

Anti-Virus Comparative



Performance test

Impact of Anti-Virus Software on System Performance

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Table of Contents



1. Introduction	3
2. Tested products	3
3. Test methods	4
4. Side notes and comments	5
5. Test results	7
6. Summarized results	15
7. Certification levels reached in this test	16
8. Copyright and Disclaimer	17

Introduction

We want to make clear that the results in this report are intended to give only an indication of the impact on system performance (mainly by the real-time/on-access components) of the various Anti-Virus products in these specific tests. Users are encouraged to try out the software on their own PCs and form an opinion based on their own observations.

Tested products

The following products¹, which were available in mid November, were evaluated (with default settings) in this test:

avast! Free 5.0	Kingsoft Antivirus 2011
AVG Anti-Virus 2011	McAfee VirusScan Plus 2011
AVIRA AntiVir Premium 10.0	Microsoft Security Essentials 1.0
BitDefender Antivirus 2011	Norman Antivirus & Anti-Spyware 8.0
eScan AntiVirus 11.0	Panda Antivirus Pro 2011
ESET NOD32 Antivirus 4.2	PC Tools Spyware Doctor with AV 8.0
F-Secure Anti-Virus 2011	Sophos ² Anti-Virus 9.5
G DATA AntiVirus 2011	Symantec Norton AntiVirus 2011
K7 TotalSecurity 10	Trend Micro Titanium Antivirus 2011
Kaspersky Anti-Virus 2011	TrustPort Antivirus 2011

Please note that the results in this report apply only to the products/versions listed above and should not be assumed comparable to (e.g.) the versions provided by the above listed vendors as part of a product suite. Also, keep in mind that different vendors offer different (and differing quantities of) features in their products.

The following activities/tests were performed:

- File copying
- Archiving / Unarchiving
- Encoding / Transcoding
- Installing / Uninstalling applications
- Launching applications
- Downloading files
- PC Mark Vantage Professional Testing Suite

¹ Versions chosen by the vendors.

² Sophos is an enterprise product.

Test methods

The tests were performed on an Intel Core 2 Duo E8300 machine with 2GB of RAM and SATAII hard disks. The performance tests were first done on a clean Microsoft Windows 7 Professional (32-Bit) system and then with the installed Anti-Virus software (with default settings).

The hard disk was defragmented before starting the various tests, and care was taken to minimize other factors that could influence the measurements and/or comparability of the systems (network, temperature, etc.). Optimizing processes/fingerprinting used by the products were also considered – this means that the results represent the impact on a system which has already been used by the user for a while. The tests were repeated several times (with and without fingerprinting) in order to get mean values and filter out measurement errors. After each run the workstation was defragmented and rebooted. We simulated various file operations that a computer user would execute: copying³ different types of clean files from one place to another, archiving and unarchiving files, encoding and transcoding⁴ audio and video files, converting DVD-Files to IPOD format, downloading files from Internet, launching applications, etc. We make use of windows automation software to replicate the activities and measure the times.

We also used a third-party industry recognized performance testing suite (PC Mark Vantage Professional Edition) to measure the system impact during real-world product usage. Readers are invited to evaluate the various products themselves, to see how they impact on their systems (such as software conflicts and/or user preferences, as well as different system configurations that may lead to varying results).

Anti-Virus products need to load on systems at an early stage to provide security from the very beginning – this load has some impact on the time needed for a system to start up. Measuring boot times accurately is challenging. The most significant issue is to define exactly when the system is fully started, as many operating environments may continue to perform start-up activities for some time after the system appears responsive to the user. It is also important to consider when the protection provided by the security solution being tested is fully active, as this could be a useful measure of boot completion as far as the security solution is concerned. Some Anti-Virus products are loading their services very late (even minutes later) at boot (users may notice that after some time that the system loaded, the system gets very slow for some moments), so the system looks like loading very fast, but it just loads its services later and makes the system also insecure/vulnerable. As we do not want to support such activities, we still do not measure boot times.

To support our concerns, we tested on an older system if the products are loading all their protection modules before e.g. malware in the start-up folder is executed. All products failed this test, except AVG and Sophos. AVG and Sophos were the only two products which detected and blocked the malware before its execution after system start-up (by loading itself at an early stage), in all others cases first the malware was successfully executed and only later detected by the AV products, when it was already too late.

³ We used 3GB data of various file categories (pictures, movies, music, various MS Office documents, PDF files, applications/executables, Windows 7 system files, archives, etc.).

⁴ Converting MP3 files to WAV, MP3 to WMA, AVI to MPG and MPG to AVI, as well as IPOD format

Side notes and comments

The on-access/real-time scanner component of Anti-Virus software runs as a background process to check all files that are accessed, in order to protect the system continuously against malware threats. For example, on-access scanners scan files as soon as they are accessed, while (e.g.) behaviour-blockers add a different layer of protection and monitor what the file does when it is already executed/running. The services and processes that run in the background to do these tasks also require and use system resources.

Anti-Virus products need to be active deep in the system in order to protect it and (e.g.) to scan processes and so on that are already active during the system start-up, to identify rootkits and other malware. Those procedures add some extra time and thus a delay in system boot/start up.

If a product takes up too many system resources, users get annoyed and may either disable or uninstall some essential protective features (and considerably compromise the security of their system) or may switch to security software that is less resource-hungry. Therefore, it is important not only that Anti-Virus software provides high detection rates and good protection against malware, but also that it does not degrade system performance or trouble users.

While this report looks at how much impact various Anti-Virus products have on system performance, it is not always just the Anti-Virus software which is the main factor responsible for a slow system. Other factors also play a role, and if users follow some simple rules, system performance can be improved noticeably. The next sections address some of the other factors that may play a part.

A few common problems observed on some user PCs:

- **Old hardware:** If a PC already runs at a snail's pace because it has ten-year-old hardware, using modern (Anti-Virus) software may make it unusable.
 - o If possible, buy a new PC that at least meets the minimum recommended requirements of the software you want to use.
 - o Adding more RAM does not hurt. If you use Windows XP or Windows 7, you should use a minimum of 2GB of RAM. If you still use Vista, switch to Windows 7.
 - o Make sure you have only ONE antivirus program with real-time protection. If your new PC came with a trial Anti-Virus program, remove this before installing a different AV program.
- **Clean up the content of your hard disk:**
 - o If your hard disk is almost full, your system performance will suffer accordingly. Leave at least 20% of your disk space free and move your movies and other infrequently accessed files to another (external) disk.
 - o Uninstall unneeded software. Often, the slowdown that users notice after installing an Anti-Virus product is due to other software on the PC running in the background (that is, due to software conflicts or heavy file access by other programs, each access requiring anti-virus scanning).
 - o Remove unneeded entries/shortcuts from the Autostart/start-up folder in the program menu

- if your PC is already messed up by residual files and registry entries left over by hundreds of applications you installed and uninstalled after trying them out over the past years, re-install a clean operating system and install only software you really need (fewer software installations, fewer potential vulnerabilities and conflicts, and so on) and use e.g. an image/backup tool in order to ensure that you do not have to reinstall everything manually in future.
- **Defragment your hard disks regularly!** A fragmented hard disk can have a very big impact on system performance as well as considerably increasing the time needed to boot up the system.
- **Keep all your software up-to-date:** Using an Anti-Virus version from 2005 does not protect you as well as the newer version would, even though you may still be able to update the signatures. Visit <http://update.microsoft.com> regularly and keep your operating system up-to-date by installing the recommended patches. Any software can have vulnerabilities and bugs, so keep all the software installed on your PC up-to-date: this will not only protect you against many exploits and vulnerabilities, but also give you any other application improvements that have been introduced.
- **Fingerprinting/Optimization:** most Anti-Virus products use various technologies to decrease their impact on system performance. Fingerprinting is such a technology, where already scanned files do not get rescanned again for a while (or more rarely) or are whitelisted. This increases the speed considerably (esp. after some time the PC was used), but also adds some little potential risk, as not all files are scanned anymore. Some Anti-Virus products do not scan all kind of files by design/default (based on their file extensions), or use fingerprinting technologies, which may skip already scanned files in order to increase the speed. It is up to the user to decide what to prefer. We suggest performing regularly a full-system scan (to be sure that all files are at least currently found as clean and to further optimize the fingerprinting).
- **Be patient:** a delay of a few additional seconds due to Anti-Virus is not necessarily a big deal. However, if even with the suggestions above your PC still needs a considerably longer time to boot up, for instance, after you have installed the Anti-Virus you should consider trying out another Anti-Virus product (if you only notice a slow-down after using the Anti-Virus for a long time, there are probably other factors behind the slowdown). Do not reduce your security by disabling essential protection features, just in the hope of gaining a slightly faster PC.

Test results

These specific test results show the impact on system performance that Anti-Virus products have, compared to the other tested Anti-Virus products. The reported data just give an indication and are not necessarily applicable under all circumstances, as too many factors can play an additional part. As we noticed that delivering percentages gets easily misinterpreted/misused, we grouped the results in four categories, as the impact within those categories can be considered almost equal, also considering error measurements. The categories were defined by the testers, based on what would be felt/noticed from user's perspective (e.g. "slow" means that the user would notice and label the added slowdown as too high, also compared to the impact of other security products). Under Windows 7 the performance impact is smaller than e.g. on XP. Due that, we use new categories to reflect better the differences under this operating system.

File copying

We copied a set of different file types which are widespread at home and office workstations from one physical hard disk to another physical hard disk.

+0% to +10%	very fast
+10% to +30%	fast
+30% to +60%	mediocre
over +60%	slow

	On first run	On subsequent runs (with fingerprinting, if available)
Avast	fast	very fast
AVG	fast	very fast
AVIRA	very fast	very fast
Bitdefender	mediocre	fast
eScan	mediocre	very fast
ESET	fast	very fast
F-Secure	fast	fast
G DATA	fast	fast
K7	very fast	very fast
Kaspersky	very fast	very fast
Kingsoft	fast	very fast
McAfee	fast	fast
Microsoft	mediocre	very fast
Norman	mediocre	fast
Panda	fast	very fast
PC Tools	slow	fast
Sophos	fast	very fast
Symantec	fast	very fast
Trend Micro	slow	fast
Trustport	fast	fast

Archiving and unarchiving

Archives are commonly used for file storage, and the impact of Anti-Virus software on the time taken to create new archives or to unarchive files from existing archives may be of interest for most users.

We archived a set of different file types which are widespread at home and office workstations from one physical hard disk to another physical hard disk and unzipped them after this again on a third physical hard disk.

The results below already consider the fingerprinting/optimization technologies of the Anti-Virus products, as most users usually make archives of files they have on their disk.

+0% to +10%	very fast
+10% to +20%	fast
+20% to +30%	mediocre
over +30%	slow

Avast	very fast
AVG	very fast
AVIRA	fast
Bitdefender	very fast
eScan	very fast
ESET	very fast
F-Secure	very fast
G DATA	fast
K7	very fast
Kaspersky	very fast
Kingsoft	very fast
McAfee	very fast
Microsoft	very fast
Norman	fast
Panda	very fast
PC Tools	mediocre
Sophos	very fast
Symantec	very fast
Trend Micro	mediocre
Trustport	very fast

Encoding/transcoding

Music files are often stored and converted on home systems, and converting such files takes system resources. Due that, many home users may be interested to know if their Anti-Virus products imposes a slowdown while converting multimedia files from one format to another.

We encoded and transcoded some multimedia files with FFmpeg, and for the IPOD conversion we used HandBrakeCLI. The impact during FFmpeg and IPOD converting was almost the same.

+0 to +5% very fast
 +5 to +10% fast
 +10 to +25% mediocre
 over +25% slow

Avast	very fast
AVG	very fast
AVIRA	very fast
Bitdefender	fast
eScan	very fast
ESET	very fast
F-Secure	very fast
G DATA	very fast
K7	very fast
Kaspersky	fast
Kingsoft	very fast
McAfee	very fast
Microsoft	very fast
Norman	mediocre
Panda	very fast
PC Tools	slow
Sophos	very fast
Symantec	very fast
Trend Micro	very fast
Trustport	very fast

Installing/uninstalling applications

We installed several programs (like Visual C++, .NET Framework, etc.) with MSI installers, and then uninstalled them and measured how long it took. We did not consider fingerprinting, because usually an application is only installed once.

+0% to +10%	very fast
+10% to +25%	fast
+25% to +50%	mediocre
over +50%	slow

Avast	very fast
AVG	fast
AVIRA	very fast
Bitdefender	fast
eScan	very fast
ESET	fast
F-Secure	very fast
G DATA	very fast
K7	fast
Kaspersky	fast
Kingsoft	very fast
McAfee	fast
Microsoft	very fast
Norman	very fast
Panda	fast
PC Tools	mediocre
Sophos	very fast
Symantec	very fast
Trend Micro	fast
Trustport	very fast

Launching applications

Office document files and PDF files are very common. We opened some large document files in Microsoft Office (and closed it) and some large PDF files in Adobe Acrobat Reader (and closed it). Before each opening, the workstation was rebooted. The time taken for the viewer or editor application to open and a document to be displayed was measured.

Although we list the results for the first opening and the subsequent openings, we consider the subsequent openings more important, as normally this operation is done several times by users, and optimization features of the Anti-Virus products take place, minimizing their impact on the systems.

+0% to +25%	very fast
+25% to +75%	fast
+75% to +150%	mediocre
over +150%	slow

	Open Word		Open PDF	
	On first run	On subsequent runs (with fingerprinting, if available)	On first run	On subsequent runs (with fingerprinting, if available)
Avast	fast	very fast	fast	very fast
AVG	fast	very fast	very fast	very fast
AVIRA	very fast	very fast	very fast	very fast
Bitdefender	very fast	very fast	fast	very fast
eScan	fast	fast	fast	fast
ESET	very fast	very fast	very fast	very fast
F-Secure	very fast	very fast	very fast	very fast
G DATA	mediocre	very fast	mediocre	very fast
K7	mediocre	very fast	fast	very fast
Kaspersky	slow	mediocre	mediocre	mediocre
Kingsoft	fast	very fast	fast	very fast
McAfee	fast	very fast	fast	very fast
Microsoft	fast	very fast	very fast	very fast
Norman	slow	mediocre	mediocre	mediocre
Panda	fast	fast	fast	very fast
PC Tools	mediocre	fast	fast	fast
Sophos	mediocre	fast	fast	fast
Symantec	fast	fast	fast	very fast
Trend Micro	fast	fast	fast	fast
Trustport	mediocre	very fast	fast	very fast

Some optimization features may not take place in some products (or not reduce enough the impact), as documents and PDF files are common infection targets and therefore are anyway scanned when opened. Nevertheless, the fingerprinting would take place in on-demand scans.

Downloading files from the Internet

Files are commonly downloaded from the internet. To avoid external influences, we used an in-house Apache web server (wget) connected with 100MB⁵ LAN and measured the download time. We tested using various large files/archives.

+0% to +25%	very fast
+25% to +50%	fast
+50% to +100%	mediocre
over +100%	slow

Avast	very fast
AVG	very fast
AVIRA	fast
Bitdefender	mediocre
eScan	very fast
ESET	fast
F-Secure	very fast
G DATA	fast
K7	very fast
Kaspersky	very fast
Kingsoft	very fast
McAfee	very fast
Microsoft	very fast
Norman	very fast
Panda	very fast
PC Tools	very fast
Sophos	very fast
Symantec	very fast
Trend Micro	very fast
Trustport	very fast

⁵ We first tested using a 1Gbit LAN, in which Bitdefender, ESET and G DATA got a (s)low score. We retested with 100Mbit network after we have been notified that there is an issue which can be observed as lag especially in 1Gbit networks, probably caused by the implementation of Windows Filtering Platform within Windows 7. Some information about WFP can be read here: <http://www.microsoft.com/whdc/device/network/wfp.mspx> Users using a 1Gbit network scenario may observe slower internet connections with some of the products which were found to have issues, likely because of a problem inherent within the operating system.

PC Mark Tests

In order to provide an industry-recognized performance test, we used the PC Mark Vantage Professional Edition⁶ 1.0.2 testing suite of FutureMark. Users using PC Mark Vantage should take care to minimize all external factors which could affect the testing suite and follow strictly at least the considerations/suggestions documented inside the PC Mark manual, in order to get consistent and valid/useful results. Furthermore, the tests should be repeated several times to verify them.

“The six Consumer Scenario suites are based on a collection of actual real-world end user applications, and reflect the system performance a typical user would expect running those applications. Each test suite contains a subset of the following tests as applicable: data encryption, decryption, compression and decompression, GPU and CPU image manipulation, image import, video playback, editing and transcoding, audio playback and transcoding, GPU and CPU game tests, game data loading, web page rendering, mail operations, media player operations, contacts search, text editing and applicable HDD tests. Each Consumer Scenario test suite generates a unique, fully comparable performance score for that series of tests. A comprehensive, overall PCMark score is generated by running the PCMark Suite. And the HDD Suite produces its own fully comparable performance score.”⁷

	PC Mark score	Points
<i>without AV</i>	3843 ⁸	-
Sophos	3728	97
eScan	3719	97
K7	3701	96
AVIRA	3653	95
AVG	3623	94
Microsoft	3611	94
Kingsoft	3553	92
F-Secure	3546	92
ESET	3544	92
McAfee	3542	92
Norman	3525	92
<i>Industry average</i>	<i>3516</i>	<i>91</i>
Panda	3507	91
Avast	3501	91
Symantec	3496	91
Kaspersky	3442	90
Trustport	3432	89
Bitdefender	3394	88
G DATA	3355	87
PC Tools	3258	85
Trend Micro	3195	83

⁶ For more information, see <http://www.futuremark.com/benchmarks/pcmarkvantage/introduction/>

⁷ [http://www.futuremark.com/pressroom/companypdfs/PCMark_Vantage_Reviewer%27s_Guide_v1.1_\(PDF\)](http://www.futuremark.com/pressroom/companypdfs/PCMark_Vantage_Reviewer%27s_Guide_v1.1_(PDF))

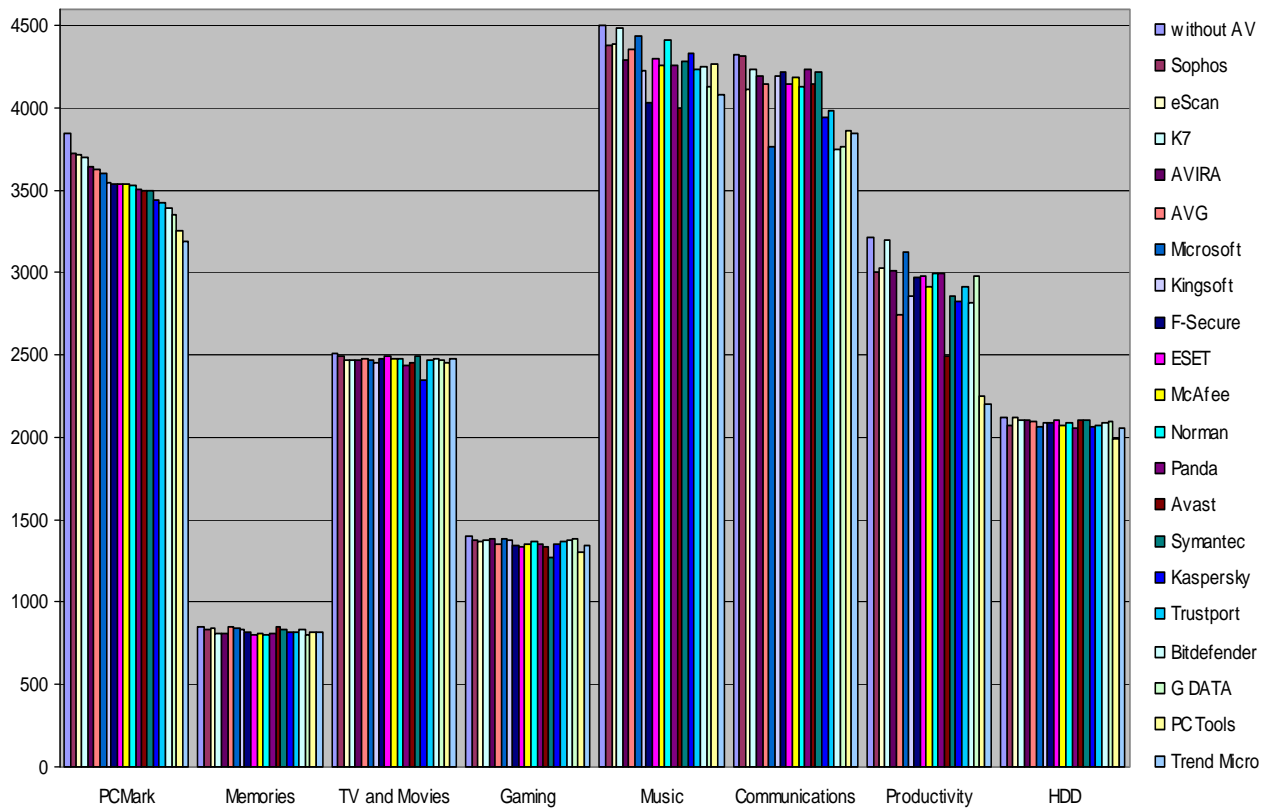
⁸ Baseline system: Intel Core 2 Duo E8300 machine with 2GB of RAM

We are not showing the scores for the subtests “Memories”, “TV and Movies”, “Gaming” and “HDD”, because the difference was minimal to a system with no AV product.

	PC Mark Music score
without AV	4497
K7	4490
Microsoft	4434
Norman	4412
eScan	4397
Sophos	4383
AVG	4361
Kaspersky	4336
ESET	4304
AVIRA	4298
Symantec	4278
Industry average	4273
PC Tools	4270
McAfee	4263
Panda	4259
Bitdefender	4254
Trustport	4236
Kingsoft	4230
G DATA	4128
Trend Micro	4092
F-Secure	4028
Avast	3997

	PC Mark Communications score
without AV	4323
Sophos	4320
K7	4244
Panda	4240
F-Secure	4220
Symantec	4215
Kingsoft	4200
AVIRA	4191
McAfee	4189
Avast	4156
ESET	4152
AVG	4148
Norman	4136
eScan	4116
Industry average	4073
Trustport	3987
Kaspersky	3944
PC Tools	3872
Trend Micro	3845
G DATA	3775
Microsoft	3766
Bitdefender	3743

	PC Mark Productivity score
without AV	3211
K7	3205
Microsoft	3127
eScan	3031
AVIRA	3017
Sophos	3002
Norman	2994
Panda	2993
G DATA	2982
ESET	2978
F-Secure	2967
Trustport	2918
McAfee	2917
Kingsoft	2867
Industry average	2860
Symantec	2858
Kaspersky	2826
Bitdefender	2822
AVG	2742
Avast	2492
PC Tools	2255
Trend Micro	2210



Summarized results

Users should weight the various subtests according to their needs. We applied a scoring system in order to sum up the various results.

	File copying (mean value)	Archiving / unarchiving	Encoding / transcoding	Installing / uninstalling	Download	Launching applications	PC Mark	TOTAL
K7	very fast (15)	very fast (15)	very fast (15)	fast (10)	very fast (15)	very fast (15)	96	181
Kingssoft	very fast (13)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	92	180
Sophos	very fast (13)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	fast (10)	97	180
Avast	very fast (13)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	91	179
Microsoft	fast (10)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	94	179
eScan	fast (10)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	fast (10)	97	177
Symantec	very fast (13)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (13)	91	177
F-Secure	fast (10)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	92	177
AVG	very fast (13)	very fast (15)	very fast (15)	fast (10)	very fast (15)	very fast (15)	94	177
AVIRA	very fast (15)	fast (10)	very fast (15)	very fast (15)	fast (10)	very fast (15)	95	175
Trustport	fast (10)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	very fast (15)	89	174
Panda	very fast (13)	very fast (15)	very fast (15)	fast (10)	very fast (15)	very fast (13)	91	172
McAfee	fast (10)	very fast (15)	very fast (15)	fast (10)	very fast (15)	very fast (15)	92	172
ESET	very fast (13)	very fast (15)	very fast (15)	fast (10)	fast (10)	very fast (15)	92	170
G DATA	fast (10)	fast (10)	very fast (15)	very fast (15)	fast (10)	very fast (15)	87	162
Kaspersky	very fast (15)	very fast (15)	fast (10)	fast (10)	very fast (15)	mediocre (5)	90	160
Norman	fast (10)	fast (10)	mediocre (5)	very fast (15)	very fast (15)	mediocre (5)	92	152
Bitdefender	fast (8)	very fast (15)	fast (10)	fast (10)	mediocre (5)	very fast (15)	88	151
Trend Micro	mediocre (5)	mediocre (5)	very fast (15)	fast (10)	very fast (15)	fast (10)	83	143
PC Tools	mediocre (3)	mediocre (5)	slow (0)	mediocre (5)	very fast (15)	fast (10)	85	123

Certification levels reached in this test

We provide a 4-level ranking system: Tested, STANDARD, ADVANCED and ADVANCED+. All products were quite good, and reached at least the STANDARD level, which means they have an acceptable impact on system performance. ADVANCED means they have only a low impact on system performance and ADVANCED+ denotes products with even lower impact (according to the test results).

The following certification levels are for the results reached in this performance test report. Please note that the performance test only tells you how much impact an Anti-Virus may have on a system compared to other Anti-Virus products; it does not tell you anything about the effectiveness of the protection a product provides. To determine, for example, how the detection rates of the various Anti-Virus products are, please refer to our other tests, available at www.av-comparatives.org

<u>CERTIFICATION LEVELS</u>	<u>PRODUCTS⁹</u>
	<ul style="list-style-type: none"> ✓ K7 ✓ Kingsoft ✓ Sophos ✓ Avast ✓ Microsoft ✓ eScan ✓ Symantec ✓ F-Secure ✓ AVG ✓ AVIRA ✓ Trustport ✓ Panda ✓ McAfee ✓ ESET
	<ul style="list-style-type: none"> ✓ G DATA ✓ Kaspersky
	<ul style="list-style-type: none"> ✓ Bitdefender ✓ Norman ✓ Trend Micro ✓ PC Tools

The above awards have been given based on our assessment of the overall impact results with default settings.

⁹ We suggest considering products with same the award to be as good as the other products with same award.

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