

IPR-150

Low Voltage, Three-Phase, 50 Hz, 150 kVA Multi-Functional In-Line Power Regulator™

The Gridco Systems Three-Phase, 50 Hertz, In-Line Power Regulator™ (IPR) for low voltage (LV) networks is a new class of agile grid infrastructure designed to enable a more flexible and resilient distribution network. It provides Distribution System Operators (DSOs) with a tool for dynamically controlling voltage, power factor and harmonics in response to high penetration levels of Distributed Energy Resources (DERs), increasing capacity constraints, sensitive customer equipment, and regulatory focus on reliability and energy efficiency.

Reliable, Maintenance-Free Design

Built with robust power electronics modules and advanced control algorithms, the IPR is a multi-function platform that is flexible, cost-effective and reliable. Designed to provide distributed, dynamic power control, the IPR effectively addresses today's challenges while ensuring long-term value and support for ongoing grid modernization. It simplifies grid planning and operations, and enables DSOs to avoid the expensive, labor-intensive and time-consuming conventional approaches of equipment and infrastructure replacement.

The IPR provides power management functions in a fast, precise and continuous manner to respond to increasingly distributed and dynamic power fluctuations throughout the grid. The IPR is purpose-built to withstand harsh outdoor environments for 25 years, employing ruggedized and passively-cooled power electronics for high reliability and maintenance-free operation.

The IPR is a freestanding, self-contained, in-line hardware system that can be deployed immediately outside the secondary substation, directly in front of a specific customer, or anywhere along the LV feeder. It is designed for installation on top of a concrete base (pad, pedestal, plinth, etc.), which provides cable feed through, thereby facilitating clean and convenient installation along sidewalks, pathways and roads.

Cost Effective, Multi-Function Power Control

Multi-function means load voltage regulation (boost and buck) in both forward and reverse power flow conditions, reactive power compensation (inject or absorb VARs), source current and load voltage harmonic cancellation, and on-board sensing all in one integrated package. This wide range of functionality gives the IPR the ability to simultaneously address various challenges on the LV network. These capabilities are proven to offer superior value and efficacy when deployed, as compared from both an economic and performance perspective with conventional approaches such as re-conductoring and asset replacement, making the IPR a key element of the future distribution system.



KEY FEATURES

- **Load Voltage Regulation:** directly boosts and bucks voltage across a wide range during forward and reverse power flow
- **Sag/Swell Mitigation:** protects sensitive loads from voltage sags and swells caused by disturbances on the grid
- **Reactive Power Compensation:** regulates power factor by dynamically injecting or absorbing reactive power
- **Harmonic Cancellation:** corrects source current and load voltage harmonic distortion, reducing overall THD
- **Power Quality Monitoring:** enables high resolution PQ monitoring via integrated voltage and current sensors
- **Operational Flexibility:** operates autonomously with options for remote management and visibility
- **Dynamic and Precise:** responds and regulates reliably and accurately in sub-cycle timeframes
- **Maintenance Free:** operates continuously with no wear-and-tear and no scheduled service unlike conventional equipment
- **High Availability:** supports non-disruptive failure-to-normal and replacement of power electronics via built-in bypass mechanism

Flexible Operations Management & Control

The IPR regulates autonomously once configured and installed. It offers a local control option as well as remote management capabilities using a built-in Gridco Systems Distributed Grid Controller™ (DGC). The IPR can be integrated into utility SCADA/DMS systems and/or the Gridco Systems Grid Management and Analytics Platform™ (GMAP) enabling real-time remote configuration and monitoring, alarm and event reporting, data access and visibility. GMAP provides additional capabilities for data analytics to confirm system performance and improve understanding of distribution circuit behavior near end customers.

Applications

Voltage Assurance

Driven by new load growth, DERs, aging assets, and congruently, increased complexity on the LV distribution network, assuring compliant service voltage at all times has become a greater challenge. The IPR responds to voltage changes on the network quickly, continuously and precisely providing consistent voltage delivery for all end customers.

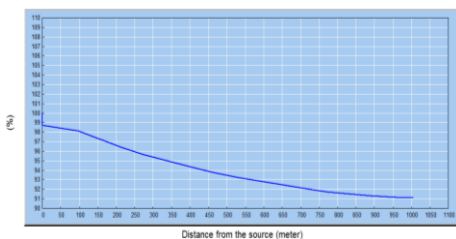
Renewables Integration

Increase solar PV hosting capacity and simplify integration of other DERs

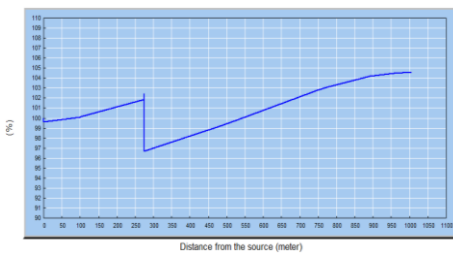
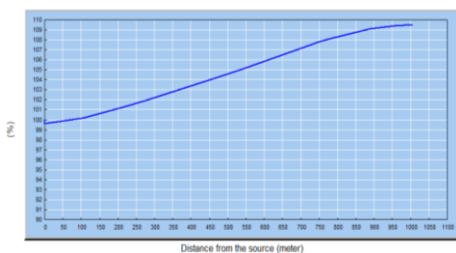
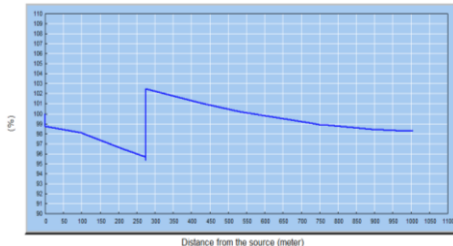
Enhanced Power Quality

Compensate for sags, swells and harmonics to prevent tripping of sensitive customer equipment, and extend customer and utility asset life.

Voltage Profile without IPR-150



Voltage Profile with IPR-150



Impact of the LV voltage profile with and without the IPR-150
(IPR-150 is placed 270m from the secondary substation)

IPR-150 SPECIFICATIONS

Phase	Three
Frequency	50 Hz
Rating (kVA)	217 A (50 kVA per phase)
Form	Concrete base-mounted
Source Voltage	400/230 VAC nominal
Source Voltage Range	0.57 – 1.30 p.u.
Load Voltage	400/230 VAC nominal
Load Voltage Regulation Range	±8.4% of nominal up to 250A; programmable set point or dead band
VAR Compensation Range	10% of rating, leading or lagging; programmable VAR or PF set point
Harmonic Correction	3 rd to 7 th harmonic 3 rd to 15 th (measured)
Harmonic Distortion	Voltage THD <3% Current TDD <5%
Efficiency	≥ 99%
Response Time	< 1 cycle
Operating Temperature	-40° to 50° C
Cooling	Passive air
Noise	< 35 dBA
Enclosure	External – IP24D (IP44 option) Electronics – IP65
Communication Protocols (DGC)	Secure Web Services Secure DNP3.0
Communication Modules (DGC)	3 rd party wired or wireless
Dimensions (WxHxD)	2070mm x 1439mm x 661mm
Weight	770 kg