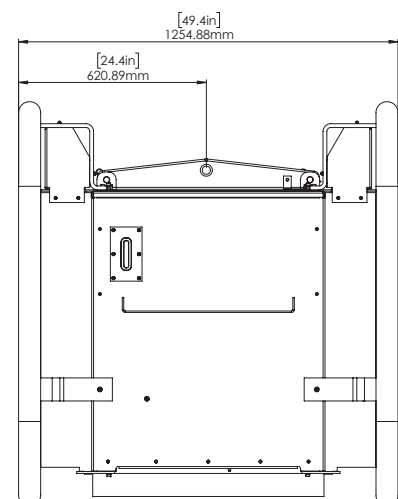
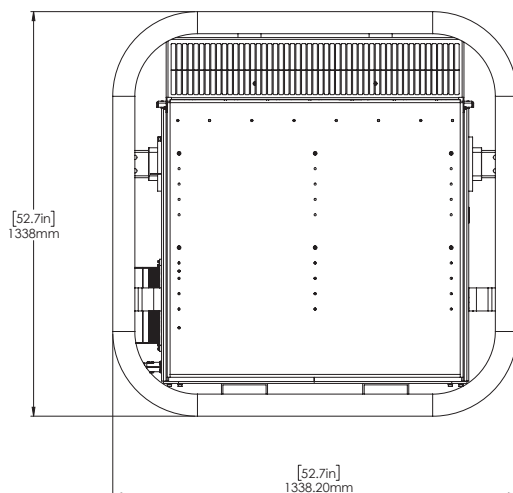
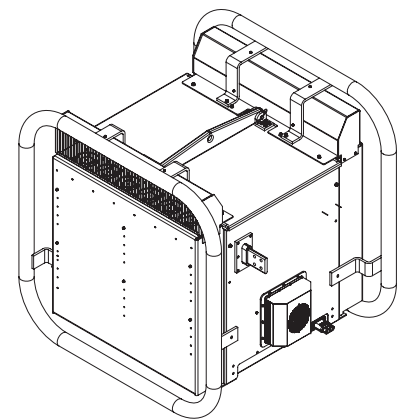
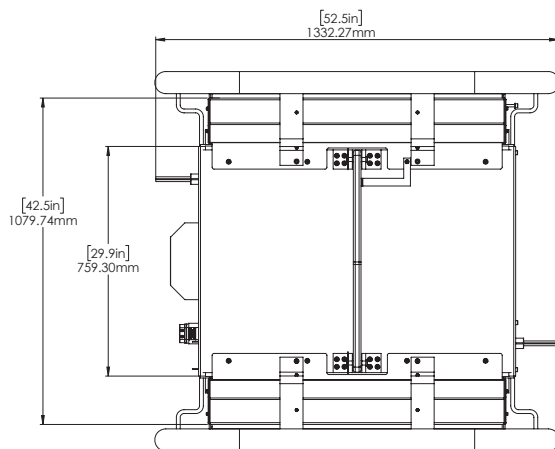


The SmartValve™ leverages proven Guardian™ technology and builds upon the success of its predecessors. By using revolutionary power electronics, the SmartValve effectively increases or decreases the reactance of a given circuit, enabling real-time control of power flow. A modular, Static Synchronous 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 and the second is the maximum continuous current rating. For example, Model 1-1800 has a reactive power rating of 1 MVAR and a maximum continuous current of 1800 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	1800 A RMS	Maximum Voltage (Corona-free)	550 kV RMS line-to-line
Maximum Emergency Current	2,160 A RMS for 2 Hours	Fault Current Rating	See Note ⁽¹⁾
Maximum Voltage Injection ⁽²⁾	±566 V RMS @ 60 Hz or @ 50 Hz	Power	Powered by line current
Minimum Current for Injection ^(3, 4)	200 A RMS	Minimum Current for Monitoring ^(3, 4)	50 A RMS

Physical

Mass	1526 lbs (692 kg)	Environmental	
Dimensions	See Figure Above	Operating Ambient Temperature Range	-40°F to 122°F (-40°C to 50°C)
Conductor Size Capacity	Agnostic	Storage Temperature Range	-40°F to 122°F (-40°C to 50°C)
Mounting ⁽⁵⁾	Deployed in pod of multiple SmartValves or suspended from structure via insulator	Condensing Operating Humidity Range	5% to 100%
Cooling	One integrated sealed forced air cooler with multiple fans on the heat sinks for redundancy	Maximum Sustained Rain	4.0 in/hr (102 mm/hr)

Communication

Communication Architecture	EMS integration via SmartBypass™ to PowerLine Gateway™ located at substation. All communication is transmitted to the SmartBypass via a wired connection ⁽⁶⁾	Standards	
		Software and Firmware	IEC 61508 SIL-2 compliant

Sensor Accuracy

AC Line Current	± 3 %	Electrical Connections	ANSI C119.4
		Intrusion Protection	IEC 60529, IP 54

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 specification 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 via SmartBypass. In Injection Mode, the SmartValve injects voltage in series with the line and telemetry data is transmitted via SmartBypass.
4. Minimum Current for Monitoring and Injection is determined the by SmartBypass, with 50 A RMS for Monitoring and 200 A RMS for Injection for devices delivered before Q2 2020 and 100 A RMS for injection for devices delivered in Q2 of 2020 or later.
5. SmartValves are deployed with a variety of methods, including individually mounted on dedicated transmission towers or deployed in pods, which are then mounted on top of insulators in banks or deployed as part of the Mobile SmartValve Unit.
6. All wired connections between the SmartBypass and SmartValve are at line potential.

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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