Dear OO.

Panasonic
INDUSTRY

Metallized Polypropylene Film Capacitor

ECWFE 450VDC Product Quality Issues and Countermeasures Report

Sep 1st, 2026

Panasonic Industry Co., Ltd.
Device Solutions Division
Film Capacitor BU

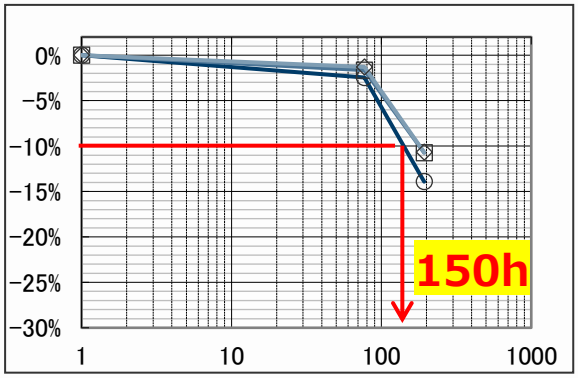
1. Background / Overview

We sincerely apologize for the great inconvenience caused to your company due to repeated delivery schedule adjustments.Below, we would like to report on our company's status and countermeasures

Eligible Products	ECWFE2W105 / 155 / 225 Series Items
Background	Detecting NG in the 2025 Internal Periodic Management Exam (April 2026)
Contents	High Temperature and High Humidity Load Test II: Test conditions: 450Vdc-60°C / 95%Rh @500h Criteria for Assessment ・Capacitance change rate: within ±10%, insulation resistance: 1000MΩ・uF or higher, dielectric tangent: 0.11% or less **Result: [Failed] ... Capacity change rate: -10% or more occurred**
Other	**❶ Durability Test, High Temperature and High Humidity Load Test I [Passed]** Confirmed ■ Criteria for Assessment ・Capacitance change rate: within ±10%, insulation resistance: 1000MΩ・uF or higher, dielectric tangent: 0.11% or less ■ Durability Test [Passed] Test Conditions: 500Vdc-85°C @ 1,000h ■ High Temperature and High Humidity Load Test I [Passed] Test Conditions: 450Vdc-40°C / 95% RH @500h **❷ Passed High Temperature and High Humidity Load Test II [Passed] in internal control tests prior to fiscal year 2023** *ECWFE2W155 2023, ECWF2W105 2019
Notice	**❶ Regarding the number of units subject to market outflow and the incidence rate (our current estimate)** Number of units: As of now, our assessment is that this applies to units from 2023 onward. Please refer to the attached sheet for detailed product numbers/quantities.* As we are currently investigating the true root cause, we will contact you immediately if the number of affected units changes as a result of that investigation. Incidence rate: Estimated at around 25% **❷ Impact on the Market** The performance of the worst products is estimated to be a capacity reduction rate of about -14%. The market impact depends on actual operating voltage and usage environment. These are our company’s estimated values, and the estimated time for each voltage is described in the next section.If you have any concerns, please let us know your actual usage status and we can discuss it together. **❸ About the next shipment** As a countermeasure to this issue, we will be shipping the modified potting resin from the next shipment onward. *Since it was confirmed the test will also pass High Temperature and High Humidity Load Test II, it is judged to be no problem.

2-1. (Reference) Estimated time by voltage under 60℃ 95% environment

(Based on calculation test)
Accelerated test
500Vdc/60℃95%RH



Apply the currently assumed worst-case product with a 14% capacity reduction to the base results.
From the test trend, the time to reach a 10% capacity reduction is estimated to be 150 hours.
Calculated using the voltage acceleration factor derived from our past evaluation results.
Under the current specification requirement of 60℃/95% × 500 hours, the voltage that can satisfy a 10% capacity reduction is 443.3V or less.

Lifetime estimation formula Arrhenius' theorem

$$L_b = L_a \times \left(\frac{V_a}{V_b}\right)^{\alpha} \times 2^{\frac{T_a - T_b}{\theta}}$$

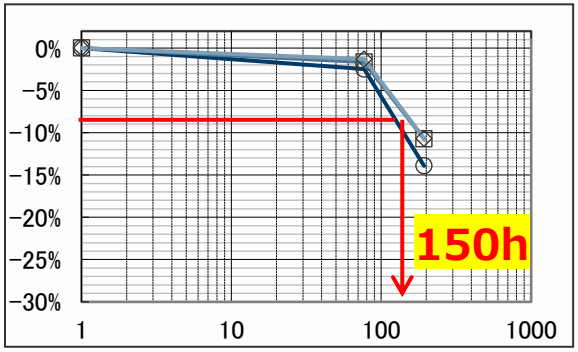
Estimated time list for 10% capacity reduction in an environment of 60℃ and 95% RH

Voltage	Time(h)	Voltage	Time(h)	Voltage	Time(h)	Voltage	Time(h)	Voltage	Time(h)
280	**49,455**	330	9,564	380	2,333	430	678	475	251
285	41,433	335	8,229	385	2,047	435	604	480	226
290	34,819	340	7,096	390	1,799	440	539	485	203
295	29,348	345	6,132	395	1,584	**443.3**	**500**	490	184
300	**24,807**	**350**	**5,310**	**400**	**1,397**	445	481	495	166
305	21,028	355	4,608	405	1,234	**450**	**430**	**500**	**150**
310	17,872	360	4,007	410	1,091	455	385	505	136
315	15,230	365	3,490	415	967	460	345	510	123
320	13,010	370	3,046	420	858	465	310	515	112
325	11,142	375	2,664	425	762	470	278	520	101

2-2. (Reference) Estimated Humidity Resistance Lifetime

Under the average environmental conditions in Malaysia (27°C / 83% RH), which are generally regarded as severe, the estimated lifetime exceeds 500,000 hours even at the rated voltage of 450 V.

■ Lifetime Estimation: Accelerated Test
500Vdc/60℃95%RH



■ Humidity Load Acceleration Model:

$L_1/L_2=\exp\{20068*(1/T_1-1/T_2)-2.59*(RH_1^{0.34}-RH_2^{0.34})\}*(V_2/V_1)^{\alpha}$

L1: Actual Operating Life L2: Test Duration
V1: Actual Operating Voltage V2: Test Voltage
T1: Actual Operating Temperature T2: Test Temperature
RH1: Actual Operating Humidity RH2: Test Humidity
α: Voltage Acceleration Factor (Based on our internal test data; confidential)

■ Assumptions for Estimated Lifetime
Under Average Malaysian Conditions (27°C / 83% RH)

T_1 : 27℃ RH_1 : 83% V_1 : refer to table below
T_2 : 60℃ RH_2 : 95% V_2 : 500
L_2 : 150

Estimated Time to Reach 10% Capacitance Reduction under 27°C / 83% RH Conditions

Voltage	Time(h)	Voltage	Time(h)	Voltage	Time(h)	Voltage	Time(h)	Voltage	Time(h)
280	64,653,787	330	12,503,595	380	3,050,270	430	886,114	475	294,959
285	54,165,865	335	10,757,868	385	2,676,498	435	789,372	480	265,924
290	45,519,167	340	9,276,521	390	2,352,492	440	704,121	485	240,001
295	38,366,671	345	8,016,473	395	2,071,111	445	628,889	490	216,831
300	32,431,104	**350**	6,942,148	**400**	1,826,309	**450**	**562,405**	495	196,098
305	27,490,073	355	6,024,080	405	1,612,962	455	503,571	**500**	177,525
310	23,364,546	360	5,237,804	410	1,426,710	460	451,436	505	160,869
315	19,909,885	365	4,562,949	415	1,263,844	465	405,177	510	145,916
320	17,008,832	370	3,982,512	420	1,121,196	465	364,079	515	132,477
325	14,566,012	375	3,482,263	425	996,059	470	327,520	520	120,387

3. Comparison of current products and countermeasure products

Eligible Products	ECWFE2W105 / 155 / 255

item		Current Models	**Countermeasure products**
turning point	Ingredients	**Potting resin (Epoxy resin) Conventional product**	**Potting resin (Epoxy resin) High moisture resistance product *Our company has proven track record**
	manufacturing	No change point	No change point
initial characteristic		No change point	No change point
Product Size		No change point	No change point
Reliability	High Temperature and High Humidity Load Test I	**qualified**	**qualified**
	High Temperature and High Humidity Load Test II	**unqualified** *Limited capacity, raising concerns about NG (no restrictions)	**qualified**
	Durability Test	**qualified**	**qualified**
	Sudden temperature change test	**qualified**	**qualified**

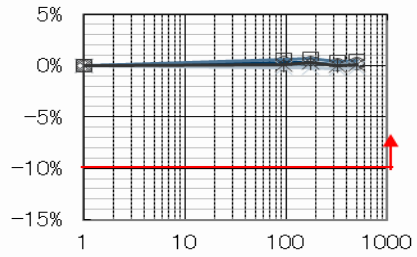
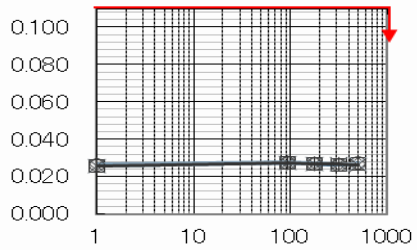
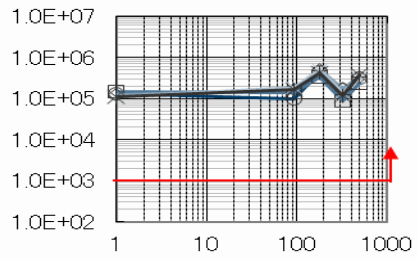
■ Notices

We have confirmed the pass results by using our proven high moisture-resistant epoxy resin.

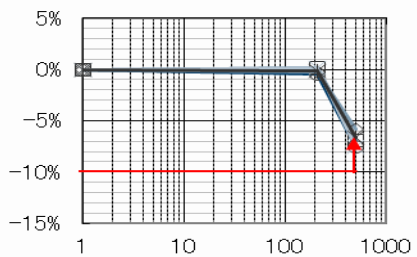
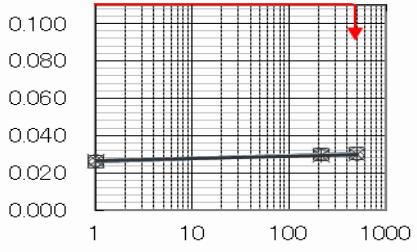
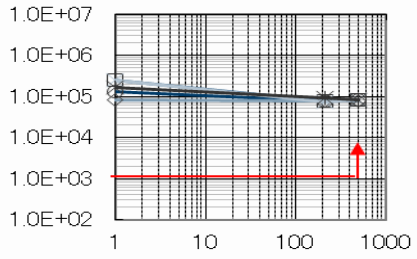
4. Countermeasures and Evaluation Results

■ **Countermeasure: Use of epoxy resin used in our high moisture resistance film capacitors**

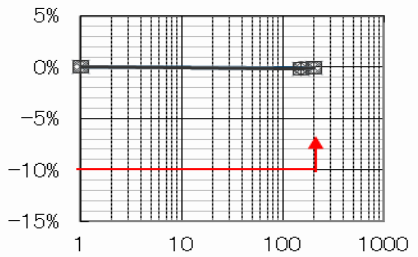
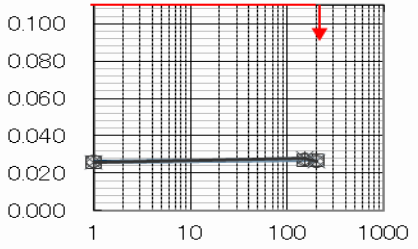
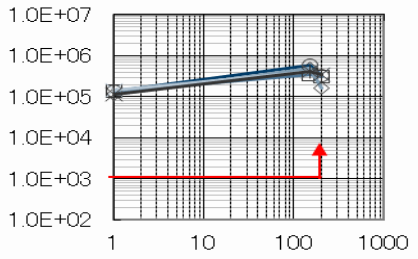
Durability test — qualified

	: ECWFE2W105J
Test Condition	試験電圧 (V_a) : **DC540V** 試験温度 (T_a) : **105°C** 時 間 : **500h**
⊿C/C	
tan δ	
IR	

High Temperature and High Humidity Load Test II — qualified

	: ECWFE2W105J
Test Condition	試験電圧 (V_a) : **DC450V** 試験温度 (T_a) : **60°C** 試験湿度 (RH) : **95%** 時 間 : **500h**
⊿C/C	
tan δ	
IR	

Rapid temperature variation test — qualified

	: ECWFE2W105J
Test Condition	試験温度 (T_a) : **-40℃ / 85°C** 時 間 : 200 CY
⊿C/C	
tan δ	
IR	

By using our proven high humidity-resistant resin, we have confirmed passing the high temperature and high humidity load test . Other tests have confirmed satisfactory results, and the effect is determined (reasonable based on resin property values)