



The science behind the report:

Lenovo ThinkCentre M90q Gen 4 Tiny: Expect big things from small packages

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 [Lenovo ThinkCentre M90q Gen 4 Tiny: Expect big things from small packages](#).

We concluded our hands-on testing on October 26, 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 September 8, 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.

Performance benchmark results

Table 1: The table below represents our benchmark results in detail. Higher benchmark scores are better. We report the median score of three runs for each test.

	Lenovo ThinkCentre M90q Gen 4 Tiny	Apple Mac mini (2023)
Cinebench R23 vR23.200 (score, higher is better)		
Multi-core	25,266	14,862
Single-core	1,990	1,656
WebXPRT 4 on Google Chrome v116.0.5845.140		
Overall score (higher is better)	323	266
Subscores (milliseconds, lower is better)		
Photo Enhancement	269	308
Organize Album Using AI	1,112	1,779
Stock Option Pricing	67	101
Encrypt Notes and OCR Scan using WASM	675	581
Sales Graphs	190	224
Online Homework	1,356	1,515

	Lenovo ThinkCentre M90q Gen 4 Tiny	Apple Mac mini (2023)
CrossMark™ v1.0.1.95 Pro (score, higher is better)		
Overall	1,980	1,771
Subscores		
Productivity	1,791	1,553
Creativity	2,366	2,225
Responsiveness	1,470	1,327
Procyon® Office Productivity Benchmark v2.6.848 using Microsoft Office v2303 Build 16227.20318		
Overall (rating, higher is better)	255,000	202,000
Subscores (higher is better)		
Word	273,000	223,000
Excel	220,000	145,000
PowerPoint	277,000	257,000
Geekbench 6 v6.1.3 (score, higher is better)		
CPU Multi-core	16,552	14,742
CPU Single-core	2775	2669

System and application responsiveness results

Table 2: The table below represents our hand-timed test findings in detail. Lower times are better. We report the median time of three runs for each test.

	Lenovo ThinkCentre M90q Gen 4 Tiny	Apple Mac mini (2023)
System boot and shutdown (seconds, lower is better)		
Time to boot	16.58	16.84
Time to resume from sleep	3.25	3.62
Microsoft Office Word (seconds, lower is better)		
Time to launch	0.7	0.8
Time to open 90MB Word document	0.8	1.0
Time to perform word Find/Replace	1.0	1.0
Microsoft Office Excel (seconds, lower is better)		
Time to launch	0.8	0.9
Time to open 92MB Excel spreadsheet containing macro	10.9	13.5
Time to open 650KB 10K row Excel spreadsheet	0.8	0.9
Time to insert 3-D 100% Stacked Column Chart	16.2	22.3
Microsoft Office PowerPoint (seconds, lower is better)		
Time to launch	0.7	0.8
Time to export 180MB PPTX to PDF	6.6	8.4

System configuration information

Table 3: Detailed information on the systems we tested.

System configuration information	Lenovo ThinkCentre M90q Gen 4 Tiny	Apple Mac mini (2023)
Processor		
Vendor	Intel	Apple
Model number	Core i7-1370P	M2 Max
Core frequency	3.9 – 5.2 GHz	3.68 GHz
Number of cores	14	12
Logical processors	20	
Memory		
Amount	64 GB	64 GB
Type	LPDDR5	Unified
Graphics #1		
Vendor	Intel	Apple
Model number	Intel Iris Xe Graphics	M2 Max 38-core GPU
Graphics #2		
Vendor	N/A	N/A
Model number	N/A	N/A
Driver	N/A	N/A
Storage		
Amount	1 TB	1 TB
Type	SSD	SSD
Connectivity/expansion		
Wireless internet	Intel Wi-Fi 6E AX211	Wi-Fi 6E (802.11ax)
Bluetooth	5.3	5.3
USB	1 x Kensington Nano Security Slot 2 x Thunderbolt 4 ports 2 x USB-A 3.2 ports	1 x MagSafe3 port 1 x SDXC card 3 x Thunderbolt 4 ports
Battery		
Type	Integrated Lithium-polymer	Integrated Lithium-polymer
Rated capacity	57 Whr	70 Whr
Display		
Size	14"	14.2"
Resolution	1,920 x 1,200	3,024 x 1,964
Operating system		
Vendor	Microsoft	Apple

System configuration information	Lenovo ThinkCentre M90q Gen 4 Tiny	Apple Mac mini (2023)
Name	Windows 11 Pro	macOS Ventura
Version	22H2 Build 22621.2134	13.5.1
BIOS		
BIOS name and version	Lenovo N3XET40W (1.15)	8422.141.2
Dimensions		
Height (in)	0.59	0.61
Width (in)	12.43	12.31
Depth (in)	8.76	8.71
Weight (system) lbs.	2.74	3.56

How we tested

Setting up the system (Windows)

Setting up and updating the OEM image

1. Boot the system under test (SUT).
2. Follow the on-screen instructions to complete installation, 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 & 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. Click the Windows Start button.
9. Type `Windows Update settings` and press Enter.
 - a. From the Pause updates drop-down menu, select Pause for 5 weeks.

Setting up the system (macOS)

Setting up and updating the OEM image

1. Boot the SUT.
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set Screen and Sleep options to Never:
 - a. Select System Settings.
 - b. Select Screensaver.
 - c. Set Lock Screen Settings to Never.
 - d. Return to System Settings, and select Battery.
 - e. Set On power adapter setting to High Power.
4. Disable Automatically adjust brightness:
 - a. Select System Settings.
 - b. Select Display.
 - c. Disable Automatically adjust brightness.
5. Run Software Update, and install all updates available.
6. Verify the date and time are correct.
7. Enable Automatic log in:
 - a. Select System Settings.
 - b. Click Users & Groups.
 - c. Select the drop-down menu next to the Automatically log in as setting, and select the User account.
8. Disable Automatic Mac Updates:
 - a. Select System Settings.
 - b. Click General.
 - c. Click Software Update.
 - d. Click the information icon next to Automatic updates.
 - e. Disable Check for updates.

Performance benchmark testing

Cinebench R23 benchmark testing

Setting up the Cinebench R23 test (Windows & macOS)

1. Download and install Cinebench from <https://www.maxon.net/en/downloads/cinebench-r23-downloads>.

Running the Cinebench R23 benchmark (Windows & macOS)

1. Launch Cinebench.
2. Select File→Advanced benchmark.
3. Set the Minimum Test Duration to Off.
4. Select either CPU (Multi Core) or CPU (Single Core), and click Start.
5. Record the result.
6. Wait 15 minutes before re-running.
7. Repeat steps 1 through 6 two more times.

Geekbench 6 Pro benchmark testing

Setting up the test (Windows & macOS)

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

Running the test (Windows & macOS)

1. Launch Geekbench.
2. Click Run CPU Benchmark.
3. Record the result.
4. Wait 5 minutes before re-running.
5. Repeat steps 1 through 4 two more times.

BAPCo CrossMark benchmark testing

Setting up the test (Windows & macOS)

1. Download and install CrossMark from the Microsoft Store or Apple App Store.

Running the test (Windows & macOS)

1. Launch CrossMark.
2. Click Settings.
3. For Number of Iterations, choose 1.
4. Enter a valid email address, and click Back.
5. Click Run Benchmark.
6. Record the result.
7. Repeat steps 1 through 6 two more times.

WebXPRT 4 benchmark testing (Google Chrome)

Running the test (Windows & macOS)

1. Open the Web browser under test, and go to <https://www.principledtechnologies.com/benchmarkxpert/webxpert/>.
2. Click Run WebXPRT 4.
3. At the Ready to test your browser screen, click Continue.
4. Click Start.
5. When the test completes, record the results.
6. Click Run Again, and click Start to rerun WebXPRT. Record the results.
7. Repeat step 6 two more times.

Procyon Office Productivity Benchmark testing

Setting up the test (Windows)

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, make sure to install a licensed version of Microsoft 365.

Setting up the test (macOS)

1. Before running the benchmark, make sure to install a licensed version of Microsoft 365.
2. On a secondary system, log into <https://testdriver.ul.com/ui/>.
3. Download the client file and API key.
4. On the SUT, run the client installation file.
5. When prompted, enter the API key.
6. In Testdriver, select the client system.
7. Click Run.
8. In the Select Test drop-down menu, select Procyon Office Productivity Mac First Time Setup.
9. Click Run.
10. On the client SUT, select Start test now.
11. Allow any on-screen permissions checks during the first-time setup run.
12. Allow the benchmark to complete, and restart the system to begin testing.

Running the test (Windows)

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 3 through 6 twice more.

Running the test (macOS)

1. Boot the system.
2. On a second system, log into <https://testdriver.ul.com/ui/>.
3. In Testdriver, select the client SUT.
4. Select Run.
5. From the Select Test drop-down menu, select Procyon Office Productivity.
6. In the Run Name field, enter a test name.
7. Click Run.
8. On the client SUT, select Start test now.
9. When the benchmark completes, record the results.
10. Wait 15 minutes before rerunning the benchmark.
11. Repeat steps 3 through 10 twice more.

Hand-timed boot and resume from sleep testing

Boot and resume from sleep hand-timed testing

Notes:

- A stopwatch is necessary for timing purposes.
- On the Windows system, configure Windows Hello. On the Mac system, configure Touch ID.

Running the test (Windows & macOS)

1. Simultaneously start the timer and boot the system.
2. Stop the timer when the Windows Taskbar or macOS Dock appears.
3. Record the result as the Boot time.
4. Allow the system to remain booted for 2 minutes.
5. Close the lid, and allow the system to go into Sleep mode.
6. Simultaneously start the timer and open the system lid.
7. Stop the timer when the Windows Taskbar or macOS Dock appears.
8. Record the result as the resume from Sleep time.
9. Shut down the system.
10. Repeat steps 1 through 9 two more times, and report the median of the three runs.

Time to complete the hand-timed Microsoft PowerPoint scenario

We recorded how long it took to launch PowerPoint, open a 180MB PowerPoint PPTX file, start a slideshow task, and export a PPTX to PDF. A stopwatch is required for this test.

We used the following application:

- Microsoft PowerPoint (Windows v16.0.16731.20194 & macOS v16.76.1.23082301)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch PowerPoint.
2. Stop the timer when PowerPoint has loaded.
3. Browse to where the test PowerPoint file is located.
4. Simultaneously start the timer and open the PowerPoint file.
5. Stop the timer when the PowerPoint file has loaded, as indicated by all 33 slides appearing in the side bar, and record the results.
6. Simultaneously start the timer and press F5 to start the slide show.
7. Stop the timer when the slide show starts to play.
8. Exit the slide show.
9. Click File→Export→Create PDF/XPS.
10. Simultaneously start the timer and click Publish.
11. Stop the timer when the PDF has been created, and record the results.
12. Repeat steps 1 through 11 two more times.

Time to complete the hand-timed Microsoft Excel scenario

We recorded how long it took to launch Excel, open a 92MB macro Excel XLSX file, open a 650KB 10K row Excel XLSX and insert a 3D 100% stacked column chart into the 10K row spreadsheet. A stopwatch is required for this test.

We used the following application:

- Microsoft Excel (Windows v16.0.16731.20194 & macOS v16.76.23081101)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Excel.
2. Stop the timer when Excel has loaded.
3. Browse to where the test Excel macro file is located.
4. Simultaneously start the timer and open the Excel macro file.
5. Stop the timer when the Excel file has loaded.
6. Close the macro test file.

7. Browse to where the test Excel 10K row file is located.
8. Simultaneously start the timer and open the 10K row file.
9. Stop the timer when the Excel file has loaded.
10. Click Insert, and select the drop-down menu next to the Insert Column or Bar Chart icon.
11. At the bottom of the drop-down menu, select More Column Charts.
12. Under the Column section, choose 3-D 100% Stacked Column.
13. Simultaneously start the timer and click Ok.
14. Stop the timer when the 3-D 100% Stacked Column Chart appears.
15. Repeat steps 1 through 14 two more times.

Time to complete the hand-timed Microsoft Word scenario

We recorded how long it took to launch Word, open a 90MB Word DOCX file, perform a find/replace task, and export a DOCX file to PDF. A stopwatch is required for this test.

We used the following application:

- Microsoft Word (Windows v16.0.16731.20194 & macOS v16.49.23082301)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Word.
2. Stop the timer when Word has loaded.
3. Locate the test Word file.
4. Simultaneously start the timer and open the Word file.
5. Stop the timer when the Word document has fully loaded.
6. Press CTRL + H/Control + H to bring up the Find/Replace dialog box.
7. In the Find What field, type I
8. In the Replace With field, type TEST
9. Simultaneously start the timer and select Replace All.
10. Stop the timer when Word has replaced every I.
11. Click File→Export→Create PDF/XPS.
12. Simultaneously start the timer and click Publish.
13. Stop the timer when the Word has exported the document to PDF.
14. Close the Word document. Do not save changes.
15. Repeat steps 1 through 14 two more times.

Read the report at <https://facts.pt/bLWYv9l>



This project was commissioned by Lenovo.



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