ENVIRONMENTAL SIMULATION, COMPONENTS, TECHNOLOGY

HALT (Highly Accelerated Life Test)

Reliability is <u>the</u> benchmark for a product.

Potential weak points must be - if possible - already recognized and eliminated in the development phase.

This fact is known – at time the implementation is difficult.

There exist a chance: **HALT**

With HALT we search weak points

The HALT-method is able to detect failure characteristics of system units, which are assembled with electronical, electrical, mechanical, electro-mechanical, etc. components.

The units will be stressed by extreme thermical, mechanical and/or product specific stress situations,

- independent of specification measures
  - till to malfunction
  - till to destruction

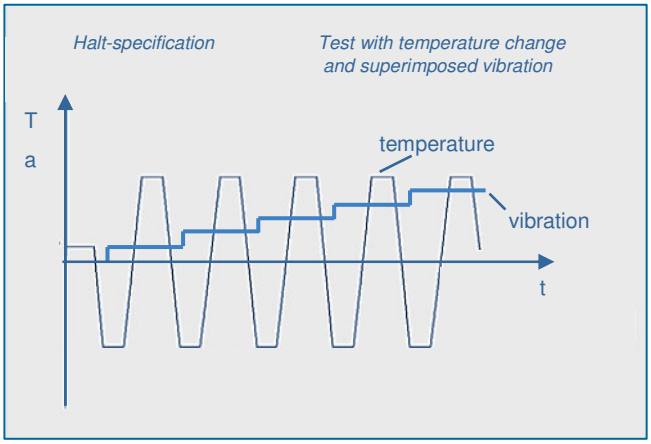
HALT allows in short time

- to recognize weak points
- to optimize the product

HALT- and product-engineers together

- define the tests
- carry out the tests
- work out improvements
- find the way to a reliable product

Highly Accelerated Life Test (HALT) equipment



Combined test with temperature shock and vibration

We carry out tests

- by Qualmark-Standard
- by customer specific requirements

We consult and assist you in matters of

- questions to test planning
- preparation of the test setup
- selection of specific tests
- improvement measures

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HALT-Test Equipment

Technical Data

	Weight UUT	Dimensions H x B x T	Volume	Comment
Allowable dimension / weight of test idem	max. 200 kg	0,78x0,78x0,9 m³	max. 0,4 m³	chamber loadable through 2 doors
	Frequency spectrum	**Accelerations**	**Exitation / process**	**Comment**
Vibration	20 – 10.000 Hz	bis 50 g_{rms}	pneumatic frequence noise	test procedures programmable manual adjustable
	Temperature range	**Temperature gradient**	**Exitation / process**	**Comment**
Temperature	-100° bis +200°C	bis Δ T_{max} : 60 K/min	Nitrogen cooling Electrical heater	test procedures programmable manual adjustable

HALT-standard test procedure

(1) Stress the product in a unlimited way to work out the "upper & lower operation limit" (UOL, LOL) and " upper & lower destruction limit" (UDL, LDL), by

- ➔ **Thermal step stress (max. range: - 100°C/ + 250 °C)**
- ➔ **Rapid thermal transitions (up to $\triangle T_{max}$: 60 K/min)**
- ➔ **Vibration step stress (up to 50 g_{rms})**
- ➔ **Combined environment (thermal + vibration stress)**
- ➔ **Product specific stresses (power cycling, load variations, etc.)**

(2) Investigate the root cause for the 1st UDL & LDL
➔ 1st weak point !

(3) Find a solution for elimination of the weak point (implement it or repair it)

➔ **Repeat steps (1) to (3) for 2nd UDL & LDL**
➔ 2nd weak point !

➔ **Same for ➔ ...3rd, 4th, ... weak point**

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