



# **HALT (Highly Accelerated Life Test)**

## **REPORT**

**G-TWI25/100EE**

**01/02/2016**

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## SUMMARY

The following table summarizes the product operation maximum limits as were observed during the HALT procedure conducted by the HALT & HASS procedures  
Functional test were performed during the test according to ELMO's set up.

UUT undergone the testing.

<b>Minimum Operation Limit Temperature</b>	-30 °C
<b>Maximum Operation Limit Temperature</b>	70 °C
<b>Maximum Operation Limit Vibration</b>	10.0 gRMS
<b>Maximum Operation Limit Cold Start</b>	-30 °C
<b>After combined cycling test, the customer performed additional Hot Thermal test and At 105°C UUT stop function after 2 minutes and recovered to work at room temp.</b>	

### Statement of Compliance with test requirements:

The G-TWI25/100EE were tested to comply with the methodology of the applicable HALT & HASS test specification.

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## 1. INTRODUCTION

### 1.1. PURPOSE

The purpose of this report is to determine the G-TWI25/100EE operation limits by performing a Highly Accelerated Life Test (HALT).

### 1.2. LAB'S ENVIRONMENTAL CONDITIONS

Parameter Name	Parameter Value	Tolerance Value	Measure Unit
Temperature	25	$\pm 10$	Degree Celsius ( $^{\circ}\text{C}$ ).
Humidity	55	$\pm 27$	% R.H.
Mains Voltage	230	$\pm 23$	Volts
Mains Frequency	50	$\pm 2$	Hertz
Site Air Pressure	760	$\pm 5$	mmHg
	1012	$\pm 5$	millibar

## 2. THE HALT PROCEDURE

### 2.1. ADDITION OR EXCLUSION FROM THE TEST METHOD

None.

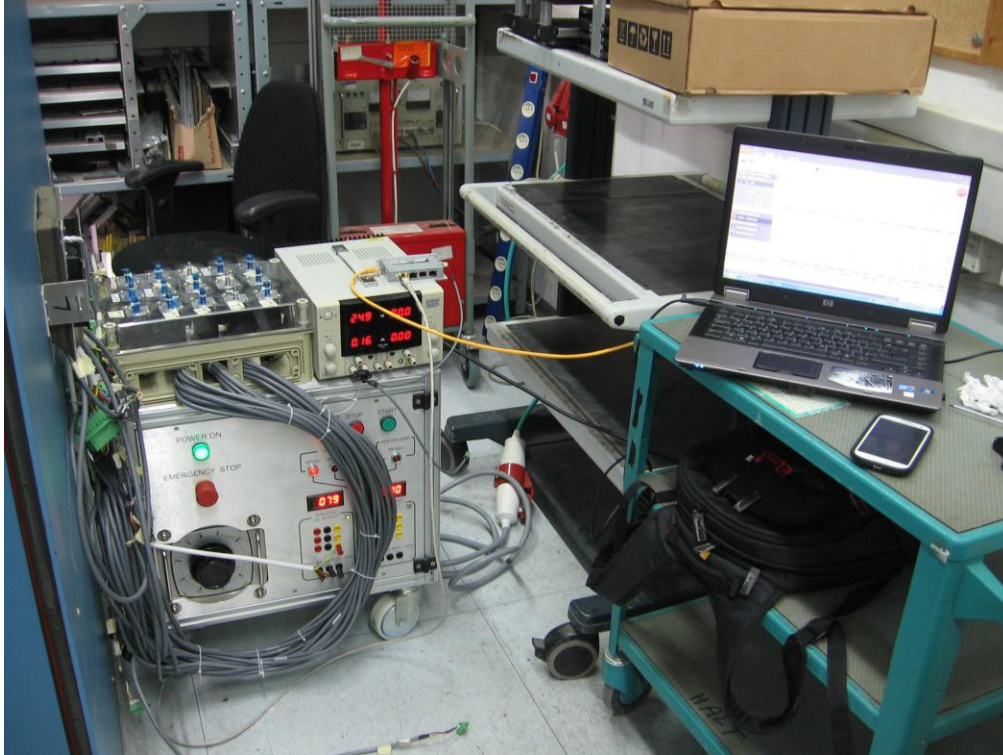
### 2.2. HALT PROCEDURE STAGES

The table below describes in details the procedures potential steps parameter during HALT process.

Step No.	Test Name	From	To	Step Description	Period
1.	Low Temperature	0 °C	-30 °C or until stops functioning	Reduction of -10 °C intervals.	Dwell time: at least 10 minutes in each step.
2.	Cold Start	0 °C	-30 °C or until: 1. UUT does NOT turn-on successfully. 2. Performance degradation.	<ul style="list-style-type: none"> <li>- Reduction of -10 °C intervals at Each step.</li> <li>- Operate the UUT for at least 10 Minutes.</li> <li>- Power off the UUT for 10 Minutes.</li> <li>- Power on the UUT and wait one Minute for an operation sign.</li> <li>- In case of failure, increase the temperature at 20 °C and operate The UUT.</li> </ul>	
3.	High Temperature	0 °C	+70 °C or until stops functioning	Increase of +10 °C intervals.	Dwell time: at least 10 minutes in each step.
4.	Vibration	5 gRMS	10 gRMS, Steps of 2.5 gRMS	20% increments between steps.	10 minutes at each load.
5.	Temperature Shock Cycling	Step 1 extreme point	Step 2 extreme point	Rate of up to 40 °C per minute.	
6.	Temperature Cycling and Vibration	Step 1 extreme point	Step 2 extreme point	Rate of up to 40 °C per minute and vibration level as identified in step 3.	
7.	Temperature Cycling and Vibration test at a lower intensity than step 5 (Detection test).	Step 1 extreme point + (+10) °C	Step 2 extreme point - (-10) °C	Rate of up to 40 °C per minute and vibration level half from the identified value in step 3. During this cycle, a functional test is performed to identify flaws. Dwell time: 10 minutes at each extreme point.	

## 2.3. ELECTRICAL EQUIPMENT TEST SETUP

The following pictures display the electrical test equipment.



The **Set Up** included 10 servo drives G-TWI25/100EE (GOLD Twitter, 25A continuous, 50A peak, operating voltage range 10VDC to 96VDC)

**Test Conditions:** All drives were connected to DC bus of 85VDC. Each drive was loaded by continuous train of 50A pulses to expose the drive to its max operating temperature – 5C.

## 3. HALT RESULTS

### 3.1. G-TWI25/100EE PASS RESULTS (UNDER FULL LOAD)

The table provides the achieved (Pass) limits during HALT process.

Test Environment		Test Description	Test Result	Remarks
Temperature [°C]	Vibration			
Minimum temperature	None	-30 °C	O.K.	
Maximum temperature	None	+70 °C	O.K.	
20 °C (room temperature)	Maximum gRMS	+10.0 gRMS	O.K.	Manually Stopped
Temperature cycling	None	-30 °C to +70 °C	O.K.	
Temperature rate per min.		40 °C	O.K.	
Combined cycling	10.0 gRMS	-30 °C to +70 °C	O.K.	
Maximum cold start temperature		-30 °C	O.K.	

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### **3.2. HALT VIBRATION RESULTS (AT ROOM TEMPERATURE)**

According to the customer requirements, the test was performed without sensors.

**3.2.1. INPUT: 5.0 gRMS RESULT: 10 minutes- O.K.**

**3.2.2 INPUT: 7.5 gRMS RESULT: 10 minutes- O.K.**

**3.2.3 INPUT: 10.0 gRMS RESULT: 10 minutes- O.K.**

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HALT TEMPERATURE RESULTS (WITHOUT VIBRATION)

**5..2. TEMPERATURE SENSORS MEASUREMENT**

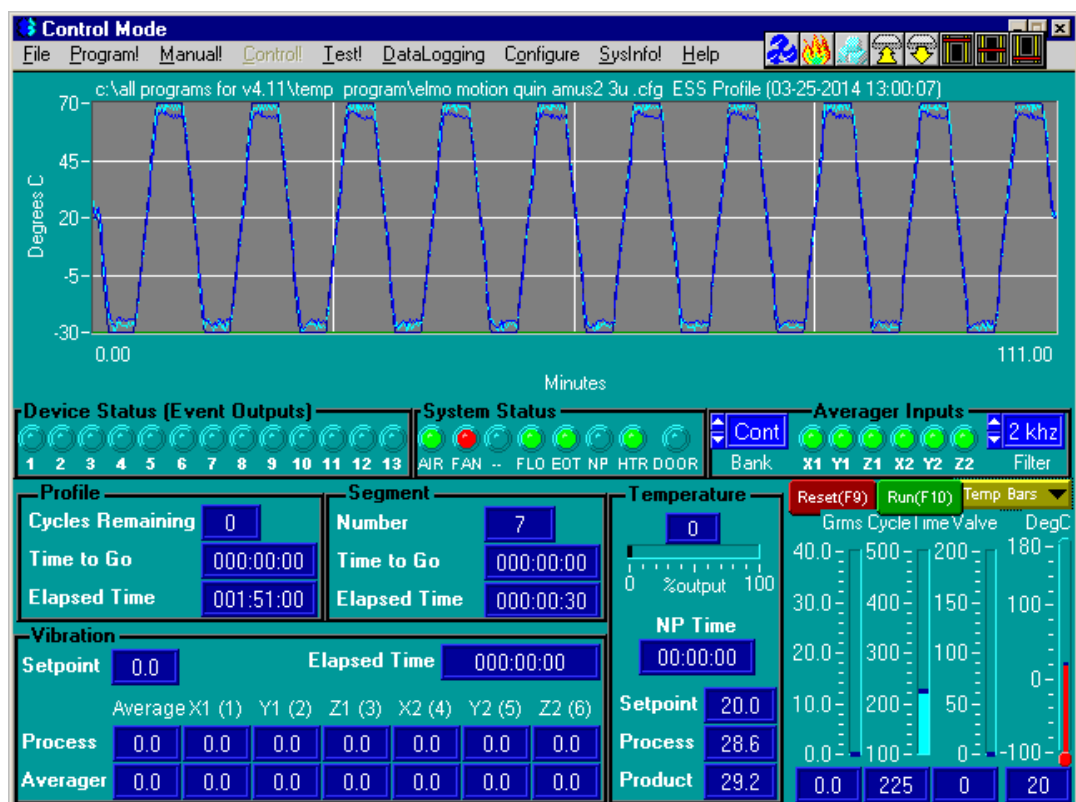
The table below defines of temperature sensor and their associated readout.

			<b>Sensor 1</b>	<b>Sensor 2</b>
No.	Ambient Temp.	Cold \Hot start	Location #1	Location #2
1.	-30 °C	O.K.	-30.0	-31.0
2.	-20 °C	O.K.	-20.0	-20.1
3.	-10 °C	O.K.	-10.5	-10.2
4.	0 °C	O.K.	0.5	-0.3
5.	+10 °C	-		
6.	+20 °C	-		
7.	+30 °C	-		
8.	+40 °C	-	40.1	40.2
9.	+50 °C	-	50.2	50.3
10.	+60 °C	-	60.2	60.4
11.	+65 °C	-		
12.	+70°C	-	70.1	70.3

**5..3. TEMPERATURE MEASUREMENT ANALYSIS**

<b>Minimum Temperature</b>	-30 °C
<b>Maximum Temperature</b>	+70°C

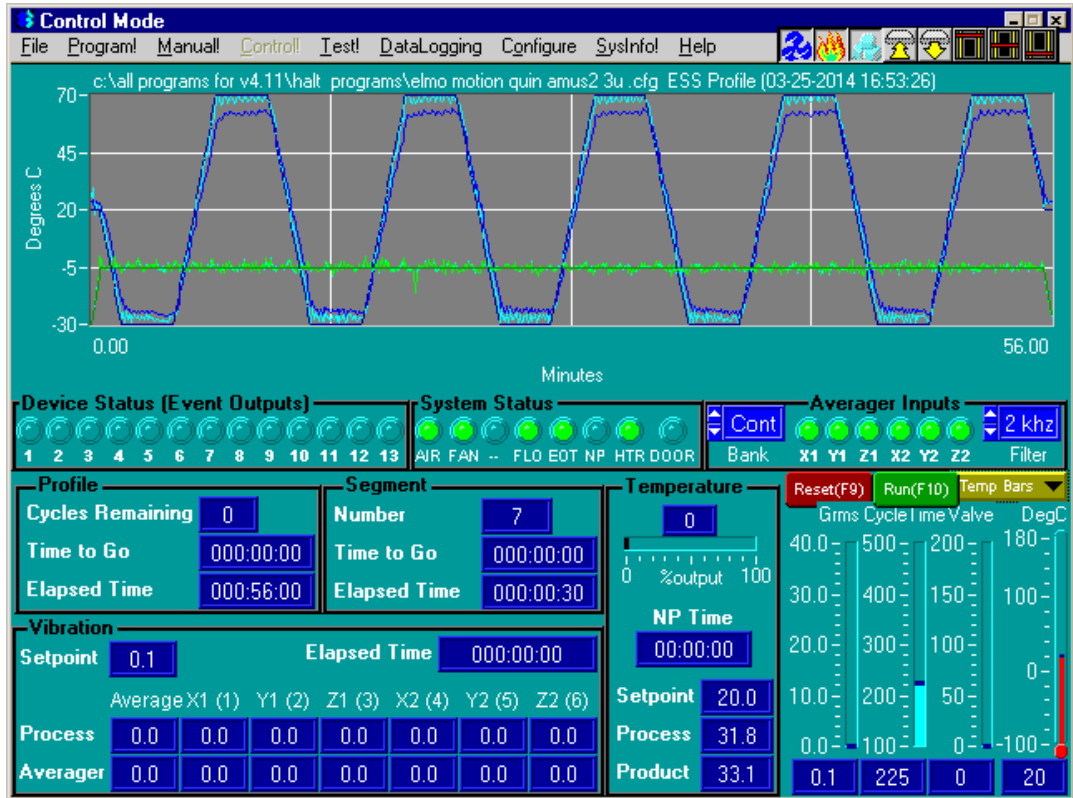
- G-TWI25/100EE - ANALYZER RESULTS**



### Thermal Cycling Parameters

- Thermal cycle range – from -30 °C to +70 °C
- Thermal rate of change 40 °C/minute
- 10 cycles





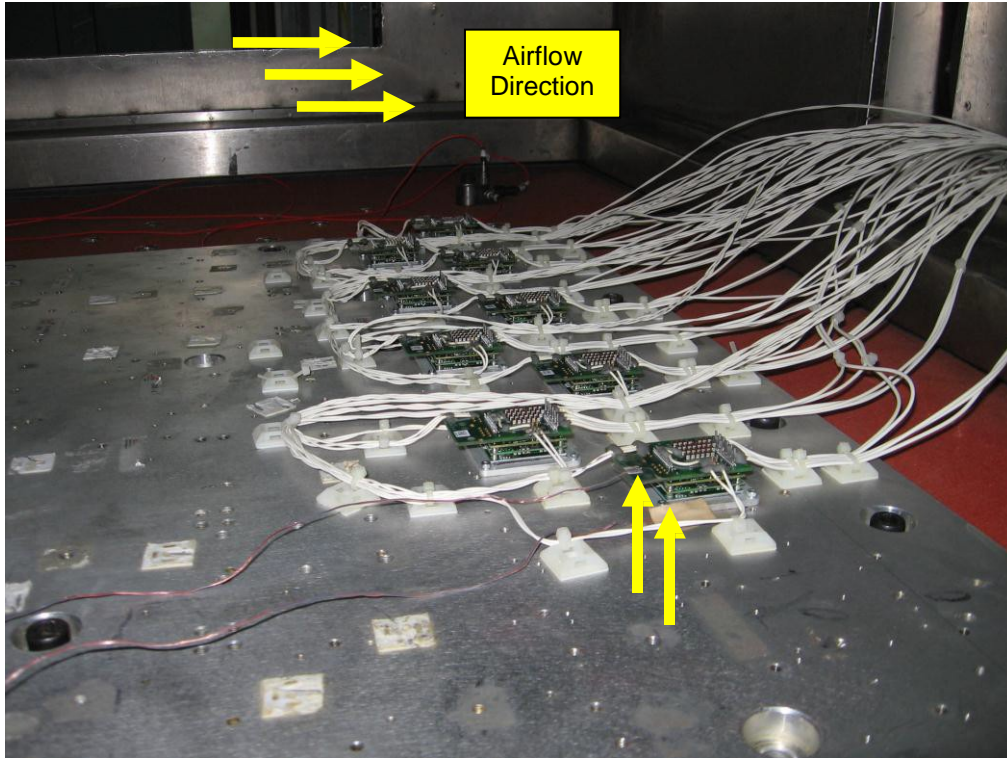
— Vibration Line  
— Temperature Line

#### Combined Cycling Parameters:

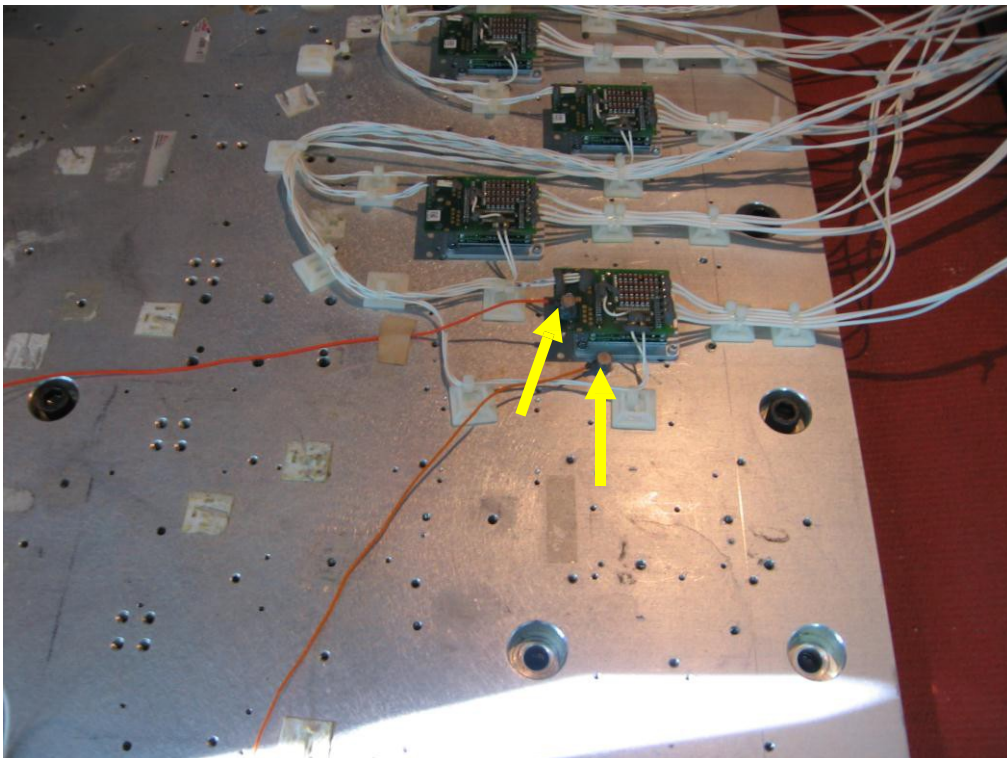
- Thermal cycle range – from -30 °C to +70 °C
- Thermal rate of change 40 °C/minute
- 3D Random vibration – high level 10.0 gRMS – low level 5.0 gRMS
- 5 cycles

## 6. G-TWI25/100EE Set Up PICTURES.

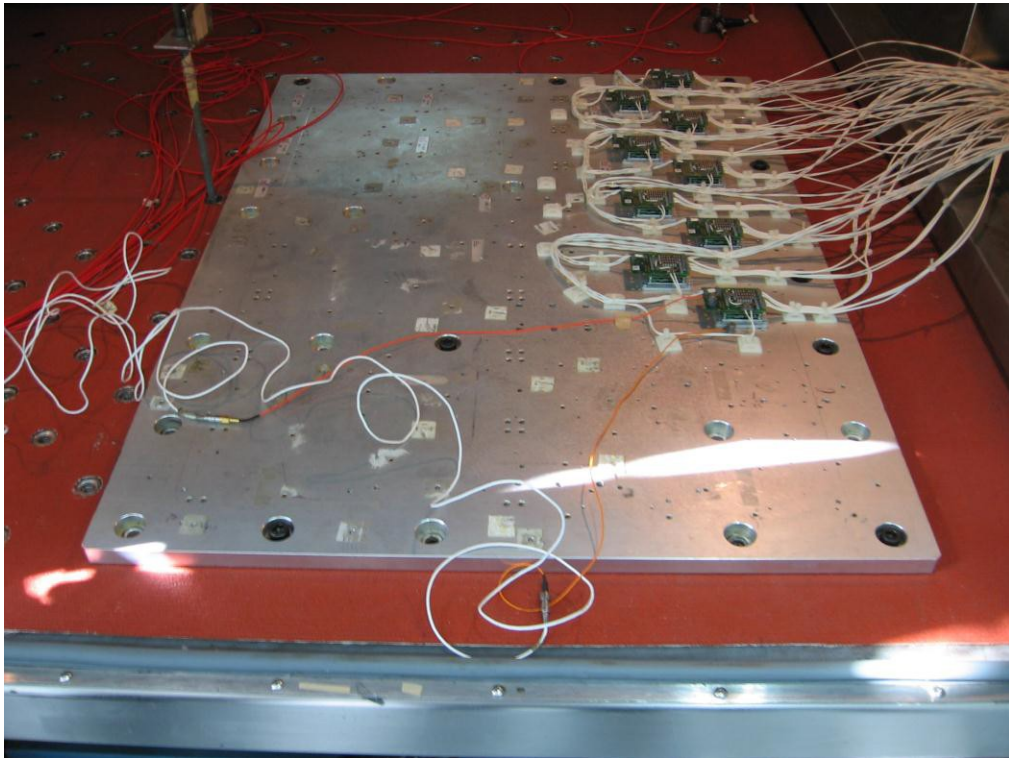
One thermocouple sensor was attached to the Jig Plate and one-on the Card of one unit



One accelerometer sensor was attached to the Jig Plate and one-on the Card of one unit



### UUT During combined cycling test



### Conclusions & RECOMMENDATIONS

During the HALT process, the goal is to find the operating and destruction limits for the units under test using thermal and vibration step stresses, and combined environmental stresses such as rapid temperature cycling combined with vibration stress.

As there was no “destruction” during this HALT test the reliability of the product is “established”