

Test Report

No.: U112488E1, 3rd Version

Designation of equipment under test: AIS SART PLOMO-500

Test Laboratory

for

**"Safety of Electrical Equipment and
Industrial Low-Voltage Devices
as well as Environmental Tests"**

accredited by

DGA Deutsche Gesellschaft für Akkreditierung mbH
in compliance with DIN EN ISO/IEC 17025

under

Reg. No. DGA-PL-105/00-12

The copying of excerpts from this report is not permitted without written the consent of the testing body. The test results indicated in this report refer exclusively to the equipment under test specified below. It is not permitted to transfer the results to other systems or configurations.

Testing body: PHOENIX TESTLAB GmbH
Königswinkel 10

D-32825 Blomberg

Applicant: Alltek Marine Electronics Corp.
7F, No.605, Ruei Guang Rd., Neihu

11492 Taipei
Taiwan, Republic of China

Order number: 11-112488

Type of test: Environmental tests:
- Dry Heat
- Cold
- Damp heat
- Vibration, sinusoidal
- Drop into water
- Oil resistance
- Water immersion

Test base: EN 60945: 2002
EN 60068-2-1: 2008
EN 60068-2-2: 2008
EN 60068-2-6: 2007
EN 60068-2-30: 2006
EN 60529: 09.2000

Equipment under
test (EUT):

EUT	Type	Serial Number
112488-1	AIS SART PLOMO-500	97016007
112488-2	AIS SART PLOMO-500	97016008

Manufacturer: See applicant

Date equipment
was received: 11 July 2011

Customer represented
during the test by the
following person(s): ---

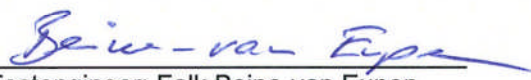
Place of test: PHOENIX TESTLAB GmbH, Blomberg

Date of test: 05 September 2011 to 04 November 2011


Test result: Test requirements and conditions are present in the following chapters.

The test requirements are conformed by the EUT.

Blomberg, 30 July 2012



Testengineer: Falk Beine-van Eupen



Authorized reviewer: Matthias Zelt

Contents:	Page
1 Test specifications and test conditions	6
1.1 Dry heat, functional test	6
1.2 Cold.....	7
1.3 Damp heat	8
1.4 Vibration	9
1.5 Drop into water.....	11
1.6 Oil resistance	12
1.7 Water immersion (portable equipment).....	13
1.8 Water immersion (temporary immersion)	14
1.9 Performance Check	14
2 Test performance and test results	15
2.1 Test performance	15
2.2 Test results	15
2.2.1 Dry Heat, functional test	15
2.2.2 Cold	16
2.2.3 Damp heat.....	16
2.2.4 Vibration	17
2.2.5 Drop into water	17
2.2.6 Oil resistance.....	18
2.2.7 Water immersion (portable equipment)	18
2.2.8 Water immersion (temporary immersion)	18
3 List of measurement equipment	19
4 Photos	20
5 Diagrams	25

1 Test specifications and test conditions

1.1 Dry heat, functional test

Test B: Dry heat / EN 60068-2-2; chapter 8.2.2, EN 60945

This test determines the ability of equipment to be operated at high ambient temperatures and operate through temperature changes. The reasonable maximum air temperature likely to be encountered over the sea is +32 °C and the maximum solar gain at sea is +23 °C giving +55 °C as the maximum temperature likely to be encountered by ships at sea.

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The EUT and, if appropriate, any climatic control devices with which it is provided shall then be switched on. The temperature shall then be raised to and maintained at +55 °C ± 3 °C.

At the end of a soak period of 10 to 16 hours at +55 °C ± 3 °C, the EUT shall be subjected to a performance test a check as specified in the relevant equipment standard.

At the end of the test, the EUT shall be returned to normal environmental conditions.

According to customers requirements the test was carried out at a temperature of + 70 °C and a duration of 16 hours.

Severity:

Temperature:	+ 70 °C ± 3 °C
Duration:	16 hours

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- Performance check before and after the test

1.2 Cold

Test A: Cold / EN 60068-2-1; EN 60945, chapter 8.4.2.4

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be reduced to, and maintained at $-25\text{ °C} \pm 3\text{ °C}$, for a period of 10 h to 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period.

The EUT shall be switched on 30 minutes later, or after such a period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a performance check test and check as specified in the relative equipment standard.

The temperature of the chamber shall be maintained at $-25\text{ °C} \pm 3\text{ °C}$ during the whole test period.

At the end of the test the EUT shall be returned to normal environmental conditions.

According to customers requirements the test was carried out at a temperature of -30 °C and a duration of 16 hours.

Severity for protected equipment:

Temperature:	$-30\text{ °C} \pm 3\text{ °C}$
Duration:	16 hours

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- Performance check before and after the test

1.3 Damp heat

Test Db: Damp heat / EN 60068-2-30; chapter 8.3, EN 60945

This test determines the ability of equipments to be operated under conditions of high humidity.

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be raised to $+40\text{ °C} \pm 2\text{ °C}$, and the relative humidity raised to $93\% \pm 3\%$ over a period of $3\text{ h} \pm 0.5\text{ h}$. These conditions shall be maintained for a period of 10 h to 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period.

The EUT shall be switched on 30 minutes later, or after such a period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a check as specified in the relevant equipment standards.

The temperature and relative humidity of the chamber shall be maintained as specified during the whole test period.

At the end of the test period and with the EUT still in the chamber, the chamber shall be brought to room temperature in not less than 1 h.

Severity for portable equipment:

Temperature:	$+40\text{ °C} \pm 2\text{ °C}$
Relative humidity:	$93\% \pm 3\%$
Duration:	16 hours

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- Performance check before and after the test
- Performance check for a time of 2 h during the test

1.4 Vibration

Vibration, sinusoidal / EN 60068-2-6; EN 60945, chapter 8.7

This test determines the ability of equipment to withstand vibration without resulting in mechanical weakness or degradation in performance. The test simulates the effect of vibration induced in a ship's hull by its propeller and machinery. This is generally at frequencies of up to 13 Hz and predominantly vertical. The test at higher frequencies simulates the effect of slamming which occurs in irregular stormy seas, and is predominantly horizontal.

The EUT, complete with any shock and vibration absorbers with which it is provided, shall be fastened to the vibration table by its normal means of support and in its normal attitude.

The EUT shall be subjected to sinusoidal vertical vibration at all frequencies between:

- 5 Hz to 13.2 Hz with an extrusion of $\pm 1\text{mm}$
- above 13.2 Hz and up to 100 Hz with a constant max. acceleration of 7 m/s^2

The frequency sweep rate shall be 0.5 octaves / min. in order to allow the detection of resonances in any part of the EUT as mounted.

Severity according to EN 60945:

Frequency range:	5 Hz to 100 Hz
Cross-over frequency:	13.2 Hz
Displacement amplitude below the cross-over frequency:	+/- 1.0 mm
Acceleration amplitude above the cross-over frequency:	7 m/s ²
Sweep rate:	0.5 octaves / min.
Test duration:	See test results
Axis:	X, Y, Z

A resonance search shall be carried out throughout the test. During the resonance search the EUT shall be observed, by unaided visual and aural means for obvious signs of any resonances of components or sub-assemblies, that may affect the integrity of the EUT.

If any resonance, as measured by a sensor fixed to the outside of the EUT at the location where obvious signs of resonance have been observed, has a magnitude ratio ≥ 5 measured relative to the surface where the EUT is fastened, the EUT shall be subjected to a vibration endurance test at each resonant frequency at the vibration level specified in the test with a duration of 2 h.

If no resonance occurred, the endurance test shall be carried out at a frequency of 30 Hz.

A functional test shall be carried out at the end of the test period.

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- Performance check before and after the test

1.5 Drop into water

Drop into water / EN 60945, chapter 8.6.2

This test simulates the effects of a free fall of equipment into the sea from the deck of a ship 20 m above.

A series of three drops shall be carried out. Each drop shall be performed with the initial position of the EUT different from the preceding one. The height of the lowest part of the EUT under test relative to the water surface at the moment of release shall be 20 m \pm 1 m.

At the end of the test the EUT shall be subjected to a performance check, and shall then be examined for damage and for unwanted ingress of water.

Severity for portable equipment:

Drop height:	20 m \pm 1 m
Number of drops:	3

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- No ingress of water
- Performance check before and after the test

1.6 Oil resistance

Oil resistance / EN 60945, chapter 8.11

This test simulates the effects of mineral oil on equipment. The EUT shall be immersed at a temperature of $19\text{ °C} \pm 5\text{ °C}$ for 3 h in mineral oil.

After the test, the EUT shall be cleaned in accordance with the manufacturer's instructions. The EUT shall then be subjected to a performance check and an examination with the naked eye.

Severity for portable equipment:

Temperature:	$19\text{ °C} \pm 5\text{ °C}$
Oil:	ASTM oil No. 1
Duration:	3 hours

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- Performance check before and after the test

1.7 Water immersion (portable equipment)

Immersion / EN 60529, EN 60945, chapter 8.9.2

The test simulates the effects of water pressure on equipment which may be required to float free from a sinking ship.

A hydraulic pressure of 100 kPa shall be applied to the EUT for a period of 5 min.

Severity for the test:

Hydraulic pressure:	100 kPa
Duration:	5 min.

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- No ingress of water
- Performance check before and after the test

1.8 Water immersion (temporary immersion)

Immersion / EN 60529, EN 60945, chapter 8.9.3

This test simulates the effects of water pressure on VHF portable radio equipment which although not designed to float may experience a temporary immersion whilst attached to a survivor.

The test is carried out by completely immersing the EUT in water. The highest located point of the EUT has to be 1 m below the surface of the water. The test is carried out for a period of 5 min.

Severity for the test:

Immersion depth:	1 m
Duration:	5 min.
Temperature difference between EUT and the water:	max. ± 5 K

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- No ingress of water
- Performance check before and after the test

1.9 Performance Check

The AIS-Transponder (EUT) is connected via RF-Link to an AIS-Simulator (Attingimus). With the Attingmus AIS-Messages are sent to the EUT and the EUT responds the AIS-Messages by sending AIS-Messages back to the Attingmus. All transmissions of the AIS-Transponder were monitored and valued.

2 Test performance and test results

2.1 Test performance

The tests will be carried out as follows:

Date	EUT	Test
05.09.2011	112488-1	Dry heat
06.09.2011	112488-1	Cold
12.09.2011	112488-1	Damp heat
14.09.2011	112488-1	Vibration
28.09.2011	112488-2	Drop into water
02.11.2011	112488-2	Oil resistance
04.11.2011	112488-2	Water Immersion

2.2 Test results

2.2.1 Dry Heat, functional test

Requirements:

- Optical test for mechanical stability
- Performance check before and after the test

Temperature	Test duration	Function	Requirements
+ 70 °C	16 h	Ok	Fulfilled

2.2.2 Cold

Requirements:

- Optical test for mechanical stability
- Performance check before and after the test

Temperature	Test duration	Function	Requirements
- 30 °C	16 h	Ok	Fulfilled

2.2.3 Damp heat

Requirements:

- Optical test for mechanical stability
- Functional test before and after the test
- Performance check for a time of 2 h during the test

Severity	Test duration	Function	Requirements
+ 40 °C // 93 % rel. h.	16 h	Ok	Fulfilled

2.2.4 Vibration

Requirements:

- Optical test for mechanical stability
- Performance check before and after the test

Axis	Function	Requirements
X	Ok	Fulfilled
Y	Ok	Fulfilled
Z	Ok	Fulfilled

2.2.5 Drop into water

Requirements:

- Optical test for mechanical stability
- No ingress of water
- Performance check before and after the test

Drop height	Number of drops	Function	Requirements
20 m.	3	Ok	Fulfilled

2.2.6 Oil resistance

Requirements:

- Optical test for mechanical stability
- Performance check before and after test

Oil	Test duration	Function	Requirements
ASTM oil No. 1	3 h	Ok	Fulfilled

2.2.7 Water immersion (portable equipment)

Requirements:

- Optical test for mechanical stability
- No ingress of water
- Performance check before and after test

Pressure	Test duration	Function	Requirements
100 kPa	5 min.	Ok	Fulfilled

2.2.8 Water immersion (temporary immersion)

Requirements:

- Optical test for mechanical stability
- No ingress of water
- Performance check before and after test

Immersion depth	Test duration	Function	Requirements
1 m	5 min.	Ok	Fulfilled

3 List of measurement equipment

Measurement equipment	PM No.
Climatic Chamber KS 600/75-5K	490161
Shaker LDS V850-440 LPT 600	490082
Accelerometer 10.61 mV/g	480612
Accelerometer 10.30 mV/g	480964
Accelerometer 9.687 mV/g	480926
Pressure Chamber	480940

4 Photos

Photo 1: Test set-up EUT in climatic chamber



Photo 2: Test set-up, vibration, X-axis with resonance accelerometer

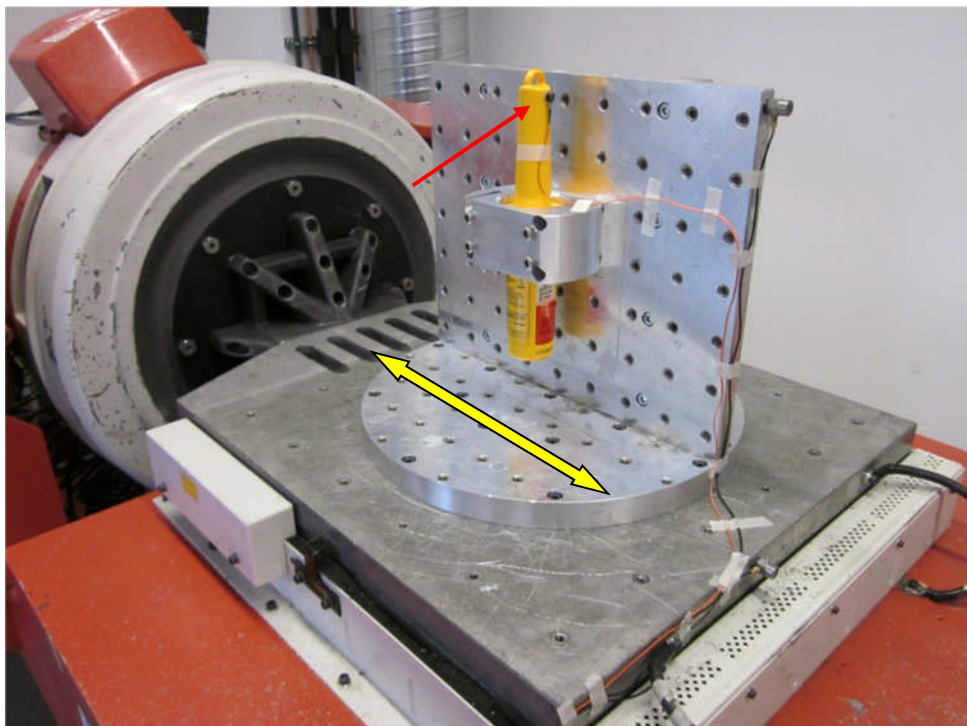


Photo 3: Test set-up, vibration, Y-axis with resonance accelerometer

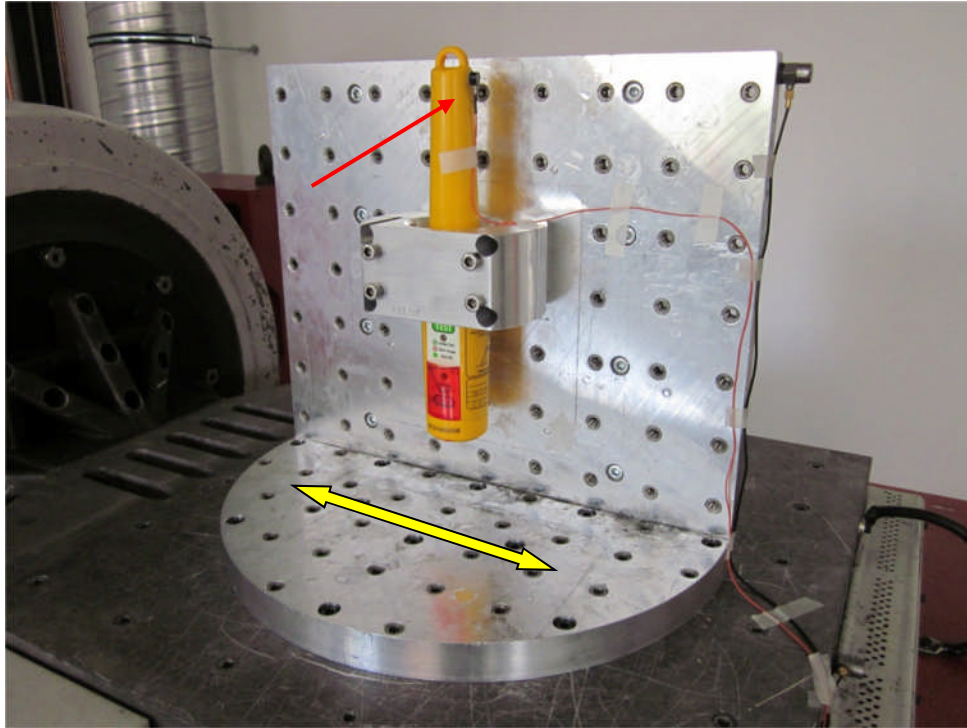


Photo 4: Test set-up, vibration, Z-axis with resonance accelerometer

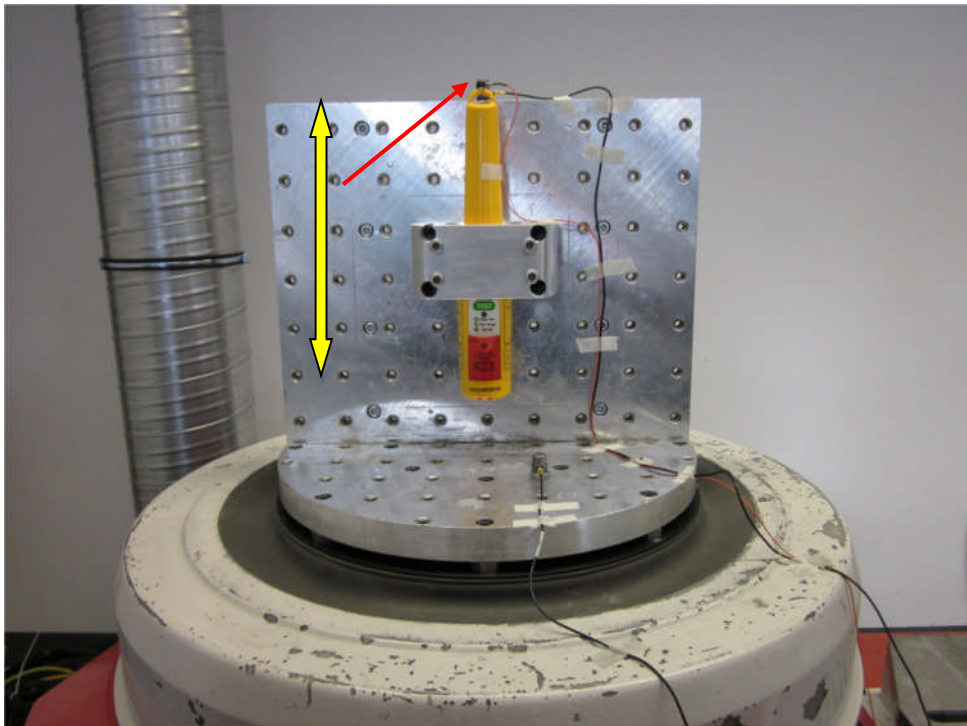


Photo 5: Test set-up, oil resistance (exemplary)



Photo 6: Test set-up, water immersion (portable equipment)

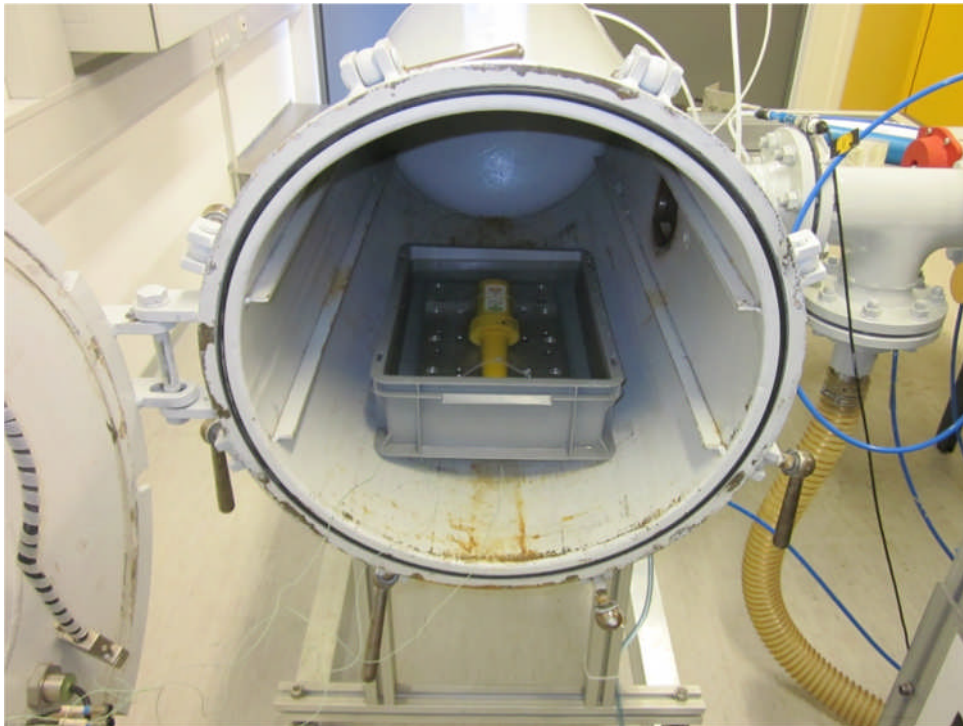


Photo 7: Test set-up, water immersion (temporary immersion)



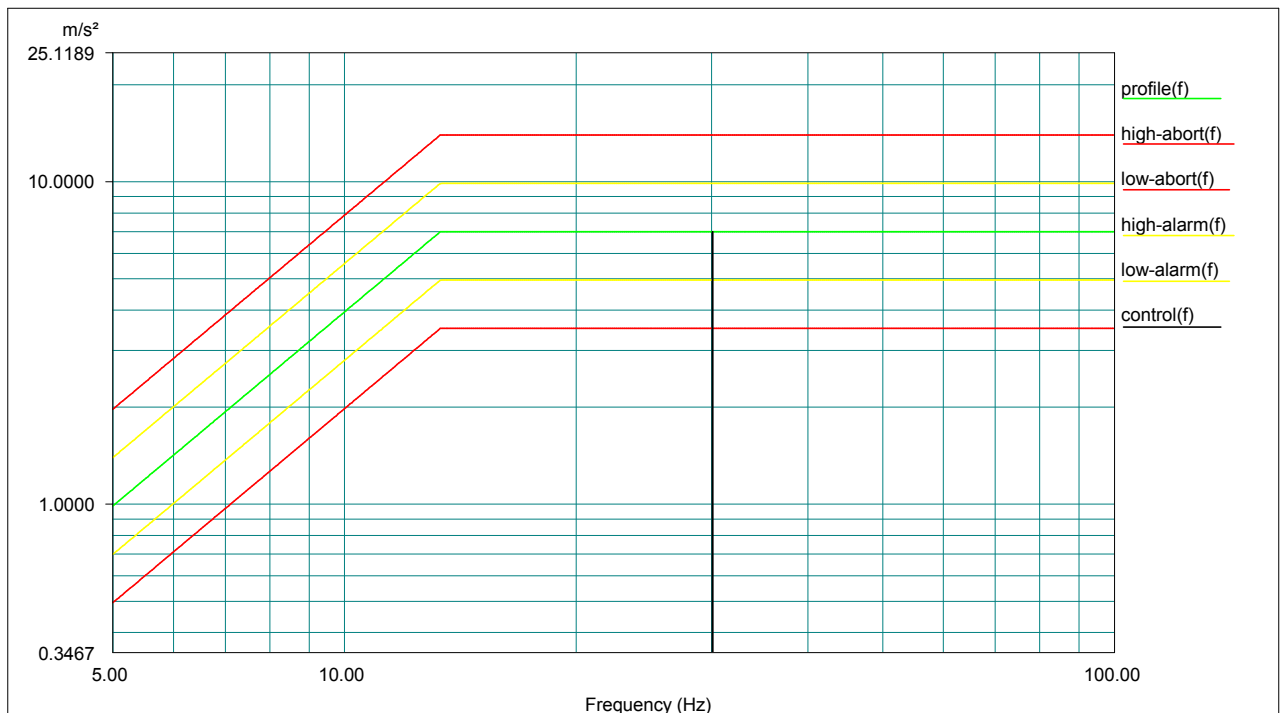
Photo 8: Test set-up, drop into water



5 Diagrams

Diagram 1: Vibration profile, X-axis

DUT: AIS SART PLOMO-500
 Serial Number: 1st axis
 Project File Name: Dwell 30Hz-7ms-2.prj
 Profile Name: Low Level
 Test Type: Swept Sine
 Run Folder: .\RunDefault Sep 14, 2011 13-40-48



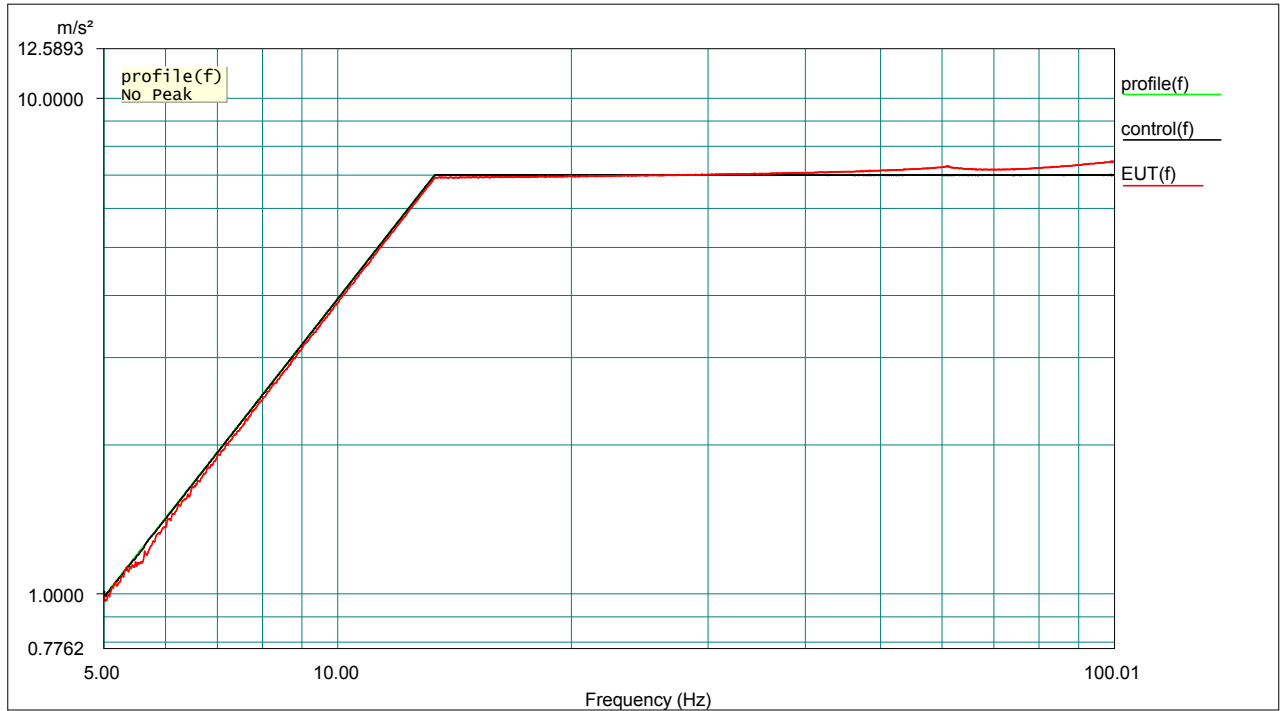
Level: 100 % Full Level Time: 02:00:00 Sweep Type: Logarithmic
 Frequency: 30.000000 Hz Time Remaining: 00:00:00 Sweep Rate: 1 Oct/Min

Data saved at 03:40:59 PM, Wednesday, September 14, 2011

Report created at 03:40:59 , Mittwoch, September 14, 2011

Diagram 2: Resonance Search, X-axis

DUT: AIS SART PLOMO-500
 Serial Number: 1st axis
 Project File Name: Reso 7ms-2.prj
 Profile Name: 5 To 100 Hz At 4gn
 Test Type: Resonance Search, Track And Dwell
 Run Folder: .\RunDefault Sep 14, 2011 13-22-52



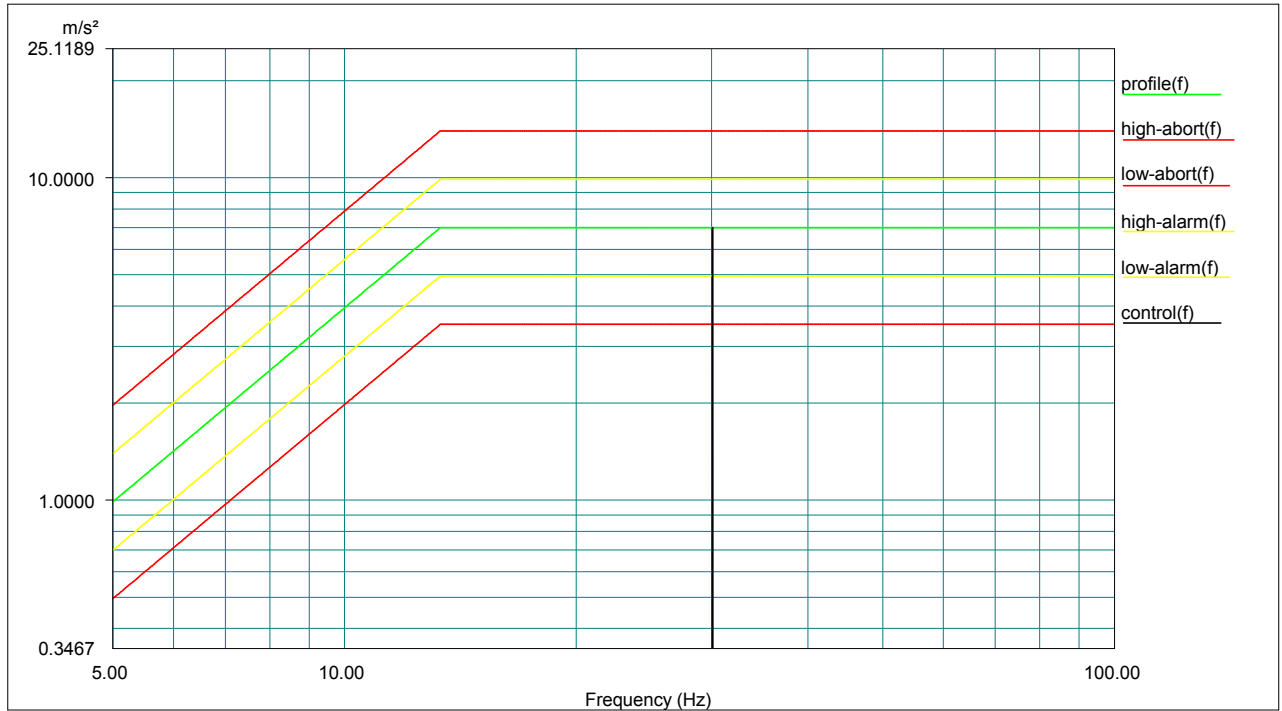
Level:	100 %	Full Level Time:	00:08:40	Sweep Type:	Logarithmic
Frequency:	99.962303 Hz	Time Remaining:	00:00:00	Sweep Rate:	0.5 Oct/Min

Data saved at 01:31:39 PM, Wednesday, September 14, 2011

Report created at 01:31:45 , Mittwoch, September 14, 2011

Diagram 3: Vibration profile, Y-axis

DUT: AIS SART PLOMO-500
 Serial Number: 2nd axis
 Project File Name: Dwell 30Hz-7ms-2.prj
 Profile Name: Low Level
 Test Type: Swept Sine
 Run Folder: .\RunDefault Sep 15, 2011 08-26-47



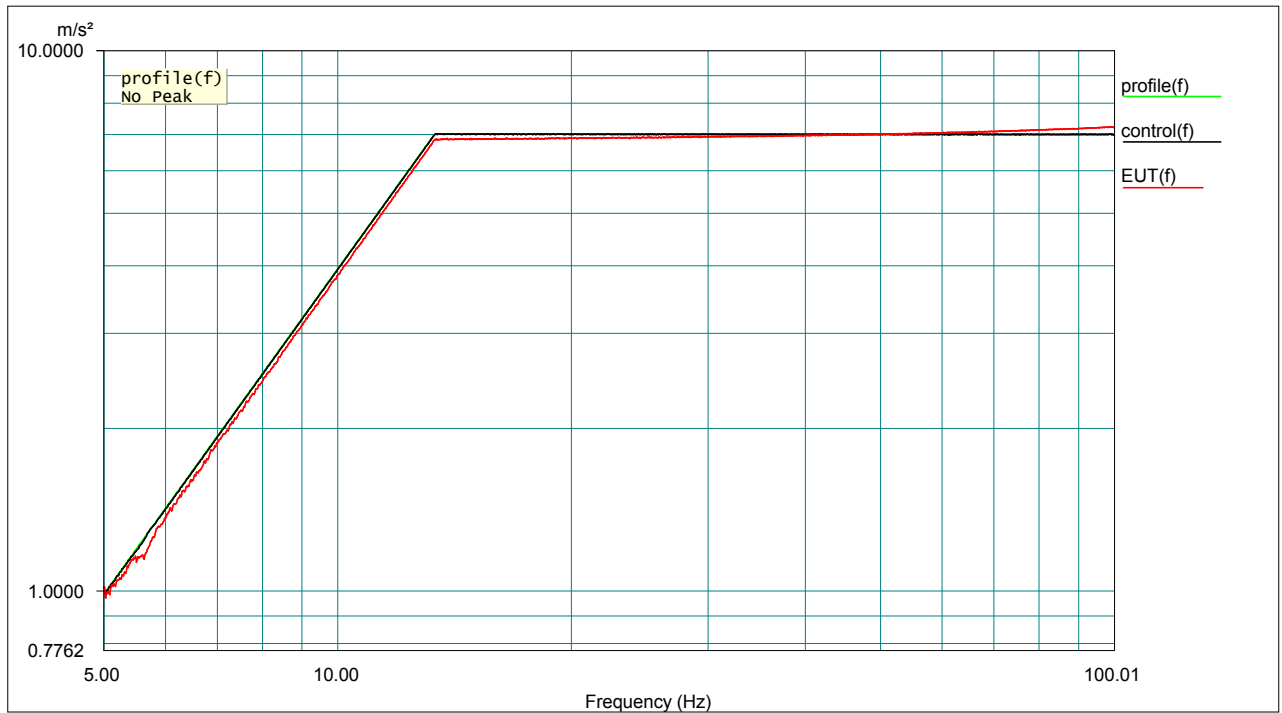
Level:	100 %	Full Level Time:	02:00:00	Sweep Type:	Logarithmic
Frequency:	30.000000 Hz	Time Remaining:	00:00:00	Sweep Rate:	1 Oct/Min

Data saved at 10:27:03 AM, Thursday, September 15, 2011

Report created at 10:27:03 , Donnerstag, September 15, 2011

Diagram 4: Resonance Search, Y-axis

DUT: AIS SART PLOMO-500
 Serial Number: 2nd axis
 Project File Name: Reso 7ms-2.prj
 Profile Name: 5 To 100 Hz At 4gn
 Test Type: Resonance Search, Track And Dwell
 Run Folder: .\RunDefault Sep 15, 2011 08-11-52



Level:	100 %	Full Level Time:	00:08:40	Sweep Type:	Logarithmic
Frequency:	99.962303 Hz	Time Remaining:	00:00:00	Sweep Rate:	0.5 Oct/Min

Data saved at 08:20:40 AM, Thursday, September 15, 2011

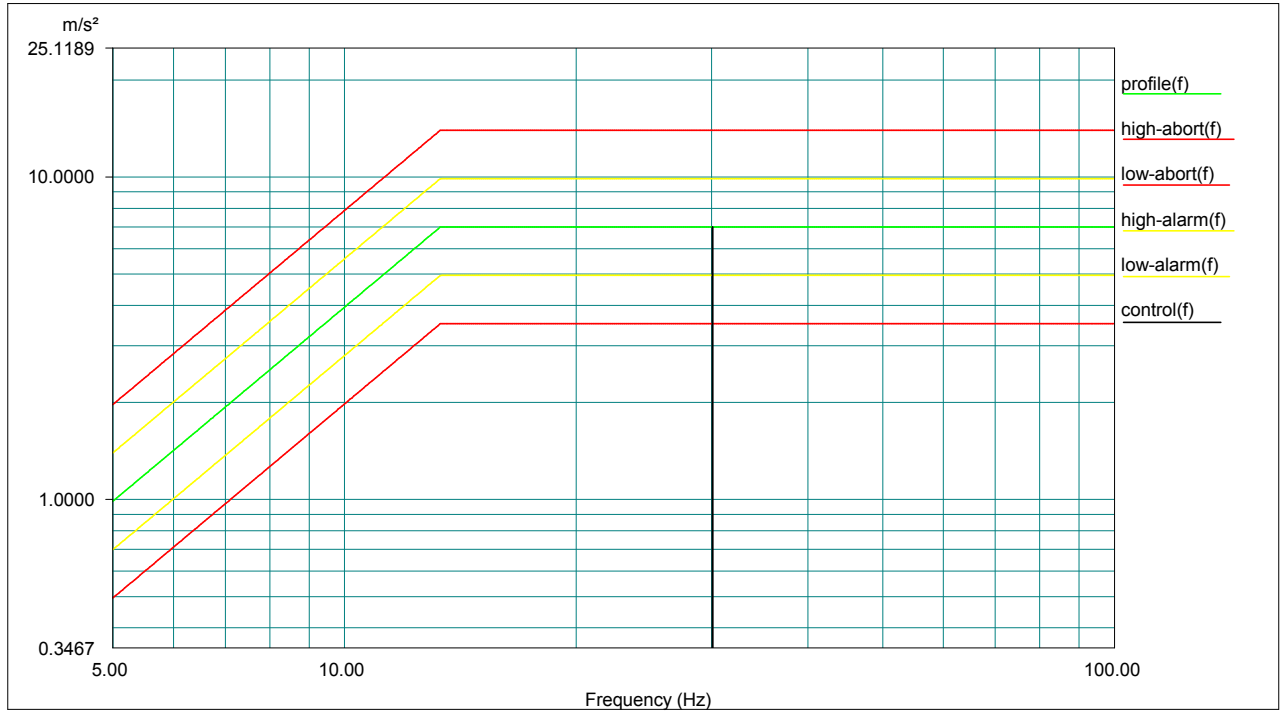
Report created at 08:20:41, Donnerstag, September 15, 2011

Diagram 5: Vibration profile, Z-axis

DUT: AIS SART PLOMO-500
 Serial Number: 3rd axis
 Project File Name: Dwell 30Hz-7ms-2.prj
 Profile Name: Low Level
 Sep 15, 2011 14-23-35

Test Type: Swept Sine

Run Folder: .RunDefault



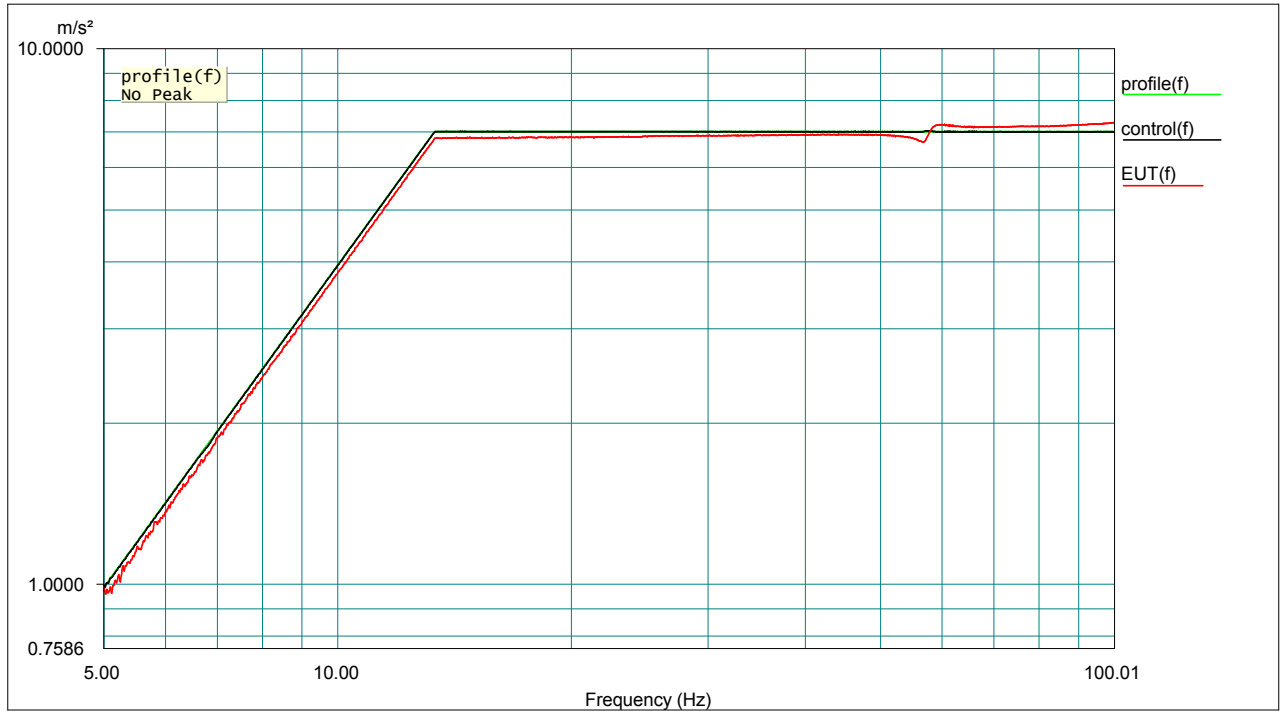
Level: 100 % Full Level Time: 02:00:00 Sweep Type: Logarithmic
 Frequency: 30.000000 Hz Time Remaining: 00:00:00 Sweep Rate: 1 Oct/Min

Data saved at 04:23:45 PM, Thursday, September 15, 2011

Report created at 04:23:46 , Donnerstag, September 15, 2011

Diagram 6: Resonance Search, Z-axis

DUT: AIS SART PLOMO-500
 Serial Number: 3rd axis
 Project File Name: Reso 7ms-2.prj
 Profile Name: 5 To 100 Hz At 4gn
 Test Type: Resonance Search, Track And Dwell
 Run Folder: .\RunDefault Sep 15, 2011 14-13-58



Level:	100 %	Full Level Time:	00:08:40	Sweep Type:	Logarithmic
Frequency:	99.980736 Hz	Time Remaining:	00:00:00	Sweep Rate:	0.5 Oct/Min

Data saved at 02:22:46 PM, Thursday, September 15, 2011

Report created at 02:22:48 , Donnerstag, September 15, 2011

Diagram 7: Temperature profile, dry heat

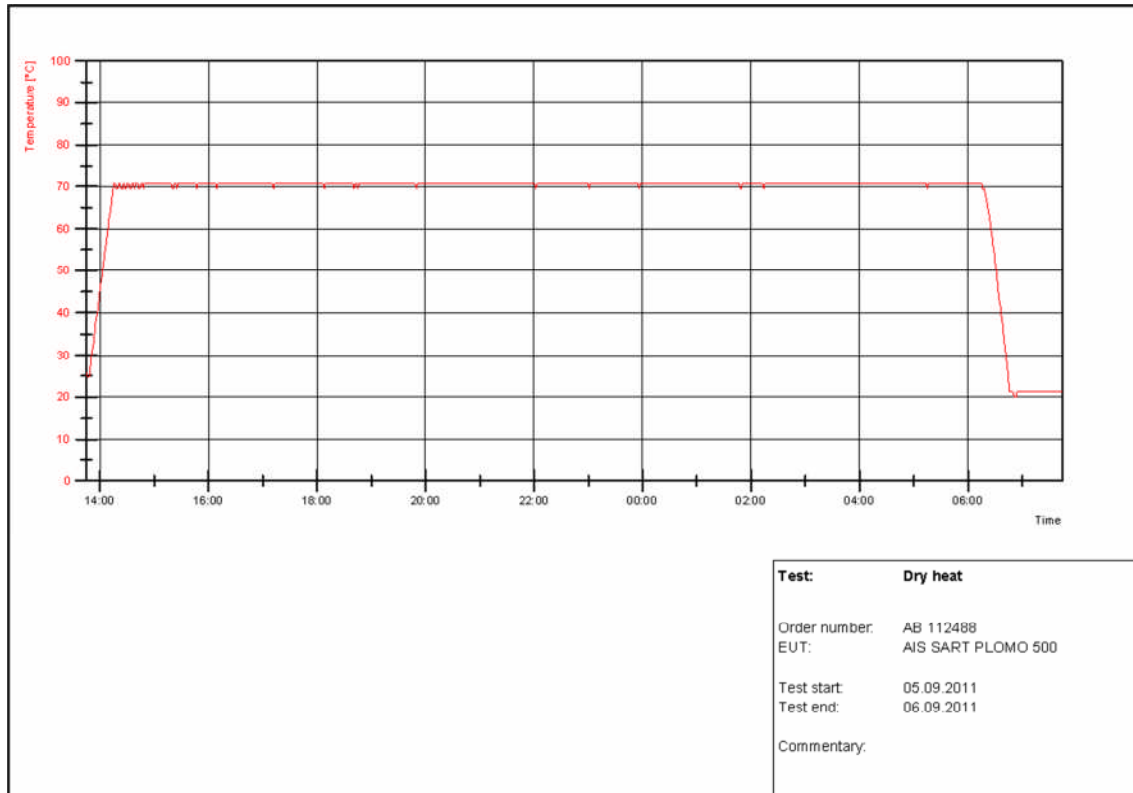


Diagram 8: Temperature profile, cold

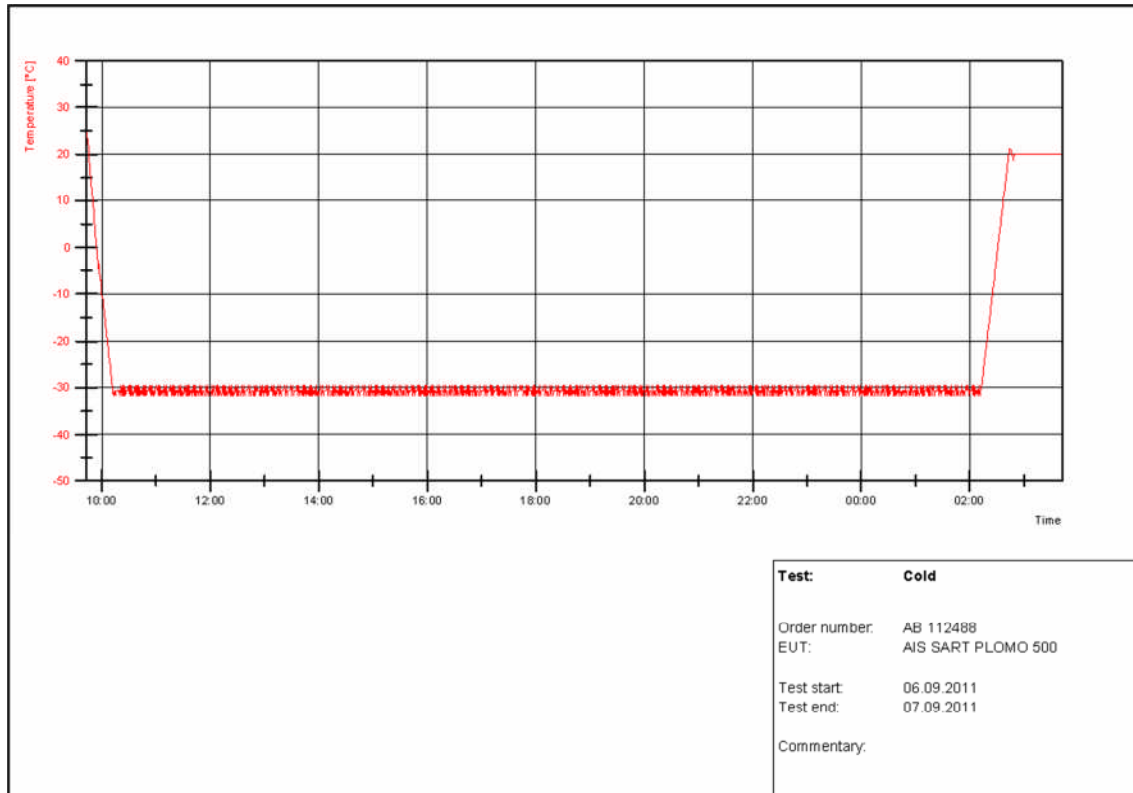


Diagram 9: Temperature profile, damp heat

