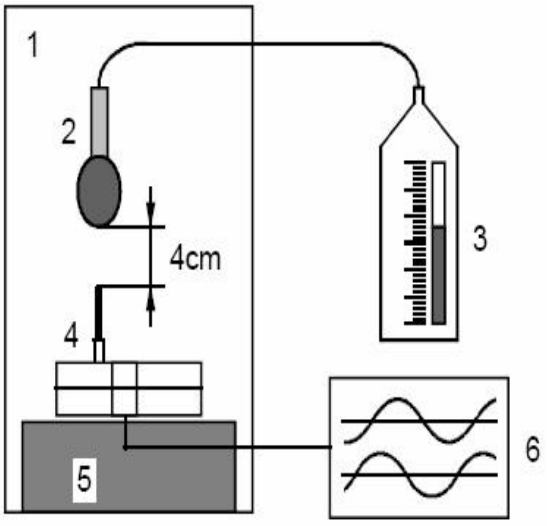


Fig.12

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

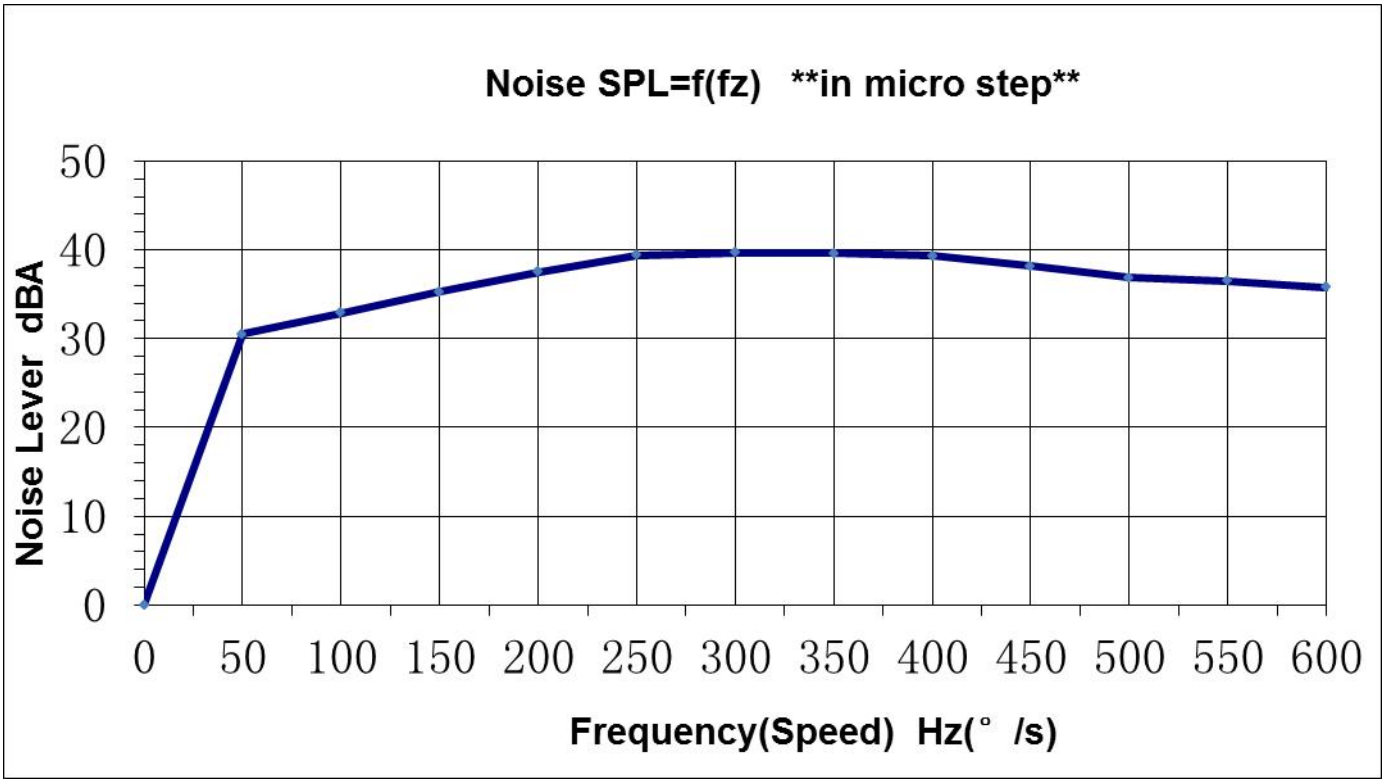


Fig.14

Pointer Parameter

Spec. / Parameter	Min.	Typical	Max.
Length(center-end):		50mm	80mm
Mass		2.5g	10g
Inertia(JL=Jp)		2E-7 Kgm*2	20E-7 Kgm*2
Unbalance(Mu)		0.01mNm	0.04mNm

Table 4

Start-Stop frequency

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

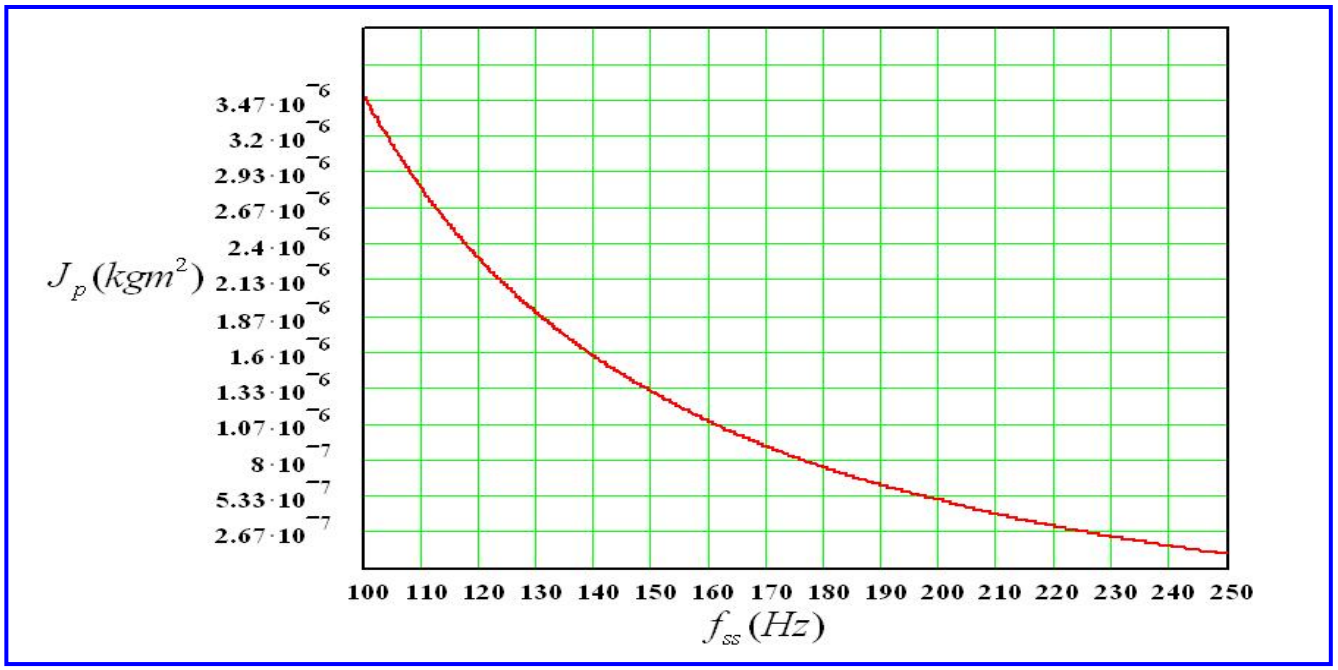


Fig.15

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

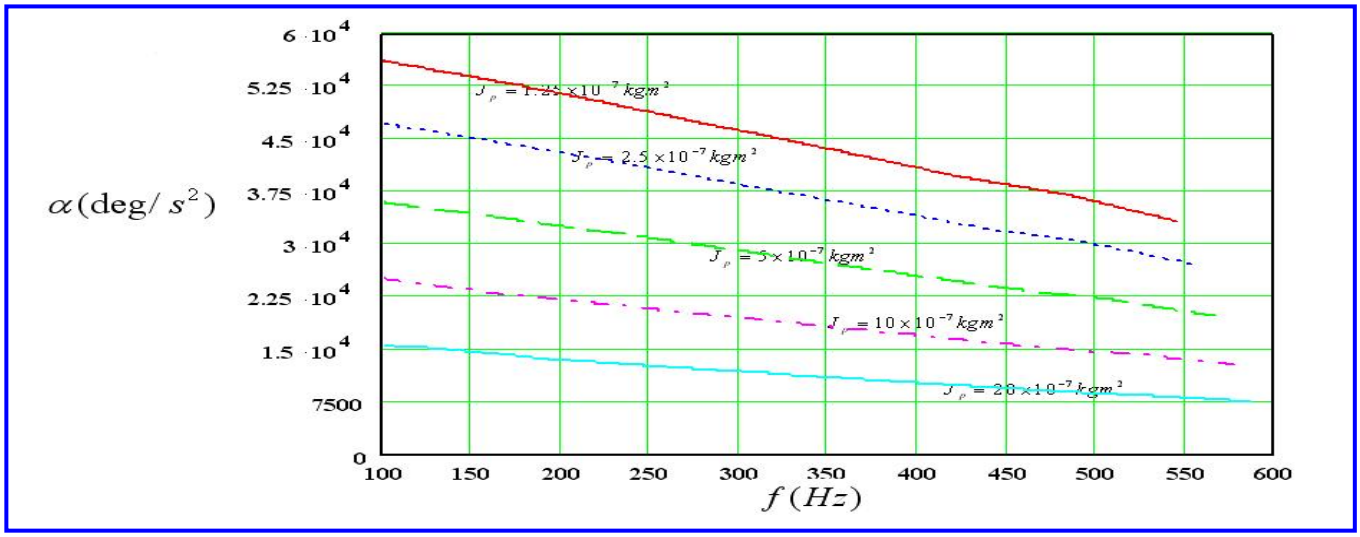


Fig.16

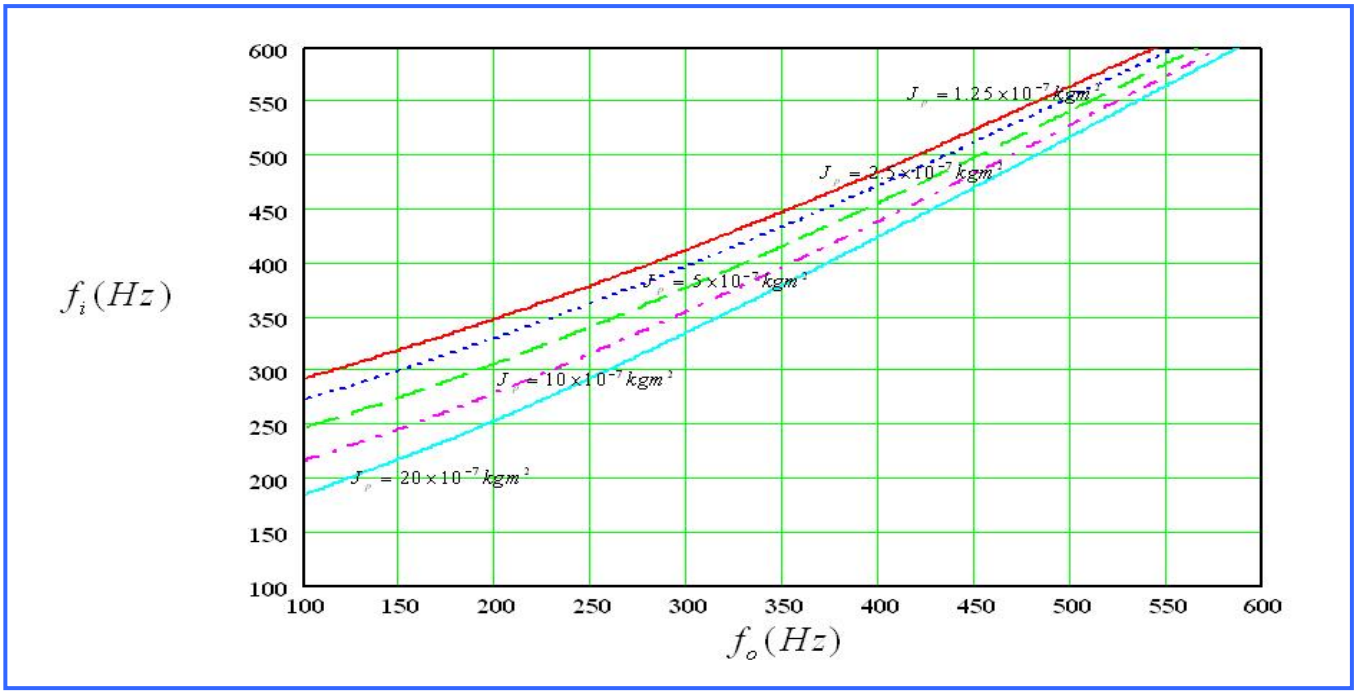


Fig.17

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

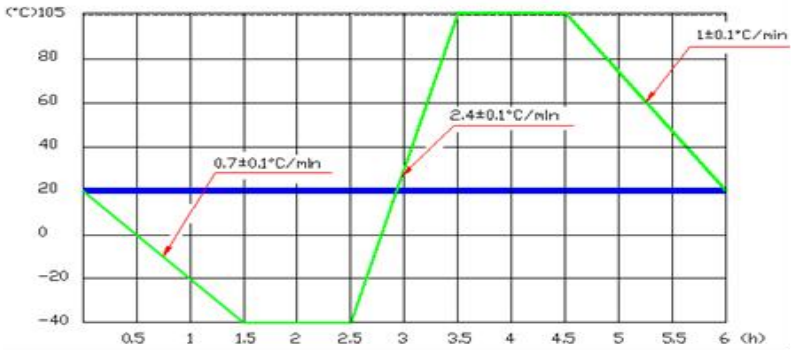


Fig.18

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

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: 65℃±2℃
--Humidity: 95±2% RH
--Storage time: 168hours
--Status: non-running
--Quantity of samples: 20pcs
--reference standard: IEC68-2-67:1995

Longevity

--Temperature: 18~28℃
--Storage time: 1000hours
--Status: running@600Hz
--Quantity of samples: 10pcs
--Reference standard: GB/T 2689.1-1981

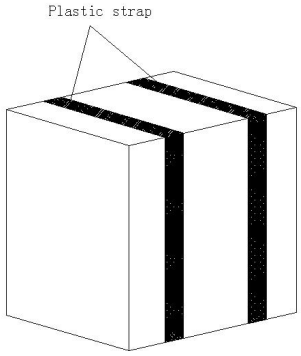
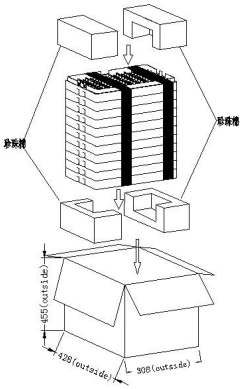
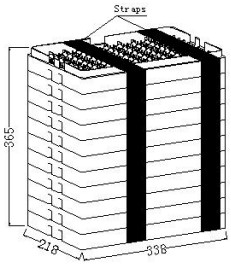
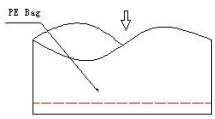
Mechanical Shock

--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 : Stacks 1 x 11885 = 11280g Plastic strap 2 x 20g = 40g Total = 11320g	
Master-carton for 1000 Motors: Material : cardboard 710g/m2 Weight : Master-carton 1 x 930 = 930g PE bag 1 x 100 = 100g Stacks 1 x 10595 = 9990g EPE 4 x 65 = 260g Total = 11280g	
Stack for 1000 Motors: Material: 11 Trays(including Cover)strapped together with plastic band Weight : Trays + Motors 10 x 960g = 9600g Cover tray 1 x 360g = 360g Plastic straps 2 x 15g = 30g Total = 9990g	 
Tray for 100 Stepper motor Material : PP (本色) Weight : Tray 1 x 360g = 360g Motors 100 x 6g = 600g Total = 960g