



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

Specification contents:

1 Revision table 1
 2 Application..... 2
 3 Specification 2
 5 Provision of revolution signal 4
 6 PWM control..... 5
 7 Special test..... 6
 8 Others..... 7
 9 Special items 10

1 Revision table

Date	Revision	page	Item	Before	After
2021/12/2	0	-	Create		

R E	APPROVED			MODEL	W40S12BS1P5-07T15
	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 1 of 10
	DRAWN	Z.FANNY	2021-12-02		

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
 DO NOT COPY AND/OR DISTRIBUTE
 this material without prior written consent of Nidec



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

2 Application

These specifications are defined for Model: W40S12BS1P5-07T15 of the DC Brushless Vane Axial Fan.

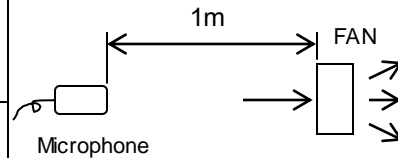
3 Specification

4 Mechanical specifications

Items	Standard	Remarks
External dimension	Refer to OUTLINE DWG.	
Material	Housing	Housing: Plastic (UL V-0)
	Impeller	Impeller: Plastic (UL V-0)
Bearing type	Ball	
Mass	About 60 g	

4.1 Electric specifications

Items	Standard	Units	Remarks	
Rated Voltage	12	VDC	Note 2	
Operating Rang	12.6			
	10.8			
Min. Starting Voltage	10.8			
Consuming Current	Max.	3.57	A	In free air at rated voltage Note 3
	Nominal	3.25		
Consuming Power	Max.	42.8	W	In free air at rated voltage
	Nominal	39.0		
Rated Speed		37400	min ⁻¹	In free air at rated voltage
		34000		
		30600		
Max. Airflow	Nominal	1.12	m ³ /min	At zero static pressure
		39.5	CFM	
	Min.	0.95	m ³ /min	
		33.5	CFM	
Max Static Pressure	Nominal	2168	Pa	At zero airflow
		8.70	inH2O	
	Min.	1668	Pa	
		6.7	inH2O	
Sound Level	Max.	76.5	dB (A)	In free air at rated voltage
	Nominal	72		
	Distance	1	m	
Operating Temperature	-10 ~ 70	°C		Normal humidity.



R E	APPROVED			MODEL	W40S12BS1P5-07T15
	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 2 of 10
	DRAWN	Z.FANNY	2021-12-02		

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
 DO NOT COPY AND/OR DISTRIBUTE
 this material without prior written consent of Nidec



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

Storage Temperature	-40 ~ 80	°C	Normal humidity. Standards should be met when measured after having sat for 24 hours at room temperature for FANS subjected to specified temperature range for 100 hours.	
Direction of Rotation	CW from exhaust side	-		
Direction of Airflow	Label side exhaust	-		
Insulation resistance	MIN. 10	Mega Ohm	At 500 VDC between frame and leads.	
Dielectric strength	Must withstand 500VAC 1min	-	Max. 1 mA between frame and leads. (Usually inspect at 600 V AC, 1 sec, 1 mA)	
Vibration	Radial	28.3	m/s ²	
	Axial	10.5		
	Vibration meter	VM-83 (RION)	-	
	Pick-up	PV-90B (RION)	-	
	HPF	20	Hz	
	LPF	10	kHz	
	Measurement mode	RMS	-	
Protection	Current limit protection	-	Note 4	
	Reverse polarity protection	-	Note 5	
	Hot swap	-		

Note 1: The standards should be the specified value at normal temperature (23°C) and normal humidity (60~65%) unless otherwise notice. It should be measured after 10 minutes operation.
 Note 2: Operating voltage is for continuous DC voltage. Power supply voltage ripple 5% maximum.
 Note 3: The maximum value of consuming current does not represent the peak value.
 Note 4: In the case that power is turned on during Fan rotor is locked, the Fan shall attempt to restart at a typical repetition rate (temperature rise will be prevented). The Fan will automatically restart when the locked rotor condition is released.
 Note 5: Power supply voltage must not be applied between signal output line and any other line directly. Reverse polarity protection is effective to just switch the positive and negative power line.
 Note 6: Control signal should be applied, or should be open.

R E	APPROVED			MODEL	W40S12BS1P5-07T15
	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 3 of 10
	DRAWN	Z.FANNY	2021-12-02		

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
 DO NOT COPY AND/OR DISTRIBUTE
 this material without prior written consent of Nidec



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

5 Provision of revolution signal

5.1 Output of revolution signal

Items		Standard	Unit	Remarks
Revolution output type		Open collector	-	As for measuring VOL, it is necessary to put CR low pass filter which is constructed of R1 and C1. The time constant of $R1 \times C1$ is to be more than 24us such as $R1=2.4k\Omega$, $C1=0.01\mu F$. Refer to Fig.1.
Electrical specification	Saturation voltage at I_c 5 mA	0.8	V	
Absolute maximum specification	Collector current	10	mA	
	Maximum voltage	15	V	
Wave form output type		$T = T1+T2+T3+T4 = 60/N$ sec, T: time, N: Fan speed	sec	At locked position, output becomes VOH or VOL. Caution: Please be careful that Revolution signal lead wire shall not have any voltage directly applied. It should damage inner circuit.

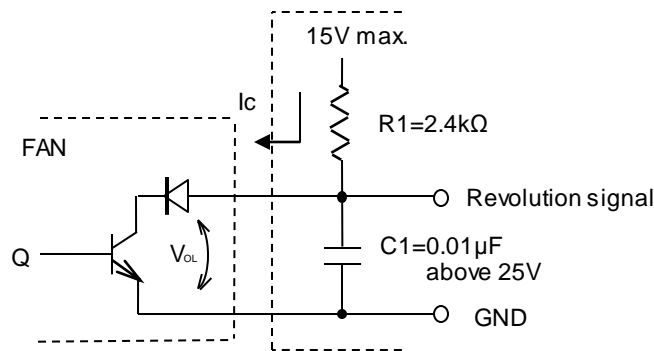


Fig. 1

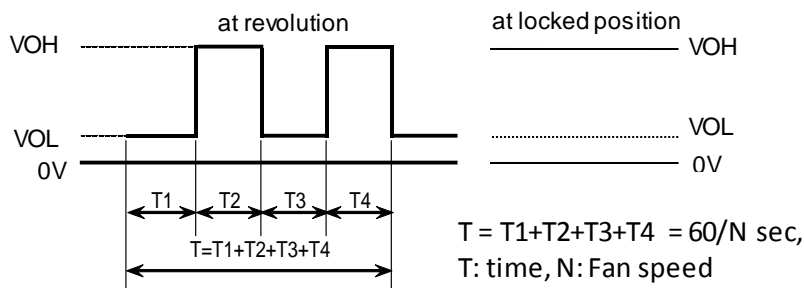


Fig.2

R	APPROVED			MODEL	W40S12BS1P5-07T15
E	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 4 of 10
	DRAWN	Z.FANNY	2021-12-02		

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
 DO NOT COPY AND/OR DISTRIBUTE
 this material without prior written consent of Nidec



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

6 PWM control

6.1 PWM type

Items			Unit	Remarks
Input specification	Vcont_high	> 2 : Full speed	V	Control signal should accept PWM control. The frequency for control signal of the fan shall be able to accept at 20kHz~30kHz.
	Vcont_low	< 0.8 : Stop		
	Vcont_open	Open : Full speed		
Frequency range	Max	30	kHz	The referred operating point for the Fan is 25kHz and duty cycle from 0 to 100%.
	Nominal	25		
	Min	20		

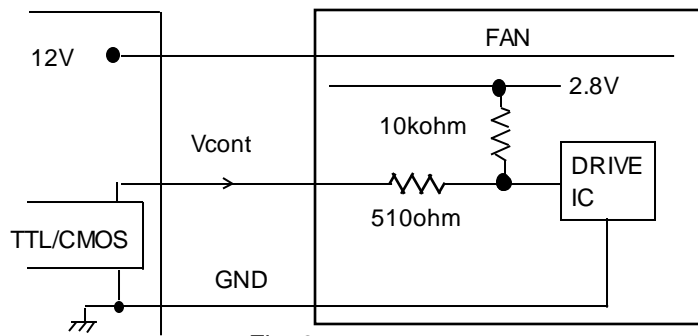


Fig. 3

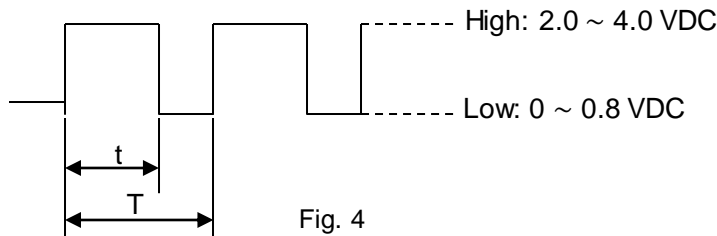


Fig. 4

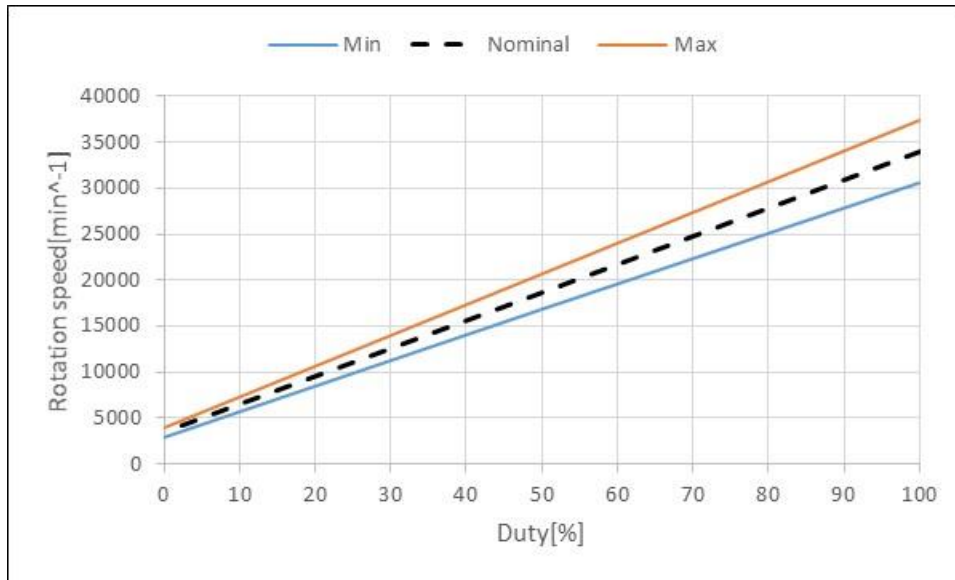
R E	APPROVED			MODEL	W40S12BS1P5-07T15
	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 5 of 10
	DRAWN	Z.FANNY	2021-12-02		

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
 DO NOT COPY AND/OR DISTRIBUTE
 this material without prior written consent of Nidec



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

Duty [%]	Speed [min ⁻¹]	Remarks
0	3400 ± 500	The standards should be the specified value at normal temperature (21~25°C) and normal humidity (60~65%) and free air unless otherwise notice.
50	18700 ± 1870	
100	34000 ± 3400	



7 Special test

Items	Standard
Life expectancy	More than 90% must run after continuous operation of 70000 hours at rated voltage, 40°C ambient temperature and 65% relative humidity. Life is defined when the motor speed decreases more than 30% against its initial speed.
Vibration	Standards for items should be met after 30minutes, 0.2mm amplitude, 55Hz vibration in each direction up-down, right-left, forward-back.
Shock	Standards for items should be met if the Fans fall naturally from a height of 30cm in the packing box for each direction.
Locked rotor	No damage shall be found for continuous 1h at locked rotor.

R E	APPROVED			MODEL	W40S12BS1P5-07T15
	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 6 of 10
	DRAWN	Z.FANNY	2021-12-02		

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
 DO NOT COPY AND/OR DISTRIBUTE
 this material without prior written consent of Nidec



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

8 Others

8.1 Connection

Items	Remarks
Connection	
Reverse connection	Please don't apply reverse voltage to the fan motor, because there is a possibility of damaging the circuit.
Usage of fan motor	Please do not put resistors or other electronic components on the extension of the fan motor lead wires for the purpose of fan motor speed reduction. It may make the voltage to the fan fluctuate and become lower than lower limit of operating voltage range. In this case, there may be such failures like no start or unstable rotation of fan motor. Please do not plug in or off when the power is on. It may damage the fan.
Earth & Electrostatic protection	Electrification and leakage can cause motor circuit or semiconductor failure. Proper grounding is required for soldering iron and conveyer belt during motor terminal or lead wire soldering to mechanism or set (+/-200V or less).
Cautions in installation of fan motors	<p>Because the clearance at Fan's mounting portion might impact on the noise and vibration during Fan's rotation. The screws or rivets should be used for installation. In case of snap-fit type, please be careful not to make the clearance during installation.</p>
	<p>The vibration to the axial direction might increase in case that the Fan is installed at one end support. Please do not install the Fan at one end support. The 4-points fixing should be recommended.</p> <p>Based on the principle of a lever, the amplitude becomes larger in case that the distance between fulcrum and power point is larger.</p>

R E	APPROVED			MODEL	W40S12BS1P5-07T15
	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 7 of 10
	DRAWN	Z.FANNY	2021-12-02		

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
 DO NOT COPY AND/OR DISTRIBUTE
 this material without prior written consent of Nidec



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

	<p>If your parts are closely put in front of the Fan motor. It might contact with the impeller when the impact force is applied. The recommended distance between your parts and the Fan motor could be 3mm or more.</p>	<p>Product Shock</p>
	<p>If the product is closely put in front of the Fan motor. The vibration and noise might increase due to vibration caused by air flow separation. The recommended distance between the product and the Fan motor could be 3mm or more.</p>	<p>There are high and small pressure layers in front of the blade. Where the blades pass through alternately. It causes the increase in vibration.</p>
	<p>The through screw should not be used for Open-flange-type Fan motor, because the deformation or crack might be caused at housing flange area when it is used. Please use a flange at only one side in case of the Open-flange-type.</p>	<p>Protrusion of blade Crack</p>
	<p>The uneven load is applied on bearing in case the exhaust outlet is closed unevenly, which might cause the uneven wear on bearing. Your consideration to make the air flow even at the exhaust outlet is highly appreciated.</p>	<p>The static pressure is added only on certain portion, and the uneven wear is caused on bearing.</p>
	<p>The housing could be damaged in case of using the Self-tapping screw which is not suitable for installation of plastic parts. "Tap tight P tight" for plastic parts should be recommended for usage in case of the Self-tapping installation.</p>	
	<p>The housing might be deformed. The impeller might go out from the housing and might contact with the installation area in case the Fan motor is installed on the poor flatness area using the screw. The flatness at installation area should be 0.1mm or less.</p>	
	<p>In case that you use the Fan motor with different usage recommended in the above, please conduct the sufficient investigation before use.</p>	

R	APPROVED			MODEL	W40S12BS1P5-07T15
E	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 8 of 10
	DRAWN	Z.FANNY	2021-12-02		



SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

Precautions	The shut-down circuit might operate wrongly under the large static electricity or EM noise. In the case, the restart type should be recommended.
	In case of reducing the Fan's rotation speed by resistor, the voltage on Fan terminal changes, and its voltage (low value) might go down to the Fan's usage voltage range. In the case, various issues might happen such as no rotation of Fan motor, unstable rotation, and sensor's wrong operation.
	When you request to add the replay or alarm circuit in the Fan motor, because of matching with control circuit, we will check the control circuit. At the same time, we would like you to evaluate it carefully too.
	You should not hold the lead wire at the time of handling because the lead wire might be broken. Please hold the flame when you use it.
	The semiconductor in motor circuit might be damaged due to the charged and / or leakage. You should take the countermeasure against static electelectricity (+/- 200 or less) in your process.
Storage	It is generally required that a storage period of Fans without any use be limited to six (6) months maximum. Storage of Fans in high temperature and or high humidity environment should be avoided.
Special usage	This usage requires a specially high level of quality and reliability of the products, which are neither intended nor guaranteed to be used for any equipment whose failure or malfunction would cause damage to the human life or body or any other serious damage (e.g. nuclear power control devices, aerospace instrument, transportation machines (e.g. cars, trains and ships), traffic signals, fuel controllers, medical equipment and various safety devices). Please contact our sales personnel for any unintended usage of the products.

R E	APPROVED			MODEL	W40S12BS1P5-07T15
	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 9 of 10
	DRAWN	Z.FANNY	2021-12-02		



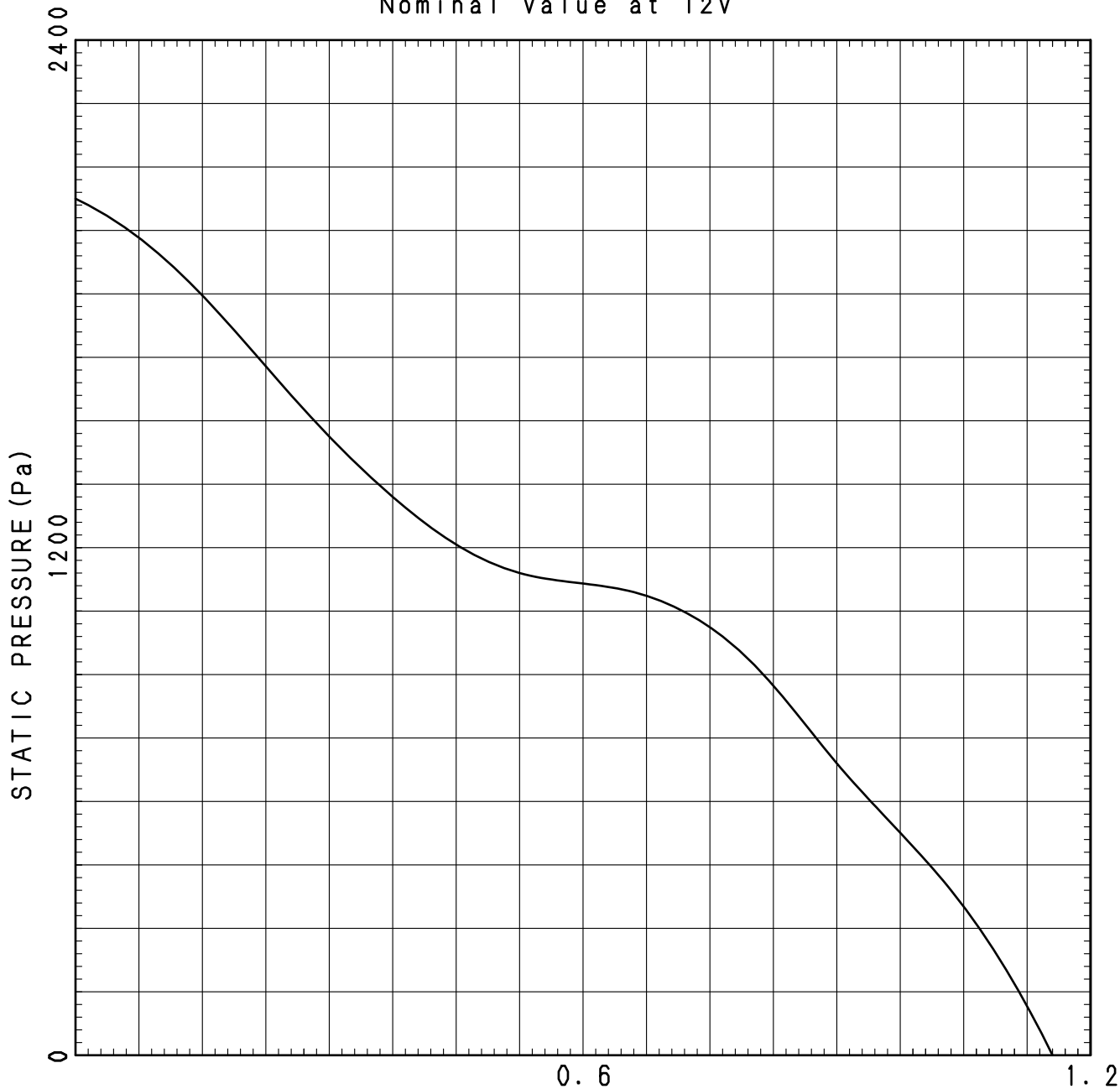
SPECIFICATION FOR DC BRUSHLESS FAN MOTOR

9 Special items

Items	Remarks
Specification change	Any change to the parameters specified in this document shall be determined by mutual agreement on both parties.
Uncertainty	In the event that a question may arise about this document or an area not specified in this document, both parties shall discuss and determine a solution in good faith.
Warranty	Our warranty is limited to the replacement of failed fan at free of charge, if and only the failure is found within two years after it was shipped out from our production facility. And if the cause of the failure is proven to be attributable to the supplier. Our liability does not extend to the consequential damages caused by the failed fan.
Production location	NIDEC (DONGGUAN) LIMITED: CHINA(DONGGUAN) or NIDEC (SHAOGUAN) LIMITED: CHINA(SHAOGUAN) or NIDEC VIETNAM CORPORATION: VIETNAM(HO CHI MINH CITY) or NIDEC PHILIPPINES CORPORATION: PHILIPPINES(LAGUNA) In case of production factory change, we shall get approval from customers beforehand.
Note	Please consider having an independent protection system in the customer's instruments in the event that the fan should stop operating.
Power source	Brushless DC fans are designed to be used at DC power source with bypass capacitor. We would recommend you to use DC power source which is filtered ripple and noise. Fans are designed to perform as expected when stable voltage is supplied.
	Fluctuation of the voltage between Vcc(+) and GND while the fan is powered must be within the specified operating voltage range.
	Fluctuation cycle of the voltage between Vcc(+) and GND while the fan is powered must be longer than the fan's rotation cycle.
	GND of the fan must be kept below the voltage of its Vcc(+) when the voltage is switched ON/OFF or the fan is not running.
Environment-related substances	Based on RoHS, Cadmium, Lead Mercury, and compound of these substances and Hexavalent Chromium compound, Polybromo Bi-Phenyl (PBB) and Polybromo Di-Phenyl Ether (PBDE) are not included in this product.

R E	APPROVED			MODEL	W40S12BS1P5-07T15
	DESIGNED				
	APPROVED	T.TAKAOKA	2021-12-02	DRAWING No.	3TSPC21Z001
	CHECKED	M.YAMADA	2021-12-02		
	DESIGNED	L.INGANN	2021-12-02	DC BRUSHLESS MOTOR	Sheet 10 of 10
	DRAWN	Z.FANNY	2021-12-02		

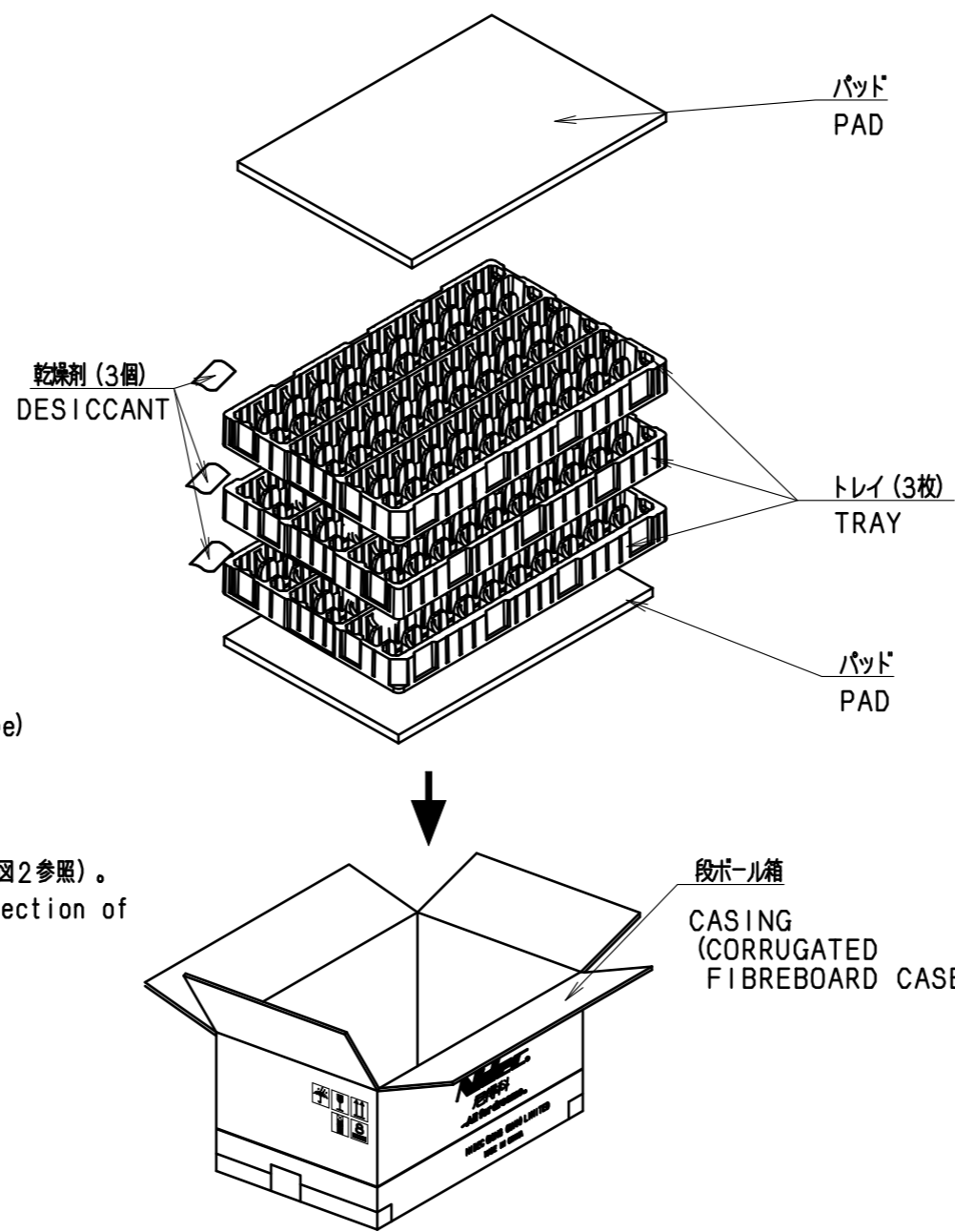
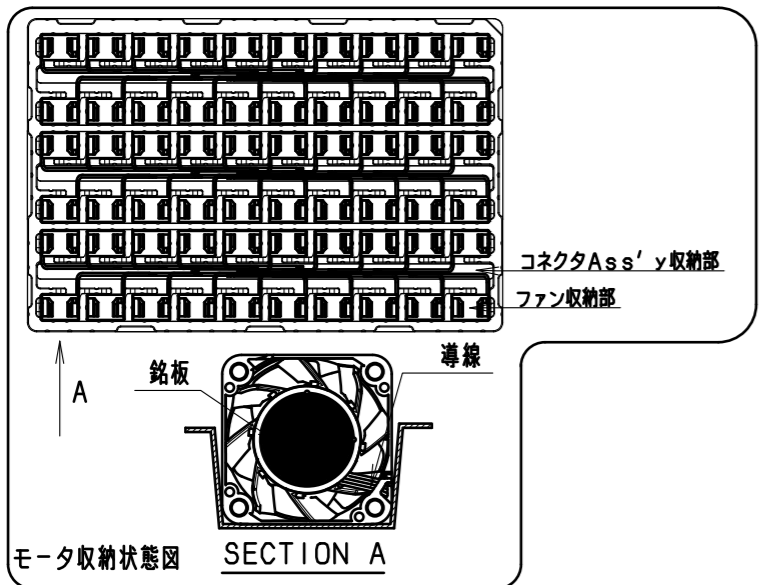
< FAN TEST DATA >
Nominal Value at 12V



SPECIFICATIONS
2021-12-07
TWSC-DEV

REV	ISSUE	ECO No.	APPROVED	DESIGNED	No.	PART No.	PART NAME	NOTE	Q' ty	UNIT	MARKS/MTL
0	Fig. 0										
							TOLERANCE UNLESS OTHERWISE SPECIFIED				MTL.
							LINEAR				MODEL W40S12BS1P5-07
							~ :±				PARTS DC Fan
							~ :±				DC Fan
							~ :±				DWG. P-Q Curve
							ANGULAR :±				P-Q Curve
							CORNER				
							OUTSIDE :C				
							INSIDE :R				
								UNIT mm	SCALE	∞	A4
											DWG. No. F982700700

W40S NCDS標準梱包



Each pallet 5 floors

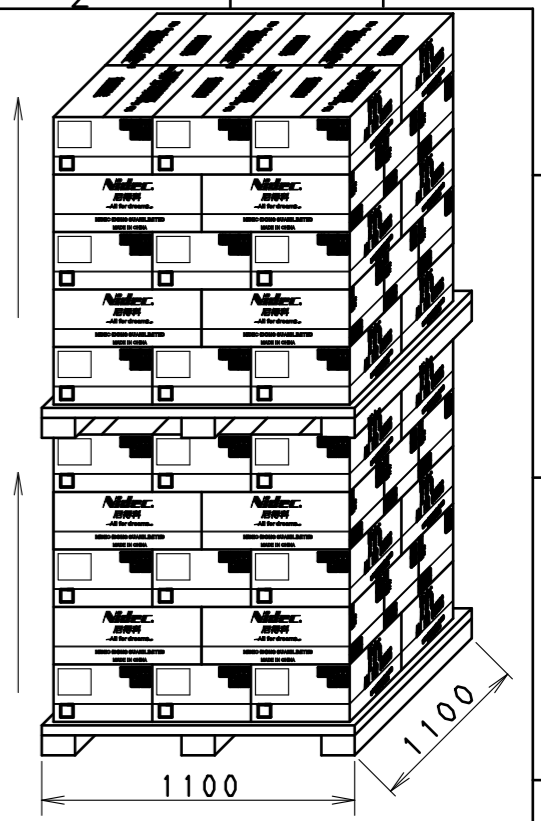
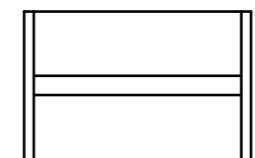
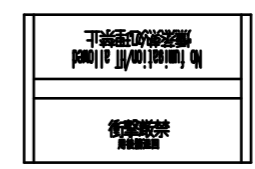
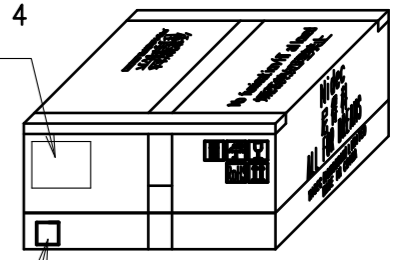


図2 梱包箱の積載状態
Fig. 2 Condition of pallet stuck up



NOTE 4
注記4

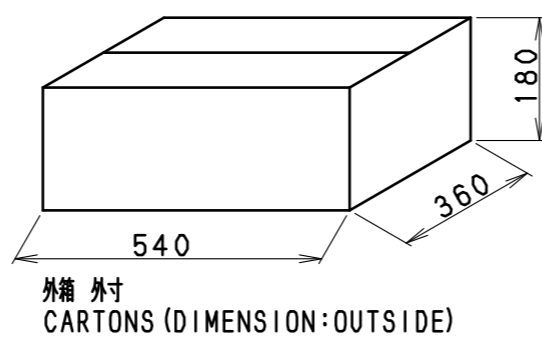


注記 Notes

- 1箱で最大180台とする。(1トレイ 60台×3トレイ)
One carton contains 180pcs. (1 tray 60pcs×2traies)
- 総重量 (180台梱包時) : 約13kg。
Total weight : About 13kg.
- 梱包用テープを”H型”にしてふたに貼り付け、箱を閉じること。
Stick packingtape on the cover (packingtape form is H type) and close the box.
- 梱包箱の側面にラベルを貼りつけること。
Affix the and Label to the side face of carton.
- 一パレットの上に5層の箱を積み上げる、向きは矢印が外側に向く様に積み上げること (図2参照)。
Each paller can be stacked 5 floors, put the carton as direction of instructions. (Refer to Fig2)
- 梱包箱の積み上げはブロック積みとし、1段ずつ互い違いとする。(図2参照)
Carton to be block stacking and stacked alternately. (Refer to Fig2)

量産工場はNCDDの場合、梱包箱 (F030184900*) を使用してください、
量産工場はNCDSの場合、梱包箱 (F030185200*) を使用してください。
梱包については、出荷先に応じて使い分けること。
・国内出荷 : K0300320*
・海外出荷 : F0301325*

SPECIFICATIONS
2021-12-07
TWSC-DEV



6	K030032000	Pallet		(1)	Plywood
6	F030132500	Pallet		1	
5	7830017300	Desiccant		3	SILICA-GEL
4	F030293200	Label (for Case)		1	
3	G030180800	Pad		2	
2	F030176800	Pallet		3	pcs
1	F030185200	Case		(1)	
1	F030184900	Case		1	
No.	PART No.	PART NAME	NOTE	Q' ty	UNIT MARKS/MTL

ISSUE	0	Fig.	TOLERANCE			UNIT	SCALE	⊗	A3	DWG.	DWG. No. K010060900		
ECO No.	3TMS219002		UNLESS OTHERWISE SPECIFIED	TREAT.			mm						
APPROVED			LINEAR										
DESIGNED			~ ±										
APPROVED	H. TAKESHITA	2020-12-23	~ ±										
CHECKED	H. KAWAKAMI	2020-12-23	~ ±										
DESIGNED	K. ONO	2020-12-18	ANGULAR ±										
DRAWN	S. YAMANE	2020-12-18	CORNER										
			OUTSIDE : C										
			INSIDE : R										

L10 DATA

作成
PREPARE
承認
APPROVE

H.KAWAKAMI
H.TAKESHITA

機種名 Model	W40S12BS1P5 Series
--------------	---------------------------

Nidec Confidential

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
DO NOT COPY AND/OR DISTRIBUTE this material without prior written consent of Nidec

Required life temperature	40	°C (degreeC)
試験機種 Sample P/N	W40S12BS6A5-51	
試験台数 Number of Sample	200	台 (PCS.)
試験時間 Test time already passed	25,000	時間 (Hours)
不良台数 Number of Failure	0	台 (PCS.)

試験条件(Test Condition)	
■温度(Temperature)	80 °C (degreeC)
■連続(Continuation Operation)	
内部発熱(Motor generation of heat)	°C (degreeC)
要求機種(Demand model) : T _d	39.5
試験機種(Examination model) : T _e	22.6

計算式 (Formula)

$$L10@ 40\text{ °C} = L10@ \# \text{ °C} \times \varepsilon$$

$$\alpha_{\text{test}} \times \{-\ln(1-10/100)\}^{1/\beta} = L10@ \# \text{ °C}$$

$$\alpha_{\text{test}} = t / (4.605/2n)^{1/\beta}$$

ε : 加速係数(Acceleration coefficient)
t : 試験時間(Test time already passed)

◇特性寿命(Characteristic Life)
α_{test} = 110718

◇形状係数(Configuration coefficient)
β = 3

◇内部温度上昇差(Internal temperature rise difference)
α ΔT = 1.5^(Te - Td/10) = 1.5^(22.6 - 39.5/10) = 0.503971

◇加速係数(Acceleration coefficient)
ε = 1.5^(80 - 40/10) = 5.063

L10 is calculated from the temperature rise of the bearing.

◇結果(Result)

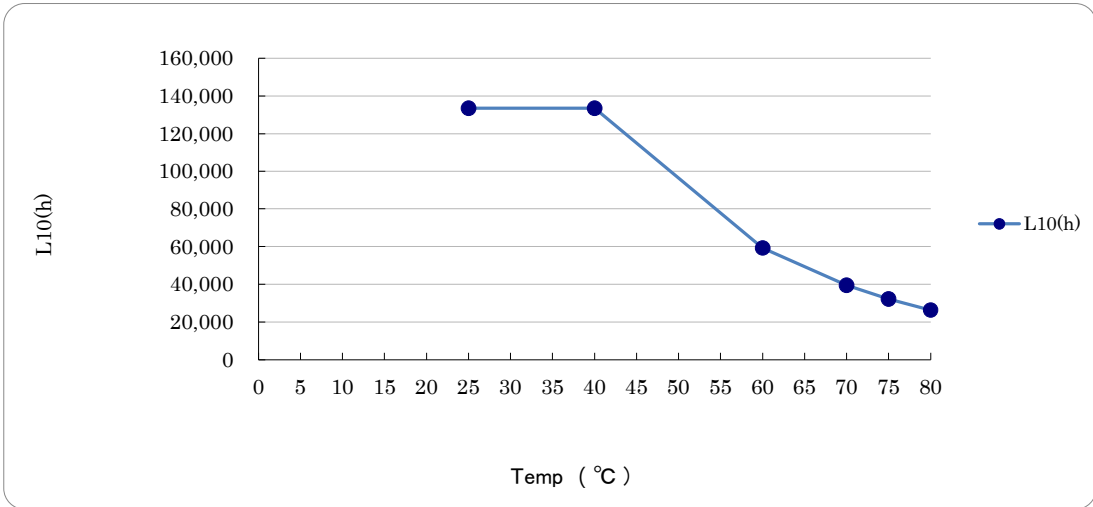
Test Model: L10@ # °C : ##### × 0.4723 = 52,293 (h)
Demand Model: L10@ # °C : 52,293 × 0.504 = 26,354 (h)
Demand Model: L10@ # °C : 26,354 × 5.063 = 133,418 (h)

IPC-9591

◇グラフ(Graph)

要求機種の温度毎のL10データ(L10 of Demand Model at different temperature)

温度(Temp)	25	40	60	70	75	80
L10(h)	133,418	133,418	59,297	39,531	32,277	26,354



MTBF DATA

作成
PREPARE
承認
APPROVE

H.KAWAKAMI
H.TAKESHITA

機種名 Model	W40S12BS1P5 Series
--------------	---------------------------

Nidec Confidential

この文書は機密情報を含みますので、許可なく複製・頒布を禁止します。
DO NOT COPY AND/OR DISTRIBUTE this material without prior written consent of Nidec

Required life temperature	40	°C (degreeC)
試験機種 Sample P/N	W40S12BS6A5	
試験台数 Number of Sample	200	台 (PCS.)
試験時間 Test time already passed	25,000	時間 (Hours)
不良台数 Number of Failure	0	台 (PCS.)

試験条件(Test Condition)	
■温度(Temperature)	80 °C (degreeC)
■連続(Continuation Operation)	
W	°C (degreeC)
要求機種(Demand model) : T _d	39.5
試験機種(Examination model) : T _e	22.6

計算式 (Formula)

$$MTBF_{@ 40\text{ °C}} = MTBF_{@ \# \text{ °C}} \times \varepsilon \quad \Gamma(1+1/\beta) : \text{ガンマ係数(Gamma function)}$$

$$\alpha_{\text{test}} \times \Gamma(1+1/\beta) = MTBF_{@ \# \text{ °C}}$$

$$\alpha_{\text{test}} = t / (4.605/2n)^{1/\beta} \quad \varepsilon : \text{加速係数(Acceleration coefficient)}$$

$$t : \text{試験時間(Test time already passed)}$$

◇特性寿命(Characteristic Life)

$$\alpha_{\text{test}} = 110718$$

◇ガンマ係数(Acceleration coefficient)

$$\Gamma(1+1/\beta) = 0.8930$$

◇形状係数(Configuration coefficient)

$$\beta = 3$$

◇内部温度上昇差(Internal temperature rise difference)からの加速係数

$$\alpha_{\Delta T} = 1.5^{((T_e - T_d)/10)} = 1.5^{(22.6 - 39.5)/10} = 0.5039713$$

◇加速係数(Acceleration coefficient)

$$\varepsilon = 1.5^{((80 - 40)/10)} = 5.063$$

IPC-9591

MTBF is calculated from the temperature rise of the bearing.

◇結果(Result)

Test Model: $MTBF_{@ \# \text{ °C}} : ##### \times ##### = 98,869 \text{ (h)}$
 Demand Model: $MTBF_{@ \# \text{ °C}} : 98,869 \times 0.504 = 49,827 \text{ (h)}$
 Demand Model: $MTBF_{@ \# \text{ °C}} : 49,827 \times 5.063 = \mathbf{252,249 \text{ (h)}}$

◇グラフ(Graph)

要求機種の温度毎のMTBFデータ(MTBF of Demand Model at different temperature)

温度(Temp)	25	40	60	70	75	80
MTBF(h)	252,249	252,249	112,111	74,740	61,025	49,827

