Quality document	Title: EVAPORATOR SPECIFICATION	Number: S041-700-001 DWG No: YG20201533

Index

Article 1	Purpose	P.2
Article 2	Applicable extent	P.2
Article 3	Referencing standards	P.2
Article 4	Specifications	P.2 -3
	4-1 Function	
	4-2 General Performance & Reliability	
Article 5	Test Conditions & Methods	P.3-5

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	Change/Date	Approved By:	Definitions
0	2006/04/28	Nader Khosropour	First issue
1			
2			
3			
4			
5			

Form's Code: 409260

Article 1. Purpose

This Standard prescribes on test method of evaporator for automotive A/C.

Article 2. Applicable Extent

This Standard applies to evaporator for automotive A/C developed and designed by SANDEN CO., LTD. However, the items that are in drawings or that have been decided by discussions with customers should have higher priority than this Standard.

Article 3. Referencing Standards

Refer to standards as following.

- JIS D1618
- JIS D1601
- JIS Z2371

Article 3. Temperature Specifications:

3.1.1) Storage Temperature: -40°C ~ +80°C

3.1.2) Usage Temperature: -30°C ~ +60°C

Article 4. Specifications

4-1 Function

To cool air by flowing refrigerant into the core and exchanging heat of the inside air with outside air.

4-2 General Performance & Reliability

Note:

Unit of Pressure shows Gage-pressure unless otherwise specified.

No.	Item	Specification	Test Method
1	Cooling Capacity	According to evaporator drawing.	5.1
2	Air flow resistance		5.2
3	Refrigerant pressure drop		5.3
4	Air-tightness test	Less than 2g/year	5.4
5	Low temperature air-tightness test	Fulfill Air Tightness Test	5.5
6	Pressure proof test	Fulfill Air Tightness Test No deformation	5.6
7	Destructive test	Fulfill Air Tightness Test.	5.7
8	Internal residual water	Less than 12mg/Evap	5.8
9	Internal residual foreign material	Less than 5mg/Evap. Two of length, side, and width are equal to 0.5mm or below respectively.	5.9
10	Repeated pressurization test	Must fulfill Air Tightness Test Item No.1-3 must be satisfied	5.10
11	Vibration test	Must fulfill Air Tightness Test	5.11
12	Repeated thermal shock test	Must fulfill Air Tightness Test Item No.1-3 must be satisfied	5.12
13	Corrosion resistance test	Must fulfill Air Tightness Test	5.13
14	Initial Odor Performance	Smell with SiO2 adhered shall have odor level equal to or lower than reference level specified below. Reference odor level A level confirmed under the conditions specified herein to the right side, with SiO2 fine powder made to adhere to untreated evaporator at 0.1g/cm2.	5.14

	Change/Date	Approved By:	Definitions
0	2006/04/28	Nader Khosropour	First issue
1			
2			
3			
4			
5			

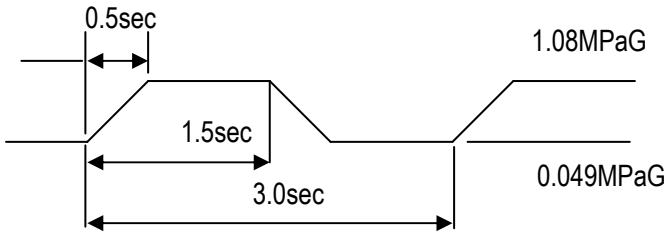
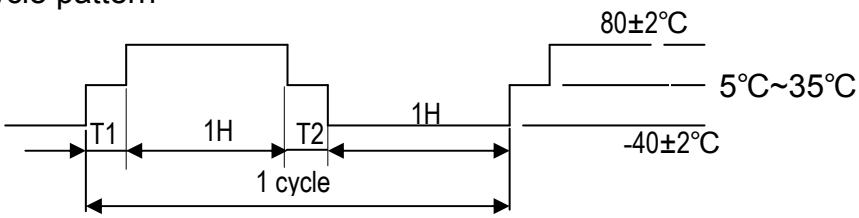
15	Odor performance	No abnormal smell detected.	5.15
16	Funginert & antibacterial test	Mold and bacteria shall be 10000 pcs/ml max. respectively	5.16

Article 5. Test Conditions & Methods

No.	Item	Test Conditions & Methods
1	Cooling Capacity	Measure by device following JIS D1618 fiscal 1992 version. Condition for inlet on air side: Dry-bulb temperature at inlet 27±1℃ Wet-bulb temperature at inlet 19.5±0.5℃ Air quantity 200 ~ 450m^3 /h Condition on refrigerant side: Pressure on EXP inlet : 1.64±0.034Mpa·G {16.7±0.35kgf/cm^2G} EXP inlet sub cool: 5±3deg Pressure on EVA outlet :0.18±0.01MPa·G {1.84±0.1kgf/cm^2·G} EVA outlet super heat: Average 5±3deg Measure temperature and humidity at air outlet, then find heat absorption amount to change of air quantity.
2	Air flow resistance	Measure differential pressure to change of air quantity in WET at the front and the back of evaporator in 4-2-1).
3	Refrigerant pressure drop	Measure differential pressure to change of refrigerant flow rate at the inlet and the outlet on evaporator refrigerant side in 4-2-1).
4	Air-tightness test	Carry out test by automatic helium detector. Gas condition: 100% of Helium Pressure force: 0.686MPa·G or up Temperature: 5℃~35℃ Pressure of Chamber inside: Less than 26.6Pa(absolute pressure)Test equipment: EXEL leak detector

	Change/Date	Approved By:	Definitions
0	2006/04/28	Nader Khosropour	First issue
1			
2			
3			
4			
5			

5	Low temperature air-tightness test	Inject nitrogen gas with pressure of $0.4^{0.1}_{0.0}$ MPa·G after leaving it in low temperature chamber at -20℃ for 24 hours, and keep immersing it in liquid(Methanol) at -20℃ for 5 minutes. Check existence of leakage for pressurized gas at the moment. Additionally carry out air-tightness test at normal temperature(5℃~35℃).
6	Pressure proof test	Put air pressure of $1.67^{0.2}_{0.0}$ Mpa , hold it for 5 minutes. Carry out air-tightness test, and check deformation visually.
7	Destructive test	Put water pressure of $2.75^{0.2}_{0.0}$ Mpa , hold it for 5 minutes minutes, check for water leakage. Measure destructive pressure.
8	Internal residual water	It measures by the Karl-Fischer method. Type of the Karl-Fischer Titration: Coulometric KFT Test equipment: Maker mane: Kyoto Densi, Model No. : MKC-510N
9	Internal residual foreign material	Put detergent(Isooctane) to around 2/3 of interior capacity of finished product, shake(1-2times/sec,more than 10 times shaking) it so that it may circulate in circuit, collect the liquid by 8μm filter, And measure amount of residual alien substance by scale. Filter condition: Before measure, it shall be dried up at 100℃ for 10 minute. And after filtering, it shall be dried same as before. Measure the filter weight before and after. The amount of foreign material present is calculated by the difference in the weight of filter before and after.

10	Repeated pressurization test	Test pressure : 0.049 ~ 1.08 $^{0.1}_{0.0}$ Mpa Repetition frequency : 150,000 times Ambient temperature : 80±5℃ Liquid used: Oil (PAG Oil) Cycle pattern 
11	Vibration test	Carry out in COOLING UNIT ASSY. Attached position corresponds to installation of actual vehicle. Based on JISD1601. Temperature : Normal temperature Vibration condition classification : Class 1 A Resonant point detection test: Category 100 Vibration endurance test : Phase 30
12	Repeated thermal shock test	Cycle pattern  T1 and T2 are within 3min. Repetition frequency: 10 times

	Change/Date	Approved By:	Definitions
0	2006/04/28	Nader Khosropour	First issue
1			
2			
3			
4			
5			

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13	Corrosion resistance test	SST (salt spray test) test. Apply JIS Z 2371. Test Duration: 3000Hr
14	Initial Odor Performance	・Inlet air condition :30℃,60% RH ・Cycle pressure : Before TXV pressure 1620kPa EVAP. Outlet pressure 190kPa ・Air Flow:120±3m^3/h or An equivalent for Lo of a actual vehicle ・Cycle:5minON,5minOFF
15	Odor performance	Odor jury test to be conducted with HVAC assembly in actual vehicle operating condition.

16	Funginert & antibacterial test	(1) Funginert (a) Apply surface treatment to the test piece (30mm*50mm*core width), which is cut out of the evaporator. (b) After immersing the cut-work of (a) in a 10% glucose water solution for five minutes, pull it up for draining, and spread nutrient (glucose) over it. (c) Inoculate 5-mL mixed liquid of mold spore (number of mold 1*104 pcs/mL or more) on all sides of cut-work with a spray. Inoculated fungus: Aspergillus niger, Cladosporium cladosporioides, Fusarium proliferaturm, Myrothecium verrucaria, Penicillium citrinum (d) After inoculation, culture it in a thermostatic chamber at a temperature of 28±2℃, and humidity of 90% and above.(In addition, there shall be no light in the chamber). (e) After cultivation for 5 days or more, cut out 20 fins from the cut-work and disperse them into the physiological saline of 9 mL. (f) After taking 1 mL out of physiological saline in (e) above, in which 20 the fin is immersed, spreading it on the standard agar plate culture medium to re-cultivate in a thermostatic chamber of 28±2℃ for 5 days, meaure the quantity of mold. (1.) Antibacterial Perform the antibacterial test in the same manner as for funginert test. However, inoculated fungus shall be: Bacillus subtilis, Escherichia coli, Pseudomonas aeruginosa, Pseudomonas fluorescens, Staphylococcus aureus and the number of fungus shall be $1*10^4$ pcs/mL or more.