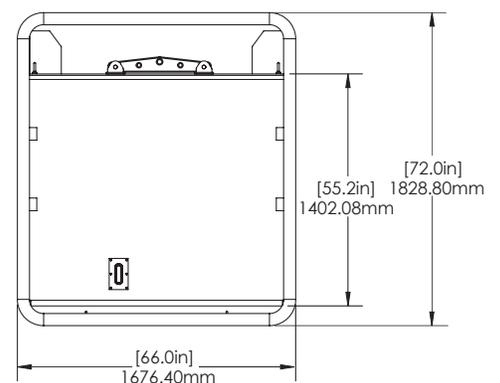
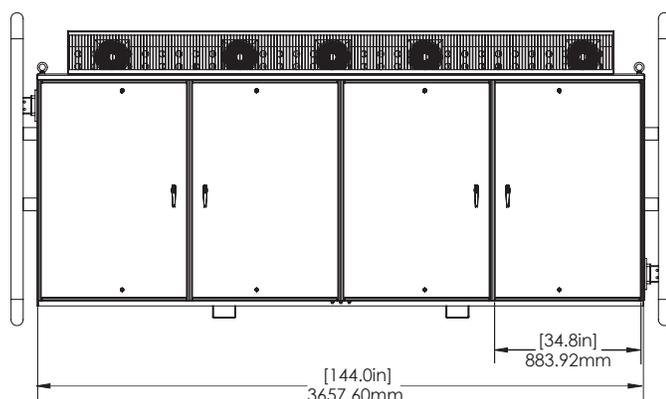
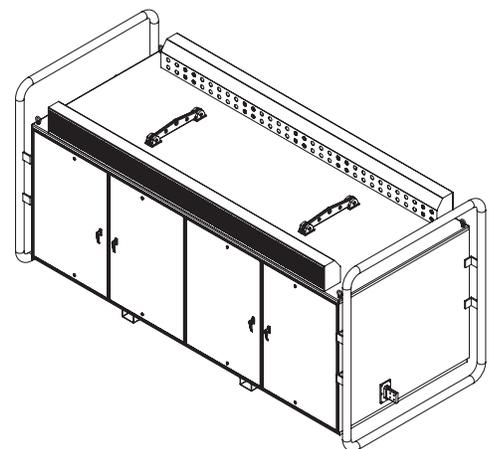
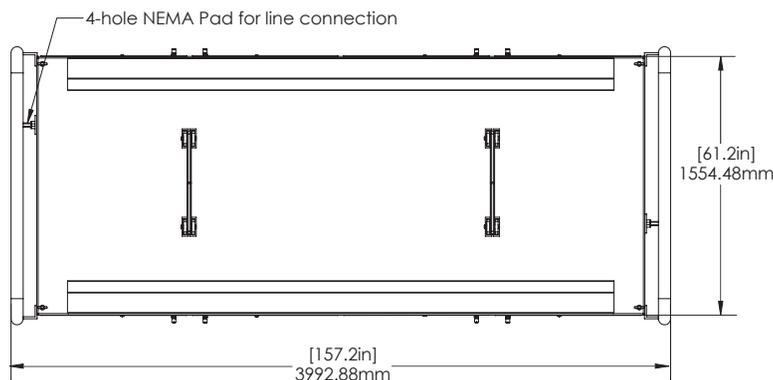


The SmartValve™ leverages proven Guardian™ technology and builds upon the success of its predecessors. By using revolutionary power electronics, the SmartValve effectively increases or decreases the reactance of a given circuit, enabling real-time control of power flow. A modular, Static Synchronous 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 solution with no single point of failure

The SmartValve is available with 1 MVar, 2 MVar, 5 MVar and 10 MVar ratings. The first number in the Model number designates the MVar rating, the second is the maximum continuous current rating, the "i" indicates that a bypass is incorporated within the SmartValve and the third number is the 1 second fault rating in kA RMS. For example, Model 5-1800i-50 has a reactive power rating of 5 MVar, a maximum continuous current rating of 1800 A RMS, an integrated bypass and a 1 second fault current rating of 50 kA 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 Voltage Injection <sup>(1)</sup> ±2830 V RMS @ 60 Hz or @ 50 Hz

Minimum Current for Monitoring <sup>(2)</sup> 50 A RMS

Minimum Current for Injection <sup>(2)</sup> 100 A RMS

### Physical

Mass 9000 lbs (4082 kg)

Dimensions See Figure Above

Conductor Size Capacity Agnostic

Mounting <sup>(3)</sup> Deployed in a bank or suspended from structure via insulators

Cooling Liquid-cooling interface between power semiconductors and redundant-fan-equipped liquid-to-air heat exchangers using redundant pumps all at line potential

### Communication

Communication Architecture EMS integration via 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 %

### SmartValve Current Ratings

Model	Injection Mode Continuous Current Rating (A RMS)	Monitoring Mode Continuous Current Rating (A RMS)	Maximum 2-Hour Emergency Current (A RMS)	Fault Current Rating (kA RMS for 1 s) <sup>(4)</sup>	Peak Fault Current (kA) <sup>(5)</sup>	
					60 Hz	50 Hz
<i>SmartValve 5-1800i-63</i>	1800	2000	2160	63.0	164.0	158.0
<i>SmartValve 5-1800i-50</i>	1800	2000	2160	50.4	131.0	126.0
<i>SmartValve 5-1800i-38</i>	1800	2000	2160	38.0	98.8	95.0
<i>SmartValve 5-1800i-25</i>	1800	2000	2160	25.2	65.0	63.0
<i>SmartValve 5-1800i-12</i>	1800	2000	2160	12.6	32.0	31.5

### Notes:

- Maximum of the fundamental of the output voltage for an individual unit. Total voltage injection determined by the number of units per phase.
- 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.
- SmartValves are deployed with a variety of methods, including individually mounted on dedicated transmission towers or mounted on top of insulators in banks or deployed as part of the Mobile SmartValve Unit.
- Fault current ratings for other durations can be provided upon request.
- Per IEC 62271-1 and IEEE C37.32, a DC time constant of 45 ms covers the majority of cases and corresponds to a rated peak withstand current equal to 2.5 times the rated short-time withstand current for a rated frequency of 50 Hz and for a rated frequency of 60 Hz it is equal to 2.6 times the rated short-time withstand current.

Maximum Voltage (Corona-free) 550 kV RMS line-to-line

Power Powered by line current

### 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

## About Smart Wires

Based in the San Francisco Bay Area, with offices in the United Kingdom, Ireland, and Australia, Smart Wires is the leader in grid optimization solutions that leverage its patented modular power flow control technology. 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.

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Version 190212