

i GARD

Unparalleled Protection



1 Neutral Grounding Resistor (NGR)



2 DSP OHMNI & TDM



3 SIGMA3-C



4 i-AVT Plus



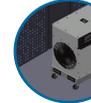
5 i-AVT Plus 150



6 i-AVT-R



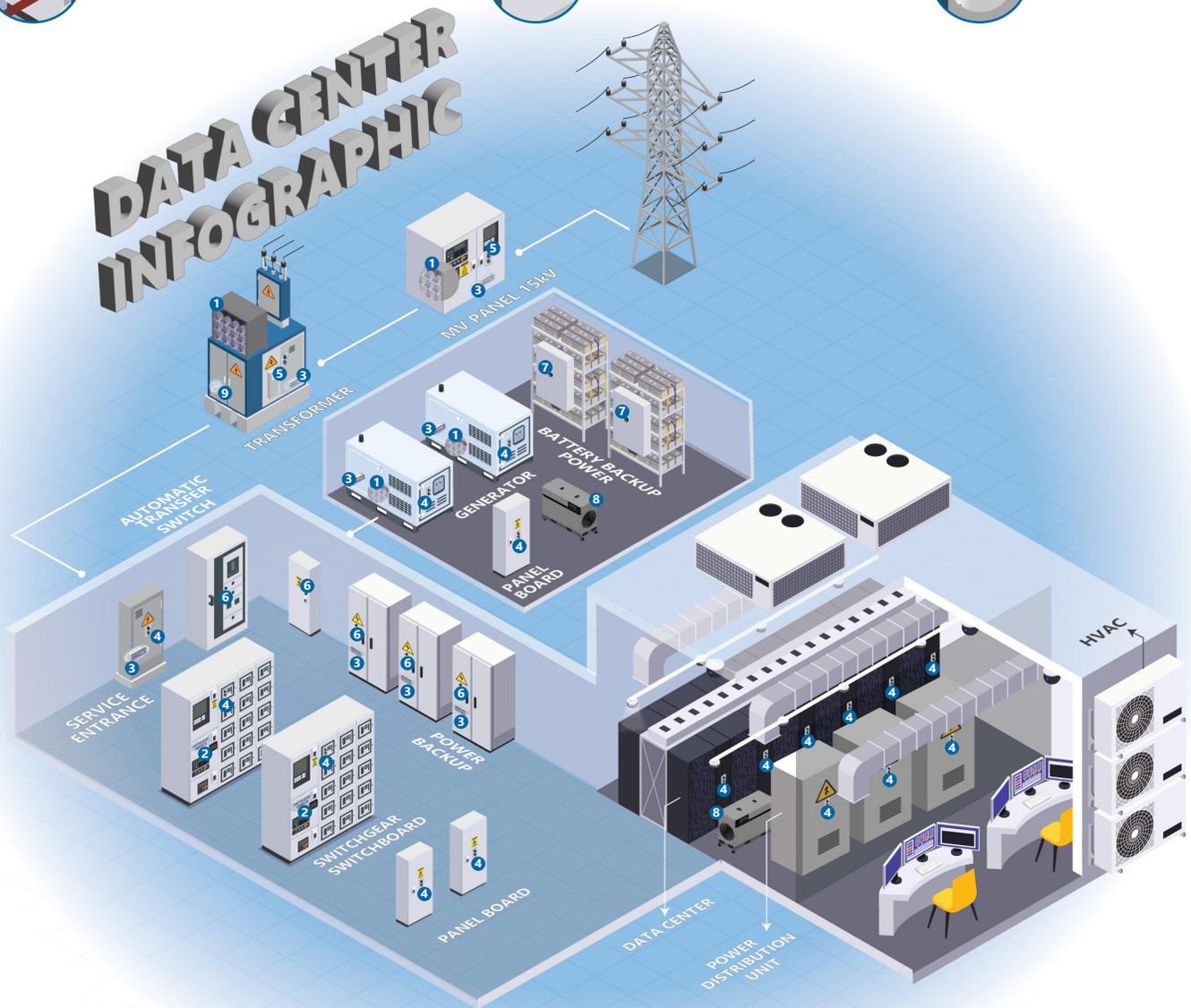
7 i-AVT-DC



8 Load Bank



9 ZORC



i-Gard Solutions for Data Centers

Enhancing Uptime, Safety, and Power Reliability Across the Entire Electrical Chain

Modern data centers operate on extremely tight reliability and uptime requirements, which means every element of the electrical infrastructure from the utility service entrance through medium voltage distribution, UPS systems, switchgear, PDUs, and down to rack level power must function with high predictability, controlled fault behavior, and minimal exposure to electrical hazards.

Achieving this level of operational integrity requires not only robust equipment but also advanced protection, grounding, and verification technologies that ensure the system behaves safely under both normal and abnormal conditions.

i-Gard's portfolio of load bank, grounding resistors, ground fault monitoring systems, and absence of voltage verification devices is engineered specifically to support these mission critical requirements.

By controlling ground fault current, providing real time visibility into grounding integrity, and enabling safe, standards compliant verification of de energized conditions, i-Gard solutions enhance electrical safety, reduce arc flash risk, and maintain system continuity across every stage of the data center power chain.

The following sections detail how each i-Gard product in the infographic contributes to the performance, protection, and maintainability of modern data center electrical systems.

1. Neutral Grounding Resistor (NGR)

A Neutral Grounding Resistor (NGR) is installed at the transformer or generator neutral to limit ground fault current to a safe, controlled level.

In a data center, this is essential because it prevents destructive fault currents that could damage switchgear, trip upstream protection, or escalate into arc flash events.

By keeping ground fault current predictable, the NGR supports selective coordination and ensures that only the affected section of the system isolates during a fault.

This stability is critical for maintaining uptime in mission critical environments where even a momentary outage can impact operations.



2. DSP OHMNI & TDM

i-Gard's Smart HRG system gives a data center a far more controlled and predictable grounding environment by combining low-energy fault behavior with advanced monitoring, diagnostics, and coordination features.

Instead of forcing an immediate trip on the first ground fault, Smart HRG maintains service continuity while identifying the exact feeder involved, using the integrated pulsing module that "modulates the current in the fault circuit which can be detected using a portable clamp-on current probe" and the DSP-DFM feeder modules that measure branch-circuit ground-fault levels and support priority-based second-fault tripping.

The touchscreen DSP-TDM interface gives operators clear visibility into system conditions, faulted phase, leakage current, feeder status, and event timestamps, consistent with the manual's description that it "indicates faulted phase,

total system leakage current, feeder branch current level and provides manual control of the pulse location system.”

Smart HRG also continuously monitors the health of the neutral grounding resistor through the DSP-DRM module, which detects resistance changes or open-circuit conditions, ensuring that the grounding path remains intact and safe.

For arc-flash mitigation, the DSP-ADM module adds real-time optical and pressure-based detection, offering “a first line of defense in the arc detection feature” and helping reduce incident energy to safer levels.

In generator-heavy data-center environments, Smart HRG integrates seamlessly with artificial neutrals (DDAI), zero-sequence CTs, and multi-module DSP architectures, maintaining consistent grounding behavior across utility and backup sources.

Altogether, Smart HRG provides a grounding system that reduces equipment stress, minimizes voltage dips, avoids unnecessary trips, and gives operators actionable insight needed to maintain uptime in mission-critical facilities.



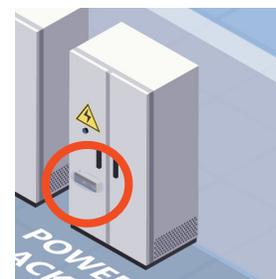
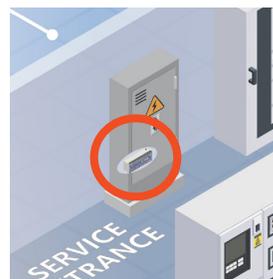
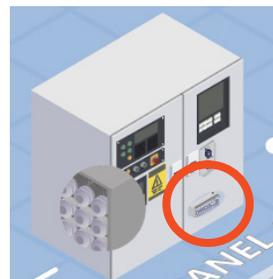
3. SIGMA3-C Ground Fault Monitoring

The SIGMA3 C is a dedicated monitoring and protection controller designed to ensure the integrity of a data center’s grounding system by continuously supervising the Neutral Grounding Resistor (NGR) and detecting ground fault conditions in real time.

In a mission critical environment, where even a *single undetected grounding failure* can compromise uptime, the SIGMA3 C provides constant visibility into neutral to ground continuity, resistor health, and ground fault current levels.

It alerts operators to open resistor conditions, abnormal current flow, or loss of grounding reference issues that can leave the system *floating* and significantly increase arc flash risk. By integrating directly with building management or SCADA systems, the SIGMA3-C ensures facility teams are immediately notified of grounding abnormalities, enabling fast corrective action.

In a data center, where stable grounding is essential for selective coordination, predictable fault behavior, and uninterrupted operation, the SIGMA3-C acts as the “watchdog” of the entire grounding network, ensuring the NGR is always functioning as designed and that the electrical system remains safe, compliant, and resilient.



4, 5, 6, and 7. i-AVT Plus, i-AVT Plus 150, i-AVT R & i-AVT DC

The i-AVT family from i-Gard, including the i-AVT Plus, i-AVT Plus 150, i-AVT R and i-AVT DC, provides a comprehensive, permanently mounted absence of voltage verification solution engineered to meet the stringent electrical safety demands of modern data centers.

These facilities operate in high-energy, high-availability environments where even routine maintenance can expose personnel to significant arc flash hazards, making it essential to confirm that equipment is fully de-energized before access.

The i-AVT-R serves as the core AVT device, using supercapacitor technology to remain operational when the bus is offline and employing supervisory circuitry with redundant phase and ground leads to ensure proper sensor continuity and installation.

This SIL3-rated design verifies that all phase-to-phase and phase-to-ground voltages are below the 3 V AC/DC threshold before allowing technicians to open an enclosure, with clear LED indicators providing immediate visual confirmation of hazardous voltage, test progress, or safe conditions.

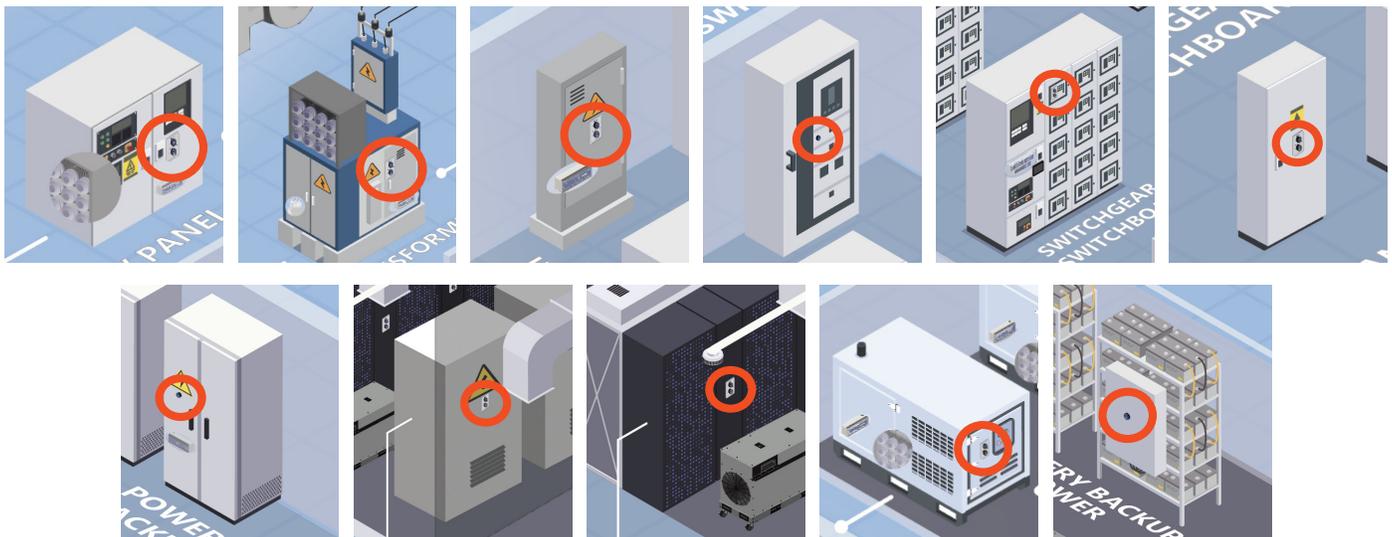
The i-AVT Plus enhances this functionality by integrating a Voltage Test Portal (VTi), enabling safe, high-impedance voltage measurements through the closed panel door in accordance with NFPA 70E Annex O, ideal for rapid troubleshooting without exposing personnel to energized conductors.

For higher-energy applications such as medium-voltage switchgear, large UPS systems, and generator paralleling gear, the i-AVT Plus 150 extends these capabilities with higher voltage component ratings and enhanced sensing performance suitable for elevated fault current environments.

Complementing the AC-focused devices, the i-AVT-DC provides the same level of safety assurance for DC systems, including UPS battery strings and DC distribution panels, where fault currents can be extremely high and do not naturally pass through zero, making DC hazards more persistent.

By continuously monitoring the DC bus, validating sensor integrity, and confirming absence of both AC and DC voltage before access, the i-AVT-DC significantly reduces risk during battery maintenance.

Together, the i-AVT product family enables data center operators to safely verify de-energization, reduce arc flash exposure, comply with NFPA 70E and CSA Z462, and maintain uptime across the entire electrical infrastructure, from MV switchgear and UPS systems to PDUs, RPPs, ATS equipment, and battery rooms.



8. Load Bank

Load banks are essential for validating the performance and reliability of backup power systems by safely applying a controlled electrical load without risking live equipment.

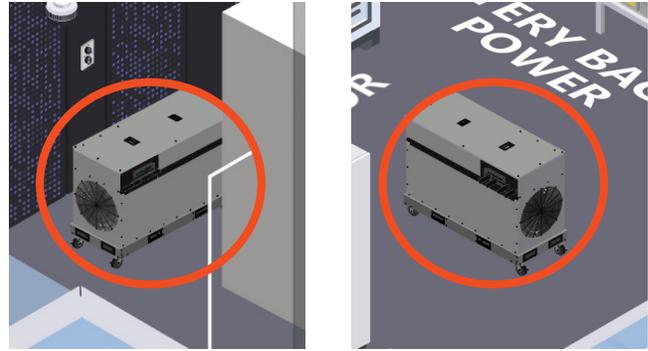
It allows engineers to simulate real-world operating conditions and confirm that generators, UPS systems, batteries, and emergency power supplies can deliver their rated capacity when needed.

In mission-critical environments such as data centers, load banks are used during commissioning, acceptance testing, and routine maintenance to ensure stable voltage, proper frequency regulation, and correct operation at *unity or 0.8 power factor*.

AC resistive, inductive, capacitive, and reactive load banks help evaluate generator behavior under different load profiles, while DC load banks support battery discharge testing and verification of DC systems.

By providing a predictable, measurable load, load banks help facilities comply with standards like NFPA 110 and CSA C282, prevent issues such as *wet stacking in diesel generators*, and identify performance problems before they impact uptime.

Ultimately, load bank testing gives operators confidence that their backup power infrastructure will perform flawlessly during an actual outage.



Standard	Scope
NFPA 110	7.13.4.5.2 The building load shall be permitted to serve as part or all of the load, supplemented by a load bank of sufficient size to provide a load equal to 100 percent of the nameplate kW rating of the EPS, less applicable derating factors for site conditions.
UL 2200	Safety for stationary engine generator assemblies.
CSA C282 (Canada)	CSA C282 ("Emergency Electrical Power Supply for Buildings") defines load bank testing as a critical, mandatory annual requirement for emergency generators, particularly for testing at 100% rated capacity. Annual Load Bankd Test (2-Hour Rule): CSA C282 requires that an emergency generator set be subjected to an annual 2-hour full-load test (100% of the generator's rated capacity)

9. ZORC

ZORC surge suppressors provide medium-voltage transient protection for critical data-center electrical infrastructure by damping steep-front over-voltages generated during *transformer energization, generator transfer, breaker operations, and large-motor switching*.

Using an RC network and ZnO elements in standard models connected phase-to-earth, ZORC absorbs high-frequency components of switching surges and dissipates their energy through resistive damping, protecting insulation systems in MV transformers, switchgear, generators, and HVAC motors.



The range currently available varies from 0.1–0.5 μF , resistances of 22–30 Ω , and BIL ratings up to 170 kV, enabling ZORC to withstand and suppress fast transients common in 3.3–22 kV data-center distribution.

The data-center infographic places ZORC at key MV nodes, *service entrance, MV switchgear, transformer primaries, generator/ATS interfaces, and large mechanical loads*, where transient activity is highest and where suppression prevents stress propagation into UPS systems, power distribution units, and downstream IT equipment.

By limiting overvoltage magnitude and rate-of-rise, ZORC reduces insulation degradation, prevents *nuisance relay trips*, mitigates harmonic-induced heating, and enhances the long-term reliability of mission-critical power paths, supporting the uptime and resilience requirements of modern data-center operations.

Why Data Centers Choose i-Gard

- An electrical safety manufacturer that has been in operation for 40+ years
- Manufactures both the current limiting resistor and ground fault relays in-house, under one roof in Canada, resulting in best lead times (currently 4–6 weeks)
- Testing is conducted to ensure quality assurance on the entire solution, verifying relay and resistor functionality
- Offers the capability to design customized units to comply with customer requirements and specifications
- We stand behind our product 100%—we are responsible for the full solution and do not depend on third parties to provide solutions or correct situations in the field
- Local in-house presence of technical support, engineering, R&D, and manufacturing in Mississauga
- Provide tailored solutions depending on system design, weather conditions, and geographic conditions
- The industry's widest range of HRG products, from the most economical to the most advanced
- The industry's most advanced HRG, ensuring process reliability and arc flash hazard reduction
- Training and commissioning assistance is provided for the products sold

Applicable Safety Standards

- UL 1053 Ground-Fault Sensing and Relaying Equipment
- CSA C22.2 No 14 Industrial control equipment
- CSA C22.2 No 144 Ground Fault Circuit Interrupters
- CSA C22.1 Section 10 and Table 17 Impedance Grounded Systems
- UL 508 (Applicable to Voltage Indicator). Industrial Control Equipment
- CSA C22.2 No. 14-13 (Applicable to Voltage Indicator). Industrial Control Equipment CAT IV 600V
- UL 61010 (Applicable to Voltage Indicator). Safety Requirements for electrical equipment for measurement, control and laboratory use - Part 1: General Requirements.
- UL 61010-2-030 (Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for equipment having testing or measuring circuits)
- EN 50581:2012 (Applicable to Voltage Test Station). Technical documentation for the assessment of electric and electronic products with respect to the Restriction of Hazardous Substances
- UL 1436 Standard for Outlet Circuit Testers and Similar Indicating Devices
- CSA C22.2#160 Voltage and Polarity Testers
- IEC 61326-3-1 Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements - Part 3-1: Immunity Requirements for Safety-Related Systems and For Equipment Intended to Perform Safety-Related Functions (Functional Safety) - General Industrial Applications
- FCC 47CFR 15: 2013 Subpart B Class - Radio Frequency Devices. Subpart B Unintentional Radiators
- CISPR 16 Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods. Radiated Emission Test. AC Mains Conducted Emissions Test
- IEC 61000-4-2 Test Standard for Electrostatic Discharge (ESD) Immunity
- IEC 61000-4-3 Electromagnetic Compatibility (EMC) - Part 4-3: Testing and Measurement Techniques - Radiated, Radio-Frequency, Electromagnetic Field Immunity Test
- IEC 61000-4-4 Electromagnetic Compatibility (EMC) - Part 4-4: Testing and Measurement Techniques - Electrical Fast Transient/Burst Immunity Test
- IEC 61000-4-5 Electromagnetic Compatibility (EMC)- Part 4-5: Testing and Measurement Techniques - Surge Immunity Test
- IEC 61000-4-6 Electromagnetic compatibility (EMC) - Part 4-6: Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
- IEC 61000-4-11 Electromagnetic compatibility (EMC) - Part 4-11: Testing and Measurement Technique - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests for Equipment with input current up to 16 A per phase
- UL 746C Standard for Polymeric Materials - Use in Electrical Equipment Evaluations
- IEC 61508-01 SIL 3 - Standard for Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems – Part 1: General Requirements - Safety Integrity Level 3- SIL 3



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