



TECHNICAL WHITE PAPER

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MIL-STD-810 test background



MIL-STD-810 TESTING FOR HP BUSINESS PCs

October 2020

COMMITMENT TO QUALITY

A product is only as great as its quality. And quality built into the overall product design requires more than just a mix of technologies, best practices, and high standards; it requires a mindset that understands that each design detail is as important as the next, each potentially a spark of quality innovation.

At HP, we make a quality commitment and stand by it. We follow through with our promises. We believe that we can always do it better—and then we do. And that belief pushes our quality standards ever higher.

Quality delivers a higher return on investment to our customers. We want them to be happy with their product throughout its lifecycle.



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WE CARE ABOUT QUALITY—IT'S IN OUR DNA

At HP, we believe quality matters. Quality is core to HP's legacy. HP's strong focus on quality design and engineering innovations dates back to its early beginnings with Bill Hewlett and Dave Packard.

Quality is foremost at every stage of HP's product development process. From the earliest design stage through product testing, manufacturing, service and support, and eventual end-of-life, we remain alert for new opportunities to improve our products, services, and customer relationships.

STRIKING A PERFECT BALANCE

Our goal is to make our products the highest possible quality with the lowest total cost of ownership. We are focused on enhancing our customers' experience with products that deliver the best price, features set, and value proposition. The HP Business PC portfolio gives customers that perfect balance of cost efficiency, reliability, durability, and innovative design.

Quality is built into every product as a design requirement. HP Business PCs are designed to meet the demands of leading businesses. Built from high-quality materials and backed by legendary HP reliability, these stylish and sturdy devices are powerful yet simple to use.

PERFORMANCE YOU CAN TRUST

As part of the design process, all HP Elite, HP Pro, Z by HP and select HP Thin Clients undergo the HP Total Test Process (TTP)¹ — an exhaustive series of rigorous tests and validation procedures that demonstrate superior quality and reliability in a wide range of applications and operating environments. To help make our business PCs more robust and a more dependable tool for our customers' evolving business needs, our testing process is constantly reviewed and enhanced.

The HP Total Test Process is an outgrowth of the longstanding HP commitment to quality. That's why we go to extreme measures to build high reliability into every HP Business PC.

Our comprehensive and proven testing program consists of a minimum of 120,000 hours of rigorous multi-tiered testing and validation procedures per computing platform. The program, driven by rigid quality specifications and standards, includes 50,000 test steps, with 240 industry-standard hardware and software products tested for compatibility.

Pre-launch HP Business PCs are exposed to rigorous conditions including harsh drops and vibration, high temperatures, and enduring mechanical and functional tests that simulate rough handling over the life of the product. Strong reliability can mean less downtime and a lower cost of ownership.

Knowledge gained through the HP Total Test Process leads to many innovations that allow HP Business PCs to deliver an enhanced computing experience. Customers can rely on HP Business PCs to help them perform at their very best when their most demanding work is on the line.

WORLD-CLASS DESIGN

First impressions are important, as they set the expectations for the rest of the user experience. HP design engineers excel at designing that very important first experience. Clean implementation of innovative PC technologies starts with a holistic design approach to quality. Design engineers work in conjunction with the manufacturing engineers to optimize the design for production in a way that upholds extremely high quality.

Any given HP Business PC design will go through multiple small builds to fine-tune the design for optimal quality and manufacturability before the design is finalized. HP Business PCs are subject to multiple design enhancements prior to our first-production build, resulting in a final design that is as elegantly built as was originally envisioned by the design engineer.

HP's attractive enterprise-class industrial designs, which combine innovation with style, use high-quality materials and flawless finishes. HP's leading-edge chassis construction, component accessibility, electrical and air flow designs elevate the customer experience with product quality and reliability.



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GOING ABOVE AND BEYOND

After careful material selection and precision-engineered construction, HP Business PCs are put to the test. Our MIL-STD-810 testing² procedures go above and beyond what a PC may endure on a typical day in business and enterprise environments. This testing helps to demonstrate overall HP product quality and reliability.

HP BUSINESS PC MODELS TESTED

All HP Elite, HP Pro, HP Chromebooks, and Z by HP notebooks, convertibles and detachables, as well as select desktop PCs and Thin Clients, undergo multiple MIL-STD-810 test procedures as a way to help demonstrate product quality and reliability. This standard, though created specifically for the U.S. Department of Defense (DoD), is widely used as a benchmark for quality for commercial products in multiple industries. It outlines a broad range of tests that can be tailored to measure the reliability of specific pieces of equipment and includes multi-tiered climatic and environmental test methods.²

THE PRODUCTS IDENTIFIED BELOW HAVE ALL UNDERGONE MULTIPLE MIL-STD-810 TESTING PROCEDURES.

HP ZBOOK DETACHABLE WORKSTATION

Tested under 810G:

- HP ZBook x2 G4

HP ZBOOK CONVERTIBLE WORKSTATION

Tested under 810G:

- HP ZBook Studio x360 G5

HP ZBOOK MOBILE WORKSTATION

Tested under 810G:

- HP ZBook 15/17 G3, G5, G6
- HP ZBook 15v G5
- HP ZBook Studio G5
- HP ZBook 14u/15u G5, G6

Tested under 810H:

- HP ZBook Create G7
- HP ZBook Studio G7
- HP ZBook Firefly 14/15 G7
- HP ZBook Fury 15/17 G7
- HP ZBook Power G7

HP Z DESKTOP WORKSTATION

Tested under 810G:

- HP EliteDesk 800 G4/G5 Tower Workstation Edition
- HP Z1 Entry Tower G5/G6
- HP Z2 Mini G5 Workstation
- HP Z2 Small Form Factor G5 Workstation
- HP Z2 Tower G5 Workstation

HP ELITEDESK DESKTOP PC

Tested under 810G:

- HP EliteDesk 800 G3/G4/G5/G6 TWR/SFF/DM
- HP EliteDesk 705 G3 MT/SFF/DM
- HP EliteDesk 705 G4 MT/SFF/DM
- HP EliteDesk 705 G5 SFF/DM
- HP ELITEDESK 805 G6 SFF & DM

HP ELITE SLICE DESKTOP PC

Tested under 810G:

- HP Elite Slice G1
- HP Elite Slice for Meeting Rooms G2

HP PRODESK DESKTOP PC

Tested under 810G:

- HP ProDesk 600 G6 SFF
- HP ProDesk 600 / 680 G6 MT
- HP ProDesk 400 / 600 G6 DM
- HP ProDesk 400 G7 SFF
- HP ProDesk 405 G6 SFF & DM

HP PROONE ALL-IN-ONE DESKTOP PC

Tested under 810G:

- HP ProOne 600 G6 All-in-One
- HP ProOne 400 G6 All-in-One

HP ELITEONE ALL-IN-ONE DESKTOP PC

Tested under 810G:

- HP EliteOne 1000 G1 34" All-in-One
- HP EliteOne 1000 G2 All-in-One
- HP EliteOne 800 G3 All-in-One
- HP EliteOne 800 G4/G5/G6 All-in-One
- HP EliteOne 800 G4/G5 Healthcare All-in-One

HP ELITE X2 DETACHABLE PC

Tested under 810G:

- HP Elite x2 1012 G2
- HP Elite x2 1012 G2 Collaboration Keyboard
- HP Elite x2 1013 G3
- HP Elite x2 G4

HP ELITEBOOK CONVERTIBLE NOTEBOOK PC

Tested under 810G:

- HP EliteBook x360 1030 G2/G3/G4
- HP EliteBook x360 1030 G3
- HP EliteBook x360 1030 G4
- HP EliteBook x360 1040 G5, G6
- HP EliteBook x360 830 G5, G6



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HP ELITEBOOK CONVERTIBLE NOTEBOOK PC

Tested under 810H:

- HP Elite Dragonfly
- HP EliteBook x360 830 G7
- HP EliteBook x360 1030/1040 G7

HP ELITEBOOK NOTEBOOK PC

Tested under 810G:

- HP EliteBook Folio G1
- HP EliteBook 1040 G4
- HP EliteBook 1050 G1
- HP EliteBook 820/840/850 G3
- HP EliteBook 820/840/850 G4
- HP EliteBook 830/840/850 G5
- HP EliteBook 830/840/850 G6
- HP EliteBook 840r G4
- HP EliteBook 840 G5, G6 Healthcare Edition
- HP EliteBook 725 G4
- HP EliteBook 735/745/755 G5
- HP EliteBook 735/745 G6

Tested under 810H:

- HP EliteBook 830/840/850 G7
- HP EliteBook 835/845/855 G7

HP PRO X2 DETACHABLE PC

Tested under 810G:

- HP Pro x2 612 G2
- HP Pro x2 612 G2 Collaboration Keyboard

HP PROBOOK CONVERTIBLE NOTEBOOK PC

Tested under 810G:

- HP ProBook x360 440 G1
- HP ProBook x360 11 G1, G2 EE
- HP ProBook x360 11 G3, G4 EE

Tested under 810H:

- HP ProBook x360 11 G5, G6 EE
- HP ProBook x360 435 G7

HP PROBOOK NOTEBOOK PC

Tested under 810G:

- HP ProBook 640/650/645 G4
- HP ProBook 640/650 G5
- HP ProBook 430/440/450/470/455 G5
- HP ProBook 430/440/450 G6
- HP ProBook 445/455/445R/455R G6

Tested under 810H:

- HP ProBook 430/440/450 G7, G8
- HP ProBook 445/455 G7
- HP ProBook 640/650 G7
- HP ProBook 630/640/650 G8
- HP ProBook 635 Aero G7

HP NOTEBOOK PC

Tested under 810G:

- HP 340/348 G5

Tested under 810H:

- HP 340/348 G7

HP CHROMEBOOK CONVERTIBLE

Tested under 810G:

- HP Chromebook x360 11 G1 EE, G2 EE
- HP Chromebook x360 14 G1, 14E G1

Tested under 810H:

- HP Chromebook x360 11 G3 EE

HP CHROMEBOOK

Tested under 810G:

- HP Chromebook Enterprise 14A G5
- HP Chromebook 14 G5, 14A G5
- HP Chromebook 11 G7 EE, 11A G6 EE

Tested under 810H:

- HP Chromebook 11 G8 EE, 11A G8 EE
- HP Chromebook 14 G6
- HP Chromebook Enterprise 14 G6
- HP Pro c640 Chromebook Enterprise
- HP Pro c640 Chromebook
- HP Elite c1030 Chromebook Enterprise
- HP Elite c1030 Chromebook

HP RETAIL

Tested under 810G:

- HP Engage One All-in-One
- HP Engage Go Mobile System
- HP Engage Go Mobile Dock
- HP Engage Flex Pro Retail System
- HP Engage Flex Pro-C Retail System

HP THIN CLIENT

Tested under 810G:

- HP mt43 Mobile Thin Client
- HP mt44 Mobile Thin Client
- HP mt20 Mobile Thin Client
- HP mt21 Mobile Thin Client
- HP mt45 Mobile Thin Client

Tested under 810H:

- HP mt22 Mobile Thin Client
- HP mt46 Mobile Thin Client
- HP mt32 Mobile Thin Client



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MIL-STD-810 test background

TEST RESULTS

The following tables summarize the independent third-party MIL-STD-810 test methods² that HP products passed.

Note: A dash (-) in the Test Results tables indicates that the test was not conducted on the PC model.

HP ZBOOK DETACHABLE WORKSTATION, HP ZBOOK CONVERTIBLE WORKSTATION

Test	HP ZBook x2 G4	HP ZBook Studio x360 G5 810G
Tested Under	810G	810G
Drop	PASSED	PASSED
Functional Shock	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED
Dust	PASSED	PASSED
Humidity	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED

HP ZBOOK MOBILE WORKSTATION

Test	HP ZBook 15/17 G3, G5, G6 810G	HP ZBook 15v G5 810G	HP ZBook Studio G5 810G	HP ZBook 14u/15u G5, G6 810G
Tested Under	810G	810G	810G	810G
Drop	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	-	-	-	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED
Sand	PASSED	-	PASSED	PASSED
Explosive Atmosphere	PASSED	-	PASSED	-
Freeze/Thaw	PASSED	-	PASSED	PASSED
Bench Handling Shock	PASSED	-	PASSED	PASSED
Crash Hazard Shock	PASSED	-	PASSED	PASSED
Transportation Shock	-	-	-	PASSED
Solar Radiation	-	-	-	-



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HP ZBOOK MOBILE WORKSTATION (CONTINUED)

Test	HP ZBook Create G7	HP ZBook Creative/Studio, Fury 15/17 G7	HP ZBook Firefly 14/15, Power G7
Tested Under	810H	810H	810H
Drop	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED
Vibration (Category 5)	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED
Explosive Atmosphere	PASSED	PASSED	-
Freeze/Thaw	PASSED	PASSED	PASSED
Bench Handling Shock	PASSED	PASSED	PASSED
Crash Hazard Shock	PASSED	PASSED	PASSED
Transportation Shock	PASSED	PASSED	PASSED
Solar Radiation	PASSED	PASSED	-

HP Z DESKTOP WORKSTATION

Test	HP Z1 Entry Tower G5	HP Z1 Entry Tower G6	HP EliteDesk 800 G4, G5 Tower Workstation Edition	HP Z2 Mini G5 Workstation	HP Z2 Small Form Factor G5 Workstation	HP Z2 Tower G5 Workstation
Tested Under	810G	810G	810G	810G	810G	810G
Drop	PASSED	PASSED	PASSED	PASSED		PASSED
Functional Shock	PASSED		PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED		PASSED	PASSED		
Dust	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	-	-	-	PASSED	PASSED	PASSED



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HP ELITEDESK DESKTOP PC

Test	HP EliteDesk 800 G3 DM/SFF/TWR 810G	HP EliteDesk 800 G4/G5 DM/SFF/TWR 810G	HP EliteDesk 800 G6 TWR 810G	HP EliteDesk 800 G6 DM 810G	HP EliteDesk 800 G6 SFF 810G
Tested Under					
Drop	PASSED	PASSED	PASSED	PASSED	
Functional Shock	PASSED	PASSED		PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED		PASSED	
Dust	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED		PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	-	-	-	-	PASSED

HP ELITEDESK DESKTOP PC (CONTINUED)

Test	HP EliteDesk 705 G3/G4 DM/SFF/MT 810G	HP EliteDesk 705 G5 DM 810G	HP EliteDesk 705 G5 SFF 810G	HP EliteDesk 805 G6 DM 810G	HP EliteDesk 805 G6 SFF 810G
Tested Under					
Drop	PASSED	PASSED	PASSED	PASSED	
Functional Shock	PASSED	PASSED		PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED		PASSED	-
Vibration (Category 24)	PASSED	PASSED		PASSED	
Dust	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	-	PASSED	PASSED	PASSED	PASSED



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HP ELITEONE ALL-IN-ONE DESKTOP PC

Test	HP EliteOne 1000 G1 34" All-in-One	HP EliteOne 1000 G2 All-in-One	HP EliteOne 800 G3 All-in-One	HP EliteOne 800 G4/G5 All-in-One	HP EliteOne 800 G4/G5 Healthcare All-in-One	HP EliteOne 800 G6 All-in-One
Tested Under	810G	810G	810G	810G	810G	810G
Drop	-					-
Functional Shock	PASSED	PASSED		PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED	PASSED	
Dust	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity		PASSED	PASSED	PASSED	PASSED	
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	-	-	-	-	-	PASSED

HP ELITE SLICE DESKTOP PC

Test	HP Elite Slice G1	HP Elite Slice for Meeting Rooms G2
Tested Under	810G	810G
Drop	PASSED	PASSED
Functional Shock	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED
Dust	PASSED	PASSED
Humidity	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED
Temperature Shock	-	-



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HP PROONE ALL-IN-ONE DESKTOP PC, HP PRODESK DESKTOP PC

Test	HP ProOne 600 G6 AiO, 400 G6 AiO 810G	HP ProDesk 600 G6 SFF 810G	HP ProDesk 400 G7 SFF 801G	HP ProDesk 400 / 600 G6 DM 810G	HP ProDesk 600 /680 G6 MT 810G	HP ProDesk 405 G6 SFF 810G	HP ProDesk 405 G6 DM 810G
Tested Under							
Drop	-	PASSED	PASSED	PASSED	PASSED		PASSED
Functional Shock	-			PASSED	PASSED	-	PASSED
Vibration (Category 4)	-	PASSED		PASSED	PASSED	PASSED	PASSED
Vibration (Category 24)				PASSED			PASSED
Dust	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED

HP ELITE X2 DETACHABLE PC

Test	HP Elite x2 1012 G2 810G	HP Elite x2 1012 G2 Collaboration Keyboard 810G	HP Elite x2 1013 G3 810G	HP Elite x2 G4 810G
Tested Under				
Drop	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	-	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED	PASSED
Explosive Atmosphere	PASSED	PASSED	PASSED	PASSED
Freeze/Thaw	PASSED	PASSED	PASSED	PASSED
Bench Handling Shock	PASSED	PASSED	PASSED	PASSED
Crash Hazard Shock	PASSED	-	PASSED	PASSED



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HP ELITEBOOK CONVERTIBLE NOTEBOOK PC

Test	HP EliteBook x360 1030 G2	HP EliteBook x360 1030 G3	HP EliteBook x360 1030 G4	HP EliteBook x360 1040 G5, G6	HP EliteBook x360 830 G5, G6
Test Under	810G	810G	810G	810G	810G
Drop	PASSED	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	-	-	PASSED	-	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED	PASSED	PASSED
Explosive Atmosphere	-	PASSED	-	PASSED	-
Freeze/Thaw	PASSED	PASSED	PASSED	PASSED	PASSED
Bench Handling Shock	-	-	PASSED	-	PASSED
Crash Hazard Shock	-	-	PASSED	-	PASSED
Transporation Shock	-	-	PASSED	-	PASSED

HP ELITEBOOK CONVERTIBLE NOTEBOOK PC (CONTINUED)

Test	HP Elite Dragonfly	HP EliteBook x360 830 G7	HP EliteBook x360 1030/ 1040 G7
Tested Under	810H	810H	810H
Drop	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED
Vibration (Category 5)	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED
Explosive Atmosphere	-	-	-
Freeze/Thaw	PASSED	PASSED	PASSED
Bench Handling Shock	PASSED	PASSED	PASSED
Crash Hazard Shock	PASSED	PASSED	PASSED
Transporation Shock	PASSED	PASSED	PASSED



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MIL-STD-810 test background

HP ELITEBOOK NOTEBOOK PC

Test	HP EliteBook Folio G1 810G	HP EliteBook 1040 G4 810G	HP EliteBook 1050 G1 810G
Tested Under			
Drop	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED
Vibration (Category 5)	-	-	-
Vibration (Category 24)	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED
Altitude (Procedure 1)	PASSED	PASSED	PASSED
Altitude (Procedure 2)	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED
Explosive Atmosphere	PASSED	PASSED	PASSED
Freeze/Thaw	PASSED	PASSED	PASSED
Bench Handling Shock	-	-	PASSED
Crash Hazard Shock	-	-	PASSED
Transportation Shock	-	-	-

HP ELITEBOOK NOTEBOOK PC (CONTINUED)

Test	HP EliteBook 820/840/850 G3 810G	HP EliteBook 820/840/850 G4 810G	HP EliteBook 830/840/850 G5 810G	HP EliteBook 830/840/850 G6 810G	HP EliteBook 840r G4 810G
Tested Under					
Drop	PASSED	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	-	-	-	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure 1)	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure 2)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED	PASSED	PASSED
Explosive Atmosphere	PASSED	PASSED	PASSED	-	-
Freeze/Thaw	PASSED	PASSED	PASSED	PASSED	PASSED
Bench Handling Shock	-	-	-	PASSED	PASSED
Crash Hazard Shock	-	-	-	PASSED	PASSED
Transportation Shock	-	-	-	PASSED	PASSED



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MIL-STD-810 test background

HP ELITEBOOK NOTEBOOK PC (CONTINUED)

Test	HP EliteBook 840 G5 Healthcare Edition 810G	HP EliteBook 840 G6 Healthcare Edition 810G	HP EliteBook 725 G4 810G	HP EliteBook 735/745/ 755 G5 810G
Drop	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	PASSED	PASSED	-	-
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure 1)	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure 2)	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED	PASSED
Explosive Atmosphere	-	-	PASSED	PASSED
Freeze/Thaw	PASSED	PASSED	PASSED	PASSED
Bench Handling Shock	PASSED	PASSED	-	-
Crash Hazard Shock	PASSED	PASSED	-	-
Transportation Shock	PASSED	PASSED	-	-

HP ELITEBOOK NOTEBOOK PC (CONTINUED)

Test	HP EliteBook 735/745 G6 810G	HP EliteBook 830/840/850 G7 810H	HP EliteBook 835/845/855 G7 810H
Drop	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED
Vibration (Category 5)	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED
Altitude (Procedure 1)	PASSED	PASSED	PASSED
Altitude (Procedure 2)	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED
Explosive Atmosphere	-	-	-
Freeze/Thaw	PASSED	PASSED	PASSED
Bench Handling Shock	PASSED	PASSED	PASSED
Crash Hazard Shock	PASSED	PASSED	PASSED
Transportation Shock	PASSED	PASSED	PASSED



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MIL-STD-810 test background

HP PRO X2 DETACHABLE PC

Test	HP Pro x2 612 G2	HP Pro x2 612 G2 Collaboration Keyboard 810G
Tested Under	810G	
Drop	PASSED	PASSED
Functional Shock	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED
Vibration (Category 5)	-	-
Vibration (Category 24)	PASSED	PASSED
Dust	PASSED	PASSED
Humidity	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED
Temperature Shock	PASSED	PASSED
Sand	PASSED	PASSED
Freeze/Thaw	PASSED	PASSED
Bench Handling Shock	PASSED	-
Crash Hazard Shock	PASSED	-
Transportation Shock	-	-

HP PROBOOK CONVERTIBLE NOTEBOOK PC

Test	HP ProBook x360 440 G1	HP ProBook x360 11 G1, G2 EE	HP ProBook x360 11 G3, G4 EE	HP ProBook x360 11 G5, G6 EE	HP ProBook x360 435 G7
Tested Under	810G	810G	810G	810G	810H
Drop	PASSED	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	-	-	-	-	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Sand	-	-	-	-	PASSED
Freeze/Thaw	-	PASSED	-	-	PASSED
Bench Handling Shock	-	-	-	-	PASSED
Crash Hazard Shock	-	-	-	-	PASSED
Transportation Shock	-	-	-	-	PASSED



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MIL-STD-810 test background

HP PROBOOK NOTEBOOK PC

Test	HP ProBook 640/650/ 645 G4 810G	HP ProBook 640/650 G5 810G	HP ProBook 640/650 G7, 630/640/650 G8 810H	HP ProBook 635 Aero G7 810H
Drop	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	-	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED
High Temp (Procedure I)	PASSED	PASSED	PASSED	PASSED
High Temp (Procedure II)	PASSED	PASSED	PASSED	PASSED
Low Temp (Procedure I)	PASSED	PASSED	PASSED	PASSED
Low Temp (Procedure II)	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED
Sand	-	PASSED	PASSED	PASSED
Freeze/Thaw	-	PASSED	PASSED	PASSED
Bench Handling Shock	-	PASSED	PASSED	PASSED
Crash Hazard Shock	-	PASSED	PASSED	PASSED
Transportation Shock	-	PASSED	PASSED	PASSED

HP PROBOOK NOTEBOOK PC (CONTINUED)

Test	HP ProBook 430/440/450/ 455/470 G5 810G	HP ProBook 430/440/ 450 G6 810G	HP ProBook 445/455/ 445R/455R G6 810G	HP ProBook 430/440/450 G7, G8 810H	HP ProBook 445/455 G7 810H
Drop	PASSED	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	-	PASSED	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temp (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temp (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temp (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temp (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Sand	-	PASSED	PASSED	PASSED	PASSED
Freeze/Thaw	-	PASSED	PASSED	PASSED	PASSED
Bench Handling Shock	-	PASSED	PASSED	PASSED	PASSED
Crash Hazard Shock	-	PASSED	PASSED	PASSED	PASSED
Transportation Shock	-	PASSED	PASSED	PASSED	PASSED



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MIL-STD-810 test background

HP NOTEBOOK PC

Test	HP 340/348 G5 810G	HP 340/348 G7 810H
Tested Under		
Drop	PASSED	PASSED
Functional Shock	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED
Vibration (Category 5)	-	-
Vibration (Category 24)	PASSED	PASSED
Dust	PASSED	PASSED
Humidity	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED
High Temp (Procedure I)	PASSED	PASSED
High Temp (Procedure II)	PASSED	PASSED
Low Temp (Procedure I)	PASSED	PASSED
Low Temp (Procedure II)	PASSED	PASSED
Temperature Shock	PASSED	PASSED
Sand	-	-
Freeze/Thaw	-	-
Bench Handling Shock	-	-
Crash Hazard Shock	-	-
Transportation Shock	-	-

HP CHROMEBOOK CONVERTIBLE

Test	HP Chromebook x360 11 G1 EE, G2 EE 810G	HP Chromebook x360 14 G1, 14E G1 810G	HP Chromebook x360 11 G3 EE 810H
Tested Under			
Drop	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED
Bench Handling Shock	-	-	-
Crash Hazard Shock	-	-	-



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MIL-STD-810 test background

HP CHROMEBOOK

Test	HP Chromebook Enterprise 14A G5	HP Chromebook Enterprise 14 G5, 14A G5	HP Chromebook 11 G7 EE, 11A G6 EE	HP Chromebook 11 G8 EE, 11A G8 EE	HP Chromebook 14 G6, HP Chromebook Enterprise 14 G6 810H
Tested Under	810G	810G	810G	810H	
Drop	PASSED	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	-	-	-	-	-
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED	PASSED
Sand	-	-	-	-	-
Freeze/Thaw	-	-	-	-	-
Bench Handling Shock	-	-	-	-	-
Crash Hazard Shock	-	-	-	-	-
Transportation Shock	-	-	-	-	-

HP CHROMEBOOK (CONTINUED)

Test	HP Pro c640 Chromebook, HP Pro c640 Chromebook Enterprise 810H	HP Pro c1030 Chromebook, HP Pro c1030 Chromebook Enterprise 810H
Tested Under	810H	810H
Drop	PASSED	PASSED
Functional Shock	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED
Vibration (Category 5)	PASSED	PASSED
Vibration (Category 24)	PASSED	PASSED
Dust	PASSED	PASSED
Humidity	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED
Temperature Shock	PASSED	PASSED
Sand	PASSED	PASSED
Freeze/Thaw	PASSED	PASSED
Bench Handling Shock	PASSED	PASSED
Crash Hazard Shock	PASSED	PASSED
Transportation Shock	PASSED	PASSED



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MIL-STD-810 test background

HP RETAIL

Test	HP Engage One All-in-One	HP Engage Go Mobile System	HP Engage Go Mobile Dock 810G	HP Engage Flex Pro Retail System 810G	HP Engage Flex Pro-C Retail System 810G
Tested Under	810G	810G			
Drop		PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	-	-
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED	PASSED
Vibration (Category 24)		PASSED	PASSED	-	-
Dust	PASSED	PASSED	PASSED	PASSED	PASSED
Humidity		PASSED	PASSED	PASSED	PASSED
Altitude (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED	PASSED
Temperature Shock	-	PASSED	PASSED	-	-
Sand	-	-	-	-	-
Explosive Atmosphere	-	-	-	-	-
Freeze/Thaw	-	-	-	-	-

HP THIN CLIENT

Test	HP mt43, mt44 Mobile Thin Client 810G	HP mt45 Mobile Thin Client 810G	HP mt20, mt21 Mobile Thin Client 810G	HP mt22, mt32, mt46 Mobile Thin Client 810H
Tested Under				
Drop	PASSED	PASSED	PASSED	PASSED
Functional Shock	PASSED	PASSED	PASSED	PASSED
Vibration (Category 4)	PASSED	PASSED	PASSED	PASSED
Vibration (Category 5)	-	PASSED	-	-
Vibration (Category 24)	PASSED	PASSED	PASSED	PASSED
Dust	PASSED	PASSED	PASSED	PASSED
Humidity	PASSED	PASSED	PASSED	PASSED
Altitude	PASSED	PASSED	PASSED	PASSED
Altitude (Procedure II)	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED
High Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure I)	PASSED	PASSED	PASSED	PASSED
Low Temperature (Procedure II)	PASSED	PASSED	PASSED	PASSED
Temperature Shock	PASSED	PASSED	PASSED	PASSED
Sand	PASSED	PASSED	PASSED	PASSED
Explosive Atmosphere	PASSED	-	PASSED	PASSED
Freeze/Thaw	PASSED	PASSED	PASSED	PASSED
Bench Handling Shock	-	PASSED	-	PASSED
Crash Hazard Shock	-	PASSED	-	PASSED
Transportation Shock				PASSED



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MIL-STD-810 test background

MIL-STD-810 TEST BACKGROUND

Created by the U.S. government, the MIL-STD-810 test method standard is intended to help organizations prepare environmental tests to evaluate how well a particular piece of equipment can perform in the field. The standard outlines dozens of test methods, each associated with a source of environment stress, such as vibration, moisture, dust, extreme temperatures, or humidity; for example, Method 500.5 describes Low Pressure (Altitude) testing, while Method 501.5 describes High Temperature testing. While there is not a recommended or required list of tests for device categories, most major PC vendors generally perform between 5 and 8 test methods.

Each test method outlines multiple test procedures; for example, Method 501.5 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 business PC; Procedure II evaluates the effects of high temperature while the PC is running.

TEST SCENARIOS

A third-party facility tested the durability of the HP Business PC models using procedures tailored from MIL-STD-810. HP used the MIL-STD-810 test menu to select tests that most closely reflect the challenges faced by today's professionals.

NOTE

MIL-STD-810 testing is conducted on select HP products. Testing is not intended to demonstrate fitness for U.S. Department of Defense (DoD) contract requirements or for military use. Test results are not a guarantee of future performance under these test conditions. Accidental damage or damage under these test conditions requires an optional HP Accidental Damage Protection Care Pack.

The following sections describe the grueling test scenarios to which these business-rugged PCs were subjected. All testing was performed by a third-party testing facility, using 810G or 810H methods and procedures.

DROP TEST²

The Drop test was performed in accordance with MIL-STD-810G, Method 516.6 or 516.7, or MIL-STD-810H, Method 516.8 Procedure IV. The objective of this test was to determine whether the unit could be safely operated after being dropped from desk height. For this test, 26 drops were performed from 30 in. onto every side, angle and edge onto 2 in. of plywood over steel over concrete. Unit is powered down and checked for operation.

FUNCTIONAL SHOCK TEST²

The Shock test was performed in accordance with MIL-STD-810G, Method 516.6 or 516.7, or MIL-STD-810H, Method 516.8 Procedure I. The objective of this test was to determine whether the unit could be safely operated after being exposed to sudden physical shock events while operational. For this test, 3 shocks were performed across each axis and direction for a total of 18 shocks.

VIBRATION TEST²

The Vibration Resistance tests were performed in accordance with MIL-STD-810G Test Method 514.6 or 514.7, or MIL-STD-810H, Method 514.8 Procedure I, Cat 24, Cat 4, and Cat 5

Non- operational test with box. Test parameters were set to simulate the following:

- Operate the unit during a 1000-mile simulation of vibrations created by a truck driving on a U.S. highway.
- Operate the unit after it has been subjected to higher levels of vibration while in storage.

Terrain, road and surface discontinuities, vehicle speed, loading, structural characteristics, and suspension system are all reflected in this simulation.

See Key Parameters below for test specifications.



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MIL-STD-810 test background

DUST TEST²

The Dust Resistance test was performed in accordance with MIL-STD-810G, Method 510.5 or 510.6, or MIL-STD-810H, Method 510.7 Procedure I (Dust). Test parameters were set so that the unit was dusted with Arizona Road Dust for six hours while being operated.

HUMIDITY TEST²

The Humidity test was performed in accordance with MIL-STD-810G, Method 507.5 or 507.6, or MIL-STD-810H, Method 507.6 Procedure II with the aggravated temperature-humidity cycle. Each cycle was one day (24 hours); ten cycles with the temperature being cycled between 30°C (86°F) and 60°C (140°F); and relative humidity was a constant 95%.

ALTITUDE TEST²

The Altitude test was performed in accordance with MIL-STD-810G, Method 500.5 or 500.6, or MIL-STD-810H, Method 500.6 Procedure I (Storage) and II (Operation). The altitude level simulated for both procedures was 15,000 feet (the highest equivalent altitude given within MIL-STD-810 for cargo pressures within military aircraft).

HIGH TEMPERATURE TEST²

The High Temperature test was performed in accordance with MIL-STD-810G, Method 501.5 or 501.6, or MIL-STD-810H, Method 501.7 Procedure I (Storage) and II (Operation). This test evaluated the unit's performance while it was being exposed to high temperature conditions: 60°C (140°F) operational and 71°C (160°F) non-operational.

LOW TEMPERATURE TEST²

The Low Temperature test was performed in accordance with MIL-STD-810G, Method 502.5 or 502.6, or MIL-STD-810H, Method 502.7 Procedure I (Storage) and II (Operation). This test evaluated the unit's performance while it was being exposed to low temperature conditions: -29°C (-20°F) operational and -51°C (-60°F) non-operational.

TEMPERATURE SHOCK TEST²

The Thermal Shock test was performed in accordance with MIL-STD-810G, Method 503.5 or 503.6, or MIL-STD-810H, Method 503.7 Procedure I. The objective of this test was to determine whether the unit's could be safely operated after being exposed to sudden changes in ambient temperature while non-operational. The high temperature was set to be 60°C (140°F) and the low temperature to be -51°C (-60°F); three high-to-low cycles were performed.

SAND TEST²

The Sand test was performed in accordance with MIL-STD-810G, Method 510.5 or 510.6, or MIL-STD-810H, Method 510.7 Procedure II. The objective of this test was to determine whether the unit could be safely operated after being exposed to blowing sand of up to 20M/S at a temperature of 60°C (140°F) for 4.5 hours (every 90 minutes, the unit is rotated 90°).

EXPLOSIVE ATMOSPHERE TEST²

The explosive atmosphere test was performed in accordance with MIL-STD-810G, Method 511.5 or 511.6, or MIL-STD-810H, Method 511.7 Procedure I. The objective of this test was to determine whether the notebook could be safely operated in fuel-air explosive atmospheres without causing ignition.

FREEZE/THAW TEST²

The Freeze/Thaw test was performed in accordance with MIL-STD-810G, Method 524.1, or MIL-STD-810H, Method 524.1 Procedure III. The objective of this test was to determine whether the unit could be safely operated after being exposed to a temperature drop of -10°C (14°F) for two hours. Unit is removed and checked for operation.

BENCH HANDLING SHOCK TEST²

The bench handling test was performed in accordance to the MIL-STD-810G, Method 516.6 or 516.7, or MIL-STD-810H, Method 516.8 Procedure VI. This test was designed to test whether the unit can withstand levels of shock resulting from bench handling, bench maintenance, and/or packaging.



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MIL-STD-810 test background

CRASH HAZARD SHOCK TEST²

The Crash Hazard test was performed in accordance to the MIL-STD-810G, Method 516.6 or 516.7, or MIL-STD-810H, Method 516.8 Procedure V. The purpose of this test was to ensure that the unit does not eject sub-elements and that its restraining devices will not fail during crash situations.

TRANSPORTATION SHOCK TEST²

The Transportation Shock test was performed in accordance with MIL-STD-810G Test Method 516.7, or MIL-STD-810H, Method 516.8 Procedure II. Simulation of this environment requires use of a package tester (Annex C, Figure 514.7C-5) that imparts a 25.4 mm (1.0 inch) peak-to-peak, circular synchronous motion to the table at a frequency of 5 Hz. This motion takes place in a vertical plane.

SOLAR RADIATION SHOCK TEST²

The Solar Radiation Shock test was performed in accordance with MIL-STD-810G Test Method 505.6, or MIL-STD-810H, Method 505.7 Procedure II. Use Procedure II to investigate the effects on materiel of long periods of exposure to sunshine. The approach is to use an accelerated test that is designed to reduce the time to reproduce cumulative effects of long periods of exposure. The 4-hour "lights-off" period of each 24-hour cycle allows for test item conditions (physical and chemical) to return toward "normal" and provide some degree of thermal stress exercising.

ESD (ELECTROSTATIC DISCHARGE) TEST²

The ESD test was performed in accordance with IEC 61000-4-2. The objective of this test was to determine whether the unit could be safely operated after being exposed to sudden electrostatic discharge events of up to 8,000 volts. Electrostatic discharge points were performed at horizontal and vertical ground planes, chassis screw, serial port ground, screen, finger pad, power cable, power button, keyboard, speaker button, and trackball for a total of 11 discharge points.

PASS/FAIL CRITERION

The third-party verified that the tested unit was operational after each environmental exposure by booting the Microsoft® Windows® operating environment.

TEST DESCRIPTIONS

The following table includes the tests performed with specific MIL-STD-810 method references and key test parameters.

Test	MIL-STD-810G Reference	Procedures	Key Test Parameters
Vibration	MIL-STD-810G Test Method 514.6 or 514.7 or MIL-STD-810H, Method 514.8	Procedure I, Category 24 (Minimum Integrity Test)	Non-operational 0.04 g ² /Hz at 20-1000 Hz, -6 dB/octave at 1000-2000 Hz; One hour/axis duration
		Procedure I, Category 4 (Ground Vehicle)	Operational U.S. highway truck exposure 1000 mile Simulation; One hour/axis duration
		Procedure II, Category 5 (Loose Cargo)	Non-operational test with box. Simulation of this environment requires use of a package tester that imparts a 25.4 mm (1.0 inch) peak-to-peak, circular synchronous motion to the table at a frequency of 5 Hz. This motion takes place in a vertical plane.
Dust Resistance	MIL-STD-810G, Method 510.5 or 510.6 or MIL-STD-810H, Method 510.7	Procedure I (Blowing dust)	Particles of Arizona Road Dust, 10.6 +/-7 grams per cubic foot
Sand	MIL-STD-810G, Method 510.5 or 510.6 or MIL-STD-810H, Method 510.7	Procedure II (Blowing sand)	Blowing sand of up to 20M/S at a temperature of 60°C (140°F) for 4.5 hours. Every 90 minutes, the unit is rotated 90°.
Humidity	MIL-STD-810G, Method 507.5 or 507.6 or MIL-STD-810H, Method 507.6	Procedure II	Relative humidity 95%; Temperature cycled between 30°C and 60°C (86°F and 140°F); Test cycle 24 hours; test consisted of ten cycles



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MIL-STD-810 test background

Test	MIL-STD-810G Reference	Procedures	Key Test Parameters
Altitude	MIL-STD-810G, Method 500.5 or 500.6, or MIL-STD-810H, Method 500.6	Procedure I (Storage/air transport)	Non-operational 15,000 feet at 57 kPa One hour duration
		Procedure II (Operation/air carriage)	Operational 15,000 feet at 57 kPa One hour duration
High Temperature	MIL-STD-810G, Method 501.5 or 501.6, or MIL-STD-810H, Method 501.7	Procedure I (Storage)	Non-operational Temperature cycled between 35°C and 71°C (95°F and 160°F)
		Procedure II (Operation)	Test cycle 24 hours; test consisted of seven cycles Operational 60°C (140°F) Four hours duration
Low Temperature	MIL-STD-810G, Method 502.5 or 502.6, or MIL-STD-810H, Method 502.7	Procedure I (Storage)	Non-operational -51°C (-60°F) Four hours duration
		Procedure II (Operation)	Operational -29°C (-20°F) Four hours duration
Temperature Shock	MIL-STD-810G, Method 503.5 or 503.6 or MIL-STD-810H, Method 503.7	Procedure I	Non-operational High temperature 60°C (140°F) Low temperature -51°C (-60°F); Three cycles (a cycle consists of a dwell low, low to high, dwell high, high to low) One hour dwell time
Functional Shock	MIL-STD-810G, Method 516.6 or 516.7 or MIL-STD-810H, Method 516.8	Procedure I	Operational 3 shocks/axis/direction for a total of 18 shocks; 40 Gs peak, 11 ms
Drop	MIL-STD-810G, Method 516.6 or 516.7, or MIL-STD-810H, Method 516.8	Procedure IV	26 drops from 30 in. onto every side, angle and edge onto 2 in. of plywood over steel over concrete. Unit is powered down and checked for operation.
Explosive Atmosphere	MIL-STD-810G, Method 511.5 or 511.6 or MIL-STD-810H, Method 511.7	Procedure I	Unit could be safely operated in fuel-air explosive atmospheres without causing ignition.
Freeze/Thaw	MIL-STD-810G, Method 524.1 or 524.5 or MIL-STD-810H, Method 524.1	Procedure III	Non-operational Exposed to a temperature drop of -10°C (14°F) for two hours Unit is removed and checked for operation
Crash Hazard Shock	MIL-STD-810G, Method 516.6 or 516.7 or MIL-STD-810H, Method 516.8	Procedure V	Non Operational 2 shocks in each axis/direction for
Bench Handling Shock	MIL-STD-810G, Method 516.6 or 516.7 or MIL-STD-810H, Method 516.8	Procedure VI	16 drops from 4 inches on a wooden bench top on all sides, edges and corners that could be impacted during normal handling or during maintenance.



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MIL-STD-810 test background

Test	MIL-STD-810G Reference	Procedures	Key Test Parameters
Solar Radiation	Method 505.6	Procedure II Sample condition: Non-Operation Radiation source: Metal halide lamp Irradiance: Spectral irradiance of (1120+/-47 W/m ² at (300-3000) nm Chamber temperature: 49 degree Exposing duration: 20 hours irradiation and 4 hours darkness per a 24-hour cycle Test duration: 1 Cycle Two units: 1 for lid close, 1 for lid open.	The purpose is to investigate the effects on material of long periods of exposure to sunshine. The approach is to use an accelerated test that is designed to reduce the time to reproduce cumulative effects of long periods of exposure. The 4-hour "lights-off" period of each 24-hour cycle allows for test item conditions (physical and chemical) to return toward "normal" and provide some degree of thermal stress exercising.

ESD TEST DESCRIPTIONS

The following table includes the specific test parameters for the Electrostatic Discharge test.

Test	Reference	Key Test Parameter
ESD (Electrostatic Discharge)	IEC 6100-42	Temperature: 23°C (73°F) Humidity 39% Between 6 to 8,000 Volts applied to: <ul style="list-style-type: none"> • Horizontal Ground Plane • Vertical Ground Plane • Chassis Screw • Serial Port Ground • Screen • Fingerprint • Power Cable • Power Button • Keyboard • Speaker B

The MIL-STD-810G and MIL-STD-810H test specifications can be accessed at <https://www.iest.org/Standards-RPs/MIL-STD-810H>.

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¹HP's Total Test Process is not a guarantee of future performance under these test conditions. Accidental Damage or damage under these test conditions requires an optional HP Accidental Damage Protection Care Pack.

²MIL - STD - 810 testing is conducted on select HP products. Testing is not intended to demonstrate fitness for U.S. Department of Defense (DoD) contract requirements or for military use. Test results are not a guarantee of future performance under these test conditions. Accidental damage or damage under these test conditions requires an optional HP Accidental Damage Protection Care Pack.

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