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COMMISSION REGULATION (EU) 2019/424

of 15 March 2019

laying down ecodesign requirements for servers and data storage products pursuant to Directive 2009/125/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 617/2013

(Text with EEA relevance)

(OJ L 74, 18.3.2019, p. 46)

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COMMISSION REGULATION (EU) 2019/424

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(Text with EEA relevance)

Article 1

Subject matter and scope

1. This Regulation establishes ecodesign requirements for the placing on the market and putting into service of servers and online data storage products.

2. This Regulation shall not apply to the following products:

(a) servers intended for embedded applications;

(b) servers classified as small scale servers in terms of Regulation (EU) No 617/2013;

(c) servers with more than four processor sockets;

(d) server appliances;

(e) large servers;

(f) fully fault tolerant servers;

(g) network servers;

(h) small data storage products;

(i) large data storage products.

Article 2

Definitions

1. For the purpose of this Regulation, the following definitions shall apply:

(1) ‘server’ means a computing product that provides services and manages networked resources for client devices, such as desktop computers, notebook computers, desktop thin clients, internet protocol telephones, smartphones, tablets, tele-communication, automated systems or other servers, primarily accessed via network connections, and not through direct user input devices, such as a keyboard or a mouse and with the following characteristics:

(a) it is designed to support server operating systems (OS) and/or hypervisors, and targeted to run user-installed enterprise applications;

(b) it supports error-correcting code and/or buffered memory (including both buffered dual in-line memory modules and buffered on board configurations);

(c) all processors have access to shared system memory and are independently visible to a single OS or hypervisor;

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(2) ‘server with more than four processor sockets’ means a server containing more than four interfaces designed for the installation of a processor. For multi-node servers, this term refers to a server having more than four processor sockets in each server node;

(3) ‘embedded application’ means a software application that permanently resides in an industrial or consumer device, typically stored in a non-volatile memory such as read-only memory or flash memory;

(4) ‘server appliance’ means a server that is not intended to execute user-supplied software, delivers services through one or more networks, is typically managed through a web or command line interface and is bundled with a pre-installed OS and application software that is used to perform a dedicated function or set of tightly coupled functions;

(5) ‘resilient server’ means a server designed with extensive reliability, availability, serviceability and scalability features integrated in the micro architecture of the system, central processing unit (CPU) and chipset;

(6) ‘large server’ means a resilient server which is shipped as a pre-integrated/pre-tested system housed in one or more full frame racks and that includes a high connectivity input/output subsystem with a minimum of 32 dedicated input/output slots;

(7) ‘multi-node server’ means a server that is designed with two or more independent server nodes that share a single enclosure and one or more power supply units. In a multi-node server, power is distributed to all nodes through shared power supply units. Server nodes in a multi-node server are not designed to be hot-swappable;

(8) ‘fully fault tolerant server’ means a server that is designed with complete hardware redundancy (to simultaneously and repetitively run a single workload for continuous availability in mission critical applications), in which every computing component is replicated between two nodes running identical and concurrent workloads (i.e., if one node fails or needs repair, the second node can run the workload alone to avoid downtime);

(9) ‘network server’ means a network product which contains the same components as a server in addition to more than 11 network ports with a total line rate throughput of 12 Gb/s or more, the capability to dynamically reconfigure ports and speed and support for a virtualized network environment through a software defined network;

(10) ‘data storage product’ means a fully-functional storage system that supplies data storage services to clients and devices attached directly or through a network. Components and subsystems that are an integral part of the data storage product architecture (e.g., to provide internal communications between controllers and disks) are considered to be part of the data storage product. In contrast, components that are normally associated with a storage environment at the data centre level (e.g. devices required for operation of

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an external storage area network) are not considered to be part of the data storage product. A data storage product may be composed of integrated storage controllers, data storage devices, embedded network elements, software, and other devices;

(11) ‘Hard Disk Drive’ (HDD) means a data storage device which reads and writes to one or more rotating magnetic disk platters;

(12) ‘Solid State Drive’ (SSD) means a data storage device that reads and writes to non-volatile solid state memory instead of rotating magnetic platters for data storage;

(13) ‘data storage device’ means a device providing non-volatile data storage, with the exception of aggregating storage elements such as subsystems of redundant arrays of independent disks, robotic tape libraries, filers, and file servers and storage devices which are not directly accessible by end-user application programs, and are instead employed as a form of internal cache;

(14) ‘online data storage product’ means a data storage product designed for online, random-access of data, accessible in a random or sequential pattern, with a maximum time to first data of less than 80 milliseconds;

(15) ‘small data storage product’ means a data storage product containing a maximum of three data storage devices;

(16) ‘large data storage product’ means a high end or mainframe data storage product that supports more than 400 data storage devices in its maximum configuration and with the following required attributes: no single point of failure, non-disruptive serviceability and integrated storage controller.

2. For the purposes of Annexes II to V, additional definitions are set out in Annex I.

Article 3

Ecodesign requirements and timetable

1. The ecodesign requirements for servers and online data storage products are set out in Annex II.

2. From 1 March 2020 servers shall comply with the ecodesign requirements set out in Annex II points 1.1.1, 1.2.1, 1.2.2, 2.1, 2.2, 3.1, 3.3 and 3.4.

3. From 1 March 2020 online data storage products shall comply with the ecodesign requirements set out in Annex II points 1.1.1, 1.2.1, 1.2.2, 3.2, 3.3 and 3.4.

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(a) From 1 March 2021 servers and online data storage products shall comply with the ecodesign requirement set out in Annex II point 1.2.3.

(b) From 1 January 2023 servers and online data storage products shall comply with the ecodesign requirements set out in Annex II point 1.1.2.

(c) Compliance with ecodesign requirements shall be measured and calculated in accordance with the methods set out in Annex III.

Article 4

Conformity assessment

1. The conformity assessment procedure referred to in Article 8(2) of Directive 2009/125/EC shall be the internal design control set out in Annex IV to that Directive or the management system set out in Annex V to that Directive.

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2. For the purposes of the conformity assessment pursuant to Article 8 of Directive 2009/125/EC, the technical documentation shall contain a copy of the product information provided in accordance with point 3.4 of Annex II and the details and results of the calculations set out in Annex III and, where applicable, Annex II.2 to this Regulation.

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Article 5

Verification procedure for market surveillance purposes

Member States shall apply the verification procedure set out in Annex IV to this Regulation when performing the market surveillance checks referred to in Article 3(2) of Directive 2009/125/EC.

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Article 6

Circumvention

The manufacturer, importer or authorised representative shall not place on the market products designed to be able to detect they are being tested (for example by recognising the test conditions or test cycle) and to react specifically by automatically altering their performance during the test with the aim of reaching a more favourable level for any of the parameters in the technical documentation or included in any documentation provided.

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Article 7

Indicative benchmarks

The indicative benchmarks for best-performing servers and data storage products available on the market on 7 April 2019 are set out in Annex V.

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Article 8

Review

The Commission shall assess this Regulation and shall present the results of this assessment, including, if appropriate, a draft revision proposal, to the Consultation Forum by March 2022. This assessment shall review the requirements in the light of the technological progress and shall address in particular the appropriateness:

(a) to update the specific ecodesign requirements on server active state efficiency;

(b) to update the specific ecodesign requirements for servers on idle state power;

(c) to update the definitions or the scope of the Regulation;

(d) to update the material efficiency requirements for servers and data storage products, including the information requirements on additional critical raw materials (tantalum, gallium, dysprosium and palladium), taking into account the needs of the recyclers;

(e) to exempt server appliances, large servers, fully fault tolerant servers and network servers from the scope of the regulation;

(f) to exclude resilient servers, High Performance Computing (HPC) servers and servers with integrated APA from the ecodesign requirements set out in Annex II point 2.1 and point 2.2;

(g) to set specific ecodesign requirements on the Processor Power Management Function of servers;

(h) to set specific ecodesign requirements on the operating condition class;

(i) to set specific ecodesign requirements on the efficiency, performance and power demand of data storage products.

Article 9

Amendment to Regulation (EU) No 617/2013

Regulation (EU) No 617/2013 is amended as follows:

(1) Article 1 is amended as follows:

(a) paragraph 1 is replaced by the following:

‘1. This Regulation establishes ecodesign requirements for the placing on the market of computers.’;

(b) in paragraph 2, point (h) is deleted;

(c) in paragraph 3, points (a) to (d) are deleted;

(2) Article 2 is amended as follows:

(a) point 2 is deleted;

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(b) point 4 is replaced by the following:

‘(4) “Internal power supply” means a component designed to convert AC voltage from the mains to DC voltage(s) for the purpose of powering the computer and has the following characteristics:

(a) is contained within the computer casing but is separate from the main computer board;

(b) the power supply connects to the mains through a single cable with no intermediate circuitry between the power supply and the mains power; and

(c) all power connections from the power supply to the computer components, with the exception of a DC connection to a display in an integrated desktop computer, are internal to the computer casing.

Internal DC-to-DC converters used to convert a single DC voltage from an external power supply into multiple voltages for use by a computer are not considered internal power supplies;’;

(c) points 12 to 16 are deleted;

(d) point 22 is replaced by the following:

‘(22) “Product type” means desktop computer, integrated desktop computer, notebook computer, desktop thin client, workstation, mobile workstation, small-scale server, game console, docking station, internal power supply or external power supply;’;

(3) Article 3 is replaced by the following:

‘Article 3

Ecodesign requirements

The ecodesign requirements for computers are set out in Annex II.

Compliance of computers with the applicable ecodesign requirements shall be measured in accordance with the methods set out in Annex III.’;

(4) in Article 7, the second paragraph is replaced by the following:

‘Checking of computers for compliance with the applicable ecodesign requirements shall be carried out in accordance with the verification procedure set out in point 2 of Annex III to this Regulation.’;

(5) Annex II is amended as follows:

(a) point 5.2 is deleted;

(b) the title of point 7.3 is replaced by the following:

‘Workstation, mobile workstation, desktop thin client and small-scale server’.

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Article 10

Entry into force

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

However, Article 9 shall apply from 1 March 2020.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

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ANNEX I

Definitions applicable to Annexes II to V

For the purposes of Annexes II to V the following definitions shall apply:

(1) ‘server with one or two processor sockets’ means a server containing one or two interfaces designed for the installation of a processor. For multi-node servers, this term refers to a server having one or two processor sockets in each server node;

(2) ‘Input/Output (I/O) device’ means a device, which provides data input and output capability between a server or a data storage product and other devices. An I/O device may be integral to the server motherboard or may be connected to the motherboard via expansion slots (such as Peripheral Component Interconnect, or Peripheral Component Interconnect Express);

(3) ‘motherboard’ means the main circuit board of the server. For purposes of this regulation, the motherboard includes connectors for attaching additional boards and typically includes the following components: processor, memory, BIOS, and expansion slots;

(4) ‘processor’ means the logic circuitry that responds to and processes the basic instructions that drive a server. For purposes of this regulation, the processor is the CPU of the server. A typical CPU is a physical package to be installed on the server motherboard via a socket or direct solder attachment. The CPU package may include one or more processor cores;

(5) ‘memory’ means a part of a server external to the processor in which information is stored for immediate use by the processor, expressed in gigabyte (GB);

(6) ‘expansion card’ means an internal component connected by an edge connection over a common/standard interface such as Peripheral Component Interconnect Express providing additional functionality;

(7) ‘graphics card’ means an expansion card containing one or more graphics processing units with a local memory controller interface and local graphics-specific memory;

(8) ‘buffered double data rate (DDR) channel’ means a channel or memory port connecting a memory controller to a defined number of memory devices in a server. A typical server may contain multiple memory controllers, which may in turn support one or more buffered DDR channels. As such, each buffered DDR channel serves only a fraction of the total addressable memory space in a server;

(9) ‘blade server’ means a server that is designed for use in a blade chassis. A blade server is a high-density device that functions as an independent server and includes at least one processor and system memory, but is dependent upon shared blade chassis resources (e.g., power supply units, cooling) for operation. A processor or memory module will not be considered a blade server when the technical documentation for the product does not indicate that it scales up a standalone server;

(10) ‘blade chassis’ means an enclosure that contains shared resources for the operation of blade servers, blade storage, and other blade form-factor devices. Shared resources provided by a blade chassis may include power supply units, data storage, and hardware for direct current power distribution, thermal management, system management, and network services;

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(11) ‘High Performance Computing (HPC) server’ means a server which is designed and optimized to execute highly parallel applications, for higher performance computing or deep learning artificial intelligence applications. HPC servers must meet all the following criteria:

(a) they consist of multiple computing nodes, clustered primarily to increase computational capability;

(b) they include high speed inter-processing interconnections between nodes;

(12) ‘server product family’ means a high-level description referring to a group of servers sharing one chassis and motherboard combination that may contain more hardware and software configurations. All configurations within a server product family must share the following common attributes:

(a) be from the same model line or machine type;

(b) either share the same form factor (i.e., rack-mounted, blade, pedestal) or share the same mechanical and electrical designs with only superficial mechanical differences to enable a design to support multiple form factors;

(c) either share processors from a single defined processor series or share processors that plug into a common socket type;

(d) share the power supply unit(s);

(e) have the same number of available processor sockets and number of available processor sockets populated;

(13) ‘power supply unit’ (PSU) means a device that converts alternate current (AC) or direct current (DC) input power to one or more DC power outputs for the purpose of powering a server or a data storage product. A server or data storage product PSU must be self-contained and physically separable from the motherboard and must connect to the system via a removable or hard-wired electrical connection;

(14) ‘power factor’ means the ratio of the real power consumed in Watts to the apparent power drawn in Volt Amperes;

(15) ‘single output PSU’ means a PSU designed to deliver the majority of its rated output power to one primary DC output for the purpose of powering a server or a data storage product. Single output PSUs may offer one or more standby outputs that remain active whenever connected to an input power source. The total rated power output from any additional PSU outputs that are not primary and standby outputs shall be no greater than 20 Watts. PSUs that offer multiple outputs at the same voltage as the primary output are considered single-output PSUs unless those outputs:

(a) are generated from separate converters or have separate output rectification stages, or

(b) have independent current limits;

(16) ‘multi output PSU’ means a PSU designed to deliver the majority of its rated output power to more than one primary DC output for the purpose of powering a server or a data storage product. Multi output PSUs may offer one or more standby outputs that remain active whenever connected to an input power source. The total rated power output from any additional PSU outputs that are not primary and standby outputs shall be no greater than or equal to 20 Watts;

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(17) ‘direct current server’ means a server that is designed solely to operate on a DC power source;

(18) ‘direct current data storage product’ means a data storage product that is designed solely to operate on a DC power source;

(19) ‘idle state’ means the operational state in which the OS and other software have completed loading, the server is capable of completing workload transactions, but no active workload transactions are requested or pending by the system (i.e., the server is operational, but not performing any useful work). For servers where Advanced Configuration and Power Interface standards are applicable, idle state corresponds only to System Level S0;

(20) ‘idle state power’ (P_{idle}) is the power demand, in Watts, in idle state;

(21) ‘low-end performance configuration’ of a server product family means the combination of two data storage devices, processor with the lowest product of core count and frequency (in GHz) and memory capacity (in GB) that is at least equal to the product of the number of memory channels and the lowest capacity dual in-line memory module (DIMM) (in GB) offered on the server that represents the lowest performance product model within the server product family. All memory channels shall be populated with the same DIMM raw card design and capacity;

(22) ‘high-end performance configuration’ of a server product family means the combination of two data storage devices, processor with the highest product of core count and frequency and memory capacity (in GB) equal to or greater than 3 times the product of the number of CPUs, cores and hardware threads that represents the highest performance product model within the product family. All memory channels shall be populated with the same DIMM raw card design and capacity;

(23) ‘hardware thread’: means the hardware resources in a CPU core to execute a stream of software instructions. A CPU core may have the resources to execute more than one thread simultaneously;

(24) ‘active state efficiency’ (Eff_{server}) means the numerical value for server efficiency as measured and calculated according to Annex III point 3;

(25) ‘active state’ means the operational state in which the server is carrying out work in response to prior or concurrent external requests (e.g., instruction over the network). Active state includes both active processing and data seeking/retrieval from memory, cache, or internal/external storage while awaiting further input over the network;

(26) ‘server performance’ means the number of transactions per unit of time performed by the server under standardised testing of discrete system components (e.g. processors, memory and storage) and subsystems (e.g. RAM and CPU);

(27) ‘maximum power’ (P_{max}) means the highest power, in Watts, recorded on the eleven worklet scores according to the standard;

(28) ‘CPU performance ($Perf_{CPU}$)’ means the number of transactions per unit of time performed by the server under standardised testing of the CPU subsystem;

(29) ‘Auxiliary Processing Accelerator’ (APA) means a specialized processor and associated subsystem that provide an increase in computing capacity such as graphical processing units or field programmable gate arrays. An APA cannot operate in a server without a CPU. APAs can be installed in a

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server either on Graphics or Extension add-in cards installed in general-purpose add-in expansion slots or integrated into a server component such as the motherboard;

(30) ‘Expansion APA’ means an APA that is on an add-in card installed in an add-in expansion slot. An expansion APA add-in card may include one or more APAs and/or separate, dedicated removable switches;

(31) ‘Integrated APA’ means an APA that is integrated into the motherboard or CPU package;

(32) ‘product type’ means the design of the server or of the data storage product including the chassis (rack, tower or blade), the number of sockets and, for servers, whether it is a resilient server, a blade server, a multi node server, a HPC server, a server with integrated APA, a direct current server or none of the previous categories;

(33) ‘disassembly’ means a process whereby an item is taken apart in such a way that it can subsequently be reassembled and made operational;

(34) ‘firmware’ means system, hardware, component, or peripheral programming provided with the product to provide basic instructions for hardware to function inclusive of all applicable programming and hardware updates;

(35) ‘secure data deletion’ means the effective erasure of all traces of existing data from a data storage device, overwriting the data completely in such a way that access to the original data, or parts of them, becomes infeasible for a given level of effort.

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ANNEX II

Ecodesign requirements

1. SPECIFIC ECODESIGN REQUIREMENTS FOR SERVERS AND ONLINE DATA STORAGE PRODUCTS

1.1. **PSU efficiency and power factor requirements**

1.1.1. From 1 March 2020, for servers and online data storage products, with the exception of direct current servers and of direct current data storage products, the PSU efficiency at 10 %, 20 %, 50 % and 100 % of the rated load level and the power factor at 50 % of the rated load level shall not be less than the values reported in Table 1.

Table 1

Minimum PSU efficiency and power factor requirements from 1 March 2020

	Minimum PSU efficiency				Minimum power factor
% of rated load	10 %	20 %	50 %	100 %	50 %
Multi output	—	88 %	92 %	88 %	0,90
Single output	—	90 %	94 %	91 %	0,95

1.1.2. From 1 January 2023, for servers and online data storage products, with the exception of direct current servers and of direct current data storage products, the PSU efficiency at 10 %, 20 %, 50 % and 100 % of the rated load level and the power factor at 50 % of the rated load level shall not be less than the values reported in Table 2.

Table 2

Minimum PSU efficiency and power factor requirements from 1 January 2023

	Minimum PSU efficiency				Minimum power factor
% of rated load	10 %	20 %	50 %	100 %	50 %
Multi output	—	90 %	94 %	91 %	0,95
Single output	90 %	94 %	96 %	91 %	0,95

1.2. **Material efficiency requirements**

1.2.1. From 1 March 2020, manufacturers shall ensure that joining, fastening or sealing techniques do not prevent the disassembly for repair or reuse purposes of the following components, when present:

(a) data storage devices;

(b) memory;

(c) processor (CPU);

(d) motherboard;

(e) expansion card/graphic card;

(f) PSU;

(g) chassis;

(h) batteries.

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1.2.2. From 1 March 2020, a functionality for secure data deletion shall be made available for the deletion of data contained in all data storage devices of the product.

1.2.3. From 1 March 2021, the latest available version of the firmware shall be made available from two years after the placing on the market of the first product of a certain product model for a minimum period of eight years after the placing on the market of the last product of a certain product model, free of charge or at a fair, transparent and non-discriminatory cost. The latest available security update to the firmwares shall be made available from the time a product model is placed on the market until at least eight years after the placing on the market of the last product of a certain product model, free of charge.

2. SPECIFIC ECODESIGN REQUIREMENTS ONLY FOR SERVERS WITH ONE OR TWO PROCESSOR SOCKETS

2.1. **Idle state power**

From 1 March 2020, the idle state power (P_{idle}) of servers, with the exception of resilient servers, HPC servers and servers with integrated APA, shall not exceed the value calculated using the following equation:

$$P_{idle} = P_{base} + \Sigma P_{add_i}$$

where P_{base} is the basic idle state power allowance in Table 3, and ΣP_{add_i} is the sum of the idle state power allowances for applicable, additional components, as determined per Table 4. For blade servers, P_{idle} is calculated as the total measured power divided by the number of installed blade servers in the tested blade chassis. For multi-node servers, the number of sockets are counted per node while P_{idle} is calculated as the total measured power divided by the number of installed nodes in the tested enclosure.

Table 3

Base idle state power allowances

Product type	Base idle state power allowance, P_{base} (W)
1-socket servers (neither blade nor multi-node servers)	25
2-socket servers (neither blade nor multi-node servers)	38
Blade or multi-node servers	40

Table 4

Additional Idle Power Allowances for Extra Components

System characteristics	Applies to	Additional idle power allowance
CPU Performance	All servers	1 socket: 10 × $Perf_{CPU}$ W 2 socket: 7 × $Perf_{CPU}$ W
Additional PSU	PSU installed explicitly for power redundancy	10 W per PSU
HDD or SSD	Per installed HDD or SSD	5,0 W per HDD or SSD
Additional memory	Installed memory greater than 4 GB	0,18 W per GB

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System characteristics	Applies to	Additional idle power allowance
Additional buffered DDR channel	Installed buffered DDR channels greater than 8 channels	4,0 W per buffered DDR channel
Additional I/O devices	Installed devices greater than two ports of ≥ 1 Gbit, onboard Ethernet	< 1 Gb/s: No Allowance
		= 1 Gb/s: 2,0 W/Active Port
		> 1 Gb/s and < 10 Gb/s: 4,0 W/Active Port
		≥ 10 Gb/s and < 25Gb/s: 15,0 W/Active Port
		≥ 25 Gb/s and < 50Gb/s: 20,0 W/Active Port
		≥ 50 Gb/s 26,0 W/Active Port

2.2. **Active state efficiency**

From 1 March 2020, the active state efficiency (Eff_{server}) of servers, with the exception of resilient servers, HPC servers and servers with integrated APA, shall not be lower than the values in Table 5.

Table 5

Active state efficiency requirements

Product type	Minimum active state efficiency
1-socket servers	9,0
2-socket servers	9,5
Blade or multi-node servers	8,0

3. INFORMATION TO BE PROVIDED BY MANUFACTURERS

3.1. From 1 March 2020, with the exception of custom made servers, made on a one-off basis, the following product information on servers shall be provided in the instruction manuals for installers and end-users (when present with the product), and on the free-access websites of manufacturers, their authorised representatives and importers from the time a product model is placed on the market until at least eight years after the placing on the market of the last product of a certain product model:

(a) product type;

(b) manufacturer's name, registered trade name and registered trade address at which they can be contacted;

(c) product model number, and if applicable the low-end performance configuration and the high-end performance configuration model numbers;

(d) year of manufacture;

(e) PSU efficiency at 10 % (if applicable), 20 %, 50 % and 100 % of rated output power, with the exception of direct current servers, expressed in % and rounded to the first decimal place;

(f) power factor at 50 % of the rated load level, with the exception of direct current servers, rounded to three decimal places;

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(g) PSU rated power output (Watts), rounded to the nearest integer. If a product model is part of a server product family, all PSUs offered in a server product family shall be reported with the information specified in (e) and (f);

(h) idle state power, expressed in Watts and rounded to the first decimal place;

(i) list of all components for additional idle power allowances, if any (additional PSU, HDDs or SSDs, additional memory, additional buffered DDR channels, additional I/O devices);

(j) maximum power, expressed in Watts and rounded to the first decimal place;

(k) declared operating condition class, as detailed in Table 6;

(l) idle state power (Watts) at the higher boundary temperature of the declared operating condition class;

(m) the active state efficiency and the performance in active state of the server;

(n) information on the secure data deletion functionality referred to in point 1.2.2 of this Annex, including instructions on how to use the functionality, the techniques used and the supported secure data deletion standard(s), if any;

(o) for blade servers, a list of recommended combinations with compatible chassis;

(p) if a product model is part of a server product family, a list of all model configurations that are represented by the model shall be supplied.

If a product model is part of a server product family, the product information required for items e) to m) under point 3.1 shall be reported for the low-end and high-end performance configurations of the server product family.

3.2. From 1 March 2020, with the exception of custom made data storage products, made on a one-off basis, the following product information on online data storage products shall be provided in the instruction manuals for installers and end-users (when present with the product), and on the free-access websites of manufacturers, their authorised representatives and importers from the time a product model is placed on the market until at least eight years after the placing on the market of the last product of a certain product model:

(a) product type;

(b) manufacturer's name, registered trade name and registered trade address at which they can be contacted;

(c) product model number;

(d) year of manufacture;

(e) PSU efficiency at 10 % (if applicable), 20 %, 50 % and 100 % of rated output power, with the exception of direct current online data storage products, expressed in % and rounded to the first decimal place;

(f) power factor at 50 % of the rated load level, with the exception of direct current online data storage products, rounded to three decimal places;

(g) declared operating condition class, as detailed in Table 6; it shall also be indicated that ‘This product has been tested in order to verify that it will function within the boundaries (such as temperature and humidity) of the declared operating condition class’;

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(h) information on the data deletions tool(s) referred to in point 1.2.2 of this Annex, including instructions on how to use the functionality, the techniques used and the supported secure data deletion standard(s), if any.

3.3. From 1 March 2020, the following product information on servers and online data storage products shall be made available from the time a product model is placed on the market until at least eight years after the placing on the market of the last product of a certain product model free of charge by manufacturers, their authorised representatives and importers to third parties dealing with maintenance, repair, reuse, recycling and upgrading of servers (including brokers, spare parts repairers, spare parts providers, recyclers and third party maintenance) upon registration by the interested third party on a website provided:

(a) indicative weight range (less than 5 g, between 5 g and 25 g, above 25 g) at component level, of the following critical raw materials:

(a) Cobalt in the batteries;

(b) Neodymium in the HDDs;

(b) instructions on the disassembly operations referred to in point 1.2.1 of this Annex, including, for each necessary operation and component:

(a) the type of operation;

(b) the type and number of fastening technique(s) to be unlocked;

(c) the tool(s) required.

In the case of servers, if a product model is part of a server product family, the product information required for items a) and b) under point 3.3 shall be reported either for the product model or, alternatively, for the low-end and high-end configurations of the server product family.

3.4. From 1 March 2020, the following product information on servers and online data storage products shall be provided in the technical documentation for the purposes of conformity assessment pursuant to Article 4:

(a) Information listed in points 3.1 and 3.3, in the case of servers

(b) Information listed in points 3.2 and 3.3, in the case of data storage products

Table 6

Operating condition classes

	Dry bulb temp °C		Humidity range, non-condensing			
Operating condition class	Allowable range	Recommended range	Allowable range	Recommended range	Max dew point (°C)	Maximum rate of change (°C/hr)
A1	15- 32	18-27	– 12 °C Dew Point (DP) and 8 % relative humidity (RH) to 17 °C DP and 80 % RH	– 9 °C DP to 15 °C DP and 60 % RH	17	5/20
A2	10-35	18-27	– 12 °C DP and 8 % RH to 21 °C DP and 80 % RH	Same as A1	21	5/20

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	Dry bulb temp °C		Humidity range, non-condensing			
Operating condition class	Allowable range	Recommended range	Allowable range	Recommended range	Max dew point (°C)	Maximum rate of change (°C/hr)
A3	5-40	18-27	– 12 °C DP and 8 % RH to 24 °C DP and 85 % RH	Same as A1	24	5/20
A4	5-45	18-27	– 12 °C DP and 8 % RH to 24 °C DP and 90 % RH	Same as A1	24	5/20

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ANNEX III

Measurements and calculations

1. For the purposes of compliance and verification of compliance with the applicable requirements of this Regulation, measurements and calculations shall be made using harmonised standards, the reference numbers of which have been published in the *Official Journal of the European Union*, or using other reliable, accurate and reproducible methods which take into account the generally recognised state of the art, and produce results deemed to be of low uncertainty.

2. Servers shall be tested either in their individual product model configuration or, for servers which are part of a server product family, in the low-end performance configuration and the high-end performance configuration as declared for Annex II, point 3.1.(p), which includes both hardware configuration and system settings, unless otherwise specified.

   All configurations offered within a server product family shall contain the same number of populated processor sockets used during testing. A server product family can be defined for a server with only partially populated sockets (e.g. one processor populated in a two socket server) as long as the configuration(s) are tested as a separate server product family, as required, and meet the same requirements for the number of populated sockets within that separate server product family.

   For servers with expansion APA, the unit under test shall be tested with the expansion APA removed, when measuring the idle state power, the active state efficiency) and the server performance in active state. Where an expansion APA relies on a separate Peripheral Component Interconnect Express switch for communication between the APA and CPU, the separate Peripheral Component Interconnect Express card(s) or riser(s) shall be removed for Active State and Idle State testing of all configurations.

   For multi-node servers, the unit under test shall be tested for per node power consumption in the fully-populated chassis configuration. All multi-node servers in the multi-node chassis shall share the same configuration (homogeneous).

   For blade servers, the unit under test shall be tested for blade server power consumption in the half-populated chassis configuration, and the chassis shall be populated as follows:

   (1) Individual blade server configuration

      (a) All individual blade servers installed in the chassis shall be identical, sharing the same configuration

   (2) Half chassis population

      (a) The number of blade servers required to populate half the number of single-wide blade server slots available in the blade chassis shall be calculated.

      (b) For blade chassis having multiple power domains, the number of power domains that is closest to filling half of the chassis shall be chosen. If there are two choices that are equally close to filling half of the chassis, the test shall be performed with the domain or combination of domains which use a higher number of blade servers.

      (c) All user manual or manufacturer recommendations for partially populating the chassis, which may include disconnecting some of the power supply units and cooling fans for the unpopulated power domains, shall be followed.

      (d) If user manual recommendations are not available or are incomplete, then the following guidance shall be used:

         (i) Completely populate the power domains;

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(ii) If possible, disconnect the power supply units and cooling fans for unpopulated power domains;

(iii) Fill all empty bays with blanking panels or an equivalent airflow restriction for the duration of testing.

3. The data to calculate the active state efficiency (Eff_{server}) and the idle power (P_{idle}) shall be measured during the same test according to the relevant standard, where the idle power can be measured either before or after running part of the test for the active state efficiency.

The active state efficiency (Effserver) of servers shall be calculated as:

$$Eff_{server} = \exp\left[W_{cpu} \times \ln\left(Eff_{cpu}\right) + W_{Memory} \times \ln\left(Eff_{Memory}\right) + W_{Storage} \times \ln\left(Eff_{Storage}\right)\right]$$

where: W_{CPU}, W_{Memory} and $W_{Storage}$ are the weightings applied to the CPU, Memory and Storage worklets respectively, as follows:

— W_{CPU} is the weighting assigned to the CPU worklets = 0,65

— W_{Memory} is the weighting assigned to the Memory worklets = 0,30

— $W_{Storage}$ is the weighting assigned to the Storage worklets = 0,05

and

$$Eff_{CPU} = \left(\prod_{i=1}^{7} Eff_i\right)^{1/7}$$

where:

— i = 1 for worklet*Compress*;

— i = 2 for worklet*LU*;

— i = 3 for worklet*SOR*;

— i = 4 for worklet*Crypto*;

— i = 5 for worklet*Sort*;

— i = 6 for worklet*SHA256*;

— i = 7 for worklet*Hybrid SSJ*;

$$Eff_{Memory} = \left(\prod_{i=1}^{2} Eff_i\right)^{1/2}$$

where:

— i = 1 for workletFlood3;

— i = 2 for workletCapacity3;

$$Eff_{Storage} = \left(\prod_{i=1}^{2} Eff_i\right)^{1/2}$$

where:

— i = 1 for workletSequential;

— i = 2 for workletRandom;

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and

$$Eff_i = 1\,000\frac{Perf_i}{Pwr_i}$$

where

— $Perf_i$: Geometric mean of the normalized interval performance measurements;

— Pwr_i: Geometric mean of the measured interval power values;

In order to create a single energy efficiency metric for a server the interval efficiency values for all the different worklets shall be combined using the following procedure:

(a) combining the interval efficiency values for the individual worklets using the geometric mean to obtain individual worklet Efficiency values for the worklet;

(b) combining worklet efficiency scores using the geometric mean function by workload type (CPU, Memory, Storage) to obtain a workload type value;

(c) combining the three workload types using a weighted geometric mean function to obtain a single, total server efficiency value.

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ANNEX IV

Verification procedure for market surveillance purposes

The verification tolerances defined in this Annex relate only to the verification of the measured parameters by Member State authorities and shall not be used by the manufacturer or importer as an allowed tolerance to establish the values in the technical documentation or in interpreting these values with a view to achieving compliance or to communicate better performance by any means.

Where a model has been designed to be able to detect it is being tested (e.g. by recognizing the test conditions or test cycle), and to react specifically by automatically altering its performance during the test with the objective of reaching a more favourable level for any of the parameters specified in this Regulation or included in the technical documentation or included in any of the documentation provided, the model shall be considered not compliant.

When verifying the compliance of a product model with the requirements laid down in this Regulation pursuant to Article 3(2) of Directive 2009/125/EC, for the requirements referred to in this Annex, the authorities of the Member States shall apply the following procedure:

1. The Member State authorities shall verify one single unit of the model or, in case the manufacturer reports on a server product family, of the model configuration. If the verification is done on the low-end performance configuration or the high-end performance configuration, the declared values shall be the values for the respective configuration. If the verification is performed on a randomly selected or ordered model configuration, the declared values shall be the values for the high-end performance configuration.

2. The model or model configuration shall be considered to comply with the applicable requirements if:

   (a) the values given in the technical documentation pursuant to point 2 of Annex IV to Directive 2009/125/EC (declared values), and, where applicable, the values used to calculate these values, are not more favourable for the manufacturer or importer than the results of the corresponding measurements carried out pursuant to paragraph (g) thereof; and

   (b) the declared values meet any requirements laid down in this Regulation, and any required product information published by the manufacturer or importer does not contain values that are more favourable for the manufacturer or importer than the declared values; and

   (c) when the Member State authorities test the unit of the model or alternatively, in case the manufacturer declared the server to be represented by a server product family, of the low-end performance configuration or the high-end performance configuration of the server product family, the determined values (the values of the relevant parameters as measured in testing and the values calculated from these measurements) comply with the respective verification tolerances as given in Table 7.

3. If the results referred to in points 2(a) or 2(b) are not achieved, the model and all model configurations that are covered by the same product information (according to Annex II point 3.1(p) shall be considered not to comply with this Regulation.

4. If the result referred to in point 2(c) is not achieved:

   (a) for models or model configurations from a server product family that are produced in quantities of less than five per year, the model and all model configurations that are covered by the same product information (according to Annex II point 3.1(p)) shall be considered not to comply with this Regulation;

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(b) for models that are produced in quantities of five or more per year, the Member State authorities shall select three additional unit of the same model or alternatively, in case the manufacturer declared the server to be represented by a server product family, a unit of both the low-end performance configuration and the high-end performance configuration for testing.

5. The model or model configuration shall be considered to comply with the applicable requirements if, for these three units, the arithmetical mean of the determined values complies with the respective verification tolerances given in Table 7.

6. If the result referred to in point 4(b) is not achieved, the model and all model configurations that are covered by the same product information (according to Annex II point 3.1(p) shall be considered not to comply with this Regulation.

7. The Member State authorities shall provide all relevant information to the authorities of the other Member States and to the Commission without delay after a decision being taken on the non-compliance of the model according to points 3 and 6.

The Member State authorities shall use the measurement and calculation methods set out in Annex III.

The Member State authorities shall only apply the verification tolerances that are set out in Table 7 of this Annex and shall only use the procedure described in points 1 to 7 for the requirements referred to in this Annex. No other tolerances shall be applied.

Table 7

Verification tolerances

Parameters	Verification tolerances
PSU efficiency (%)	The determined value shall not be lower than the declared value by more than 2 %.
Power factor	The determined value shall not be lower than the declared value by more than 10 %.
Idle state power, P_{idle} and maximum power (W)	The determined value shall not exceed the declared value by more than 10 %.
Active state efficiency and performance in active state	The determined value shall not be lower than the declared value by more than 10 %.

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ANNEX V

Indicative benchmarks referred to in Article 6

The following indicative benchmarks are identified for the purpose of Part 3, point 2 of Annex I to Directive 2009/125/EC.

They refer to the best available technology by 7 April 2019.

The indicative benchmarks for the best available technology on the market for servers and online data storage products are as follows.

Table 8

Benchmark for idle state power, server efficiency and operating condition

Product type	Idle power, W	Active state efficiency	Operating condition class
Tower server, 1 socket	21,3	17	A3
Rack server, 1 socket	18	17,7	A4
Rack server, 2 socket, low performance	49,9	18	A4
Rack server, 2 socket, high performance	67	26,1	A4
Rack server, 4 socket	65,1	34,8	A4
Blade server, 2 socket	75	47,3	A3
Blade server, 4 socket	63,3	21,9	A3
Resilient server, 2 socket	222	9,6	A3
Data storage products	Not applicable	Not applicable	A3

Table 9

Benchmark for PSU efficiency at 10 %, 20 %, 50 % and 100 % load level and power factor at 20 % or 50 % load level

PSU nameplate power	10 %	20 %	50 %	100 %
< 750W	91,17 %	93,76 %	94,72 % Power factor > 0,95	94,14 %
≥ 750W	95,02 %	95,99 % Power factor > 0,95	96,09 %	94,69 %