

MSI Kombustor 4

Technical Guide

December 12, 2019 – Kombustor v4.1.2



MSI KOMBUSTOR

> (GL) MSI-01
> GEFORCE RTX 2070/PCI-E/SSE2
> VRAM: 8192MB (USAGE: 2021MB)
> OPENGL 4.6.0 NVIDIA 431.60
> 1407 X 1195 (WINDOWED)



MSI Kombustor is a tool for evaluating the graphics performances of gaming PCs. It includes different graphics tests designed to stress test the graphics hardware (the GPU). Some tests are CPU-intensive as well.

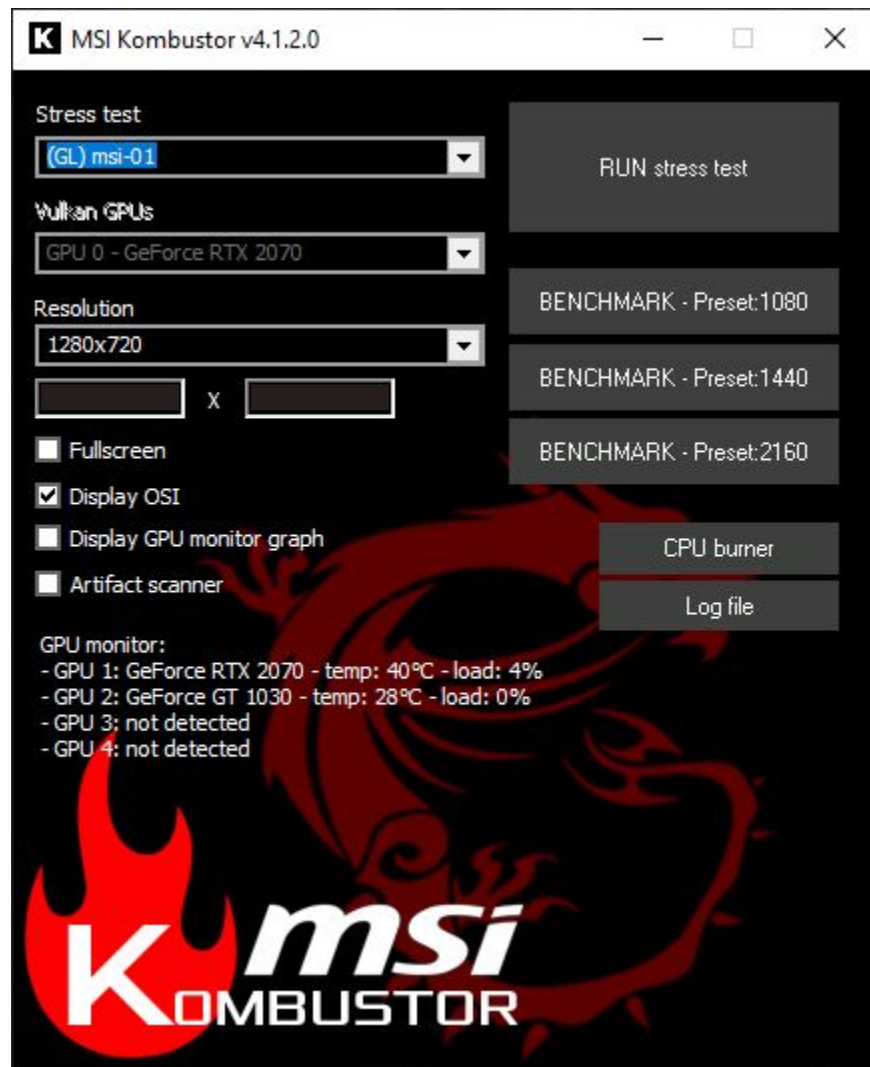
Kombustor can be downloaded from this page: <https://geeks3d.com/furmark/kombustor/>

Kombustor is made up of several small **OpenGL** or **Vulkan** graphics tests that allow to quickly benchmark a graphics card. These tests are available in two modes:

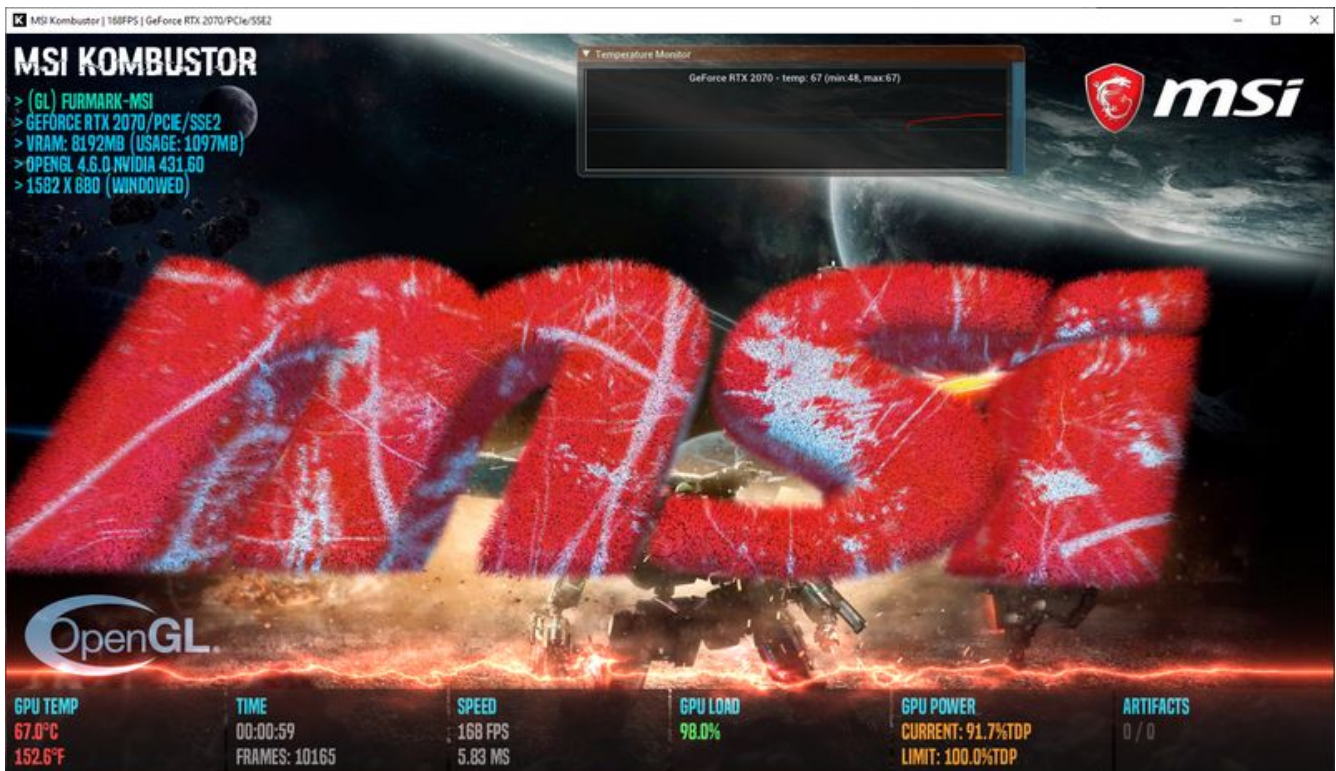
- **demo mode** (or **stress test mode**): in this mode, the test runs until the user stops it (ESC key).
- **benchmark mode**: the test runs during a certain lapse of time (60 seconds) and displays a score at the end. Depending on the test, the score can be submitted to an online database.

Kombustor is also an useful tool for overclockers and repair centers: it allows to check if current overclocking settings are stable and if the cooling system does its job.

Kombustor is available with a built-in **artifact scanner** and all Kombustor tests can be launched from the **command line**.



FurMark Tests



First versions of Kombustor (nearly one decade ago) have been developed as customized versions of **FurMark**, the popular GPU burner (<https://geeks3d.com/furmark/>). That's why, in each iteration of Kombustor, we find a FurMark-based graphics test. Kombustor is the first tool that comes with the OpenGL and Vulkan version of FurMark. FurMark is a rude stress test. It's not here to please your GPU, it has been designed to suffocate it.

Here are the FurMark tests available in the current version of Kombustor:

- **(GL) FurMark-MSI**: OpenGL version of FurMark displaying a furry MSI object.
- **(VK) FurMark-MSI**: Vulkan version of FurMark displaying a furry MSI object.
- **(GL) FurMark-Donut**: OpenGL version of FurMark displaying the original FurMark object: the donut.
- **(VK) FurMark-Donut**: Vulkan version of FurMark displaying the original FurMark object (donut).

The next tests are available in OpenGL only and are special versions of FurMark that try to stress test both the GPU core (like the original FurMark) and the GPU memory (VRAM). This test is useful to detect an issue with graphics memory.

- **(GL) FurMark-Donut-1700MB**: in this test, FurMark allocates 1700MB (or 1.7GB) of graphics memory to store its data (for graphics cards with 2GB or more of VRAM).

- **(GL) FurMark-Donut-3200MB:** in this test, FurMark allocates 3200MB (or 3.2GB) of graphics memory to store its data (for graphics cards with 4GB or more of VRAM).
- **(GL) FurMark-Donut-5200MB:** in this test, FurMark allocates 5200MB (or 5.2GB) of graphics memory to store its data (for graphics cards with 6GB or more of VRAM).
- **(GL) FurMark-Donut-6500MB:** in this test, FurMark allocates 6500MB (or 6.5GB) of graphics memory to store its data (for graphics cards with 8GB or more of VRAM).

An error message is displayed if the amount of VRAM is insufficient.

TessMark tests

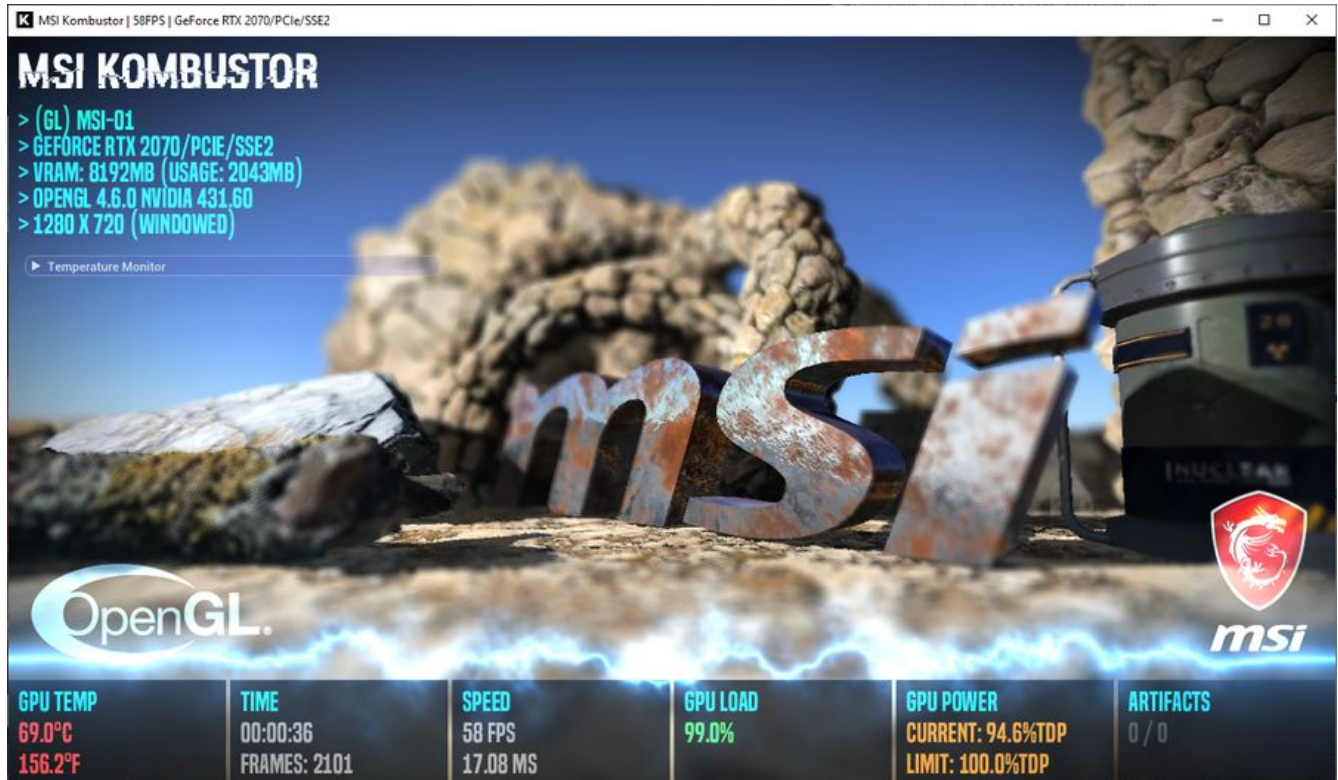


TessMark is a graphics test focused on the tessellation engine, that every GPU has since many years. Tessellation is a technique that allows to tessellate (or densify) a low resolution mesh in order to add details. This technique is widely used in video games. The amount of tessellation is defined by the tessellation level: from 1 to 64 in modern GPUs. The tessellation level has a great impact on performances: more tessellation means lower performances. High levels of tessellation require powerful GPUs. A tessellation level of X16 is common in video games.

Like FurMark, TessMark is a simple graphics test that displays a tessellated sphere. A post processing filter has been added to enhance the visual aspect of the test.

- **(GL) TessMark-X32:** OpenGL version of TessMark with a tessellation level of X32.
- **(VK) TessMark-X32:** Vulkan version of TessMark with a tessellation level of X32.
- **(GL) TessMark-X16:** OpenGL version of TessMark with a tessellation level of X16.
- **(VK) TessMark-X16:** Vulkan version of TessMark with a tessellation level of X16.

MSI-01



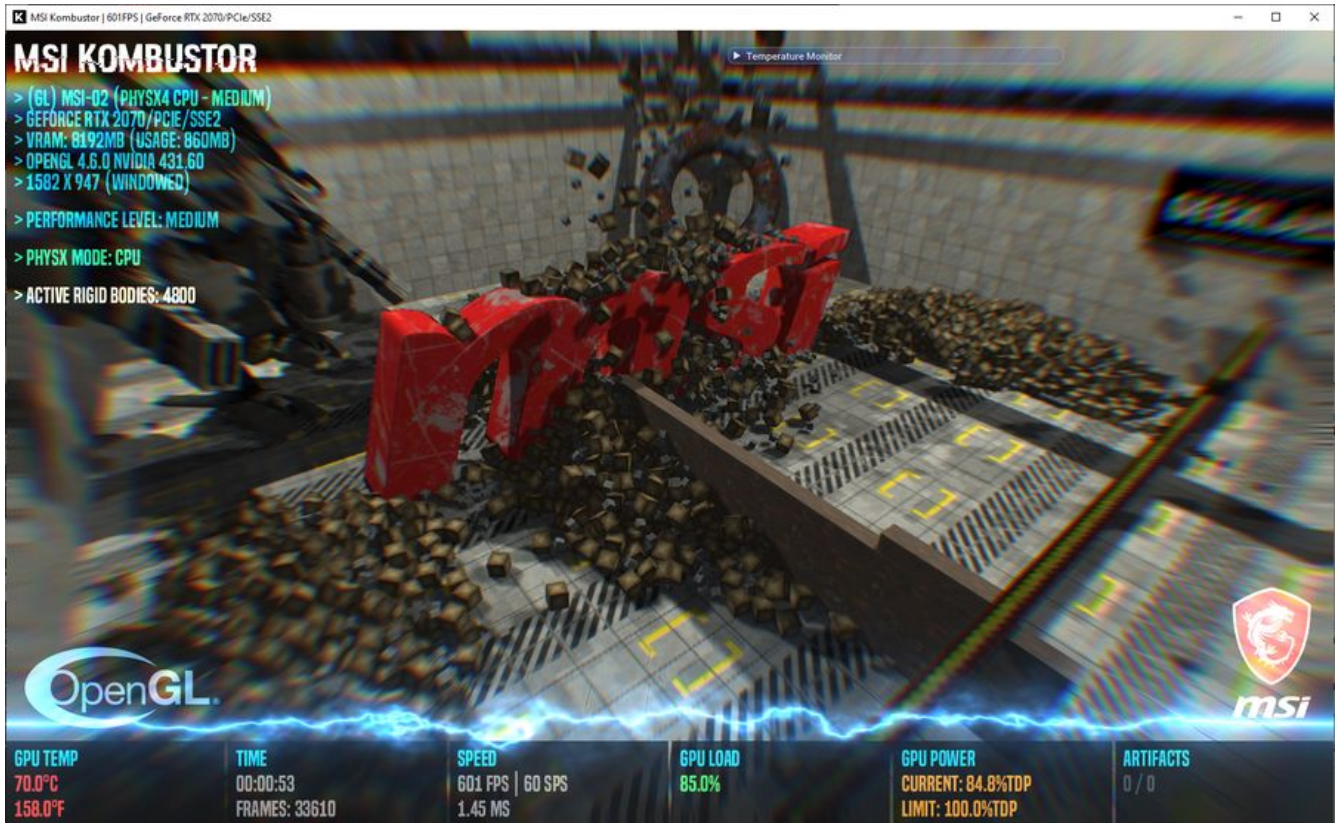
MSI-01 is a graphics test that displays a more complex scene. Several common effects are in use: tessellation for some objects, shadow mapping, HDR (high dynamic range), DoF (depth of field), and PBR (physically based rendering). This scene loads 2k and 4k textures and is GPU intensive. A powerful GPU is required to get good scores!

This scene has been developed with GeeXLab (<https://geeks3d.com/geexlab/>), a cross-platform tool for 3D programming, demos creation, game development, interactive applications, creative coding and prototyping. Do not hesitate to try it, it's free.

MSI-01 is available in two versions:

- **(GL) MSI-01**: the regular version of the test / benchmark.
- **(GL) MSI-01 (burn-in mode)**: this version is a stress test mode only. Benchmarking is disabled. On some graphics cards, this mode is more intensive (power consumption, GPU temperature) than regular MSI-01.

MSI-02



MSI-02 is a graphics test focused on NVIDIA PhysX. PhysX is a physics engine and physics simulations can run in CPU (software mode) or in GPU (hardware acceleration).

The GPU PhysX tests require a NVIDIA graphics card (GeForce or Quadro) for hardware acceleration. In the opposite side, CPU PhysX tests can run on any CPU and do not require a specific graphics card (so AMD Radeon owners can run this test, same thing for Intel GPUs). In CPU mode, PhysX 4 is multi-threaded and multi-core CPUs are welcome.

MSI-02 is based on PhysX 4, the latest version of the PhysX engine.

Like MSI-01, this stress test has been developed with GeeXLab (<https://geeks3d.com/geexlab/>).

MSI-02 display an endless fall of cubes with collisions and shadow mapping, geometry instancing and a touch of post processing finalize the rendering. The test is available in different versions:

- **(GL) MSI-02 (PhysX4 CPU - medium)**: this test forces the use of CPU PhysX with a max number of 4800 cubes.

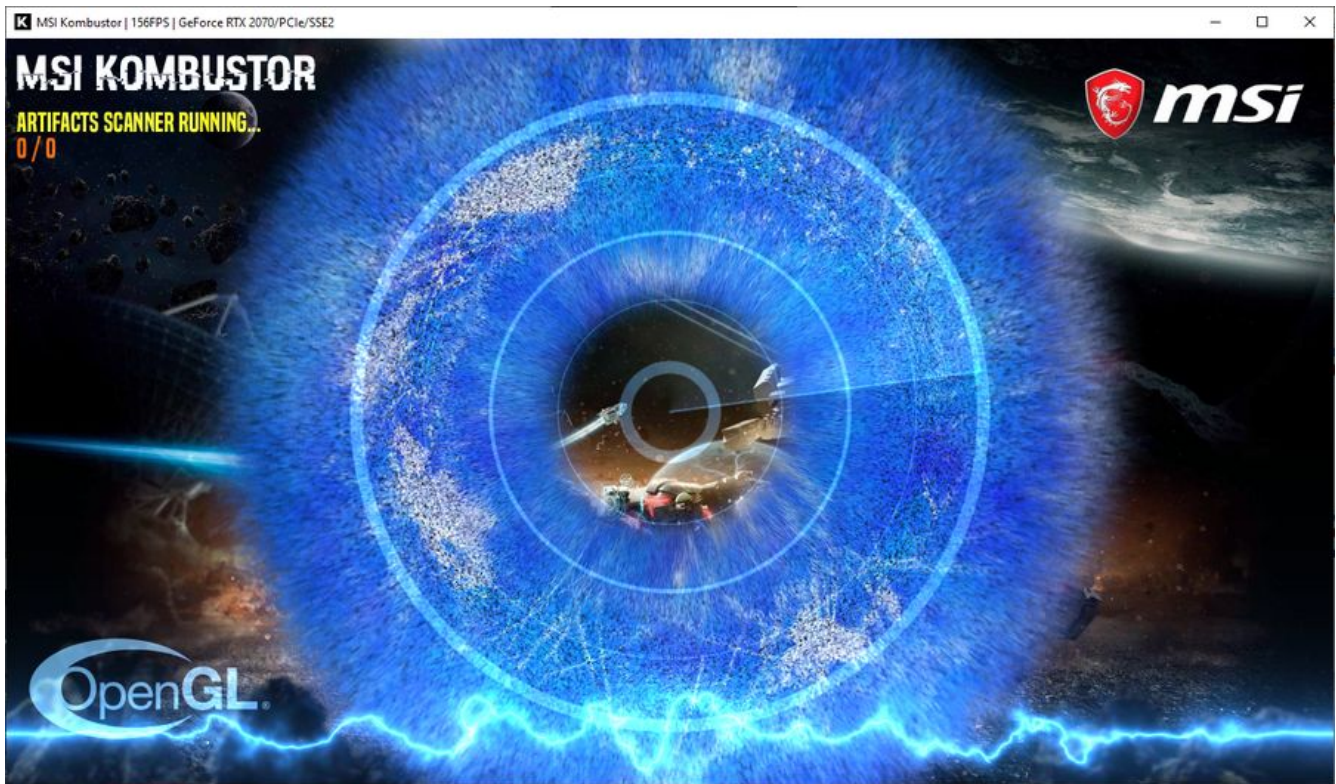
- **(GL) MSI-02 (PhysX4 GPU - medium)**: this test forces the use of GPU PhysX with a max number of 4800 cubes. A NVIDIA GPU is required.

- **(GL) MSI-02 (PhysX4 CPU – medium++)**: this test forces the use of CPU PhysX with a max number of 6000 cubes. The precision of physics computing has been increased (the number of iterations of the physics solver has been multiplied by four), resulting in a higher CPU usage.
- **(GL) MSI-02 (PhysX4 GPU – medium++)**: this test forces the use of GPU PhysX with a max number of 6000 cubes. The precision of physics computing has been increased (the number of iterations of the physics solver has been multiplied by four), resulting in a higher GPU usage.
- **(GL) MSI-02 (PhysX4 CPU – hard)**: this test forces the use of CPU PhysX with a max number of 9600 cubes. Same PhysX settings than MSI-02 (PhysX4 CPU – medium).
- **(GL) MSI-02 (PhysX4 GPU – hard)**: this test forces the use of GPU PhysX with a max number of 9600 cubes. A NVIDIA GPU is required. Same PhysX settings than MSI-02 (PhysX4 GPU – medium).

In demo mode, the user can move the camera (free look at camera) using the WASD keys + mouse left button.

PhysX simulations and 3D rendering are decoupled, that is why the number of frames per second (FPS or framerate) is different from the number of simulations per second (or SPS).

Artifact Scanner



The artifact scanner mode is enabled by checking the Artifact Scanner checkbox on the main interface. In this mode, the stress test scene is static and the scanner analyzes the current image. The entire image is scanned and this work is stopped when the first artifact is found. Then the scanner takes the next image and restarts the scanning process. The current number of artifacts and the total number of artifacts are displayed.

Artifacts can appear when overclocking settings (GPU core clock, VRAM clock or GPU voltage / vddc) are too high or if the cooling system is not correctly designed or mounted.

It's recommended to disable the OSI (On Screen Information) during artifact scanning.

Benchmarks

Most of the tests can be benchmarked. Three presets are available:

- **Preset:1080** : runs the benchmark in fullscreen mode at a full HD resolution (1920x1080).
- **Preset:1440** : runs the benchmark in fullscreen mode at a QHD resolution (2560x1440).
- **Preset:2160** : runs the benchmark in fullscreen mode at a UHD/4K resolution (3840x2160).

When benchmark mode is supported by a test, the three benchmark buttons are enabled.

Each benchmark lasts 60 seconds. At the end of the benchmark a score box is displayed and the possibility to submit score is enabled.

Stress Tests

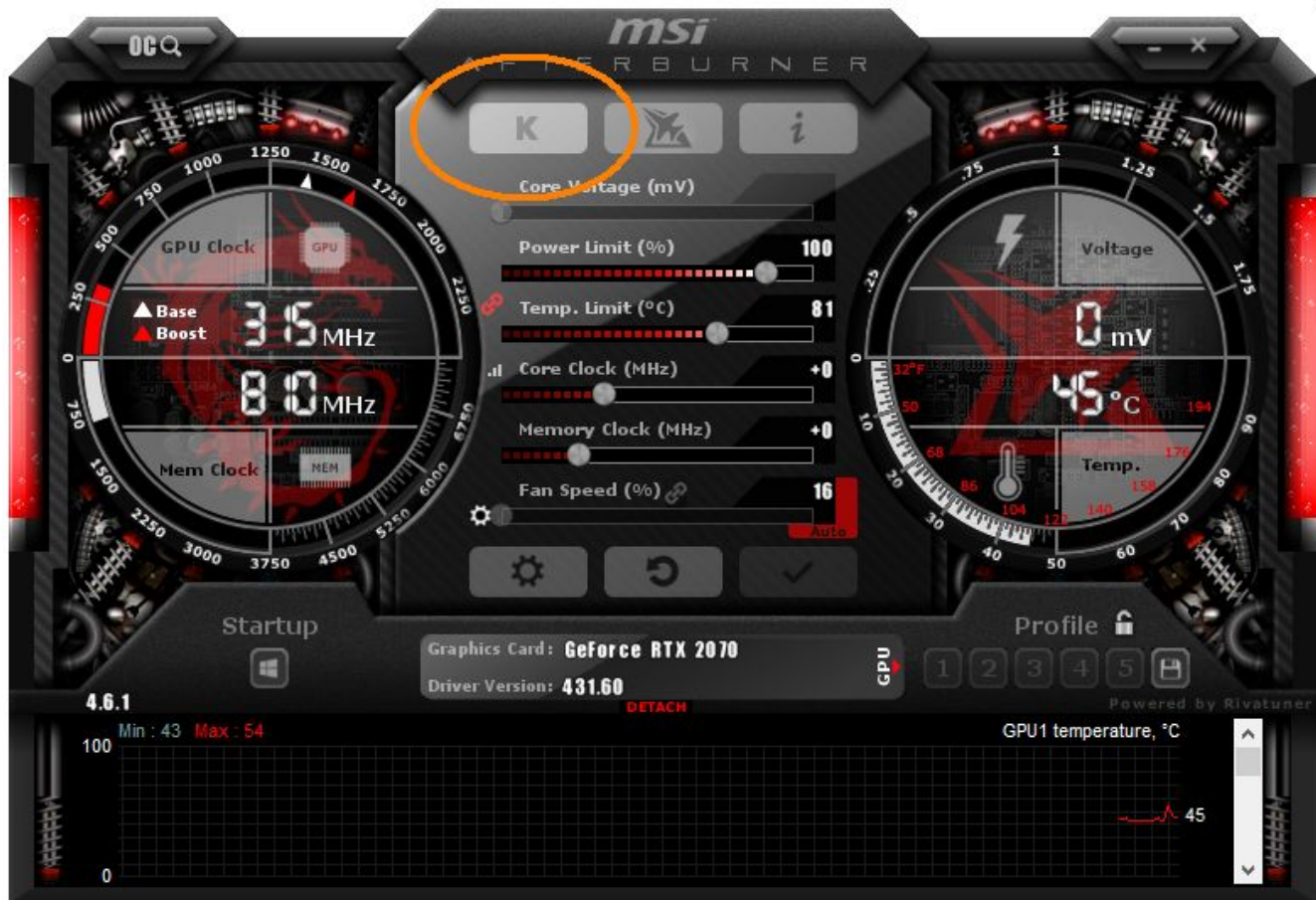
Kombustor is a perfect tool for stress testing your GPUs. Stress testing is a way to check the stability of your system. Thanks to a stress test session, you can identify a faulty hardware or the need for better cooling system.

Stress testing is not an exact science. It's rather an empiric science. Each system is different and each stress test session is unique. But all stress test sessions follow a common pattern: the PC must run the stress test as long as possible without visual artifacts while keeping GPU temperature at a reasonable value. A quick stress test session can last at least 5 minutes but 15 minutes or 30 minutes are good stress test sessions. In some extreme cases, artifacts can appear after days of non stop stress testing...

To really stress test your graphics hardware, try to increase the power target (using Afterburner). For example, a basic GeForce RTX 2070 has a maximal power target of 106% TDP. By default, the graphics driver will limit the power consumption to 100% TDP by lowering the GPU core clock speed. If you unlock the power target, the graphics card will draw more power and will be able to keep its clock speeds at nominal values.

MSI Kombustor and MSI Afterburner

Kombustor can be launched directly from **MSI Afterburner** interface. If both utilities are installed, the **K** button of MSI Afterburner can launch Kombustor.



Afterburner can be downloaded from this page: <https://www.msi.com/page/afterburner>

Command line

Kombustor tests can be launched from the command line. Here is the general syntax:

```
MSI-Kombustor-x64.exe [options]
```

The following options are available:

<code>-width=<xxx></code>	Set the test width.
<code>-height=<xxx></code>	Set the test height.
<code>-benchmark</code>	Specify the benchmark mode
<code>-fullscreen</code>	Specify the fullscreen mode
<code>-gpu_index=<x></code>	Specify the GPU index (Vulkan only) : 0 (first GPU), 1 (second GPU), 2 (third GPU), 3 ...
<code>-<test_name></code>	<p>Specify the name of the test. The following names are available:</p> <p>vkfurrytorus glfurrytorus vkfurrymsi glfurrymsi</p> <p>glfurmark1700mb glfurmark3200mb glfurmark5200mb glfurmark6500mb</p> <p>glmsi01burn glmsi01</p> <p>glmsi02cpumedium glmsi02cpumedium++ glmsi02gpumedium glmsi02gpumedium++ glmsi02cpuhard glmsi02gpuhard</p> <p>glphongdonut vkphongdonut</p> <p>glpbrdonut</p> <p>vktesyspherex32 vktesyspherex16 gltesyspherex32</p>

	glteessyspherex16
-scan	Start the artifact scanner.
-tempgrah	Display the temperature graph.
-log_gpu_data	Write GPU data (GPU temperature, FPS, etc.) to the log file every second.
-update_score_file_disabled	The score file is not updated at the end of a benchmark.
-logfile_in_app_folder	By default the log file is saved in the user's temp folder (C:\Users\USER_NAME\AppData\Local\Temp). This option allows to save the log file in Kombustor folder.