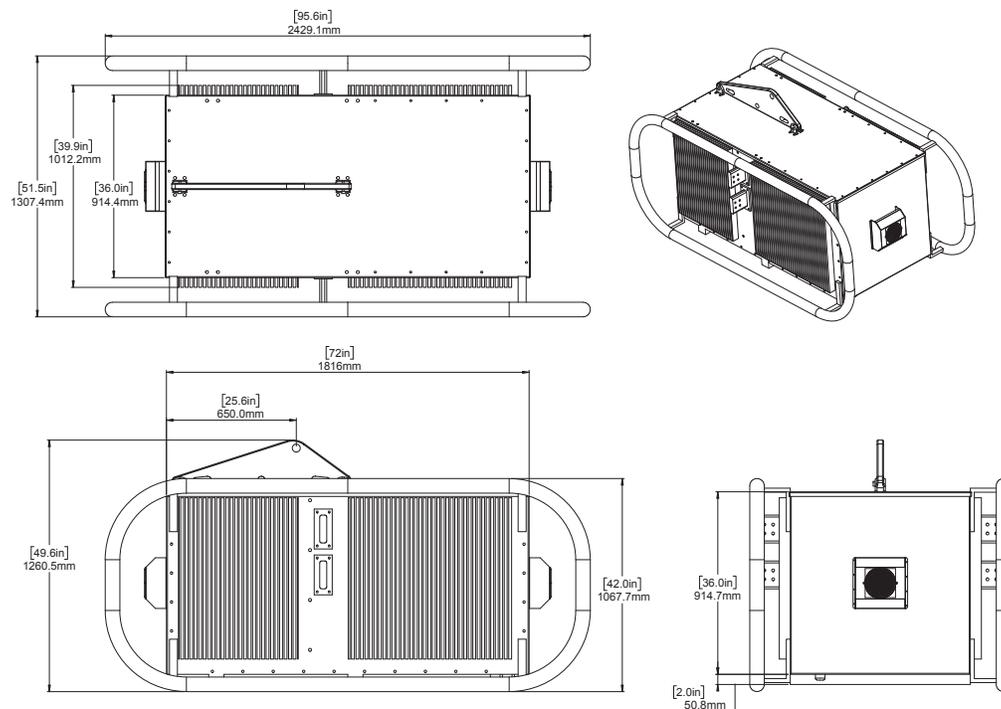


The SmartValve™ leverages proven Guardian™ technology and builds upon the success of its predecessors. By using revolutionary power electronics, the SmartValve effectively increases or decreases the reactance of a given circuit, enabling real-time control of power flow. A modular, Static Synchronous Series Compensator (SSSC), the SmartValve injects a leading or lagging voltage in quadrature with the line current, providing the functionality of a series capacitor or series reactor respectively. However, unlike conventional series capacitors or reactors, the SmartValve can inject the voltage independently of the line current, thus increasing the ohmic injection when operated below the rated value. Also, the SmartValve does not have the negative characteristics of these passive devices, such as the risk of sub-synchronous resonance (SSR) with series capacitors and the constant VAR consumption of series reactors. As a modular device like the Guardian, it eases deployment or re-deployment, allowing the solution size to be scaled up or down to support the dynamic needs of the transmission grid. Given the fast response of the unit's power electronics, the unit's set-point can be changed frequently to actively manage power flows with no degradation in unit life.

The SmartValve enables utilities to get more from their existing grid by:

- Addressing short-duration and emergency needs with rapidly deployable and easily re-deployable solutions
- Accommodating changes in generation and load by deploying a fleet of units in weeks rather than years
- Pushing power away from overloaded transmission facilities or pulling power onto underutilized facilities
- Avoiding the use of precious substation space
- Providing high uptime via a modular, redundant solution

The SmartValve is available with 500 kVAr, 1000 kVAr and 2000 kVAr ratings. The first number in the Model number designates the kVAr rating and the second is the maximum continuous current rating. For example, Model 2000-3600 has a reactive power rating of 2000 kVAr and a maximum continuous current of 3600 A RMS. These units are typically installed as part of a fleet and enable a continuous range of control up to the collective rating of the deployment.



Technical Specifications

Electrical

| | | | |
|----------------------------|------------------------|-------------------------------|-------------------------|
| Maximum Continuous Current | 3600 A RMS | Maximum Voltage (Corona-free) | 550 kV RMS line-to-line |
| Maximum Emergency Current | 4320 A RMS for 2 Hours | Fault Current Rating | See Note ⁽¹⁾ |

Electrical (continued)

Maximum Voltage Injection ⁽²⁾ ±566 V RMS @ 60 Hz or @ 50 Hz

Minimum Current for Injection ⁽³⁾ 200 A RMS

Physical

Mass 1600 lbs (726 kg)

Dimensions See Figure Above

Conductor Size Capacity Agnostic

Mounting ⁽⁴⁾ Suspended from structure via insulator

Cooling Active using two sealed forced coolers

Communication

Communication Architecture EMS integration using PowerLine Gateway™ located at substation

Mesh Communication Security Features Multilevel ISM band wireless protocol optimized for fast telemetry. Protocol uses SHA-256 to ensure cryptographic integrity of all messages while supporting full observability by utility firewalls

Sensor Accuracy

AC Line Current ± 3 %

Notes:

1. Operates in conjunction with a SmartBypass™ module to provide a fault current rating of up to 63 kA RMS for 1.0 sec and 164 kA peak for the first cycle. See the SmartBypass spec sheet for more details.
2. Maximum of the fundamental of the output voltage for an individual unit. Total voltage injection determined by the number of units per phase.
3. In Monitoring Mode, the SmartValve is bypassed and does not inject voltage, while telemetry data is still transmitted. In Injection Mode, the SmartValve injects voltage in series with the line and telemetry data is transmitted.
4. SmartValves are typically installed on dedicated transmission towers (SmartTowers™) or in banks (SmartBanks™). SmartBanks are typically located in substations or parcels within/near the transmission right-of-way. SmartValves are also well suited for deployment on the Smart Wires mobile platform.

About Smart Wires

Based on the San Francisco Bay Area, with offices in the United States, the United Kingdom, Ireland and Australia, Smart Wires is the leader in grid optimization solutions that leverage its patented modular power flow control technology. Smart Wires solutions are quickly deployable, enabling utilities to react quickly and address emergency problems. This flexible technology is also easily re-deployable, providing a robust investment to solve short-duration need windows and hedge against the uncertain nature of their systems' future needs. Driven by a world-class leadership team with extensive experience delivering innovative solutions, Smart Wires partners with utilities around the globe to address the unique challenges of the rapidly evolving electric system. Smart Wires' technology was developed by utilities for utilities, led by a consortium of large U.S. utilities at the National Electric Energy Testing Research and Applications Center (NEETRAC). This core group of utilities, which included Southern Company and Tennessee Valley Authority (TVA), defined the vision for the original modular power flow control solution. PG&E, EirGrid (Ireland), Minnesota Power, Central Hudson, and Western Power (Australia) are some of the other utilities leveraging Smart Wires power flow control solutions.

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Power Powered by line current

Minimum Current for Monitoring ⁽³⁾ 50 A RMS

Environmental

Operating Ambient Temperature Range -40°F to 122°F (-40°C to 50°C)

Storage Temperature Range -40°F to 122°F (-40°C to 50°C)

Condensing Operating Humidity Range 5% to 100%

Maximum Sustained Rain 4.0 in/hr (102 mm/hr)

Standards

Software and Firmware IEC 61508 SIL-2 compliant

Electrical Connections ANSI C119.4

Intrusion Protection IEC 60529, IP 54

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