



The science behind the report:

# Shorten the time from conception to execution with the HP ZBook Studio 16 G10

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report [Shorten the time from conception to execution with the HP ZBook Studio 16 G10](#).

We concluded our hands-on testing on September 22, 2023. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on July 31, 2023 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

## Our results

To learn more about how we have calculated the wins in this report, go to <http://facts.pt/calculating-and-highlighting-wins>. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 1: Results of our benchmark and hand-timed design workflow comparisons. Higher benchmark scores are better. Lower hand-timed test times are better.

	HP ZBook Studio 16 G10	HP ZBook Studio 16 G9
Geekbench 6 Pro score (higher is better)		
GPU Compute OpenCL	147,565	121,351
GFXBench scores (higher is better)		
1,080p Aztec Ruins OpenGL (normal tier) offscreen	51,408.6	37,559.8
1,080p Car Chase offscreen	41,461.1	31,492.0
1,80p Manhattan 3.1.1 offscreen	36,374.3	27,977.5
1,080p T-Rex offscreen	177,470.0	115,168.0
1,080p Tessellation offscreen	299,660.0	198,422.0
1,080p ALU 2 offscreen	274,576.0	187,332.0
1,080p Texturing offscreen (MTexel/s)	325,356.0	202,162.0

	HP ZBook Studio 16 G10	HP ZBook Studio 16 G9
Blender 3.6.0 scores (higher is better)		
Monster	2,827.6	1,626.4
Junkshop	1,392.7	1,001.4
Classroom	1,332.7	859.1
Basemark GPU scores (higher is better)		
DirectX 12	14,657	10,446
Vulkan	15,327	11,276
3DMark® Time Spy scores (higher is better)		
Overall score	13,274	10,171
Procyon Office Productivity score (higher is better)		
Overall score	5,780	5,212
PugetBench for Photoshop score (higher is better)		
Overall score	955	781
Procyon® AI Inference Benchmark for Windows scores (higher is better)		
Windows ML - GPU, Float32	626	491
Windows ML - GPU, Integer	186	164
Intel OpenVINO™ - CPU, Float32	83	70
Intel OpenVINO - CPU, Integer	181	143
Hand-timed design workflow comparisons, in seconds (lower is better)		
Import 50 photos using Adobe® Lightroom® Classic	10	15
Upscale image resolution 4x using Gigapixel AI	10	18

## System configuration information

Table 2: Detailed information on the systems we tested.

System configuration information	HP ZBook Studio 16 G10	HP ZBook Studio 16 G9
Processor		
Vendor	Intel	Intel®
Model number	Core i9-13900H	Core™ i9-12900H
Core frequency (GHz)	4.1 – 5.4	3.8 – 5.0
Number of cores	6 P-cores, 8 E-cores	6 P-cores, 8 E-cores
Cache (MB)	24	24
Memory		
Amount (GB)	32	32
Type	DDR5	DDR5
Speed (MHz)	5,200	4,800
Integrated graphics		
Vendor	Intel	Intel
Model number	Iris® Xe Graphics	Iris Xe Graphics
Discrete graphics		
Vendor	NVIDIA®	NVIDIA
Model number	RTX™ 4080	RTX 3080
VRAM (GB)	12	16
Storage		
Amount (TB)	1	1
Type	PCIe®-based flash	PCIe-based flash
Connectivity/expansion		
Wireless internet	Intel AX211 Wi-Fi 6E	Intel AX211 Wi-Fi 6E
Bluetooth	5.3	5.2
USB	1x USB Type-A, 3x USB Type-C	1x USB Type-A, 3x USB Type-C
Thunderbolt	2	2
Video	1x USB-C DisplayPort	1x USB-C DisplayPort
Battery		
Type	Lithium-polymer	Lithium-polymer
Size	Integrated	Integrated
Rated capacity (WHr)	86	86

System configuration information	HP ZBook Studio 16 G10	HP ZBook Studio 16 G9
Display		
Size (in.)	16.0	16.0
Type	IPS	IPS
Resolution	3840 x 2400	3840 x 2400
Touchscreen	No	No
Operating system		
Vendor	Windows	Windows
Name	Windows 11 Pro	Windows 11 Pro
Build number or version	22H2	22H2
BIOS		
BIOS name and version	HP 8B8F U3E1	HP 89C3 U3E1
Dimensions		
Height (in.)	0.75	0.75
Width (in.)	14.02	14.02
Depth (in.)	9.53	9.53
Weight (lb.)	3.81	3.81

# How we tested

## Setting up the HP ZBook Studio 16 mobile workstations

### Creating and updating the OEM Windows 11 home image

1. Boot the system.
2. To complete installation, follow the on-screen instructions, using the default selections when appropriate.
3. Set the Windows (plugged in) Power Mode to Best Performance.
4. Set Screen and Sleep options to Never:
  - a. Right-click the desktop, and select Display settings.
  - b. From the left column, select System.
  - c. Click Power and Battery.
  - d. For all power options listed under Screen and Sleep, select Never.
5. Disable User Account Control notifications:
  - a. Select Windows Start, type UAC, and press Enter.
  - b. Move the slider control to Never notify, and click OK.
6. Run Windows Update, and install all updates available.
7. Verify the date and time are correct, and synchronize the system clock with the time server.
8. Pause Automatic Windows Updates:
  - a. Right-click Windows Start.
  - b. Type Windows Update settings, and press Enter.
  - c. From the Pause updates drop-down menu, select Pause for 5 weeks.

## Measuring system performance with benchmarks

### Using the Basemark GPU benchmark

#### Setting up the test

1. Download the Basemark GPU benchmark from <https://www.basemark.com/benchmarks/basemark-gpu/>.
2. To install Basemark GPU with the default options, double-click the Basemark GPU installer file.
3. Follow the installation instructions and install any necessary Microsoft Visual Redistributable components.

#### Running the Basemark GPU test

1. To launch the benchmark, double-click the Basemark GPU desktop icon.
2. Select the Graphics API, Graphics Device, Texture Compression, and Content Quality.
3. Click Run Official Test.
4. When the benchmark run completes, record the results.
5. Repeat steps 1 through 4 two more times.

### Using the GFXBench 5.0 benchmark

#### Setting up the test

1. Download and install the GFXBench 5.0 installer from <https://gfxbench.com/windows-download/gfxbench/>.

#### Running the GFXBench 5.0 test

1. Launch GFXBench.
2. Ensure the default API (OpenGL) and correct device are selected for testing.
3. Click Select.
4. Click Start all.
5. Record the results.
6. Wait 5 minutes before rerunning.
7. Repeat steps 1 through 6 two more times.

## Using the Blender benchmark

### Setting up the test

1. Download and install the Blender benchmark from <https://opendata.blender.org/>.

### Running the Blender test

1. Launch the Blender Benchmark Launcher.
2. To accept the agreement, click Next.
3. Leave the default 3.6.0 Blender Version selected, and click Next.
4. Confirm the scenes the benchmark will render, and click Next.
5. Ensure the correct Benchmark Device is selected, and click Start Benchmark.
6. Record the results.
7. Wait 5 minutes before rerunning.
8. Repeat steps 1 through 7 two more times.

## Using the 3DMark Time Spy benchmark

### Setting up the test

1. Download the 3Dmark benchmark from <http://www.futuremark.com/benchmarks/3dmark/all>.
2. To install 3Dmark with the default options, double-click the 3Dmark installer.exe file.
3. To launch 3Dmark, double-click the 3Dmark desktop icon, enter the registration code, and click Register.
4. Exit 3Dmark.

### Running the 3DMark Time Spy test

1. To launch the benchmark, double-click the 3Dmark desktop icon.
2. At the top of the 3Dmark Home screen, click the Benchmarks tab.
3. Select Time Spy.
4. Click Run.
5. When the benchmark run completes, record the results.
6. Perform steps 1 through 6 two more times.

## Using the Geekbench 6 Pro GPU OpenCL benchmark

### Setting up the test

1. Purchase a Pro license, and download and install Geekbench 6 Pro from <https://www.geekbench.com/download/>.

### Running the Geekbench 6 Pro GPU OpenCL test

1. Launch Geekbench.
2. Click Run Compute Benchmark.
3. Record the result.
4. Wait 5 minutes before rerunning.
5. Repeat steps 1 through 4 two more times.

## Using the Procyon Office Productivity Benchmark

### Setting up the test

1. Download and install Procyon.
2. Open Procyon.
3. Click Office Productivity Benchmark.
4. Click Register.
5. Enter the license key for the Office Productivity Benchmark, and click Register.
6. Before running the benchmark, install a licensed version of Microsoft 365.

### Running the Procyon Office Productivity test

1. Boot the system.
2. Launch Procyon.
3. Click Office Productivity Benchmark.
4. Click Run.
5. When the benchmark is complete, record the results.
6. Wait 15 minutes before rerunning the benchmark.
7. Repeat steps 1 through 6 twice more.

## Using the UL Procyon AI Inference Benchmark

### Setting up the test

1. Download and install Procyon.
2. Open Procyon.
3. Click AI Inference Benchmark.
4. Click Register.
5. Enter the license key for the AI Inference Benchmark, and click Register.

### Running the Procyon AI Inference test

1. Boot the system.
2. Launch Procyon.
3. Click AI Inference Benchmark.
4. Select the version of the AI Inference Benchmark to run.
5. Click Run.
6. When the benchmark is complete, record the results.
7. Wait 15 minutes before rerunning the benchmark.
8. Repeat steps 1 through 7 twice more.

## Running hand-timed tests

### Importing 50 photos with Adobe Lightroom Classic

1. Launch Lightroom.
2. Click the Import button.
3. Select the test file directory.
4. Start the timer, and click Import.
5. When the import task completes, stop the timer, and record the time.
6. Remove all images from the test library.
7. Repeat steps 1 through 6 two more times.

### Upscaling image resolution 4x

#### Setting up the Gigapixel AI test

1. Register, download, and install the Topaz Labs Gigapixel AI free trial from <https://www.topazlabs.com/gigapixel-ai>.
2. Launch Gigapixel AI, and enter the username and password.
3. Close Gigapixel AI.

## Running the test

1. Launch DeNoise AI.
2. Open File → Preferences, select the appropriate AI Processor, and set Allowed Memory Consumption to High.
3. Click Browse, and select the test image. Leave the default Scale and AI Model resize options selected.
4. To start the upscale process, click Save.
5. Once the save process completes, record the time it took. This appears in the box located at the bottom of the screen.
6. Wait 5 minutes before performing the next run.
7. Repeat steps 1 through 6 two more times.

Read the report at <https://facts.pt/CX6eqAK> ▶

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