

Business-rugged HP EliteBook Notebook PCs: tested to meet Military Standard MIL-STD-810F



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Executive summary

HP Business Notebook PCs are designed with durability in mind; all are subject to the HP Total Test Process, undergoing over 95,000 hours of testing. The 50,000 steps of HP's comprehensive, proven testing program help ensure superior product quality and reliability. This program is intended to build solid, more reliable business notebooks, reducing downtime and lowering the total cost of ownership. For instance, mechanical tests simulate opening and closing the notebook 10 times every day for six years (25,000 cycles), and seven years of keyboard usage (10 million keystrokes).

Within the industry, three marketing categories are used to characterize the durability of business notebook PCs: business-rugged, semi-rugged, and fully-rugged. While these categories are informal, they tend to be based on the particular features offered by a notebook and on its ability to pass a battery of tests based on Military Standard MIL-STD-810F, the Department of Defense (DoD) Test Method Standard for Environmental Engineering Considerations and Laboratory Tests¹. This standard, though created specifically for DoD, is widely used for commercial applications.

Business-rugged HP EliteBook Notebook PCs pass many of the MIL-STD-810F-based tests ([Table 2](#)) that competitors normally reserve for their fully- and semi-rugged offerings. This successful exposure to environmental extremes demonstrates the fitness of HP EliteBook Notebook PCs for the most demanding road warriors.

HP EliteBook Notebook PCs are equipped with a broad range of durability features, designed to closely address the environmental challenges facing today's mobile professionals. While often subjected to more rigorous testing than competitors' semi-rugged offerings, business-rugged HP Business Notebook PCs may not provide all the same features. For example, HP's offerings do not include brighter, daylight-viewable displays – although the HP 2730p EliteBook Notebook PC provides a useful outdoor-viewable display that tends to be less bulky and use less power.

A fully- or semi-rugged notebook may include expensive features that you do not need. If you are looking for a ruggedized¹ notebook at the right price, you should consider an HP EliteBook Notebook PC, which provides a broad range of durability features without adding bulk and cost.

Ruggedness categories

The durability of business notebook PCs can be categorized as follows:

- Business-rugged – The business-rugged category is the least well-defined of the three, tending to characterize notebook PCs with a feature set that closely accommodates the challenges faced by today's mobile professionals. For example, since HP does not intend business-rugged notebooks to be used outdoors while it is raining, they are not subjected to MIL-STD-810F-based testing for water ingress. However, business-rugged notebooks do feature spill-resistant keyboards.
- Semi-rugged – Intended to withstand some environmental extremes, semi-rugged notebook PCs typically offer a feature set that can withstand a battery of environmental tests (such as vibration, drop, dust resistance, humidity, altitude, and, in some cases, high and low temperature).
- Fully-rugged – While these are informal marketing classifications rather than industry standards, it is generally accepted that a fully-rugged business notebook PC is almost impenetrable by dust and water; it can withstand significant vibration and being dropped from 30 inches or more; it can operate at high altitude or when subjected to high humidity; and it can withstand high and low temperatures, and sustain sudden changes of temperature.

¹ Testing was not intended to demonstrate fitness for DOD contracts requirements or for military use. Test results are not a guarantee of future performance under these test conditions.

Note that there may be penalties (such as size, weight, and reduced battery life) associated with semi- and fully-rugged notebook PCs; these devices often provide expensive features that are not required for your particular application.

Product features

The following product features have become associated with ruggedized notebook PCs:

- Magnesium casing
- Shock-mounted hard disk drive (HDD)
- Water-resistant keyboard
- Shock-mounted display
- Daylight-viewable
- Carrying handle
- Port covers
- Touch screen
- HDD heater
- Global Positioning System (GPS)

Table 1 provides examples of features that are commonly deployed in business-, semi-, and fully-rugged notebooks.

Table 1. Key features

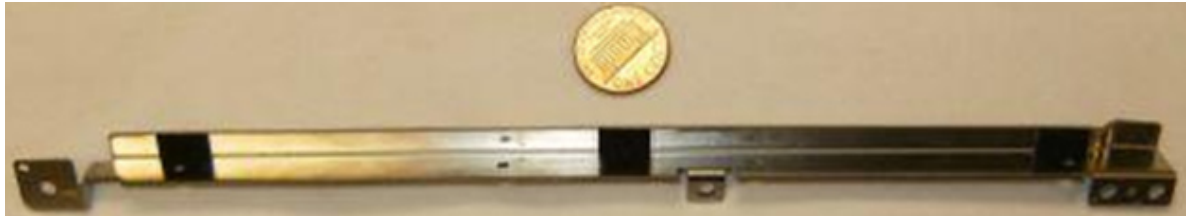
Business-rugged	Semi-rugged	Fully-rugged
<ul style="list-style-type: none"> • Full magnesium alloy chassis • Shock-resistant hard disk drive (HDD) or Solid State Drive (SSD) • Spill-resistant keyboard 	<ul style="list-style-type: none"> • Shock-mounted display • Outdoor-viewable LCD display • Port covers • Removable HDD* • Carrying handle* 	<ul style="list-style-type: none"> • Almost impenetrable by water and dust • Vehicle mount • HDD heater* • Global Positioning System (GPS)*

* Optional

Is it really rugged?

As with the categories for ruggedness², specifications for the features associated with these categories have not been standardized. Thus, while some vendors implement expensive shock-mounting solutions, a vendor that places small felt pads around the HDD or display (as shown in Figure 1) can claim to use shock-mounting.

Figure 1. A competitor claims “shock-mounting” for their LCD display merely by using small felt pads



HP, on the other hand, implements shock-resistance on business-rugged 2008 HP Business Notebook PCs³ through features such as HP 3D DriveGuard, which can reduce the transmission of shock and protect data from the effects of everyday bumps and drops. The capabilities of HP 3D DriveGuard include:

- A hard mount solution reduces the transmission of shock to the hard drive; counter-measures include rigid mounting, foam to eliminate micro-motion, enhanced foot design, and a pad to reduce flex.
- A three-axis digital accelerometer provides additional protection against operational shock. Its motion-sensing device can sense impending risk to the notebook’s hard drives from sudden changes in motion – before the disks can be damaged by a drop. The three-axis digital accelerometer notifies system software of the danger, giving the system time to temporarily stop the disks by unloading their heads; in this way, information stored on the disks can be protected.
- With HP 3D DriveGuard, the notebook need no longer be in standby mode with the lid closed to provide protection for the hard drives.

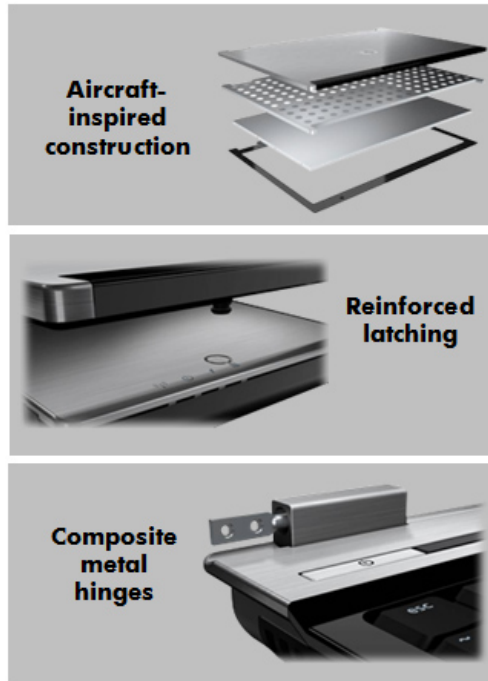
Alternatively, HP allows you to eliminate the risk of HDD damage entirely on HP EliteBook Notebook PCs by utilizing a Solid State Disk (SSD), which also obviates the need for the HDD heater featured on some fully-rugged models.

² Testing was not intended to demonstrate fitness for DOD contracts requirements or for military use. Test results are not a guarantee of future performance under these test conditions.

³ Except HP Thin Clients

Other durability features implemented on HP EliteBook Notebook PCs include a full magnesium alloy chassis (HP DuraCase) and a spill-resistant keyboard.

HP DuraCase provides a broad range of components designed to help protect the notebook from wear and tear:



- A full magnesium alloy chassis – up to 18 times stronger than PC/ABS plastic – protects both top and bottom of the notebook during rigorous usage.
- Inspired by aircraft construction for its durability, precision, and lightness, the new magnesium/aluminum display enclosure utilizes an inner magnesium shell with a honeycomb pattern that is thermally bonded to aircraft-construction-grade anodized aluminum. While still lightweight, this enclosure has a solid construction with enhanced impact protection for the display. The result is a stiffer, more durable panel with a professional high-end finish.
- Anodized aluminum with an attractive brushed finish is also used on the palm-rest surface.
- The newly-improved display latch creates a four-point lock-down for the top and bottom of your notebook when the lid is closed. Reinforced metal pins and hooks help protect the display enclosure from additional vibrations, resulting in better protection against shock and side impacts.
- Metal alloy hinges with hardened steel pin axels are designed to withstand extensive use.

Another of the features designed to improve the overall durability of HP Business Notebook PCs is HP DuraFinish, which creates a surface finish that can sustain day-in, day-out usage while maintaining overall finish and appearance. 2008 HP EliteBook Notebook PCs have an anodized aluminum finish that is six times more scratch-resistant than the finish on previous-generation HP p-series Business Notebook PCs. Due to the extreme hardness of the anodized aluminum, notebook cases show no scratches after being brushed with #3 steel wool.

A semi- or fully-rugged notebook may include expensive features that you do not need; furthermore, these features may make the notebook thicker and heavier, and may reduce battery life. For example, semi-rugged offerings typically include daylight-viewable displays that use brightness – 400 nits or more, twice as bright as many conventional displays – to be viewable outdoors. This level of brightness can place an unacceptable load on the notebook's battery. However, the HP 2730p EliteBook Notebook PC provides an outdoor-viewable display that does not rely on raw power; instead, this business-rugged notebook's screen uses a built-in film to reduce light reflection and maximize contrast outdoors. Similarly, while HP Business Notebook PCs do not provide expensive touchscreen capability, the HP 2730p EliteBook Notebook PC offers pen input.

The following section recaps the durability features offered in 2008 HP Business Notebook PCs.

Durability features in HP Business Notebook PCs

HP Business Notebook PCs are designed with reliability in mind. Durability features for 2008 include:

- Durable materials
 - HP DuraCase
 - HP DuraKeys
 - HP DuraFinish
 - HP Total Test Process
 - HP Panel Protection System
 - Spill-resistant keyboard
 - Touch-sensitive controls
- Data protection
 - HP 3D DriveGuard
 - HP Recovery Manager
 - RAID 1 mirroring
- Hard drive performance
 - RAID 0 striping

Is business-rugged right for you?

Are you looking for a durable notebook at the right price? If so, you should consider a business-rugged HP EliteBook Notebook PC, which provides numerous features without the expensive add-ons that you may not need. These notebook PCs are ideal for a broad range of applications (such as transportation, factory use, construction sites, law enforcement, oil and gas, medical, and financial) and are so durable that they can withstand more MIL-STD-810F tests than many semi-rugged offerings produced by competitors.

The drivers for buying a business-rugged HP EliteBook Notebook PC include the following:

- Your data is sufficiently important to require protection from HP 3D DriveGuard, SSD, or RAID 1 mirroring
- You need a spill-resistant keyboard
- You occasionally operate in environments where conditions such as extreme temperatures (hot vehicles) or dust (construction sites) may be potential issues
- You need to use the notebook while it is exposed to vibration⁴ – on a train, for example
- You want a lightweight, mobile notebook PC with long battery life

The following section provides more information on testing used to validate the durability of a notebook PC.

⁴ SSD drives obviate the need for cumbersome, expensive HDD shock-mounting

Testing

MIL-STD-810F and IP54 standards are typically used to help characterize the durability of notebook PCs.

MIL-STD-810F

Created by the U.S. government, the MIL-STD-810F test method standard is intended to help organizations prepare environmental tests to evaluate how well a particular piece of equipment can survive in the field. The standard outlines 23 test methods, each associated with a source of environment stress, such as vibration, moisture, dust, extreme temperatures, or humidity; for example, Method 500.4 describes Low Pressure (Altitude) testing, while Method 501.4 describes High Temperature testing.

Each test method outlines multiple test procedures; for example, Method 501.4 describes Procedure I (Storage) and Procedure II (Operation). Thus, Procedure I can be used to evaluate the effects of high-temperature storage on the subsequent performance of a notebook PC; Procedure II evaluates the effects of high temperature while the notebook is running.

To tailor MIL-STD-810F so that you can assess the durability of a notebook PC, you must first identify the environmental challenges faced by notebook users in the field. For example, the notebook may be dropped from a desk; it may be used in a moving vehicle or a harsh outdoor work environment; or it may be stored in an unheated building or in a car trunk during seasonal temperature extremes.

Based on these environmental stressors, you can select appropriate test methods from the menu provided by MIL-STD-810F. You then choose which of the procedures described by each test method you wish to run. Finally, using requirements and guidelines provided by MIL-STD-810F, you complete the tailoring process by identifying appropriate parameter levels along with applicable test conditions and techniques for each selected procedure.

Fully-rugged notebook PCs must typically pass the following battery of MIL-STD-810F tests⁵:

- Vibration
- Drop
- Dust Resistance
- Humidity
- Altitude
- High Temperature
- Low Temperature
- Thermal Shock
- Water Resistance

Business- and semi-rugged notebook PCs face are subjected to a less rigorous battery of tests.

⁵ Testing was not intended to demonstrate fitness for DOD contracts requirements or for military use. Test results are not a guarantee of future performance under these test conditions.

Test results for HP EliteBook Notebook PCs

Business-rugged HP EliteBook Notebook PCs are subjected to tests that some competitors do not even perform on their semi-rugged offerings.

Table 2 outlines third-party test results for 2008 HP EliteBook Notebook PCs.

Table 2. Test results

Test	Test method	2530p	2730p	6930p	8530p/w	8730w
Humidity	Method 507.4 aggravated	R	R	R	R	R
Sand and dust	Method 510.4, Procedure I	R	R	R	R	R
Operational vibration	Method 514.5, Procedure 1	R	R	R	R	R
Shock	Method 516.5, Procedure I	R	R	R	R	R
Drops from 30 inches	Method 516.5, Procedure IV	R	R			
High temperature	Method 501.4, Procedure I, storage, Procedure II, operation	R	R	R	R	R
Altitude	Method 500.4, Procedure I, storage, Procedure II, operation	R	R	R	R	R

R indicates that the notebook PC successfully booted the Microsoft® Windows® operating system after each test. Third-party test reports are available to customers under a non-disclosure agreement (NDA).

IP54

Fully-rugged notebooks may also be tested against IP54, which characterizes the degree of protection a particular notebook PC offers against the intrusion of dust and water.

The IP Code, which is defined in international standard IEC 60529, classifies the degrees of protection provided against the intrusion of solid objects, dust, accidental contact, and water in electrical enclosures. Intended to provide more specific information than vague terms like “waterproof,” the IP – or international protection rating – Code includes two digits and an optional letter.

For IP54, the “5” signifies that, while the entry of dust into the notebook’s enclosure has not been entirely prevented, it does not enter in sufficient quantity to interfere with the notebook’s satisfactory operation. The “4” signifies that water splashed against the enclosure from any direction has no harmful effect.

For more information

HP Business Notebook PCs

http://www.hp.com/sbso/solutions/pc_expertise/article/cpro-vpro-notebook.html

<http://h10010.www1.hp.com/wwpc/us/en/sm/WF02d/321957-321957-64295.html#>

MIL-STD-810F

<http://www.dtc.army.mil/navigator/>

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