Nidec

SPECIFICATION FOR DC BRUSHLESS MOTOR

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REV					
	APPROVED	J.LU	2017-10-27	MODEL	17S VA Type.6
	DESIGNED	H.XU	2017-10-25		
APPROVED		H.ICHIZAK	09/07/10	DRAWING No.	SP198A153803
CHECKED		T.KANATANI	09/07/10		
DESIGNED		S.UEDA	09/07/10	DC BRUSHLESS MOTOR	Sheet 1 of 9
DRAWN		I.SORI	09/07/10		

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1.Purpose

This document defines the motor requirements for spinning a color for filter wheel in a color projector.

2.Specification

2-1. Ratings

No.	Item	Specification	Notes
1	Supply voltage	DC 12 [V] +/-5%	
2	Type	12 poles, 3 phases, brush less, outer rotor sensor less DC motor.	
3	Speed of rotation	10800 [min^{-1}] / (9000[min^{-1}]) / (7200[min^{-1}])	
4	Direction of rotation	CW	As rotor side view
5	Load(Color wheel)	Unbalance : G6.3 MAX. Mass : 15 [g] MAX. Inertia : 56.9 [g-cm^2] MAX.	with motor / At 10800[min^{-1}]
6	Set position	Can be used at any angle.	The angle is based on base-plate.
7	Mass	20 [g] MAX.	Motor only
8	Motor Inertia (Rotor assembly)	Mass : 4.8 [g] Inertia : 3.1 [g-cm^2]	As nominal value
9	Starting Current	1.1 [A] MIN (In the setting of the circuit board of an actual device)	Nidec recommends the customer to set the current limit at the motor coil line to 1.1[A] or more for the motor start up after the low temperature and the long preservation.

2-2.Electrical parameters (At 20degree C, normal humidity)

No.	Item	Specification	Notes
1	No Load Current	300 [mA] MAX.	Speed:10800[min^{-1}], shaft perpendicularity, Coil current only, One minutes after started.
2	K_T(Torque constant)	0.0056 [Nm/A] +/- 10%	
3	Terminal Resistance	3.06 [Ω] +/-15%	Common-each coil
4	Inductance	1.0 [mH] MAX.	1[kHz], Common-each coil, Avg.

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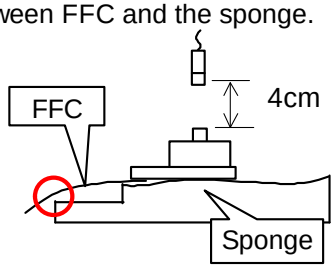
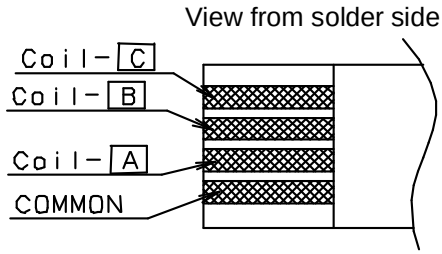
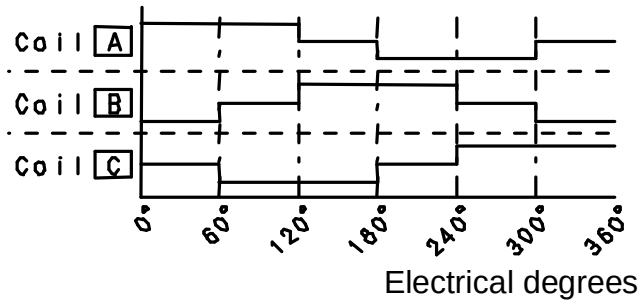
5	Noise	51 [dB (A)] MAX. ---(Initial value)	Speed :10800[min^{-1}],No load, Shaft vertical, on Sponge. Microphone at 4[cm] aligned on the motor axis. Frequency range : 0-10[kHz] Check no vibration of chattering between FFC and the sponge.  The background noise at measuring environmental is to be margin 10[dB(A)] min from motor noise.
6	Unbalance	0.08 [g-cm] MAX.	Motor only, At single plane At 10800[min^{-1}].
7	Axial Play	0.55 [mm] MAX.	
8	Insulation resistance	10 [MΩ] MIN. (At DC 250[V])	Check between FFC and base-plate.
9	Hi-pot	1 [s] MIN. (At AC 300[V], 1[mA])	Check between FFC and base-plate.

※ Character of motor be guaranteed at 10800[min^{-1}]

2-3.Electrical interfaces



2-4.Timing chart



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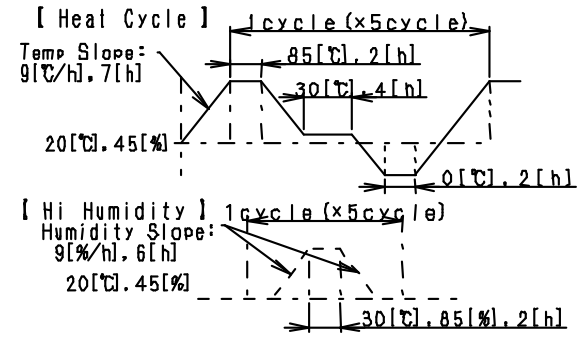
3.Environmental Conditions

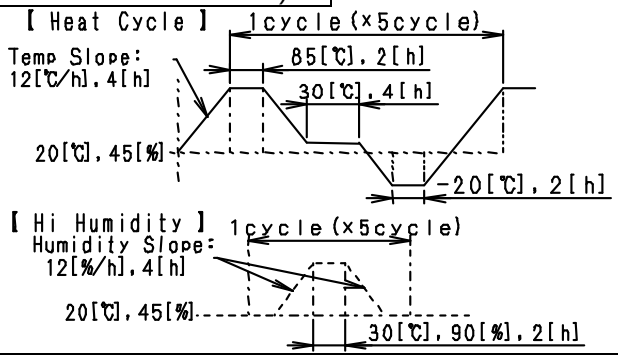
3-1. Check conditions

The check conditions should be kept 24 hours min at normal temp and humidity.

3-2.Environmental and Test conditions

No.	Item	Specification	Test conditions	Judgement
1	Operating	Dry bulb temperature: 0 ~ 85 [deg.C]※ Wet bulb temperature: 30 [deg.C] MAX. Relative humidity: 0 ~ 85 [%] (Humidity condition is to be refer to 3-3. No condense.)	10800[min^{-1}],No load	*It should be specified by item 2-2 parameters. (Except noise) *Noise should be 10 [dB(A)] MAX from initial value.
2	Non-operating	Dry bulb temperature: -20 ~ 85 [deg.C] Wet bulb temperature: 30[deg.C] MAX Relative humidity: 0 ~ 90 [%] (Humidity condition is to be refer to 3-3. No condense.)	*No bearing damage by vibration of burn in box	*It should be specified by item 2-2 parameters. (Except noise) *Noise should be 15 [dB(A)] MAX from initial value.





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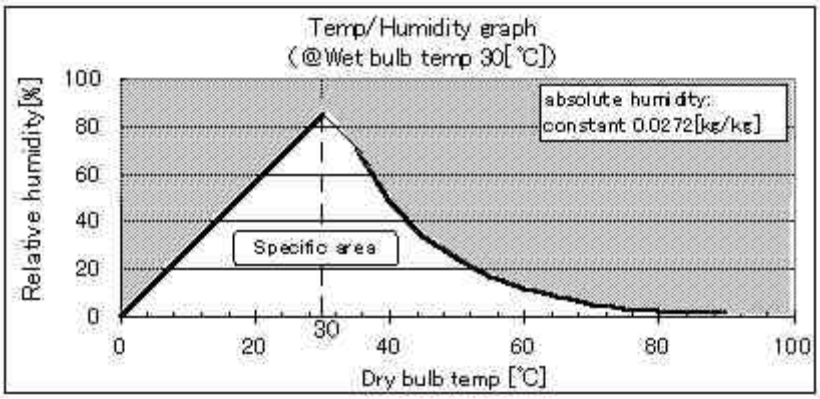
3	Vibration	5 ~ 500 [Hz], 9.8 [m/s^2], sine waves	Apply Axial : XYZ With rated load or equivalent inertia. Apply time: 30 [min] per orientation Sweep Speed: 1 [oct./min]	*It should be specified by Item 2-2 parameters. (Except noise) *Noise should be 10 [dB(A)] MAX from initial value. *Not to be pull out the rotor.
4	Shock	490 [m/s^2], 11 [ms], half-sine waves	Apply Axial : XYZ With rated load or equivalent inertia. Number of times: 3 drops per orientation	

※ Nidec only guarantee 0～5 [deg.C] for motor starting at 1.2 [A] with customer circuit (IC:Allegro8904SLB) and rated load (Mass:15[g]MAX., Inertia:56.9[g-cm^2]MAX.)

3-3.Humidity condition

The worst environment is under high temperature/humidity, i.e. at 30 degrees centigrade and 100% humidity. Wet bulb temperature to be set as under 30 [deg.C].
Therefore, relative humidity changes by dry bulb temperature as following shows, and environment condition should be within the specific area.



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4.Life

4-1.Check Conditions

The check conditions should be kept 24 hours min at normal temp and humidity.

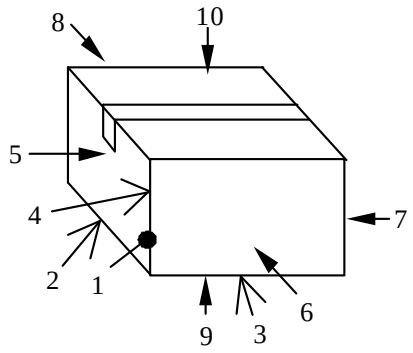
4-2.Spec and Test conditions

No.	Item	Specification	Notes	Judgement
1	MTTF	20,000[h]	Temperature: 0 ~ 85 [deg.C] Humidity: normal condition (No condense) With rated load or equivalent inertia. At rated speed Unbalance:G6.3	*When no load current changed 30% MIN from initial value. *Noise should be 10[dB(A)] MAX from initial value. *However, in case the noise level is satisfied spec, the time exceed the spec is to be the motor life.
2	L_1 (Failure rate 1%)	Continuous Running: 20,000[h] MIN		*The motor should rotate at rated speed without the lock of bearing.

5.Packing

5-1.Drop Test

No.	Item	Specification	Notes	Judgement
1	Packing	Must meet level Ⅱ in JIS-Z0200.	*Drop height: Drop from 80[cm] +/-2% *Drop procedure: Drop the package to the Concrete ground one time on each side as following order. Corner (1 corner)/ Edge(3edges)/side(6 sides) Corner and edge should be dropped as the gravity line of the package pass through the corner or edge. The side should be dropped as the all side hit the ground. The order of the dropping is as the left picture. (The order of (2-4) and (5-10) is changeable) ex)1-(2-4-3)-(10-8-9-6-7-5)	*It should be specified by item 2-2 parameters.



5-2.Fumigation

Exposure of this product's bearing to corrosive gas may cause corrosion, which may affect the motor's characteristics and durability.

Therefore, the motor's characteristics cannot be guaranteed if any wooden packing materials are fumigated together with packing boxes containing the product.

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6.Parts list

No.	Parts	Material or Type	UL		Manufacture
			Grade	File No.	
1	Thrust Plate	SECC	-	-	-
2	Thrust Washer	PEEK:Aptiv1000	94HB	E161131	VICTREX
3	Stopper	POLY ESTER FILM	94VTM-2	E86511	TORAY
4	Sleeve Bearing	VAB	-	-	-
5	Bush	C3604,C3602	-	-	-
6	Plate	SECC	-	-	-
7	Insulation sheet	POLY ESTER FILM	94VTM-2	E86511	TORAY
		FR-02	94VTM-0	E51424	MITSUBISHI PLASTICS INC
8	PCB	R8700	94V-0	E164387	SOZHOU MATSUSHITA ELECTRIC WORKS PRINTED CO., LTD
9	Tape	No.5015	-	-	NITTO DENKO
10	FFC	POLYESTER	UL20861 VW-1	E41105	SUMITOMO ELECTRIC INDUSTRIES CO., LTD
			UL20861 VW-1	E188165	SHS HARNESS MANUSAC TURER LTD Rev.3*1
11	Washer	POLY ESTER FILM	94VTM-2	E86511	TORAY
12	Stator Lamination	35A250	-	-	-
13	Stator Coating	3M Scotchcast 266+	B TYPE	E65803	3M CHINA LTD
		EX-1101	B TYPE	E98667	SUMITOMO BAKELITE CO.,LTD
14	Copper wire	SEUW-N	F TYPE	E135754	SUMITOMO ELECTRIC WINTEC CO., LTD.
		SF.BY(L)	F TYPE	E339330	TOTOKU ELECTRIC CO., LTD.
		UEW-Y	F TYPE	E164502	GUANDONG RONSEN SUPER MICRO-WIRE CO.,LTD.
15	Pat	AX-S<HX>	-	-	-
16	Shaft	SUS420,3Cr13, X30Cr13(420B)	-	-	-
17	Main Magnet	Ne-Fe-B Isotropy	-	-	EPSON, CHENGDU GALAXY,
18	Rotor Holder	SPCC(Ni coating)	-	-	-

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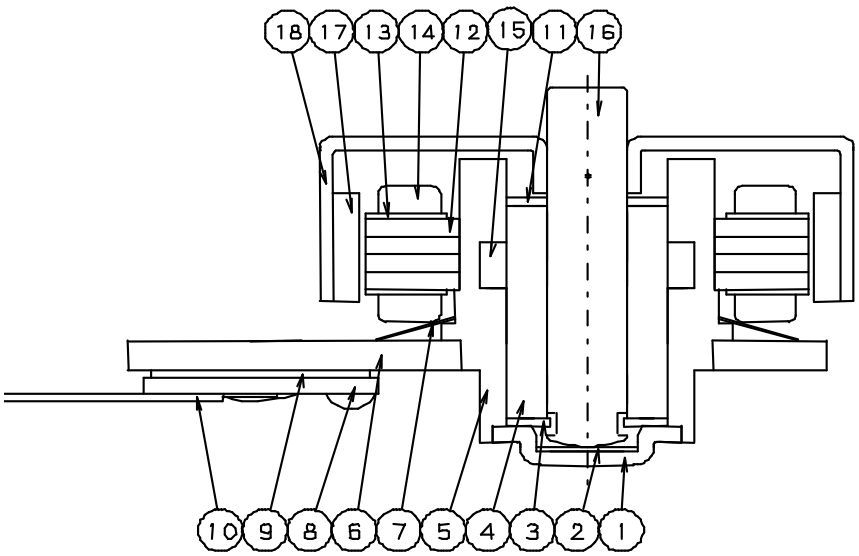

7. Change history

Date	Rev.	No.	Before	Design	Approved
2009/8/19	00A	1	52 [dB(A)]MAX	S.Ueda	H.Ichizaki
2010/3/11	00B	1,2,3	5 ~ 85 [degree C]	S.Ueda	H.Ichizaki
2010/8/23	00C	1	Revised Parts list (FFC, Copper wire)	S.Ueda	H.Ichizaki
2016/1/28	1	1	Item" Set position" is updated.	Y.BAI	J.LU
2016/1/28	1	2	Update the"Item "6.Parts list" : The material of Thrust Washer is updated.	Y.BAI	J.LU
2016/1/28	1	3	Update the"Item "6.Parts list" : The supplier of PCB is updated.	Y.BAI	J.LU
2016/1/28	1	4	The "Material or Type" of "Tape" is corrected.(from "No.501" to" No.5015")	Y.BAI	J.LU
2016/1/28	1	5	Update the"Item "6.Parts list" : the item of " UL NO." is Changed(E142578)	Y.BAI	J.LU
2016/1/28	1	6	Update the"Item "6.Parts list" : the item of " UL NO." is Changed(E79029)	Y.BAI	J.LU
2016/3/24	2	1	'<Contents>'is updated. (The sheet '7 Change History' is changed from 8 to 8-9	Y.BAI	J.LU
2016/3/24	2	2	Update the Item "6.Parts list" : The material of 'Thrust Washer' is updated. (The material of 'FS-1100C'is deleted)	Y.BAI	J.LU

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2016/3/24	2	3	Update the"Item '6.Parts list' : The "Material or Type" of 'Insulation sheet' is changed. (from 'PET/DIALAMY' to 'FR-02')	Y.BAI	J.LU
2016/3/24	2	4	Update the"Item '6.Parts list' : The supplier of FFC is updated.	Y.BAI	J.LU
2016/3/24	2	5	Update the Item "6.Parts list" : The material of 'Stator Coating' is updated. (The material of 'SCOTCH CAST#260 (SUMITOMO 3M) ECP-251-GC,EX-1101 (SUMITOMO BAKELITE) EL-1000 (TOA GOSEI) is deleted)	Y.BAI	J.LU
2016/3/24	2	6	Update the Item "6.Parts list" : The material of 'Copper wire' is updated. (Thematerial of 'FBWMBDU、FBWMBAU、2-SEUW-N(SNX)、SF.B.LOCK、SF.BY(L)') 'is deleted)	Y.BAI	J.LU
2016/3/24	2	7	Update the"Item '6.Parts list' : The material of Shaft is updated. (X30Cr13(420B) is appended)	Y.BAI	J.LU
2016/3/24	2	8	Update the Item "6.Parts list" : The material of 'Main Magnet' is updated. (Thematerialof'DAIDO,EPSON, CHENGDU,GALAXY,JAHWA,SKYSURPASS'i s deleted)	Y.BAI	J.LU
2016/3/24	2	9	Update the"Item "6.Parts list" : The material of Rotor Holder is updated. (SPCE is deleted)	Y.BAI	J.LU
2017/10/25	3	1	Update the Item '6.Parts list' : The FFC manufacture is updated. (FFC manufacture SHS is added)	H.XU	J.LU