
Powering
data centers
from grid to chip
Uptime: 92%
State : Active
CONNECTED
flex

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Introduction

The advance of AI, machine learning (ML), cryptocurrencies and cloud computing is dramatically reshaping data centers.

Needing to support a wide array of services from high-resolution video streaming to complex AI-driven data processing that require intensive computational power, data centers are rapidly becoming one of the largest consumers of global energy resources. The International Energy Agency has projected that if current trends continue, these data centers could consume over 1,000 terawatt-hours by 2026, a stark increase from the 460 terawatt-hours recorded in 2022.

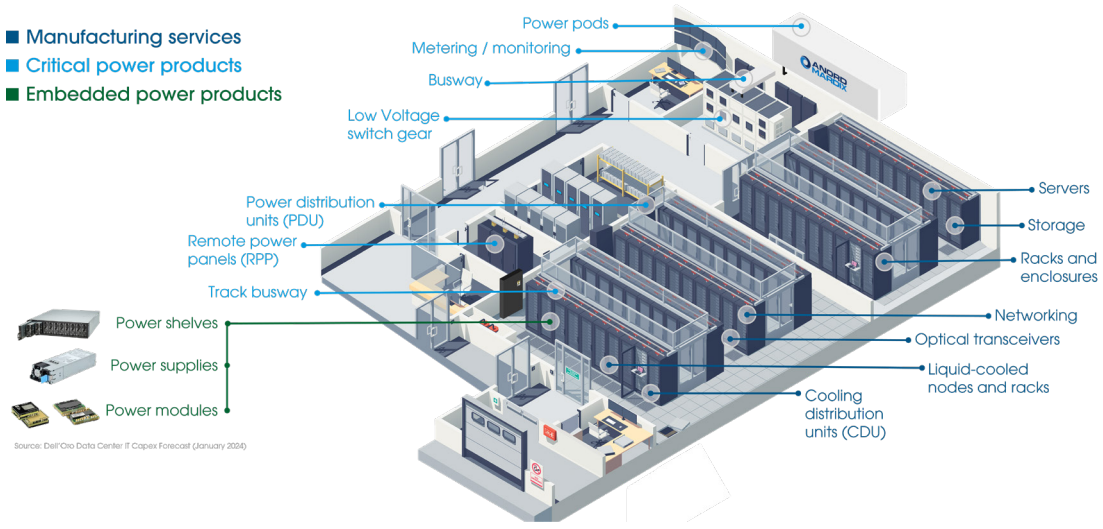
Power solutions for data centers

As data centers continue to grow and adapt to keep up with processing demands, they encounter significant challenges. In an era of unprecedented data throughput, power distribution strategies are evolving to ensure energy efficiency, reduced heat generation, optimized space utilization, and effective cost management. Traditional data centers manage around 12 kW per rack, but AI data centers are seeing a dramatic increase, with current ultra high-density racks consuming 85 kW per cabinet. Future projections suggest that this could rise to between 200 kW and 250 kW per rack as AI workloads become more demanding [1].

In this brochure we will highlight how Flex addresses data center infrastructure requirements to support accelerated customer expansion plans and timelines.

We do this through a comprehensive portfolio of data center IT and power infrastructure solutions and advanced manufacturing services spanning the entire product lifecycle, including design, fulfilment, and circular economy with global scale and local impact.

Flex is the only manufacturer of data center infrastructure with a power portfolio that extends from grid to chip. Our power solutions are designed to meet the demands of tomorrow's requirements for data centers.



[1] Source: https://spectra.mhi.com/data-center-cooling-the-unexpected-challenge-to-ai

Critical power

Our commitment to engineering excellence ensures that our products and services deliver safe, reliable, and high-quality critical power solutions. We deliver innovative engineering solutions to our clients, effortlessly meeting even the most complex technical requirements, no matter the challenge.

We operate on a global scale, with manufacturing facilities strategically located across the Americas, EMEA, and APAC regions. Our customers trust us to provide high-quality field support for the seamless commissioning of our products and solutions.

ANORD MARDIX
A Flex Company

Our critical power solutions, provided by Anord Mardix, a Flex company, empower customers to enhance energy efficiency, simplify complex systems, and accelerate build times while reducing costs. Tailored to meet the critical power demands of data center infrastructure, these solutions ensure reliability and efficiency at every stage.

Engineering Excellence

We deliver safe, reliable, and quality critical power products

Hyperscale Innovation

Committed to innovation leadership

Customized Solutions

Completely custom built to fulfil your requirements and timelines

We are powering the future for a resilient world

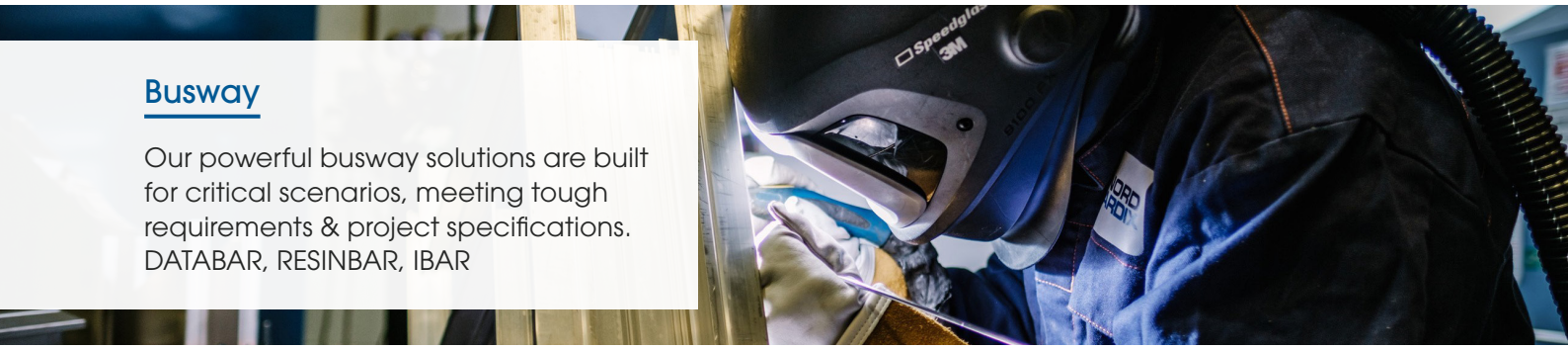
Anord Mardix built customer trust over a century of pioneering innovation, reliability and safety in the critical power industry

Critical power solution portfolio

In addition to showcasing our main product lines, we also provide a comprehensive range of support services.

Modular

We specialize in factory-built, custom designed Power PODs fully-fitted & ready for integration into your data center facility

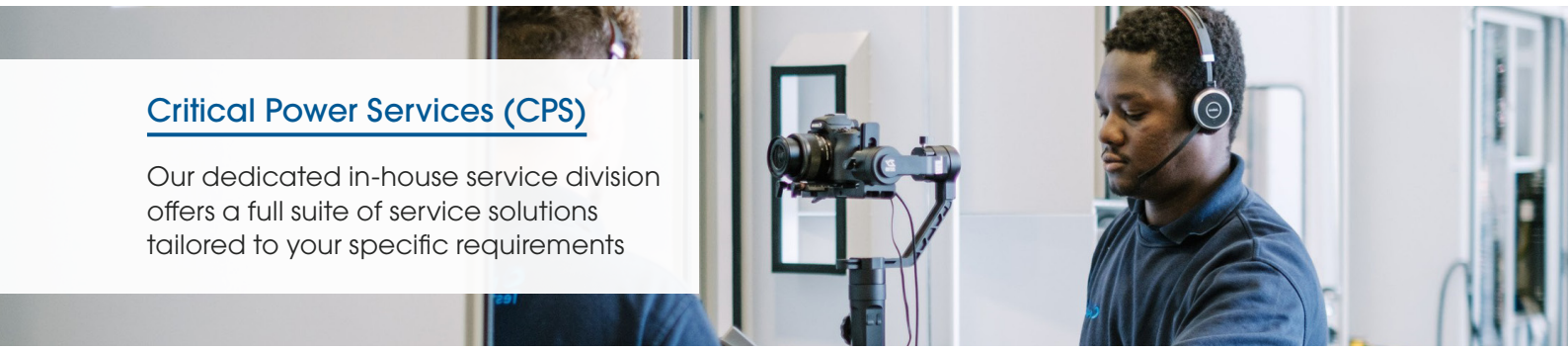


Busway

Our powerful busway solutions are built for critical scenarios, meeting tough requirements & project specifications. DATABAR, RESINBAR, IBAR

Switchgear

We have a deep knowledge & expertise on LV switchboard enabling high power & high efficiency solutions



Critical Power Services (CPS)

Our dedicated in-house service division offers a full suite of service solutions tailored to your specific requirements

MODULAR SOLUTIONS

POWER PODS
Scalable, flexible, hyper-scale

Deploy power capacity in greenfield and brownfield data centers with plug-and play, modular Power PODs. We build, test, and commission a complete solution vertically integrated with everything needed to connect directly to the grid. This solutions leads to 75% reduction in onsite assembly and testing which translates into cost savings.

POWER SKIDS
Re-defining offsite construction

Reduce complexity, cost, and build times with vertically integrated power sub-systems. Our Power SKIDs are pre-assembled on an open metal frame structure with critical power components, such as UPS, batteries, static transfer switches, and switchgear.

BUSWAY

DATABAR, IBAR, RESINBAR

Patented designs built to connect and distribute power across transformers, switchgear, panelboards, and racks. Our Busway products are configured for any data center environment from single to multi-story facilities, indoor and outdoor applications, and unique regional requirements.

SWITCHGEAR

LV Switchgear

Low Voltage: High-quality with the smallest footprint in the industry, we offer flexible configurations with cable access in front, rear, top or bottom.

MV Switchgear

Medium Voltage: Well-engineered, expertly commissioned with vacuum, gas-insulated (GIS) and sulfur hexafluoride (SF6) options.

Power Distribution Units

We deliver basic or intelligent PDUs to meet customer requirements. We design and build Power Distribution Units (PDUs) and its critical components, such as generators, switchgear, transformers, uninterruptible power systems (UPS), remote monitoring and management capabilities.

Remote Power Panel

Custom-engineered with the highest level of protection and performance for distributing power to racks. Its highly compact footprint as small as 450mm x 300mm reduces operating costs, increases floor space and allows for flexible expansion.

Packaged Substations

Support remote mounting of low voltage (LV) transformers, options for medium voltage incomer (main incoming supply source from substation), top or bottom high-voltage (HV) cable connections, fluid-filled air cooled or forced, and in-house PLC programming for dual redundancy.

Distribution Panelboards

Modular design to suit user configuration requirements such as metering on each outgoing way or top/bottom cable-entry.

POWER MANAGEMENT

MCMS, Energy Management Systems, IMS DCIM, SCADA Systems

Our metering systems can be retrofitted into existing power infrastructure and SCADA systems. Modular Circuit Monitoring System (MCMS) supports hardware and software integration with a variety of SCADA or Energy Monitoring Systems. This ensures a single, tested system that gives you the most reliable results.

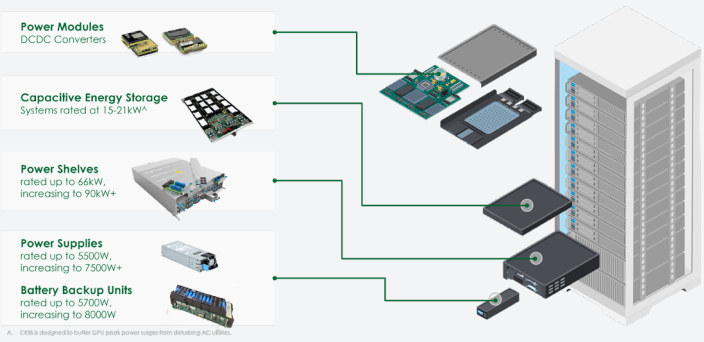
Critical Power Services

Whether you require a one-off site modification, start-up support, planned maintenance or a bespoke 24/7 callout facility, our service teams around the world will develop a Service Level Agreement (SLA).

Embedded power

Flex's embedded power portfolio addresses power density requirements in the data center by improving efficiency at the board and rack levels, reducing latency and space, and accelerating time-to-market.

Flex delivers a broad range of embedded power solutions, including AC/DC and DC/DC converters, racks, shelves, and battery back-up.



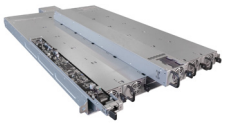
Embedded power's portfolio

Power Shelves

Our Power Shelves are customized solutions and are adapted to our customer's unique needs and requirements.

FLEX GB200

The Flex GB200 latest generation of power shelf for demanding GPUs. It provides DC power to all the payloads inside a rack and consists of 6 PSUs with a maximum output power of 33kW in total.



1RU power shelf

PSC module

Main features

- 50V 1RU 19" power shelf
- AI / Data Center / Cloud Server / 6+0
- Hot pluggable PSUs and PSC
- Telemetry and monitoring over Redfish
- Bootloader to field upgrade PSC and PSU firmware
- Current sharing between multiple shelves
- Wide input voltage range of 200 – 240 V_{ac} (346 – 457V_{ac} WYE 5wires 3L+N+PE)

Bus bar clip

5500W PSU

Dimensions

19" - 43.6 x 448 x 718.8mm (HxWxL)

27.5kW PSU & BBU POWER SHELF (48V)

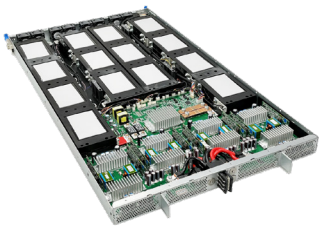
Main features

- Driven by 48V cloud data center requirements
- Parallel operation of 6 PSU & 6 BBUs in parallel in rack BBU power shelf
- Data Center / Cloud Server / N+1

Dimensions

21" – 130.5 x 534 x 946mm (HxWxL)

CAPACITIVE ENERGY STORAGE SYSTEM (CESS)



The Flex CESS is the first to market Capacitive Energy Storage System which balances utility power in datacenters

Main features

- Supports and balances power supply systems during large power transients
- Long lifespan
- Operating temperature +10 to +45 °C
- 16kW Local Energy Storage Tray (LEST)
- Parallelable up to 8 units per Rack Power Zone

Dimensions

465 x 788 x 44 mm (HxWxL)

DC/DC converters by Power Modules

Flex Power Modules has a comprehensive product portfolio of board-mounted DC/DC modules for data centers – which typically run on a narrow 40-60V supply voltage in order to feed power hungry data center applications. These power modules come in small form factors for board-space efficiency and serve power needs up to 3kW.

In the datacom market, we offer solutions for **cloud**, **storage**, **hyperscale computing**, **AI** and **network security** applications. We innovate in this market with the use of Inductor-Inductor-Capacitor (LLC) and Switched Capacitance Converter (SCC) topologies and leading-edge components to deliver extremely high levels of power density.

Vertical Power Delivery (VPD) is transforming the way data centers manage their power needs, offering a groundbreaking approach that significantly reduces energy losses and enhances overall efficiency. Traditional lateral power delivery methods often result in substantial power dissipation across the printed circuit board (PCB), leading to higher energy costs and increased thermal management challenges. By contrast, VPD minimizes the distance power travels by positioning voltage regulators directly beneath high-demand processors, such as those used in generative AI (GenAI) applications. This proximity reduces power plane resistance and improves current density, leading to a dramatic decrease in power losses and a more reliable, efficient power supply.

Our Vertical Power Delivery (VPD) designs facilitate direct underside connections to the power pins of processors and ASICs, further enhancing efficiency and performance in demanding data center environments.

Our products can be categorized accordingly:

- 48V Non-isolated unregulated DC/DC converters
- 48V Non-isolated regulated DC/DC converters
- 48V Isolated regulated DC/DC converters
- Integrated power stages / VRM
- Vertical Power delivery

In the following pages we will present our latest products within these different categories. More detailed information about the products is found on the Flex Power Modules website.

48V NON-ISOLATED UNREGULATED DC/DC CONVERTERS

Main features

- High power density IBC
- Fixed ratios 4:1 for BMR31x series
- Fixed ratios 8:1 for BMR32x series
- Digital interface with PMBus

ARTIFICIAL INTELLIGENCE | CLOUD | MACHINE LEARNING | HYPERSCALE

PRODUCT		V_{in} (V)	V_{out} (V)	P_{TDP} / P_{peak}(W)	EFFICIENCY (%)	DIMENSIONS (mm / in)
	BMR313	38-60	9.5-15	1000 /3000	97.3	23.4 x 17.8 x 7.65mm / 0.92 x 0.7 x 0.3 in
	BMR314	38-60	9.5-15	800 /1500	97.4	23.4 x 17.8 x 9.65mm / 0.92 x 0.7 x 0.38 in
	BMR316	38-60	9.5-15	1000 /3000	97.7	23.4 x 17.8 x 7.65mm / 0.92 x 0.7 x 0.3 in
	BMR320	40-60	5-7.5	400 /740	97.6	27 x 18 x 6.4 mm / 1.06 x 0.71 x 0.25 in
	BMR321	40-60	5-7.5	750 /1500	98.05	41.47 x 17.67 x 6.9mm / 1.63 x 0.69 x 0.27 in

48V NON-ISOLATED REGULATED DC/DC CONVERTERS

Main features

- Non-isolated, digital quarter brick
- Fully regulated output
- Peak power capabilities

CLOUD | HYPERSCALE

PRODUCT		V_{in} (V)	V_{out} (V)	P_{TDP} / P_{peak} (W)	EFFICIENCY (%)	DIMENSIONS (mm / in)
	BMR350	38-60	8-13.2	600-1300 / up to 1700	97.2	58.4 × 36.8 × 12 mm / 2.3 × 1.45 × 0.47 in
	BMR351	40-60	8-13.2	1600 / 2300	97.8	58.4 × 36.8 × 14.2–14.7 mm / 2.3 × 1.45 × 0.56–0.58 in
	BMR352	40-60	8-13.2	2000 / 3000	97.7	58.4 x 36.8 x 14.7 mm 2.30 x 1.45 x 0.58 in

48V ISOLATED REGULATED DC/DC CONVERTERS

Main features

- Isolated, digital converter
- Fully regulated output
- HRR (Hybrid Regulated Ratio)

CLOUD HYPERSCALE

PRODUCT		V_{in} (V)	V_{out} (V)	P_{TDP} / P_{peak} (W)	EFFICIENCY (%)	DIMENSIONS (mm / in)
	BMR492	40-60	8-13.2	450-800 / up to 1100	Up to 97.5	58.4 × 22.7 × 12.7 mm / 2.3 × 0.89 × 0.5 in
	BMR491	40-60	8-13.2	1300-1540 / 2450	Up to 97.5	58.4 × 36.8 × 14 mm / 2.3 × 1.45 × 0.55 in

INTEGRATED POWER STAGES / VRM

Main features

- 2-phase voltage regulation modules
- Non-isolated, digital converter
- Power stage on top for optimal cooling

ARTIFICIAL INTELLIGENCE CLOUD HYPERSCALE

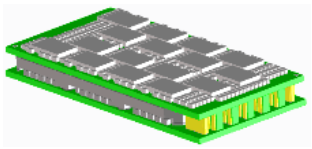
PRODUCT		V_{in} (V)	V_{out} (V)	$I_{TDC\ /\ peak}$ (A)	EFFICIENCY (%)	DIMENSIONS (mm / in)
	BMR510	4.5-15	0.5-1.3	80 | 140	92	10 × 9 × 7.63 mm / 0.39 × 0.35 × 0.3 in

VERTICAL POWER DELIVERY

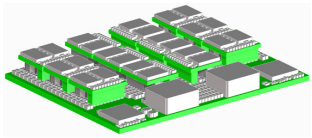
Vertical power delivery is applied to feed power hungry applications to supply high current, low voltage and extremely fast load transient response by placing the voltage regulators directly under the processors on the bottom of a PCB.

These solutions are always customized and developed in a tight cooperation with our customers.

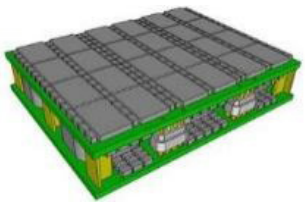
We have already developed various VPD solutions from 1-7 rails and 8-48 phases and gained a deep knowledge and expertise in this complex technology.



VPD | 16 phases, 1 rail



VPD | 48 phases, 5 rails



VPD | 24 phases, 5 rails

POINT OF LOAD

We also have a wide range of Point of Load (PoL) products applicable for data center applications with Input ranges from 4.5 – 15 V and Output ranges 0.6-5 V.

These devices incorporate a digital interface for easy monitoring, configuration and control. To find out more, please refer to our PoL section on the Flex Power Modules website.

Connect with us

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Flex (Reg. No. 199002645H) is the manufacturing partner of choice that helps a diverse customer base design and build products that improve the world. Through the collective strength of a global workforce across 30 countries and responsible, sustainable operations, Flex delivers technology innovation, supply chain, and manufacturing solutions to various industries and end markets.

For more information, visit flex.com.

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