

High Temperatures in Data Centers



AI Overview

High temperatures in data centers pose risks to equipment, data integrity, and operational efficiency, but modern design and cooling strategies can mitigate these challenges. Data centers generate substantial heat due to dense arrays of servers and networking equipment. If temperatures rise beyond safe limits, hardware can overheat, leading to unexpected shutdowns, data corruption, or permanent equipment damage. Frequent thermal cycling—repeated heating and cooling—can weaken components over time, increasing the likelihood of failures and compromising data integrity. In extreme cases, overheating can even trigger fires, especially when flammable materials are present nearby. Personnel working in overheated environments are also at risk of heat stress, dehydration, and reduced cognitive performance, which can affect operational safety and efficiency.

Operational and Environmental Impacts Rising global temperatures and climate change exacerbate cooling challenges. Many top data center hubs are increasingly exposed to heat waves, which can force temporary shutdowns to prevent damage, disrupting cloud services and business operations. By 2080, projections suggest that up to 80% of major data center hubs could face high cooling demands for longer periods annually, increasing energy and water consumption significantly. For example, a mid-size data center may use around 1.4 million liters of water per day for cooling, and this demand will grow as ambient temperatures rise. High temperatures also elevate electricity costs and contribute to higher carbon emissions if energy efficiency is not optimized.

Industry Guidelines and Temperature Ranges Modern data centers no longer require extremely cold environments. The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recommends an operating range of 18–27°C (64–81°F), with wider allowable ranges for specific equipment. Advanced servers, including AI and high-performance computing systems...

Article Content

Weather Data Center

Weather Data Viewer also implements various calculation methods found in the ASHRAE Handbook, such as those for return period minimum/maximum temperatures, degree-days to any base, design

Factors behind record-high temperatures over Japan in summer 2025

Record-high summer mean surface air temperatures over Japan have been observed in three consecutive years (2023 to 2025), far exceeding the projected linear trend of temperatures based on

Climate Data Online (CDO)

Climate Data Online Climate Data Online (CDO) provides free access to NCDC's archive of global historical weather and climate data in addition to station history information. These data include

Climate change: global temperature

Global temperatures in 2024 were above the 1991-2020 average (red) across most of the planet. Yearly temperatures compared to the 20th

High Temperature Resistance Solution for EMS in Singapore Data Centers

Research and Technologies for next-generation high-temperature data In addition, a through review of the main temperature-sensitive IT components (e.g., hard disk drives and CPU) is done, and their

Monitoring Coolant Flow in High-Density Liquid-Cooled

Why Continuous Flow Monitoring is Critical Maintaining proper coolant flow at all times is mission-critical in liquid-cooled data centers. If flow

Tracking Heat Across Europe

The New York Times Intense heat has contributed to record-breaking summer temperatures around the globe in recent years. The map above shows the latest forecast.

Loss and Efficiency, Data Center, High Voltage Spacecraft Power ...

This edition highlights the latest advances in GaN power electronics and next-generation power conversion. Discover new research on high-efficiency EV inverters, power converters for AI

The AI-Driven Energy Surge: A comprehensive review of sustainable

The meteoric rise of artificial intelligence (AI) has propelled global data center energy consumption to 415 terawatt-hours in 2024, with projections doubling to 945 TWh by 2030, driven by AI's

Thermal Guidelines and Temperature Measurements in Data Centers

A few local areas with high temperatures ("hotspots") may drive the entire cooling strategy of the data center. The IT staff is interested in ensuring adequate thermal conditions in the

Data center temperature and humidity guidelines

ASHRAE's data center temperature and humidity standards help admins determine what the environment of the facility should be for optimal

Climate threats to data centers set to surge

However, presently, 16 out of 529 data centers in the state are already at high risk. Therefore, the report contends that without significant investment in

PJM Emergency Order: Heat Wave Threatens Record Demand (2026 ...

The Department of Energy issued two emergency orders allowing PJM to curtail data centers and waive power plant pollution limits as a severe heat wave pushes electricity demand

This summer's heat is a live stress test for data centers

Data centers require extensive cooling equipment to make sure the servers they hold don't overheat, but high temperatures can cause these cooling systems to fail faster.

Data centers may be forming "heat islands," with raised temperatures

AI infrastructure is significantly warming surrounding areas, creating a "data heat island effect" with the potential to impact hundreds of millions of people living nearby, a new working paper...

Top 3 Myths about Data Center Operating Temperatures

In truth, data center operating temperatures have been slowly rising for decades as industry standards evolve and equipment is designed for greater efficiency. However, common

Average Florida Temperatures By Month

The table below lists Florida's state-wide average temperature by month. The temperatures are monthly means based on data collected by weather stations throughout the state from 1991 to 2020 for the

Energy-saving potentials in high-temperature data centers: A spatio ...

This study investigates high-temperature data centers, where operating temperatures are moderately increased to reduce cooling energy consumption while maintaining safe hardware

Assessing the Global Temperature and Precipitation Analysis in 2025

High ocean temperature anomalies were most pronounced in the North Pacific. In contrast, cooler-than-average conditions were observed in the tropical central and eastern Pacific

Nvidia's high-temperature liquid cooling for AI data centers

Nvidia has developed a closed-loop, warm-liquid cooling system that operates at higher temperatures to reduce or eliminate mechanical chiller use and on-site water consumption. The technology ...

Majority of world's top data centre hubs face array of rising heat ...

Rising global temperatures pose an increasing risk to the resilience of well over half of the world's top 100 data centre hubs, according to our latest research.

Data centers are creating "heat islands" and warming

The vast data centers that power artificial intelligence are so energy hungry that they're heating up their surroundings, according to new research.

We mapped the world's hottest data centers

There are nearly 9,000 data centers in operation around the world, a figure set to triple by 2030. The ideal temperature range for data centers is 18 C to 27 C (64.4 F to 80.6 F). Hot

Data center temperature and humidity guidelines

Most data centers maintain a cooler operating temperature. Although it can be theoretically allowable for Class A1 to operate at temperatures as high as 32 degrees C (89.6

NVIDIA's new liquid-cooled data centers are running at an unexpected ...

Nvidia's DSX AI data centers are hosting its Rubin AI infrastructure, and they're not being cooled by conventional methods like fans or cold aisles.

The global energy impact of raising the space temperature for high ...

Here, we report the global energy impacts of adopting high-temperature data centers and critically analyze the trade-off between cooling-energy savings and server power rise using

UAE summer temperatures surge near record highs

The United Arab Emirates is facing surging temperatures this summer after its hottest spring ever, with temperatures soaring close to record highs at

Data centers are creating "heat islands" and warming the land around ...

The vast data centers that power artificial intelligence are so energy hungry that they're heating up their surroundings, according to new research.

NVIDIA's New Liquid-Cooled Data Centers Are Running At An ...

Traditionally, data center operators have recommended an ambient temperature of 18 to 27 degrees Celsius (approximately 64 to 80 degrees Fahrenheit) for data center equipment. But in an

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