WG Extended Mission Profiles

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AEC RW Detroit - April 2026

AEC USE STATEMENT

- The material shared in this presentation was discussed at the AEC Reliability Workshop in Novi, Michigan March 31 – April 2
- The information provides a status of the specific committee or workgroup, but until a standard is passed via ballot and released the material is subject to change

AEC Working Group per April 2026

WG Member	
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Mykola Blyzniuk	Melexis
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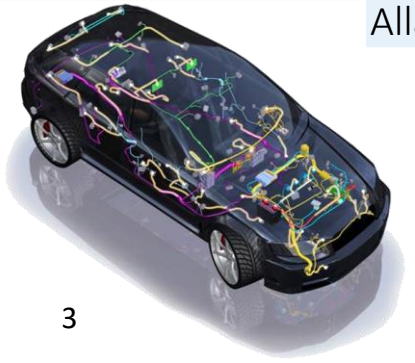


AEC WG on Extended Mission Profiles – Charter (1)

In scope:

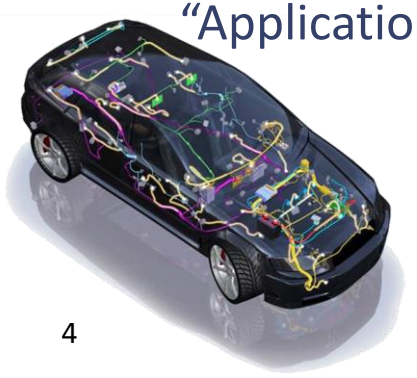
- Classes of Mission Profiles (e.g., via “extension” of the Q100 grade framework)

Not in scope:

- Standardized Extended Mission Profiles

Deliverables:

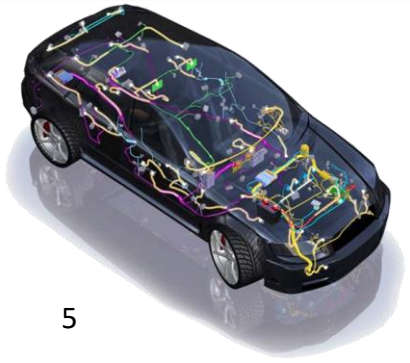
- Classes of Mission Profiles
- Qualification Requirements per “Class”
- Guidelines for assessing Extended Mission Profiles (Application of Robustness Validation)
- Guidelines for Tiers 1 how to judge whether a qualified part in “Class xyz” for “Application A” may fit in “Application B”



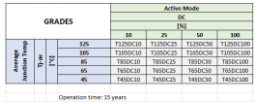
AEC WG on Extended Mission Profiles – Charter (2)

Approach & Schedule:

- Meeting every 3 weeks since kick-off on Feb 5th, 2025
- Report out to AEC, AEC-RW Eu 2025, Oct 8 – 9, 2026
- First Meetings with OEMs for consultation, March 2026
- Report out to AEC, AEC-RW US 2026, Mar 31 - Apr 2, 2026
- Second Meetings with OEMs for consultation, April 2026
- Draft Proposal H2 2026



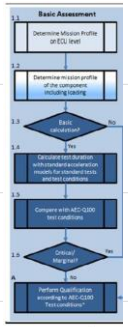
Classes of Mission Profiles – Overview of Proposals

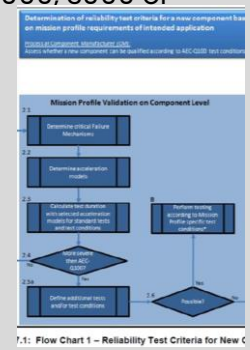
Proposal *	AEC-Q100 adaption	Classes	Reference
Fritz / Bosch	Standard AEC Grade Tamb +deltaT (for Tj) at Tamb,max	- HT-Class (e.g. 2000h at Tj=175, with evidence / Ea = xyz eV) - LT-Class (e.g. 20kh at -40°C) - TC-class (e.g. 2000 cycles @ 185°C / CM exponent 3.0)	Mission_Profile_proposal_V1.5.pdf
Matthias/ Aumovio	Standard AEC grades with Tj,avg and potentially adding grades	Active mode class (e.g. T125DC50 = Tj=125°C / DC = 50%)	
Mykola/ Melexis	Adding Grade 4 (0 to 70°C)	- Low Power Combustion (LPC) vs Electrical (LPE) and High Power Combustion (HPC) vs Electrical HPE) - LPE and HPE upto 60 kh operation - All LP: Tamb	Deliverable es V1_MBL_Propo
Jim/ Intel	- Standard AEC Grade Tamb +25°C (for Tj) at Tamb, max - adding Grade 4 (0 to 95°C)	Target EMP converted to (Tj-eff, t-eff, V-eff, f-eff) go to model per mechanism and pass/fail cirteria set for EMP	AEC WG on EMP l 16 2025_V1.0_Inte
Alan/ TI	Not needed, AEC-Q100 is minimum requirement, transform from Tamb to Tjunc	Not needed, instead communicate device capability in Lx/Bx terminology, e.g.: - Adopt 0.1% failure rate limit - Electromigration : EM-L0.1 : 100,000 POH @105C	AEC-EMP-TI-Prop discussions 5-7-2

* These proposals are from the individual WG members and do not necessarily reflect an aligned company position

Towards Qualification Requirements…

Scope:	Temp-Time Profiles			
	AEC-Q100-class	**HT-class**	**LT-Class**	**RV-Class**
Lx is Life Percent	L1%	L1% or L0.1%	L1% or L0.1%	
Grade 0	Ta 150 °C / 1000 h	e.g., Tj 175°C / 200(	e.g., Tj 25°C / 10000 h	Per Failure Mechanism; e.g. EM: L0.1% / Tj 105°C / 100.000h
Grade 1	Ta 125 °C / 1000 h	e.g., Tj 150°C / 200(	e.g., Tj 25°C / 10000 h	
Grade 2	Ta 105 °C / 1000 h	e.g., Tj 125°C / 200(	e.g., Tj 25°C / 10000 h	
Grade 3	Ta 85 °C / 1000 h		e.g., Tj 25°C / 10000 h	
Grade 4	Ta 70 °C? / 1000 h		e.g., Tj 25°C / 10000 h	
Use case	12000 h / 15 y			
	Flow A (Appx 7)	**Flow B (Appx 7)**		**Flow C (Appx 7)**
Remarks	-	This approach needs models to be used for projecting on a Mission Profile Validation does not necessarily mean that you have product reliability test results We need to avoid product level validation for 2000, 3000 or 4000h (expectation / requirement) Suitable for commodity products?		This approach needs models to be used or projecting on a Mission Profile (White Paper) Not easy to standardize Advantage: more detailed statement around Mission Profile Capability Product level, or at IP level will only work in direct contact between supplier and user Use reference models and parameters (conservative) to start with, case by case a supplier can use different parameters or refer to an own white paper white paper With lead customers





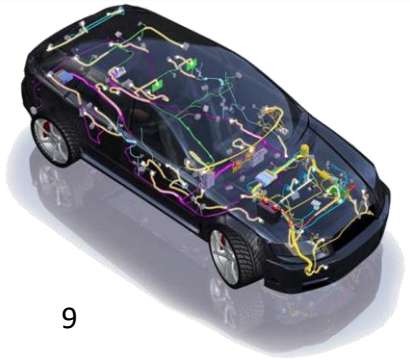
Framework Idea (Based on 6 Proposals Discussed in WG)

First focus is on operation and Temp-Time Profiles

Class	**Basic grade**	**E-grade**	**E+ grade**
	12.000 POH (POH: Power On Hours)	**65.000 POH**	**131.000 POH**
Qualification	HTOL 1000 h at Tamb (Grade)	HTOL 1000 h at Tj,max and Parameter Shift Analysis on Key Parameters with Extrapolation (until 2000 h)	HTOL 2000 h at Tj,max and Parameter Shift Analysis on Key Parameters with Extrapolation (until 4000 h)
		or, 2000 h at Tj, max	
Discussion ongoing		and, HCI requirement (Group D - Test D3), or aging simulation?	and, HCI requirement (Group D - Test D3), or aging simulation?
	on 3 lots / 77 pcs	on 1 lot / 77 pcs (plus 3 lots / 77 pcs for Basic Grade)	on 1 lot / 77 pcs (plus 3 lots / 77 pcs for Basic Grade)
Component Classification	Grade 0	Grade 0E	Grade 0E+
	Grade 1	Grade 1E	Grade 1E+
	Grade 2	Grade 2E	Grade 2E+
	Grade 3	Grade 3E	Grade 3E+
Discussion ongoing	Grade 4?	Grade 4E?	Grade 4E+?
Reliability Specification	nr. POH at Tj,high-ref / Ea to be used	nr. POH at Tj,high-ref / Ea to be used	nr. POH at Tj,high-ref / Ea to be used
(to be used by Tier1/OEM)	nr. POH at Tj,low-ref	nr. POH at Tj,low-ref	nr. POH at Tj,low-ref
Example	Qualification : 1000 h at Tamb 105 °C	Qualification : 2000 h at Tj 150 °C	Qualification : 2000 h at Tj 150 °C with PSA
	Comp. Class : AEC-Q100 Grade 2	Comp. Class : AEC-Q100 Grade 1E	Comp. Class : AEC-Q100 Grade 1E+
	Rel Spec : 8 kh at Tj,high-ref = 95°C (Ea = 0.7 eV) 2 kh at Tj,low-ref = 25 °C	Rel Spec : 50 kh at Tj,high-ref = 105°C (Ea = 0.6 eV) 20 kh at Tj,low-ref = 25 °C	Rel Spec : 131 kh at Tj,high-ref = 80°C (Ea = 0.6 eV) 40 kh at Tj,low-ref = 25 °C

Some Comments to Framework Idea

- Are all extended grades needed?
- Aging simulation for e.g., HCI are difficult to capture in a standard requirement.
- Reliability Specification is covering a failure level e.g., 0.1% after 50 kh at 105 °C, is there a need?
- Any framework proposal needs to validated against already released products for EMP by several companies: will this work in practice?
- Note: this proposed framework has presented to OEMs BMW/ Volkswagen/ Audi; feedback to be expected in April 2026.



Discussion and Q&A