

AIPCS Controller

Powering AI & Hyperscale Infrastructure.
Millisecond-Level Load Compensation.
Energy exchange management.
Grid code compliance.



Advanced control solution for AI Data Centers,
powered by the Power Electronics Power Plant
Controller platform.



MECHANICAL DATA	Material	Steel
	Installation	Wall or floor mounted ^[1]
	Cable entry	Bottom in & out
	Maintenance	Front Access Required
	Cooling	Forced Ventilation
	Weight ^[2]	85 kg / 188 lbs (base PPC-family enclosure)
	Dimensions (H x W x D) ^[2]	1000 x 845 x 300 (mm) / 40 x 33.27 x 12 (inches)
ELECTRICAL DATA	Maximum consumption	230 W
	AC Voltage input	230 Vac (IEC) [$\pm 10\%$], 120 Vac (UL) [$\pm 10\%$]
	DC Voltage input	120 - 290 Vdc
	Frequency input	50/60 Hz
COMMUNICATIONS	Compatible BESS inverters	PCSM, PCSK, Multi PCSM, Multi PCSK
	Supervision protocols	Modbus TCP / ADS, for inverter control and BCI reporting
	Fast control network	High-speed cyclic setpoint distribution to the inverter
	Communication switch	8 RJ45 ports + 2 optional monomode or multimode FO transceivers
	Load Sensing response time ^[3]	< 25 ms from a sudden load rise/drop to the moment the BESS reaches the requested operating point (~50 μ s fast-metering sampling; ~200 μ s Load Sensing scan rate)
ENVIRONMENTAL CONDITIONS	Temperature range	From -25 °C to +50 °C
	Humidity	From 5% to 95 % non-condensing
	Protection degree	IP54 / NEMA 12
	Pollution degree	PD3
	Maximum altitude	4000 m / 13123 ft
	Impact Protection	IK10
STANDARDS	Marking	CE
	Standards	UL 6200 / IEC 61010-1 / UL 3141
FUNCTIONALITIES	General	The AIPCS Controller is a variant of Power Electronics' Power Plant Controller platform. In the FreePuls solution, the fast load compensation is merged internally with standard BESS plant control (power limits, plant balancing, charge/discharge scheduling) into a single combined inverter setpoint.
	Active power control	In the FreePuls solution, the active power setpoint is determined based on the magnitude of the load oscillation and the current plant operating conditions, including inverter availability, battery availability and power capability, and estimated plant losses.
	Reactive power control	Reactive power or voltage control at the POI remains available simultaneously with active power control / fast load compensation.
	Diagnosis functions	Warning / fault messages, real-time data monitoring, plant phasor operation diagrams. O&M Diagnostic.
	Others	Collects availability data (available power per power block, derating indicators) from BCIs via the standard supervision channel (e.g., ADS) to correctly allocate the corrective action across inverters and to provide maximum/minimum power boundaries for coordinated operation. Manages multiple storage inverters, SOC balancing, P/Q plant limitations, hot standby redundancy, controlled plant start, individual inverter control, line drop compensation, and security processes when plant failures occur.
OTHERS	Web server	For local and remote monitoring / control.
	Customizable solution	Flexible solution built on the same modular, programmable controller platform shared with the PPC PRO / BPC PRO / HPC PRO family.

NOTES

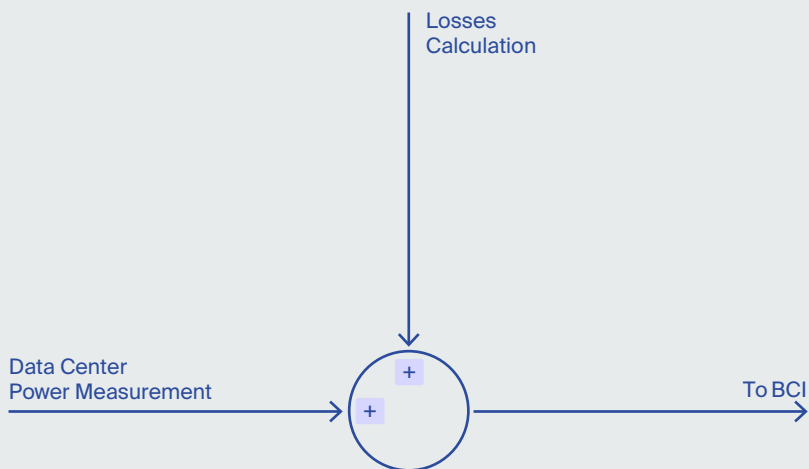
[1] If floor installation is required, an optional plinth must be added.

[2] Weight and dimensions correspond to the base PPC-family enclosure; they may vary depending on the specific solution.

[3] Estimated response time based on the system design target; actual performance depends on network topology, grid conditions and inverter configuration.

Operating Principle

How Fast Load Compensation works



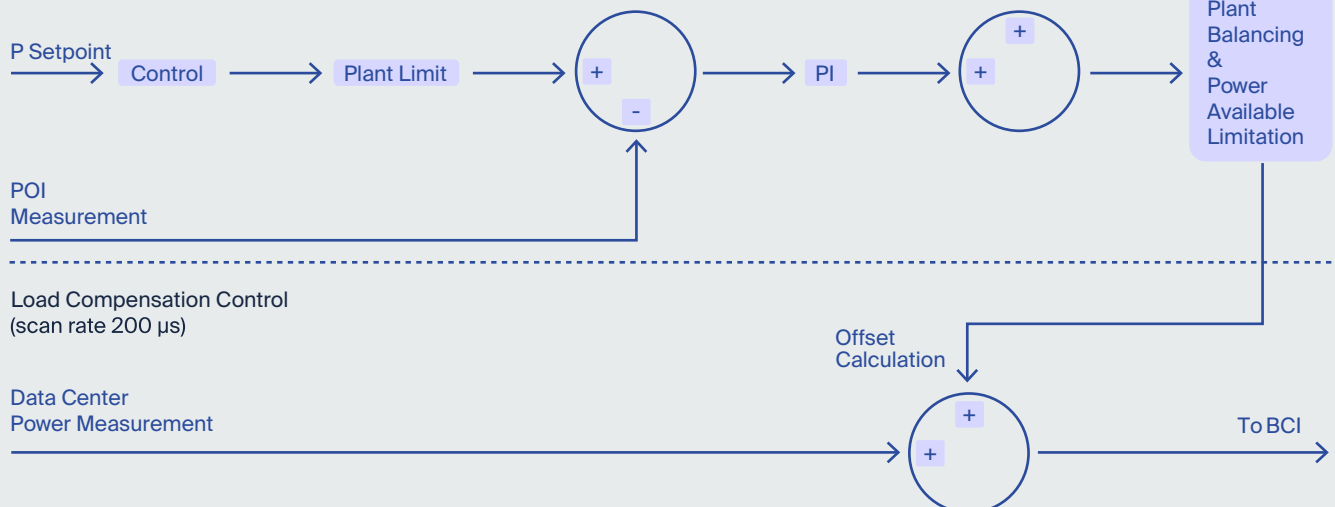
AI/GPU clusters generate fast power ramps during compute phases and abrupt drops when workloads pause or move data, with oscillations that can occur multiple times per second.

The FreePuls AIPCS Controller uses the BESS to inject or absorb active power, reducing power oscillations at the POI and smoothing the power profile seen by the grid.

System Architecture

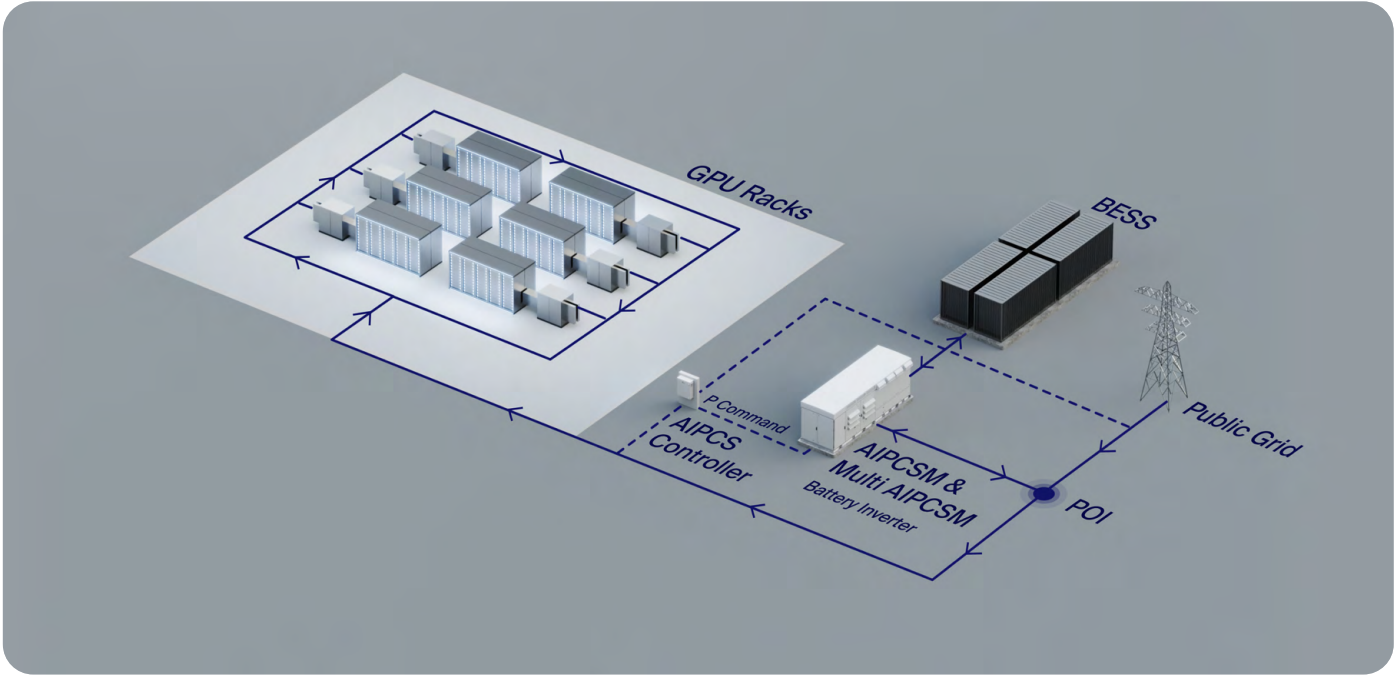
The FreePuls AIPCS Controller is structured into two main parts: (1) Load Compensation, which compensates data centre power oscillations, and (2) standard BESS plant control, which manages normal plant operation, including limits, balancing, charge/discharge scheduling and grid code compliance at the POI. The Load Compensation routine operates with an execution cycle of approximately 200 μ s.

Standard Control BESS
(scan rate 5 ms)



FreePuls AIPCS Controller

Fast load compensation is integrated with standard BESS plant control, including power limits, plant balancing and charge/discharge scheduling, into a single combined inverter setpoint.



FreeQon AIPCS Controller

The control architecture for this application consists of two layers: a central AIPCS Controller and multiple Battery Control Interfaces (BCIs), with one BCI assigned to each power block. The AIPCS Controller is responsible for overall plant energy management and can simultaneously provide reactive power or voltage control at the POI when required.

