

IBM® Power® S1024

Product Carbon Footprint

IBM is committed to environmental leadership in all its business activities, from operations to the design of its products and use of its technology. To help our clients better understand the environmental impacts associated with IBM products, we report the product carbon footprint (PCF) for representative products using the Product Attributes to Impact Algorithm (PAIA) model. Table 1 describes a typical IBM® Power® S1024 configuration considered for this PCF analysis.



Limitations of PAIA

PAIA results represent a streamlined Life Cycle Assessment (LCA). While the product carbon footprint provides a high-level estimate of the emissions associated with the product, it should not be used for emissions inventory, formal carbon footprinting exercises or comparing products. LCA results are strongly influenced by the assumptions made by the analyst.

If those assumptions are inconsistent, comparisons are not likely meaningful. Furthermore, PAIA may not be compliant with the primary data requirements of some LCA standards. The results from the PAIA tools are liable to change over time as the methodology is improved and data is updated. More information on these limitations, as well as general guidance for interpreting this report, is available in the publication [“Assessment of lifecycle carbon footprints of products.”](#)

| Power S1024 | |
|-------------------|-----------------------------|
| Model | S1024-9105-42A |
| Processor | IBM Power10® |
| Configured memory | 512 GB |
| Features | 1x Generic PCI card |
| | 2x Generic solid state disk |

Table 1: Typical product configuration of the IBM® Power® S1024 considered for this PCF analysis.



This PCF estimate was produced using the Product Attributes to Impact Algorithm (PAIA) model, developed by the Massachusetts Institute of Technology’s Materials Systems Laboratory and partners, Version 1.4.0, August 15, 2024, copyright by the ICT Benchmarking collaboration including the Massachusetts Institute of Technology’s Materials Systems Laboratory and partners.

For the configuration shown in Table 1, Table 2 provides the total estimated mean greenhouse gas (GHG) emissions in carbon dioxide equivalent (kg CO₂e¹) associated with the manufacturing, assembly, electricity consumption², transportation and end-of-life handling, over 4 years, using hypothetical average GHG emissions factors. Figure 1 shows the estimated contribution of each life cycle phase to the total estimated mean GHG emissions.

The data used in the PAIA server tool for each representative configuration is provided in Table 3. This PCF was generated using a distribution of emissions factors across the location, based on International Energy Agency (IEA) emissions factors⁴.

Impact by phases of the product’s lifecycle

The PCF for server equipment is largely driven by the use phase which is highly variable based on the electricity generation source used to power the product, the expected use life of the product, and the power profile. This PCF was generated using a distribution of emissions factors across the respective location. Table 2 shows that 89% - 95% of the carbon footprint occurs in the use phase. IBM recommends that you customize the use phase GHG emissions based on your specific data center conditions, using the guidance provide in “[Assessment of life cycle carbon footprints of products](#)”. IBM focuses on improving our product energy efficiency and on providing tools for our clients to estimate and measure the energy consumption of their product. The [IBM Systems Energy Estimator](#) can be used to estimate the power consumption of your specific product configuration.

Uncertainty in the product carbon footprint

All estimates of carbon footprint are uncertain. To provide transparency around this uncertainty, Table 2 also reports the Standard Deviation and the 95th percentile of the carbon footprint estimate. The 95th percentile means that 5% of the time the carbon footprint will exceed the value provided.

| | | Total estimated mean GHG emissions in kg CO ₂ e ¹ | % of Estimated mean GHG emissions in the use phase ⁴ | Standard deviation of the estimated GHG emissions in kg CO ₂ e ¹ | 95 th percentile of the estimated GHG emissions in kg CO ₂ e ¹ |
|-------------|---------------|---|---|--|---|
| Power S1024 | Europe | 22,940 | 89% | 13,900 | 55,400 |
| | East Asia | 47,740 | 95% | 15,500 | 82,200 |
| | United States | 16,540 | 93% | 4,200 | 26,900 |

Table 2: Summary of the estimated GHG emissions for the typical product configuration listed in Table 1 for the IBM® Power® S1024.



Figure 1: Carbon footprint impact by phase for the IBM® Power® S1024 product configurations listed in Table 1 using the PAIA model assuming a 4-year product lifetime.

| PAIA input data | | Power S1024 | |
|--|---------------|------------------------|-------------|
| Server type | | Rack | |
| Server quantity | | 1 | |
| Number of PSU | | 4 | |
| Number of fans | | 6 | |
| Server weight | | 36.3 kg | |
| Rack mount weight ³ | | 0.0 kg | |
| Packaging weight | | 16.0 kg | |
| PWB area | | 2138.6 cm ² | |
| CPU quantity | | 2 | |
| CPU package area | | 65.3 cm ² | |
| DRAM total capacity | | 512 GB | |
| Chipset & other ICs package area | | Default | |
| Chipset & other ICs quantity | | Default | |
| Sub card total PWB area | | 1448.7 cm ² | |
| Sub card main chip package area | | 153.1 cm ² | |
| Sub card chip count | | 188 | |
| PSU weight | | 1.07 kg | |
| PSU dimensions | | 23.5 cm x 4.0 cm | |
| Product lifetime | | 4 years | |
| Yearly energy consumption ⁵ | | 10354 kWh | |
| Assembly location | | Mexico | |
| Transportation | | Mode: Air | Mode: Truck |
| | Europe | 6,120 km | 300 km |
| | Japan | 10,900 km | 300 km |
| | United States | 0 km | 1,549 km |
| Fraction recycled | | 0.97 | |

Table 3: Data used in the PAIA server model for the IBM® Power® S1024.

Disclaimers

1. The results are reported using the units of kilograms of carbon dioxide equivalent (kg CO₂e). This represents the amount of global warming caused by a quantity of GHGs (CO₂, CH₄, N₂O, HFCs, PFCs and SF₆) at a specific point in time, expressed in terms of the amount of CO₂ which would have the same instantaneous warming effect. Recognizing the uncertainty in carbon footprint estimates, the results have been rounded.
2. The electricity consumption is incurred by clients using an IBM product. The estimate used is not specific to any client deployment of the IBM product or client workload.
3. The estimated carbon footprint was computed excluding the rack.
4. The mean electricity emissions factor used in the PAIA analysis for each location is calculated based on the energy consumption and use phase emissions. These values are 0.49 kg CO₂e/kWh for Europe, 1.09 kg CO₂e/kWh for East Asia, and 0.37 kg CO₂e/kWh for the United States. The region definition for Europe follows the World Bank definition.
5. Power consumption data is obtained using the [IBM Systems Energy Estimator](#), a web-based tool for estimating power requirements for the IBM® Power S1024. This tool estimates the power requirements for the specific configuration listed in Table 1 under normal operating conditions. The power consumption assumes the product operated at 30% utilization. The energy consumption assumes that the product operates 24 hours a day, 365 days a year for its product lifetime.

© Copyright IBM Corporation 2024 IBM Corporation
New Orchard Road
Armonk, NY 10504

Produced in the United States of America, August 9, 2024.

IBM, the IBM logo, ibm.com, Power and Power10, are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies.

A current list of IBM trademarks is available on the web at "Copyright and trademark information" at ibm.com/legal/copytrades.html.

The registered trademark Linux is used pursuant to a sublicense from the Linux Foundation, the exclusive licensee of Linus Torvalds, owner of the mark on a world-wide basis.

This document is current as of the initial date of publication and may be changed by IBM at any time. Not all offerings are available in every country in which IBM operates.

The performance data discussed herein is presented as derived under specific operating conditions. Actual results may vary.

THE INFORMATION IN THE DOCUMENT IS PROVIDED "AS IS" WITHOUT ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING WITHOUT ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND ANY WARRANTY OR CONDITION ON NON-INFRINGEMENT. IBM products are warranted according to the terms and conditions of the agreements under which they are provided.

