Orbit-Ready

Long-Term Conservation and Relifing of Space Electronics

Holger Krumme, Fabian Zentner and Christian Melzer | HTV Conservation GmbH | ACCEDE | 27.03.2025

Securing the future of orbit

Long-term storage and relifing of electronic components

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Obsolescence management

Foresighted planning of electronic component availability

Component storage

Problematic ageing phenomena

TAB® procedure

Optimised storage of electronic components

Relifing for the space sector

Strategic safeguarding of your space project

ALTER | HTV - Facts

Year of foundation: 1986 / CEO: Holger Krumme & Christian Wilps / Number of employees: around 140

HTV Halbleiter-Test & Vertriebs-GmbH

- Component test
- Component programming
- Component processing
- HTV Academy

HTV Conservation GmbH

- Institute for Material Analysis
- Long-term preservation and storage

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Obsolescence

Product life cycle

SOP: Start of Production

NRND: Not Recommended for New Design

PCN: Product Change Notification

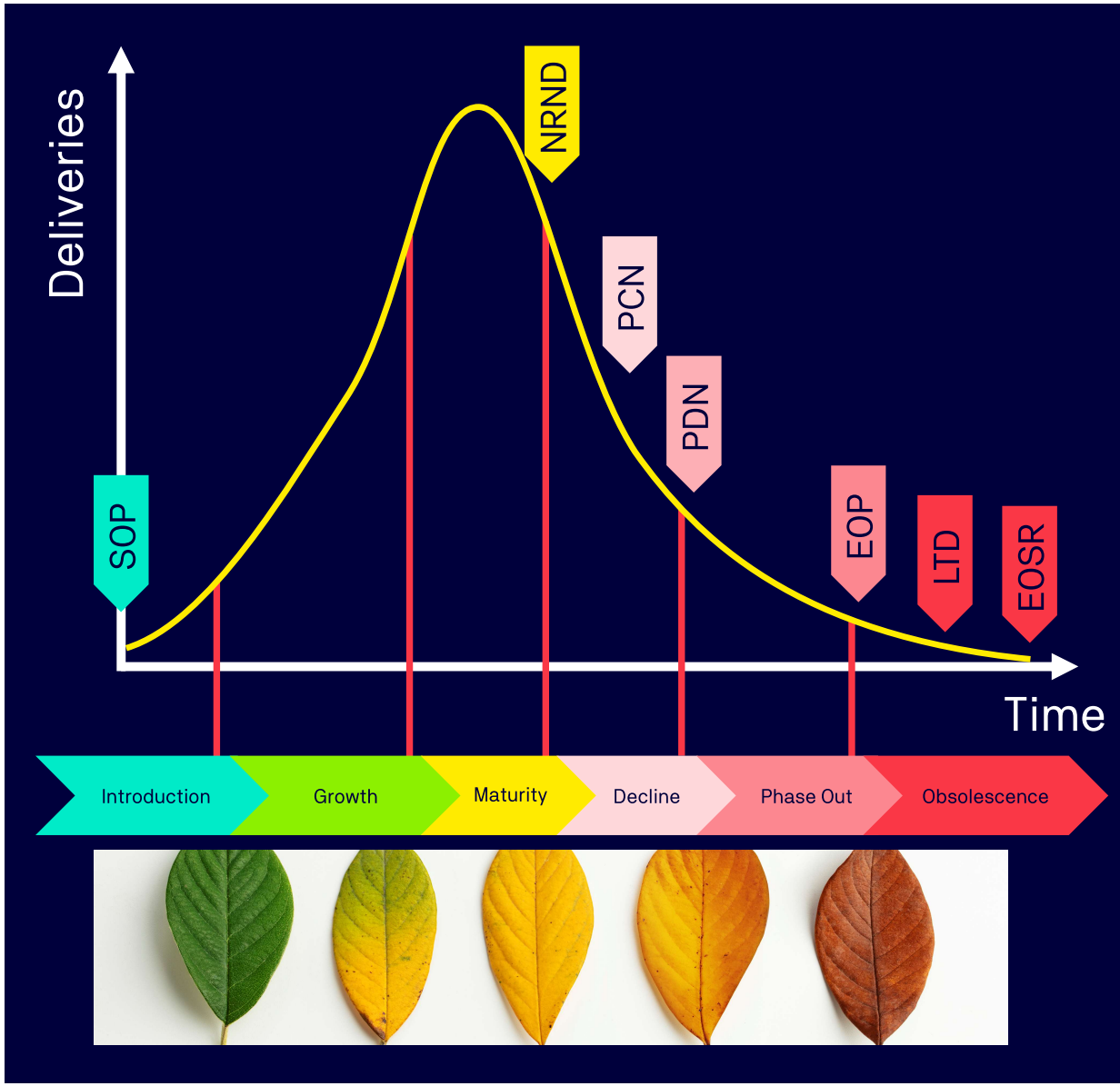
PDN: Product Discontinuance Notification

EOS: End Of Sale

EOP: End Of Production

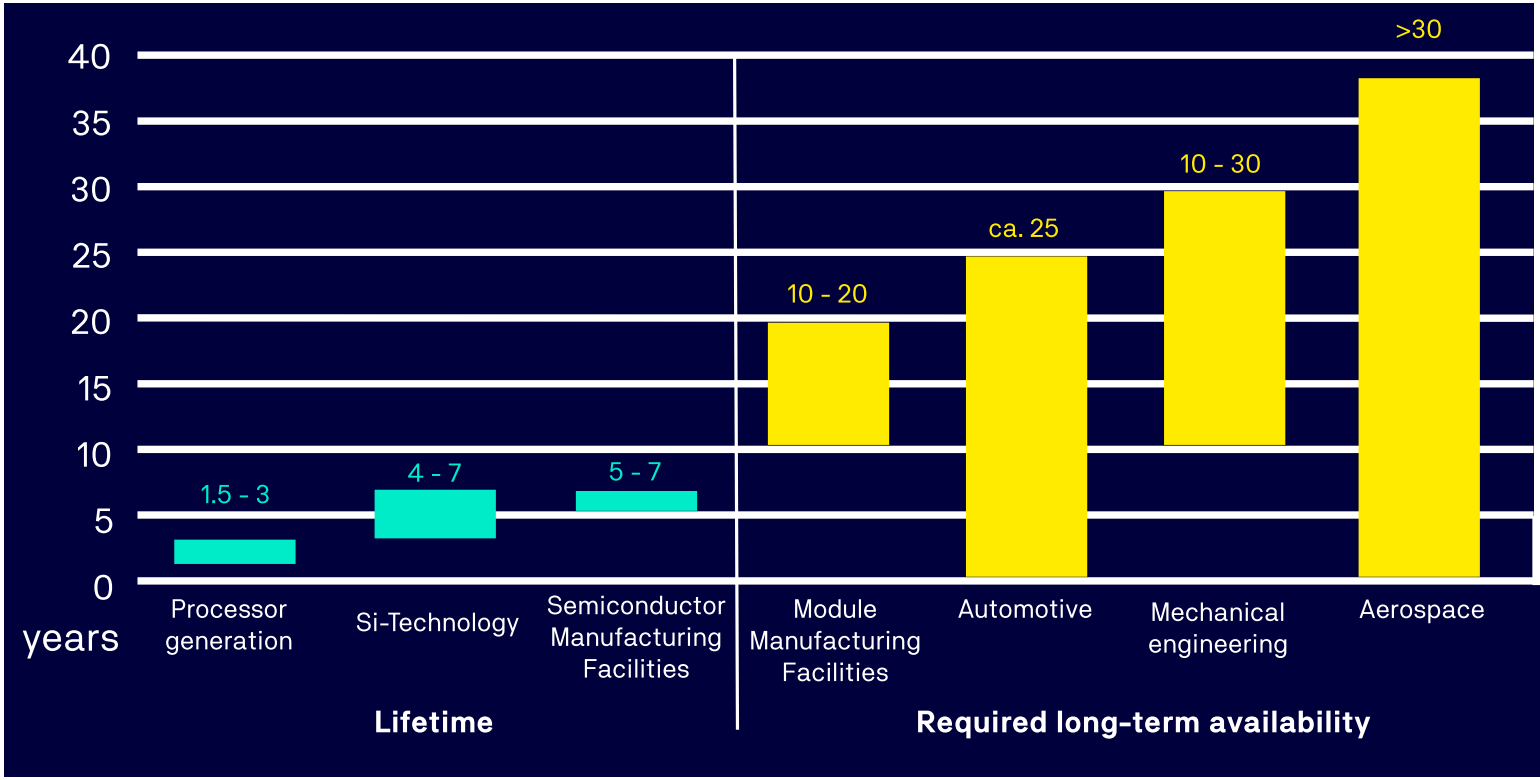
LTD: Last Time Delivery

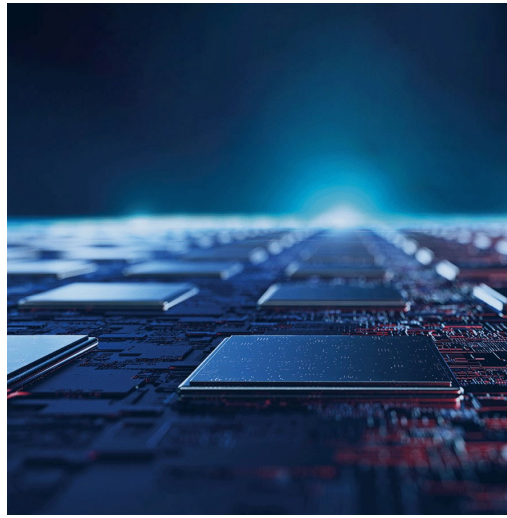
EOSR: End Of Service and Repair



Obsolescence

Service life versus required long-term availability





Discontinuation of components before the end of the product life cycle

Obsolescence

Management from reactive to strategic

Reactive	Proactive	Strategic
Obsolescence management (OM)		
Action after EOL message ⇨High risk	Action before EOL message ⇨Extended action	Long term strategy, regular forecast and cost analysis along the entire life cycle ⇨Predictive action
Actions		
• Last-time buy • **Long-term storage** • After market supply • Redesign …	• Reactive OM • Risk assessment • Life cycle analysis • Partnership and contracts with distributor • Electronic monitoring of key components • Cyclic coordination …	• Reactive OM • Proactive OM • Second source strategy • Stock management • Sustainable design • Alternative design …

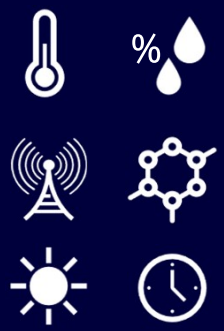
EOL: End of Life

Component storage

Ageing

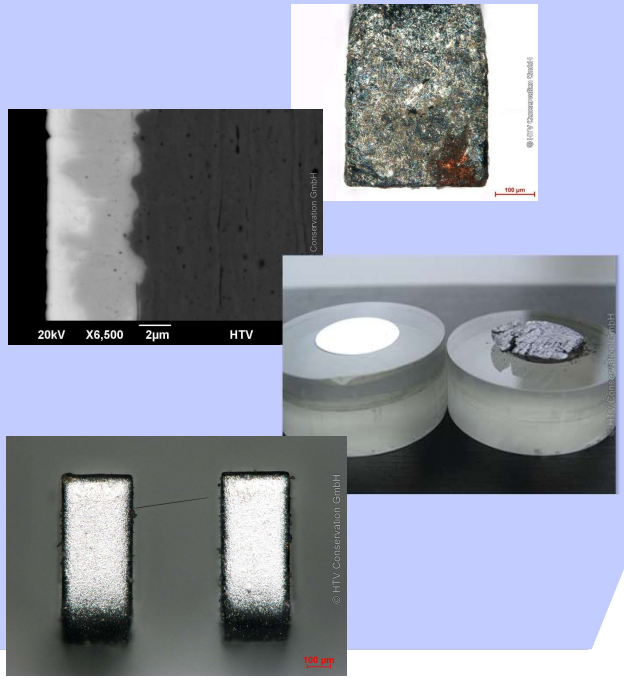
External influence

- Humidity
- Radiation
- Temperature
- Outgassing
- Time



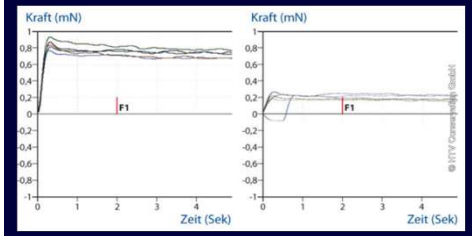
Ageing phenomena

- Internal diffusion
- Delamination
- Popcorn effect
- Intermetallic phase growth
- Corrosion
- Whisker growth
- Tin pest
- ...



Result

- Loss of processability



- Loss of function

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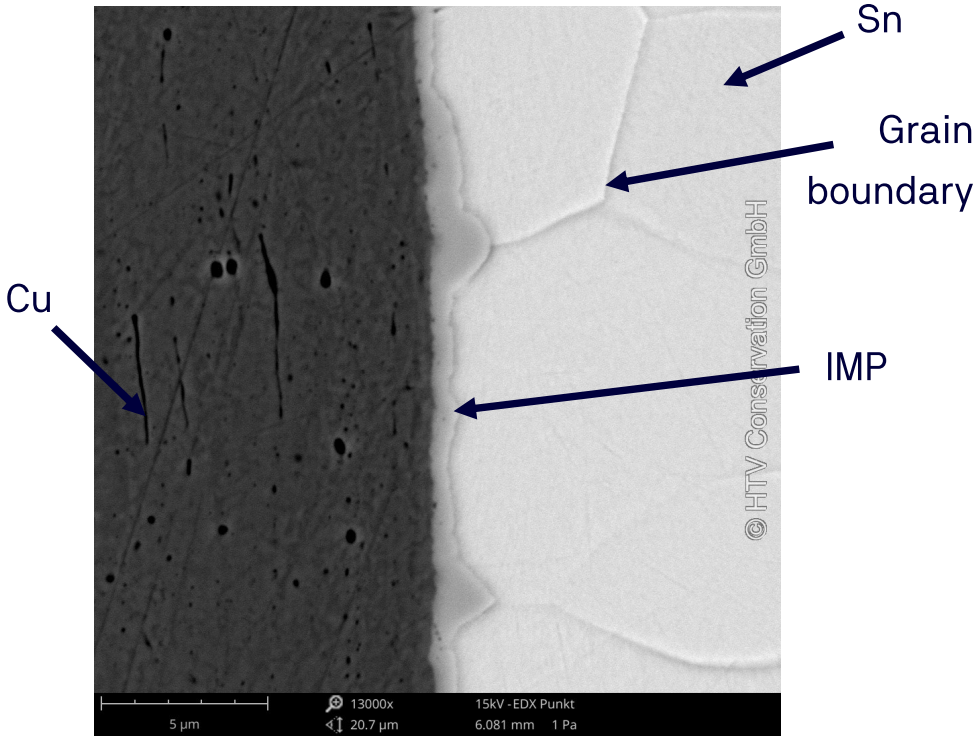
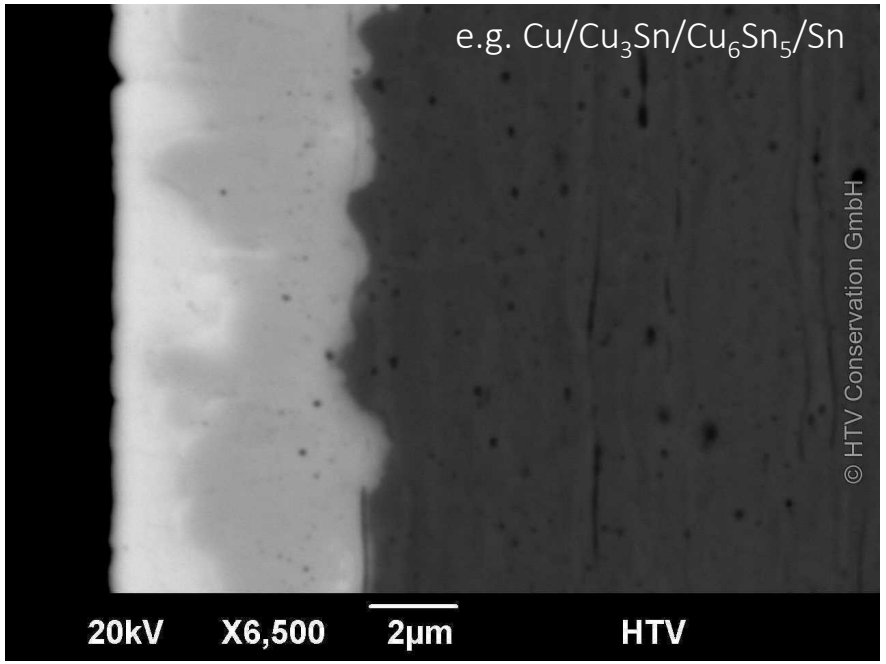
Aging phenomena

Intermetallic phase growth

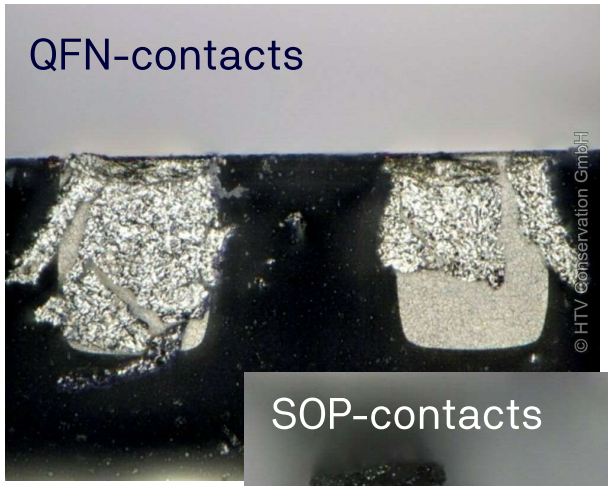


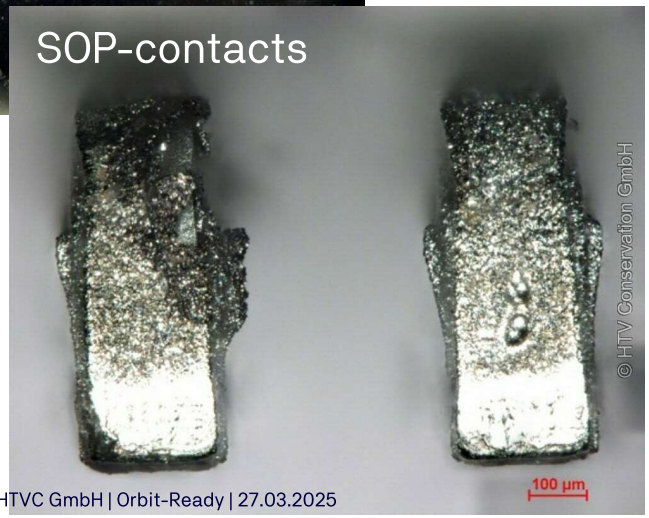


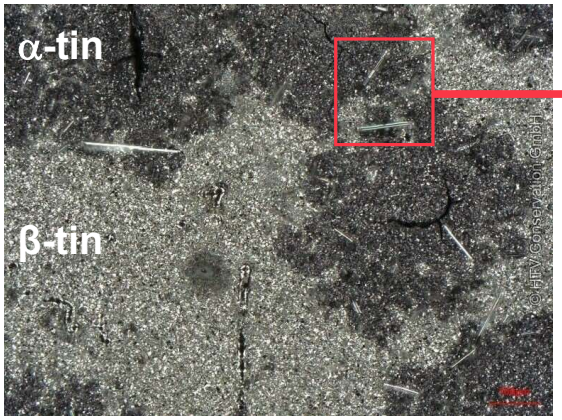
- IMP growth thermally driven
- IMP affects processability

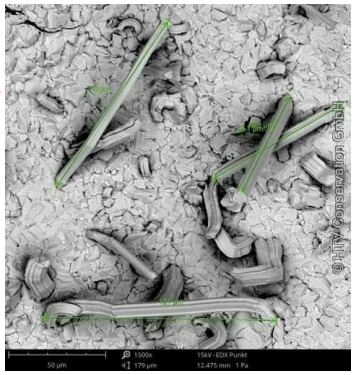
Aging phenomena

Tin pest

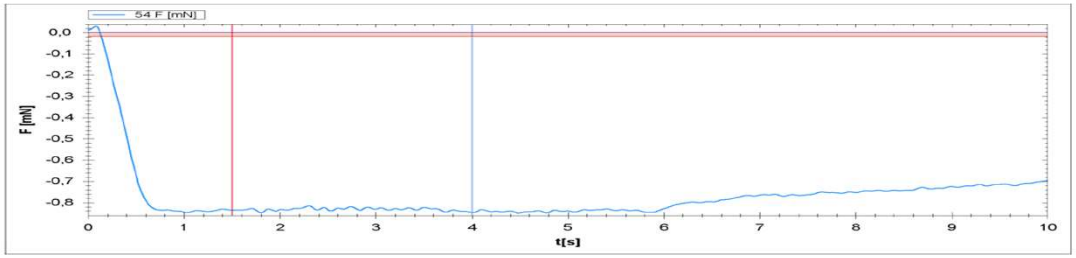








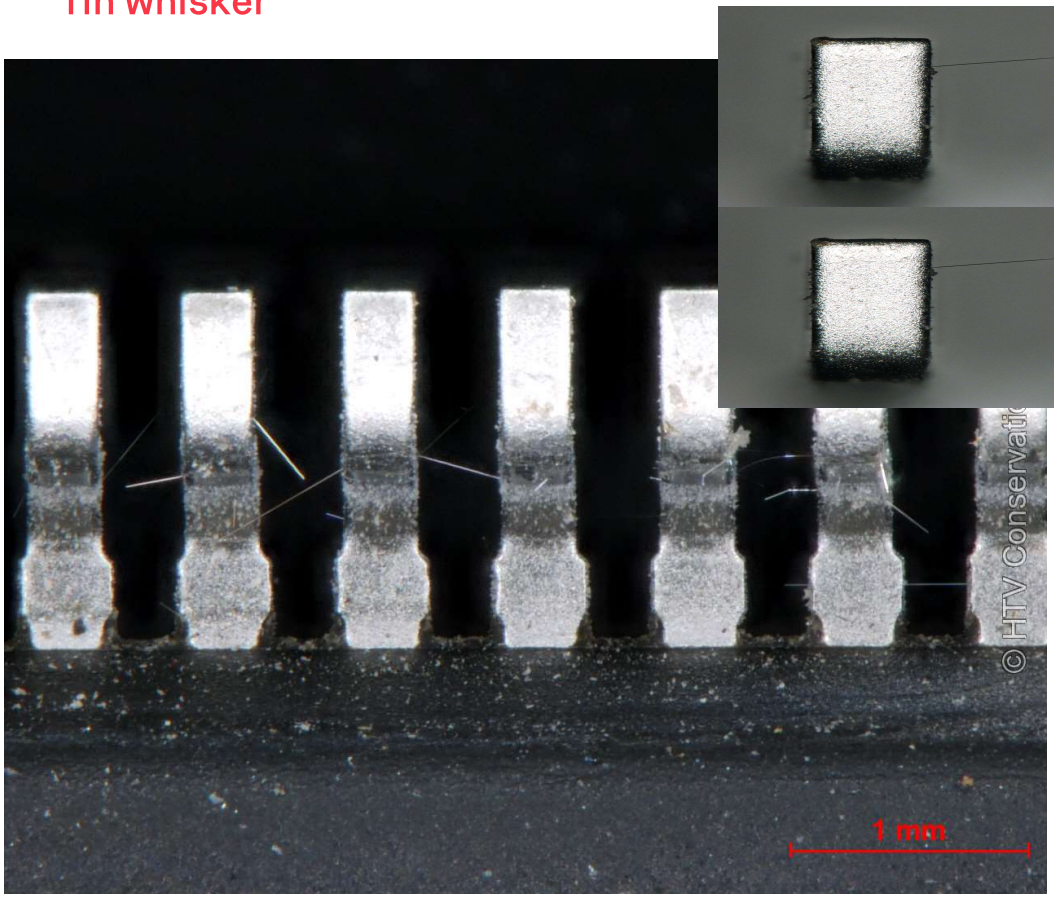
Tin pest triggers whisker growth

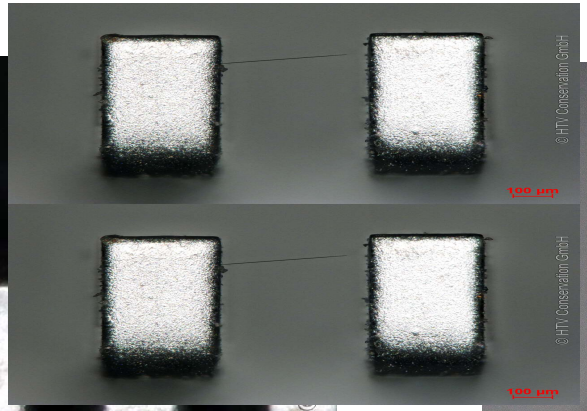


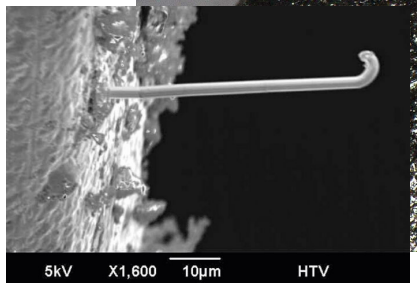
- Tin pest degrades β-tin to mechanically weak α-tin
- Tin pest possible below 13,2°C
- Tin pest infected devices hardly processable

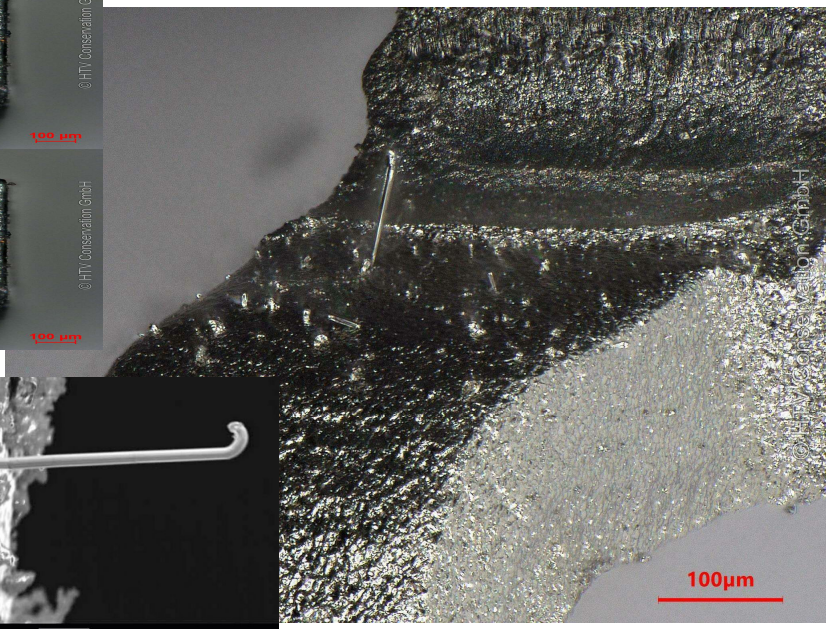
Aging phenomena

Tin whisker





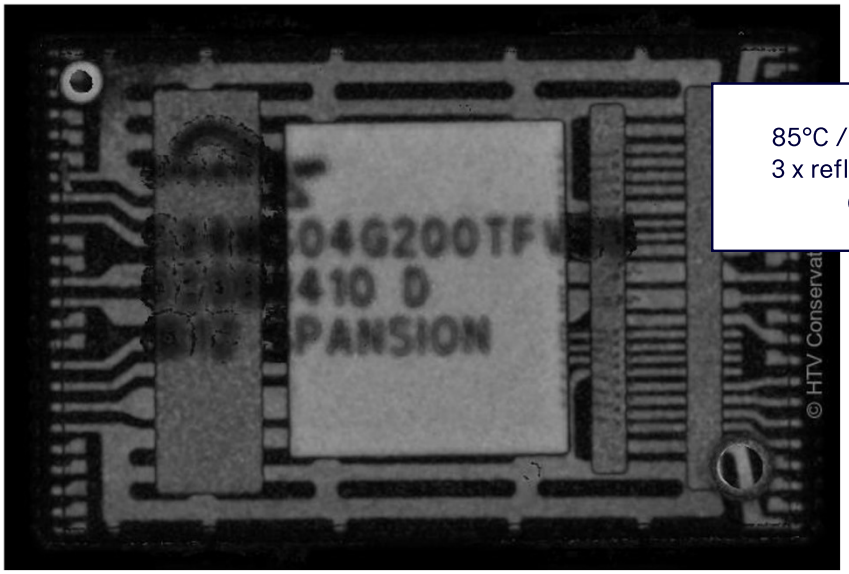




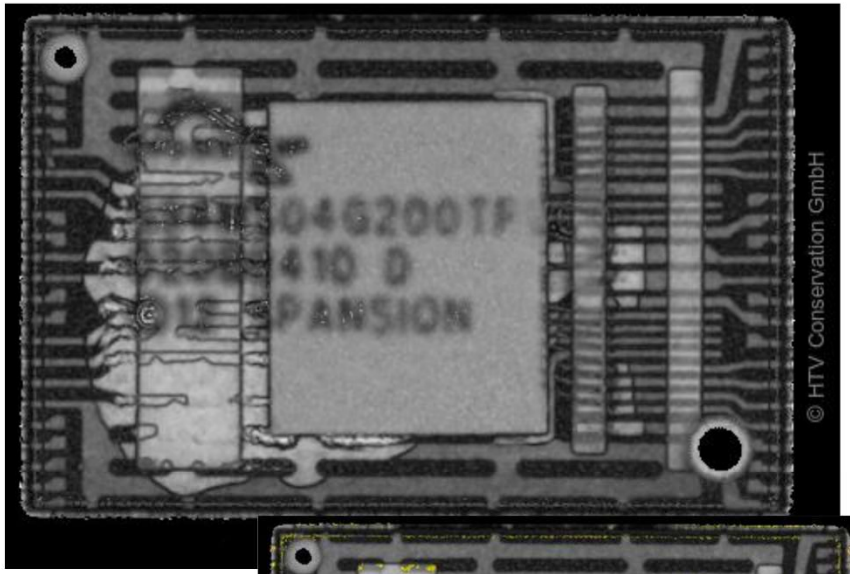
- Whiskers at gullwing contacts
- Whisker growth stimulated by stress
- Whiskers might bridge contacts

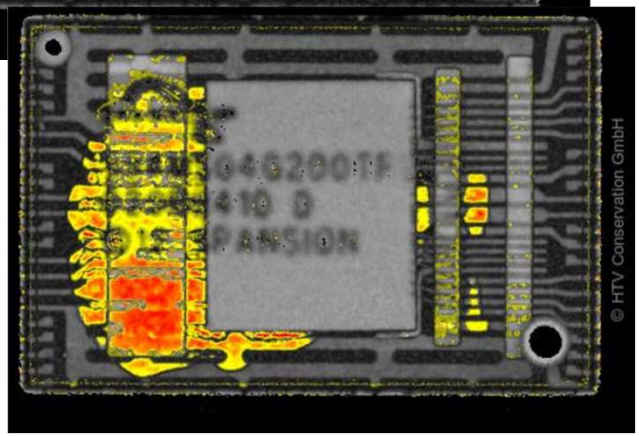
Aging phenomena

Popcorn effect



85°C / 85% RH / 168h
3 x reflow J-STD-020,
@260°C

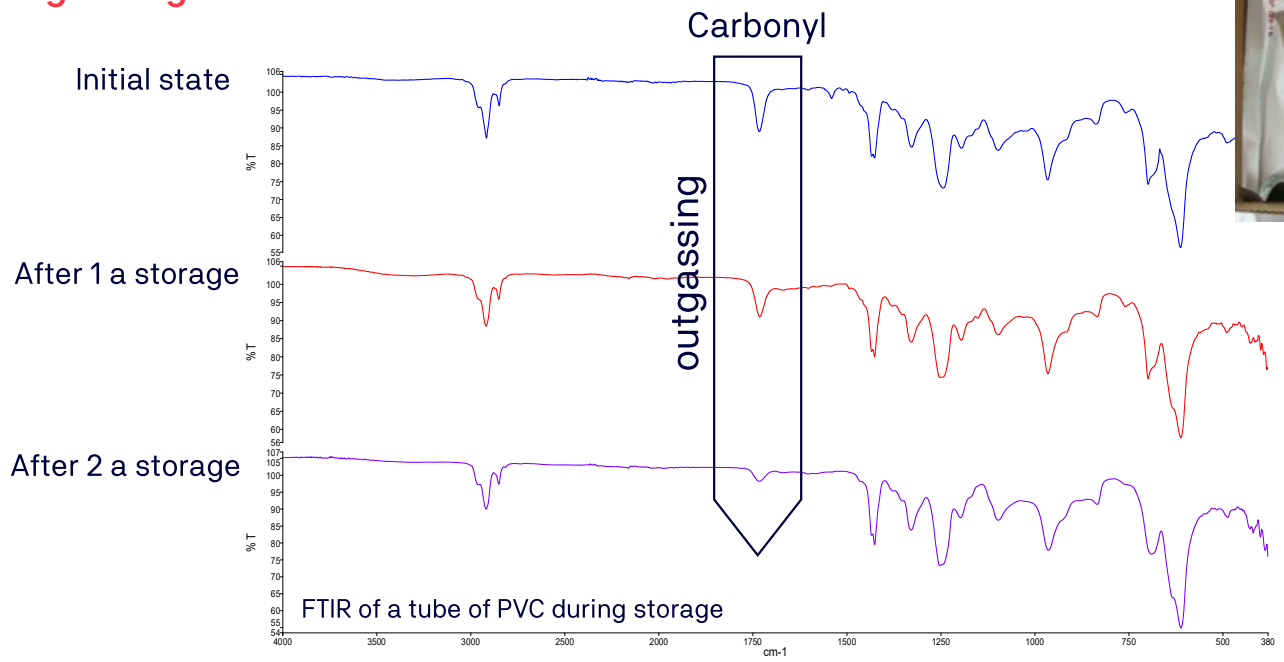


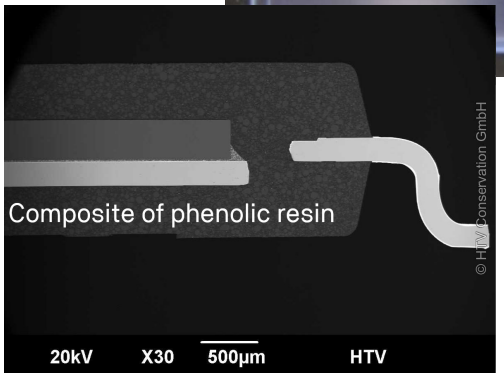


- SAM-inspection of a SOP48 flash memory
- Package cracks due to vapor penetration
- Internal delamination

Aging phenomena

Outgassing





- Outgassing a risk for electronic components
- Manyfold sources down to the component package

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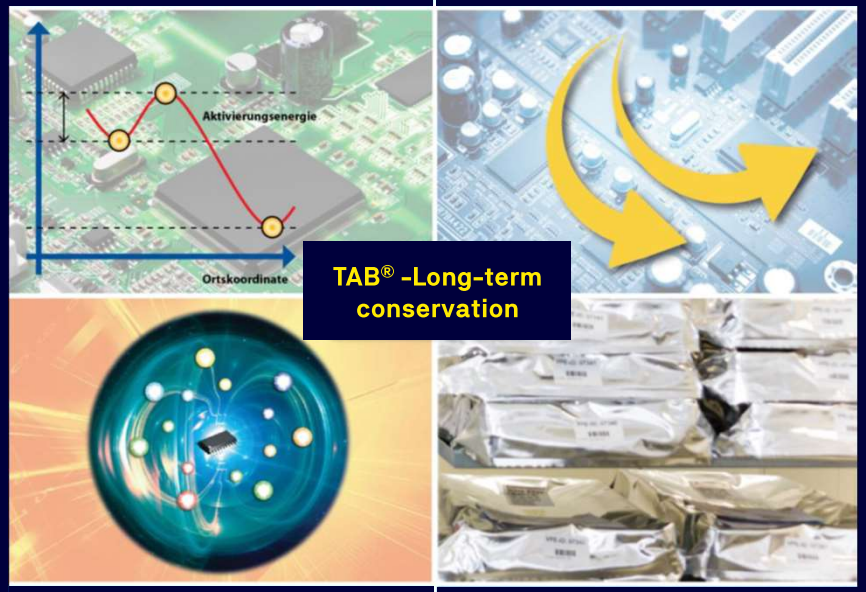
TAB®-Procedure

Thermal-absorptive gas-treatment

Reduction of almost all relevant ageing processes

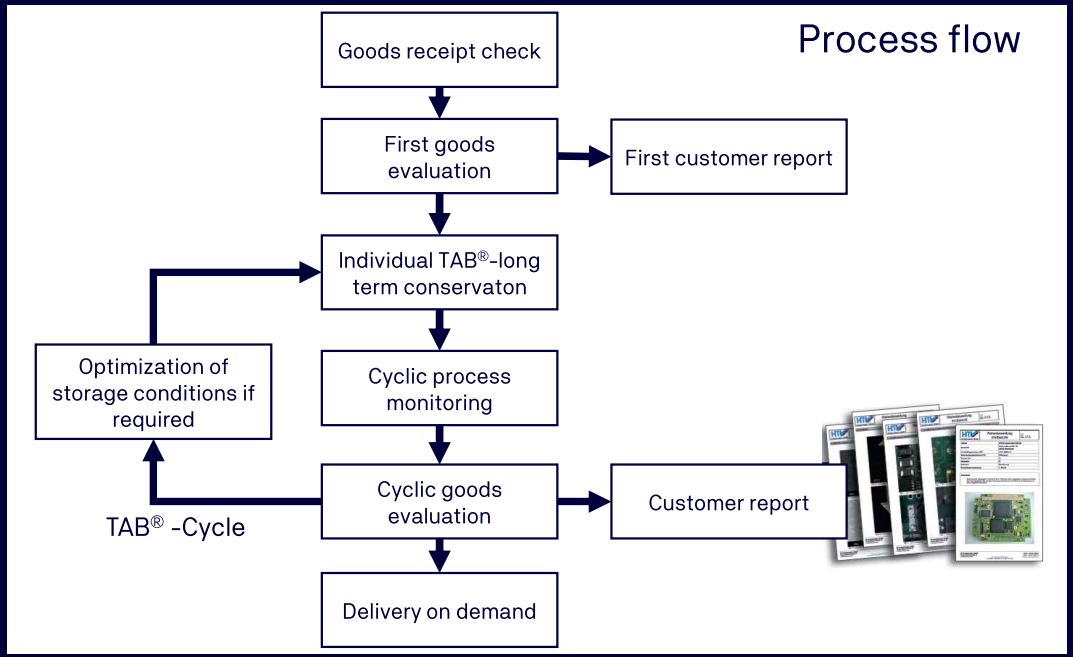
Reduction of internal and external diffusion through specifically customised temperature reduction

Absorption of pollutants by different special absorbers



Conserving storage atmosphere

HTV- special functional packaging



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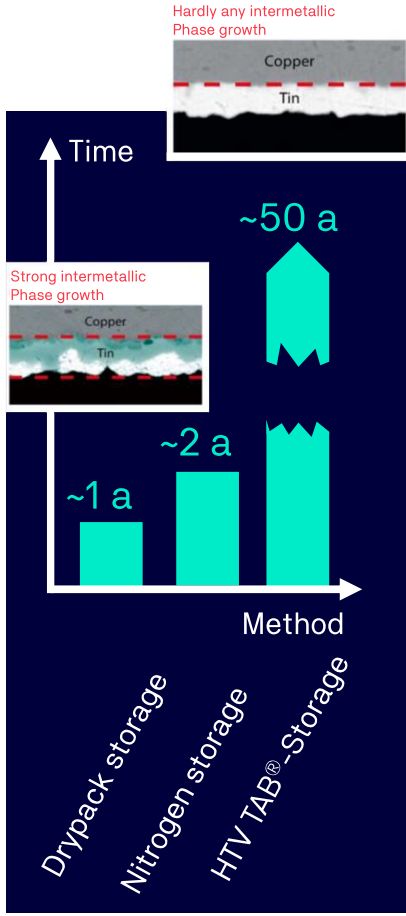
TAB®-Procedure

Long-term storage under optimal conditions

Risk	N2 Drypack		Corrosion protection film		HTV-TAB®	
	Effect	Valuation	Effect	Valuation	Effect	Valuation
Diffusion	unchanged	--	unchanged	--	Drastic reduction & cyclical control	+
Humidity	reduced	-	unchanged	--	Specific reduction & control	+
Oxygen	reduced	-	unchanged	--	Oxygen-free & preservative atmosphere	+
Pollutants						
- Corrosive gases	unchanged	--	Reaction with packaging , degradation products	-	Absorption	+
- Hydrogen sulphide	unchanged	--	Reaction with packaging , degradation products	-	Absorption	+
- Sulphur dioxide	unchanged	--	Reaction with packaging , degradation products	-	Absorption	+
- Chlorine gases	unchanged	--	Reaction with packaging , degradation products	-	Absorption	+
- Solvent	unchanged	--	unchanged	--	Absorption	+
- Additives	unchanged	--	unchanged	--	Absorption	+
- Ammonia	unchanged	--	unchanged	--	Absorption	+
Tin pest	not tested	--	not tested	--	Cyclically analysed	+
Whisker	not tested	--	not tested	--	Cyclically analysed	+
Process control	not carried out	--	not carried out	--	Performed cyclically	+
Cyclical valuation	not carried out	--	not carried out	--	Carried out	+
Security	not defined	-	not defined	-	High security storage	+
Suitable for	• Interim storage		• Metallic components • Transport • Interim storage		Long-term storage of electronic and mechanical components for up to 50 years	



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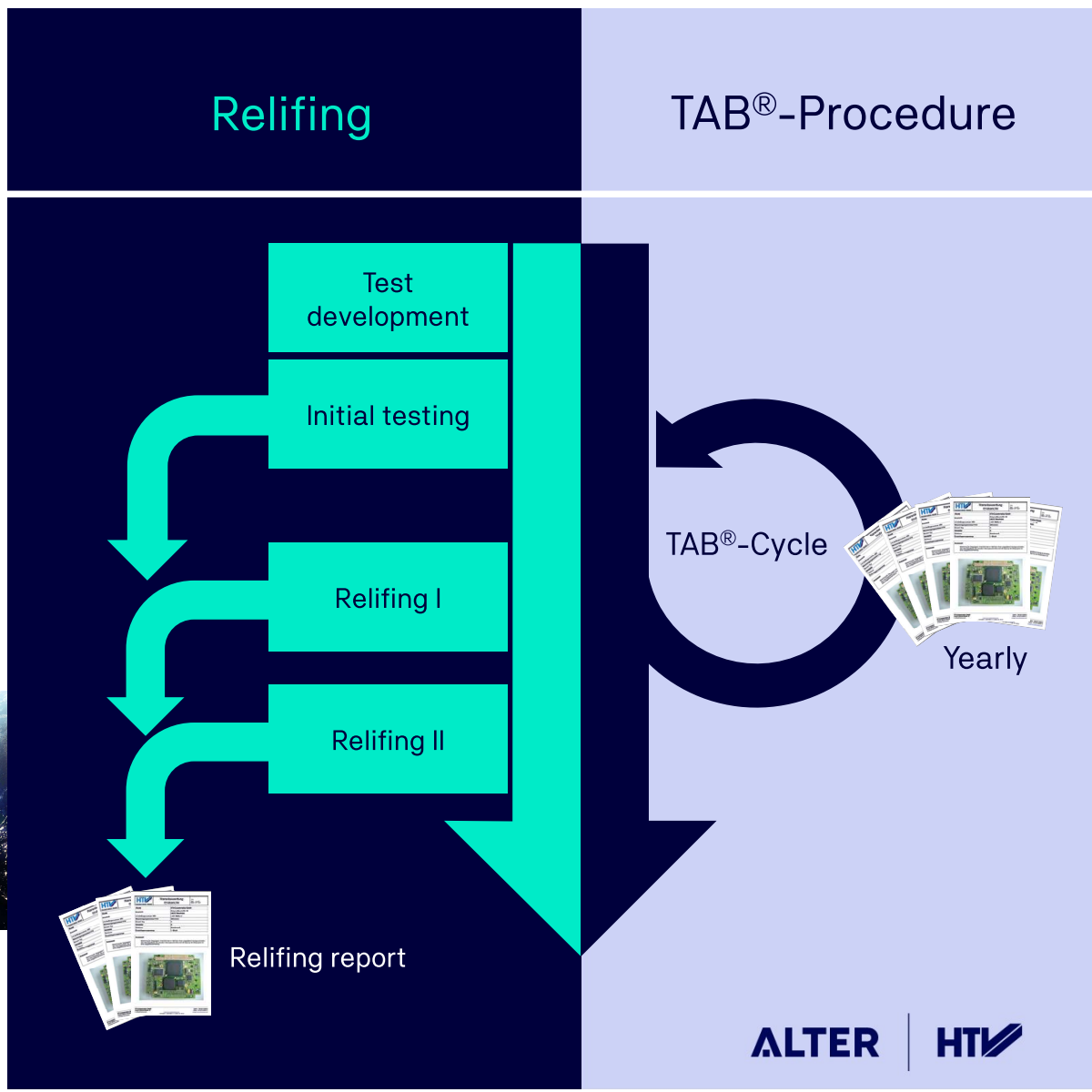
Relifing

of electronic components | EEE parts according to ECSS-Q-ST-60-14C

Relifing is a quality control measure in which electronic components for space applications are

- stored as planned,
- tested periodically,
- and removed in a controlled way.

Relifing is part of systematic obsolescence management in the space sector



Relifing

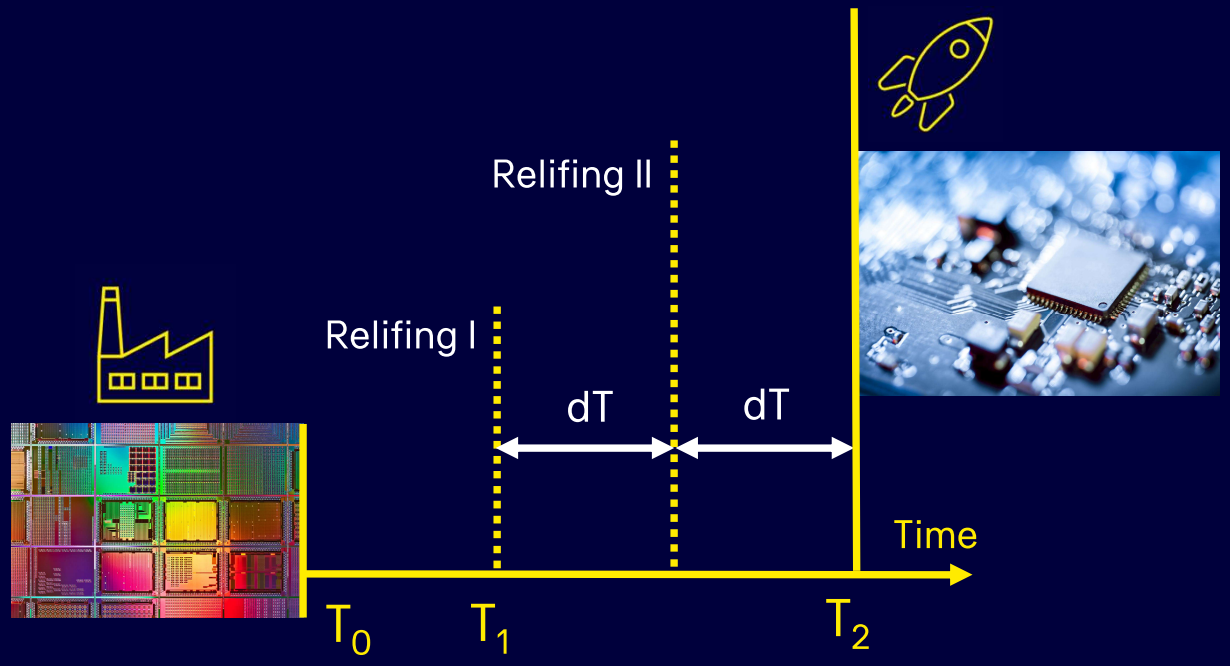
Relifing periods according to ECSS-Q-ST-60-14C

T_0 : Production of the EEE component original date code

T_1 : Max. possible storage period without relifing (7 years)

T_2 : Max. possible storage period between manufacture and installation (15 years)

dT: Maximum permitted storage period after one relifing, which can be repeated once (4 years)



Relifing

Tests according to ECSS-Q-ST-60-14C

Class 3	Class 2	Class 1
	• Seal test	

- External visual inspection
- Electrical tests
- Specific tests (e.g. solderability...)

Relifing report

- Detail of the lot
- Test details
- Test results
- 👍 / 👎
- Relifing DC

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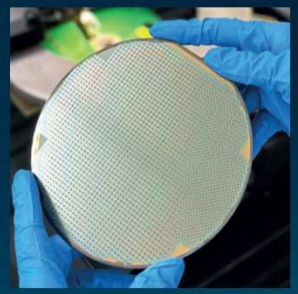
Your service centre for electronic components

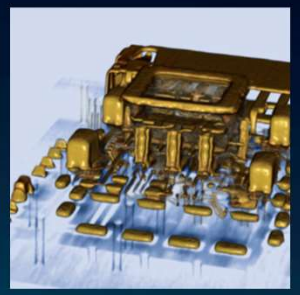
Test house



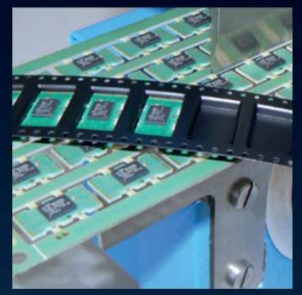
Component programming

Long-term preservation

Institute for Material Analysis



Component processing



Thank you for your attention

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HTV - Facts

Service provider for electronic components

Year of foundation: 1986

CEO:
Holger Krumme, Christian Wilps

Number of employees: around 130

One of the world's largest providers of services for electronic components:

- Component test
- Component programming
- Long-term preservation and storage
- Institute for Material Analysis
- Component processing
- Development and research projects
- HTV Academy

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ALTER | HTV within TÜV NORD GROUP

TÜVNORDGROUP

Mobility
Intermodal connected transportation

Industry
Security for the digital industry

Energy & Resources
Advancing the change in energy sources

Digital & Semiconductor
Essential technologies for a digital world

Certification
Certifications create trust

People & Empowerment
Empowering people and making them stronger

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Business Unit Digital & Semiconductor

Key figures for the financial year 2023

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115

Revenue
in Million €

655

Employees
FTE on avarage

38

Years
in the market segment

12

Locations
weltweit

8.000

Square meters
of research laboratories

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BU – in a nutshell

We enable essential technologies for a digital world

Shaping values

We support the building of trust by bundling the foundations of trust.

Think ahead

Realize your goals based on our complementary services.

Mastering complexity

Your knowledge center for converging digital technologies.

Aerospace ++ Aviation ++ It & Telecommunications ++ Automotive ++ ++ Medical ++ Defense ++ Energy ++ Nuclear++ ...

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Stronger together

Most important locations of the BU Digital & Semiconductor

HTV - Facts

Service provider for electronic components

HTV Halbleiter Test- und Vertriebs GmbH

- Electrical test
- Programming
- Packaging

COTS market

HTV Conservation GmbH

- Component analysis
- Material analysis
- Long-term storage
- Cyclical commodity valuation
- Relifing

HTV Academy

- Internal & external training

- Aerospace
- OSAT services
- Engineering
- Qualification
- Procurement

ALTER TECHNOLOGY

BU Digital & Semiconductor

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