

DURATEQ 3100 Conforms to MIL-STD 810F

DURATEQ

HEAVY DUTY.
WITHOUT THE HEAVY.

Objective:

Softeq Development Corporation hired a 3rd party test house to test and confirm that the DURATEQ 3100 handheld device conforms to the relevant Military Standard 810F criteria for handheld devices. We also wanted to verify, based on the testing, that the DURATEQ 3100 meets the requirements for an IP54 rating.

The DURATEQ 3100 was subjected to a series of performance tests conducted by The National Technical Systems in Plano, Texas. As a result, the DURATEQ conforms to the relevant MIL-STD 810F tests for handhelds and the IP54 rating has been verified. Conformance for all the testing done refers to testing completed with no visible damage noted that would impair the unit's ability to operate as designed. This whitepaper describes the method of testing and the results. A full report by NTS is available for download at www.durateq.com.

Altitude Test

The first test done, the DURATEQ was put through a series of tests to make sure it would operate properly when brought to a higher altitude level. This test took place on October 15, 2008 and the unit conformed. The unit was installed into a chamber for the altitude testing and then verification took place before operation began. After ten minutes the chamber was adjusted to 23C for the start of the test. When the chamber reached the 23C, it was then adjusted to 1500 feet altitude. The testing went on for about three hours and the unit operated normally throughout all the testing and satisfies procedures 1 and 2 of 500.4 sections.



Figure 1

DURATEQ installed in Altitude Chamber

Company

Softeq
Development
Corporation

Name of Case Study

DURATEQ 3100
Passes MIL-STD
810F Testing

Industry

Hardware
and Custom
Software
Development

Solution

The DURATEQ
3100 is the thinnest
& lightest rugged
handheld on the
market today!

High Temperature Test

Next the DURATEQ 3100 was subjected to the [high temperature](#) test which took place October 31, 2008. The unit was installed into a chamber, and the chamber was then adjusted to 23C for the stabilization soak. The temperature was then increased to 60C and the unit was periodically checked to see if it was still operating properly throughout tests. The chamber was then adjusted back to 23C. The unit conformed to all tests for the high operating temperature (Method 501.4, Procedure I). The device was then tested for high temperature for storage up to 70C and then checked out after cooling again to 23C. It operated properly and conforms to Procedure II.



Figure 2

DURATEQ installed in High Temperature Chamber

Low Temperature Test

The next test was the [low temperature](#) test, assuring that the DURATEQ 3100 could withstand high and low temperature shocks was essential and ensures users of the device that it is a durable, rugged handheld in cold outdoor environments. The unit was installed in a chamber and then adjusted to 23C for the beginning of the test. The chamber was lowered to -30C for an operating test, and when reached that degree. The stabilization soak began. This process went on for about 24 hours, and Unit performed normally throughout all testing for the low temperature tests. For storage temperature test, the unit was lowered to -40C and the chamber was then adjusted back to 23C. The DURATEQ 3100 operated normally again. These low temperature tests conformed to Method 502.4, Procedures I & II.



Figure 3

DURATEQ installed in Low Temperature Chamber

Temperature Shock Test

The DURATEQ 3100 unit next conformed to the [temperature shock test](#) Method 503.4, Procedure I. The unit was installed into a chamber, the chamber was then adjusted to -20C and then to 60C. The chamber adjusted the temperature seven different times from low to high and throughout testing, the unit operated normally post test and showed no damage.



Figure 4

DURATEQ installed in Temperature Shock Chamber

Rain Test

The unit was then tested for its ability to operate in and after [rain](#). This test took place October 31, 2008. The unit was tested on all 6 sides, face, rear, right, left, bottom, and top with wind driven rain. The rainfall rate was 1.7mm/min (4.0 in/hr) and the wind velocity was 18m/sec (40mph). The unit operated normally between each axis change and throughout all testing, conforming to the Method 506.4 standard. This result also meets the IEC 60529 test requirement for an IP5x rating for moisture resistance, important for wet outdoor environments.



Figure 5

Rain Testing Setup



Figure 6

DURATEQ Post Rain Testing

Humidity Test

Method 507.4 tests to see how a unit withstands high and low amounts of [humidity](#). The unit was first installed into the chamber and it was then adjusted to 23C and 50% Relative Humidity. When the chamber reached this condition, the stabilization soak began. The chamber was then adjusted to 60C and 90% RH, back to 20 C 90% RH, then -20C RH uncontrolled, and back to 60C 90% RH. There were 10 different cycles like this that took place. After all cycles were complete the chamber was adjusted to ambient conditions. The unit operated normally after all testing was complete.



Figure 7

DURATEQ Installed in Humidity Chamber

Vibration Tests

The unit then went through two methods of [vibration tests](#) Method 514.5, Procedures I & II. One test was structural integrity and another to stimulate a loose cargo situation-a transportation vibration typical of mobile environments. The unit was placed loosely on a table for a 30 minute sustained vibrations were conducted. The unit was then removed from the table and visually inspected for damage, scuffing was noted on the back of the device. It was then placed on the table again, rotated 90 degrees and a 30 minute vibration was conducted again. After the visual inspection, scuffing on the units back was noted again. Then a thorough series of random vibration tests were done to the device for one hour per axis and the performed normally throughout all.



Figure 8

Vertical, Longitudinal, & Lateral Vibration Tests performed on DURATEQ clamped down on the vibrate table

Drop Test

Next was the physical shock or [drop test](#) Method 516.5 Procedure IV where the unit was dropped 26 times on each face, side, corner and edge 36 inches onto wood over concrete. This test took place November 26, 2008. Result: the DURATEQ took it in stride, powered up, and there was no physical or operational damage detected. The DURATEQ 3100 conforms to the drop test at 36 inches onto wood over concrete.

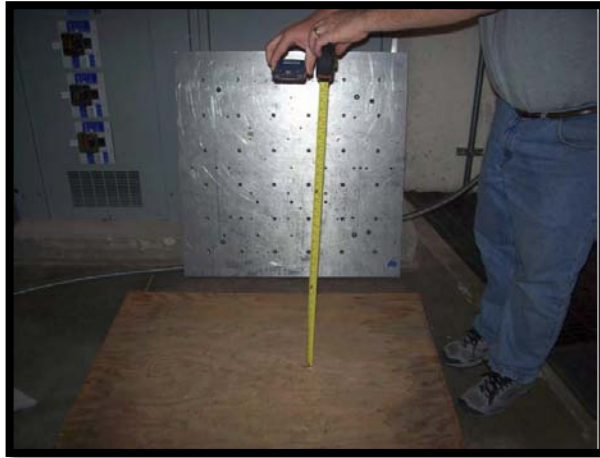


Figure 9

Drop Test Setup

Dust Test

The final test was the [dust test](#), where the unit went through a series of tests to determine if it could withstand large amounts of dust. The unit conforms to this testing, and the device operated normally throughout all tests and post testing.



Figure 10

DURATEQ Post Dust Testing

Summary

The DURATEQ 3100 handheld device conforms to the relevant MIL STD 810F criteria for handheld devices and meets the requirements for the IP54 rating.

MIL-STD-810F Method	DURATEQ 3100 Conformance
Altitude (Method 500.4, Procedures I & II storage & operational)	Operating at 15,000 feet at 73 F (23 C)
High Temperature (Method 501.4, Procedures I & II)	Operating at 140 F (60C) Non-operating at 158 F (70C)
Low Temperature (Method 502.4, Procedures I & II)	Operating at -22 F (-30C) Non-operating at -40 F (-40C)
Temperature Shock Operating (Method 503.4, Proc I)	Operating at -4 F to +140 F (-20C to +60C) for 4 cycles at 5 degree per minute variation
Humidity (Method 507.4)	Exposure to 90% relative humidity on temperature cycle -20C to 60C
Vibration (Method 514.5, Proc I, II, Figure C-17 and C-5 loose cargo)	Clamped down minimum integrity 1 hour / axis and simulates 1,000 miles of transportation / loose cargo
Drop Test (Method 516.5, Proc IV)	26 drops on each face, side, corner and edge from 36" height onto plywood over concrete
Rain (Method 506.4, Procedure I & IEC 60529 IP-5X)	Protected against water sprayed from any direction. Limited ingress permitted.
Blowing Dust (Method 510.4, Procedure I & IEC 60529 IP-X4)	Exposure to blowing dust. Limited protection against dust ingress (no harmful deposit)

Appendix

General Information on Rugged Rating Organizations and Standards

Ratings are set by various government agencies, industry groups and/or independent laboratories and are cited by manufacturers in order to establish a more exact degree of environmental protection and reliability. Some of the more common standards include:

MIL-STD (Military Standard) 810F

Military Standard 810F is a series of performance and manufacturing guidelines set by the US Department of Defense for military and commercial equipment and applications. These guidelines specify allowable parts and environmental condition ranges that a tool or other device must be able to operate in to meet compliance.

MIL-STD 810 E and F are generally accepted as the highest standard for ruggedized testing by mobile computer manufacturers.

MIL-STD 810 test method is used to generate confidence in the environmental worthiness and overall durability of material system design. The testing process follows guidelines which include program documentation, program roles, test standards and laboratory test method guidelines for all categories. The laboratory test methods are broken down into 24 categories. Not all categories make sense for all devices or all use cases. The DURATEQ 3100 was tested for conformance against the handheld industry benchmarks.* (asterisked in list below.)

The required compliance test categories include:

Environment	MIL-STD 810F
*Low Pressure (Altitude)	Method 500.4
*High Temperature	Method 501.4
*Low Temperature	Method 502.4
*Temperature Shock	Method 503.4
*Contamination by Fluids	Method 504
Solar Radiation (Sunshine)	Method 505.4
*Rain	Method 506.4
*Humidity	Method 507.4
Fungus	Method 508.5
Salt Fog	Method 509.4
*Sand and Dust	Method 510.4

Explosive Atmosphere	Method 511.4
Immersion	Method 512.4
Acceleration	Method 513.5
*Vibration	Method 514.5
Acoustic Noise	Method 515.5
*Shock (Drop Testing)	Method 516.5
Pyroshock	Method 517
Acidic Atmosphere	Method 518
Gunfire Vibration	Method 519.5
Temperature, Humidity, Vibration, and Altitude	Method 520.2
Icing/Freezing Rain	Method 521.2
Ballistic Shock	Method 522
Vibro-Acoustic/Temperature	Method 523.2

Before testing can begin, the item has to have environmental exposure, which means that the test item is run under standard ambient conditions to ensure the item is operating properly and to ensure pretest baseline performance data is collected.

After completion of each environmental test, the post-test data is examined and recorded in accordance with material specifications and program guidelines. The results are compared with the pre-test data. The post test record includes: test sequence used, deviations from planned test program, performance data, test conditions and a signature of the test team, to name a few. A final test report should be created for each test which includes an analysis of the test results.

You may notice some products will carry a MIL-STD 810E rating and some may state they are MIL-STD 810F compliant. MIL-STD 810F is a revision of MIL-STD 810E. The tests and methods are basically the same but much of the standard has been rewritten to provide clearer direction. Many of the changes that can be found with the MIL-STD 810F are minor or administrative in nature, but technical changes and improvements can be found throughout (i.e. additional technical testing guidelines).

IP Ratings (Ingress Protection) Rating for Equipment and Enclosures

A three-digit number established by the International Electrotechnical Commission, is used to provide an “IP Rating” to a piece of electronic equipment or to an enclosure for electronic equipment. The IP code indicates the level, or amount of the protection.

The **first digit** represents protection against ingress of solid objects.

The **second digit** represents protection against ingress of liquids.

The larger the value of each digit, the greater the protection from that influence. As an example, a product rated as IP54 would be better protected against environmental factors than another similar product that was only rated as IP43 or not rated at all.

IP TABLE

	First Number (Solids)	Second Number (Liquids)
0	No protection	No protection
1	Protected against solid objects over 50mm e.g. hands, large tools.	Protected against vertically falling drops of water or condensation.
2	Protected against solid objects over 12mm e.g. hands, large tools.	Protected against direct sprays of water up to 15° from vertical.
3	Protected against solid objects over 2.5mm e.g. wire, small tools.	Protected against direct sprays of water up to 60° from vertical.
4	Protected against solid objects over 1.0mm e.g. wires.	Protected against water sprayed from any direction. Limited ingress permitted.
5	Limited protection against dust ingress (no harmful deposit)	Protected against low pressure water jets from any direction. Limited ingress permitted.
6	Totally protected against dust ingress.	Protected against high pressure water jets from any direction. Limited ingress permitted. (Shipdeck)
7	N/A	Protected against the effects of immersion between 15cm and 1M.
8	N/A	Protected against long periods of immersion under pressure.

More information on DURATEQ Handheld Solutions

DURATEQ Handheld Solutions

Developed by Softeq Development, DURATEQ handheld solutions were created for businesses requiring durable, handheld technology in a small form factor. Based on HP iPAQ Pocket PC technology, DURATEQ gives you a ruggedized durable device that's maximized for compatibility with commercial and custom applications without the bulk, weight, and awkwardness of other rugged handhelds.

For more information, visit www.durateq.com.

Softeq Development Corporation

Headquartered in Houston, TX, Softeq Development Corp. specializes in system integration, project management, and product development for Fortune 500 companies worldwide guiding them toward a common goal: the successful release of a product.

For more information, visit www.softeq.com.

