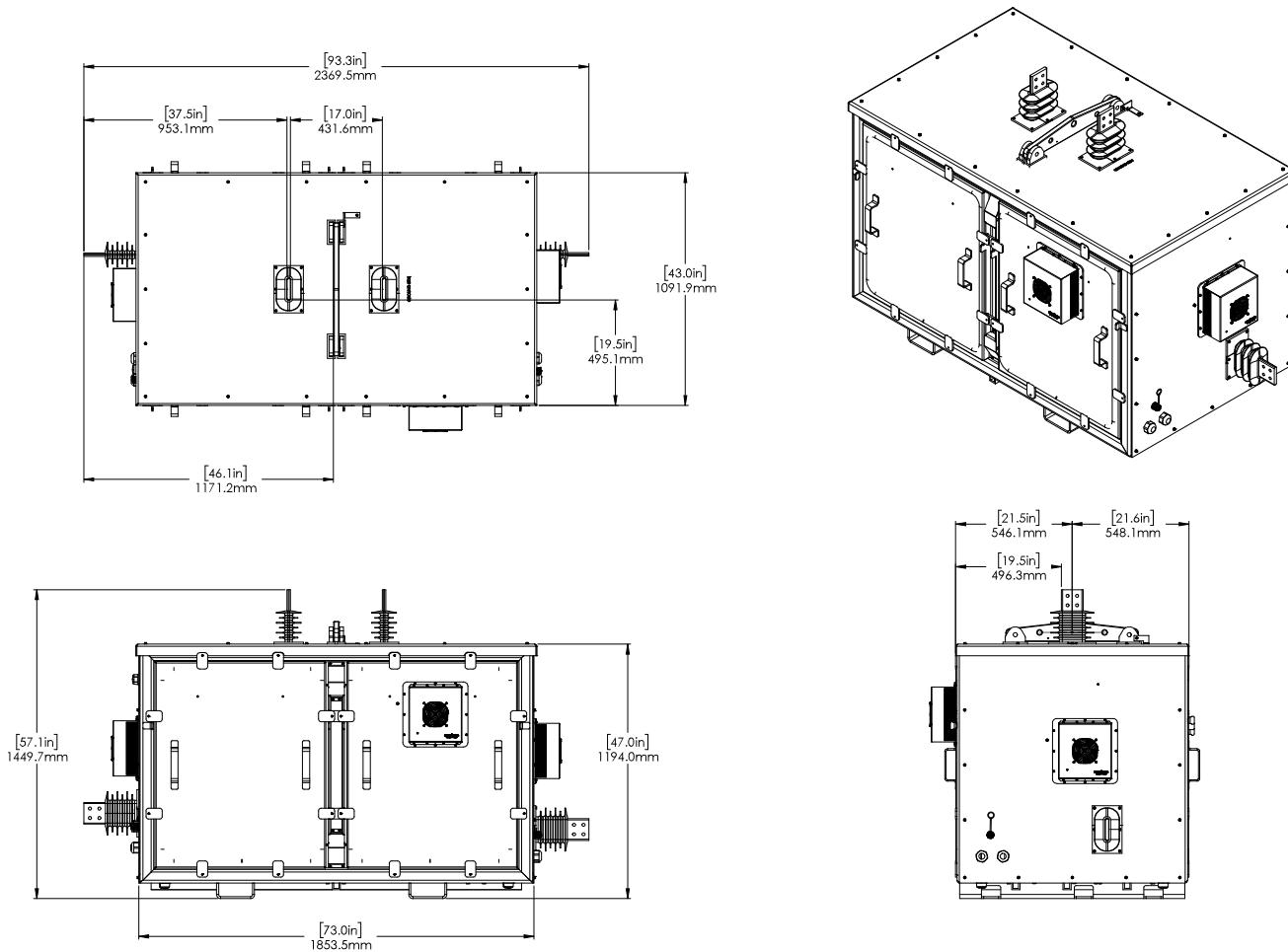
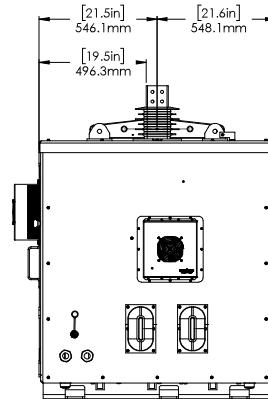
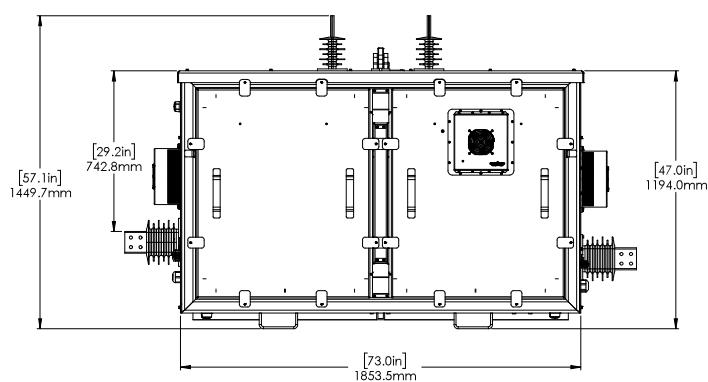
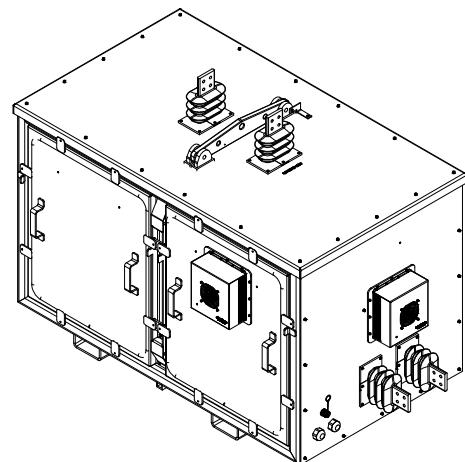
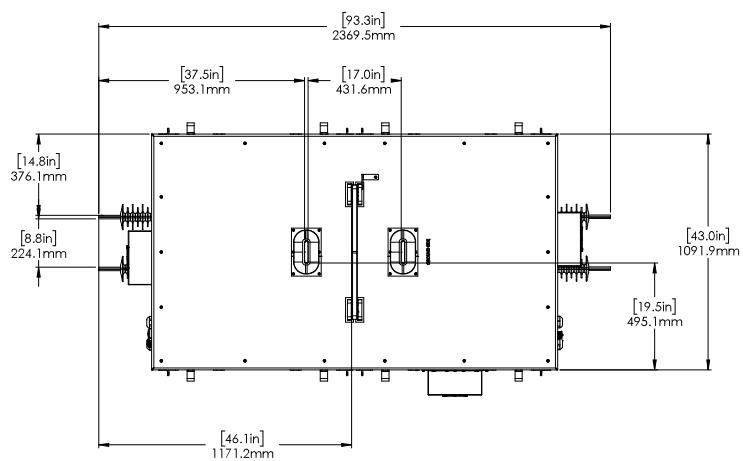


The SmartBypass™ builds upon the proven success of the bypass systems used in the PowerLine Guardian® and Power Guardian™ 390 products. The SmartBypass provides rapid protection during fault conditions for SmartValve™ Models that do not have integrated bypass capability. Under normal operation, it enables operators to manually bypass a SmartValve, or it can switch it in series with the transmission line. When in series with the line, a SmartValve can inject its controllable reactance for power flow control. The SmartBypass can operate at line currents of thousands of amps during normal bypass operation and withstand different fault current levels depending on the model. The SmartBypass models are differentiated by continuous current rating and maximum fault current rating. For example, the SmartBypass 4000-63 is rated for continuous line currents up to 4000 A RMS and fault currents of up to 63 kA RMS for 1 second. The SmartBypass provides telemetry for itself and associated SmartValves when operating in monitoring mode or injection mode⁽¹⁾.

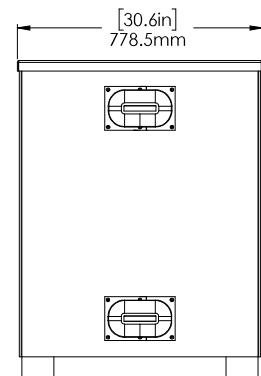
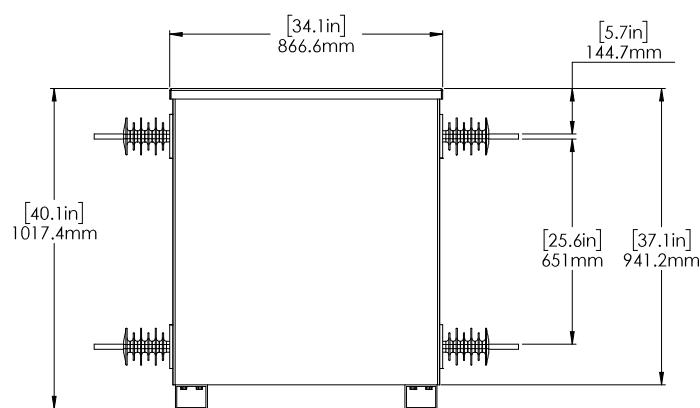
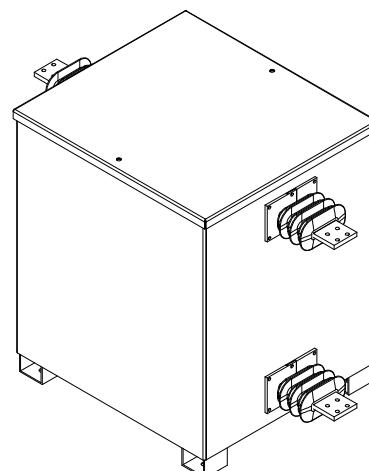
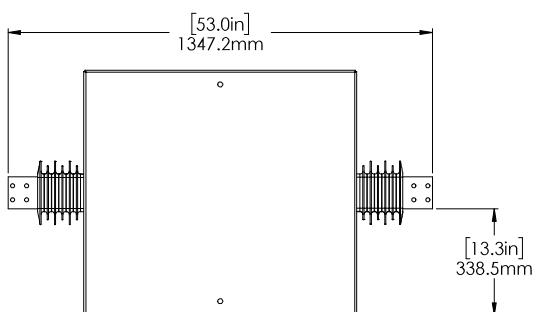
The SmartBypass operates in conjunction with a separate enclosure of filter components called the Bypass Filter. Deployment of the SmartBypass requires the Bypass Filter, hence the specifications for it are also included below. The Bypass Filter contains filter components that bypass transmission line traveling waves so they do not enter the main SmartBypass enclosure. Thus the Bypass Filter provides immunity to typical transmission line transients such as line switching and lightning surges that generate voltage and current traveling waves that propagate from one end of the line to the other. The same Bypass Filter is used for all SmartBypass Model variants as shown in the specification table below. The Bypass Filter connects to the top two NEMA pads on the SmartBypass. The physical details of the connection methods will depend on the deployment type.



SmartBypass 2000-XX Dimensions



SmartBypass 4000-XX Dimensions



Bypass Filter Dimensions

Technical Specifications⁽²⁾

Electrical

Maximum Continuous Current See Model Table Below

Maximum Fault Current See Model Table Below

Maximum Emergency Current See Model Table Below
Maximum Operating Voltage ≤550 kV RMS line-to-line
(Corona-Free)

Peak Fault Current See Model Table Below
4000 V_{peak}
Maximum Blocking Voltage at Terminals

Minimum Current for Monitoring Mode⁽³⁾ 60 A RMS

Power Powered by line current

Minimum Current for Injection Mode^(4, 5) 200 A RMS

Physical

Mass for SmartBypass See Model Table Below

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

Mass for Bypass Filter 717 lbs (325 kg)
Dimensions See Figures Above

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

Conductor Size Capacity Agnostic

Condensing Operating Humidity Range 5% to 100%

Mounting⁽⁶⁾ Deployed in a pod of multiple SmartValves or suspended from structure via insulator

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

Communications

Communication Architecture⁽⁷⁾ EMS integration via PowerLine Gateway™ located at substation
Communication Security Features⁽⁷⁾ 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

Standards Software and Firmware⁽⁷⁾ IEC 61508 SIL-2 Compliant

Sensor Accuracy

AC Line Current⁽⁷⁾ ± 3%

Electrical Connections ANSI C119.4

Intrusion Protection IEC 60529, IP 54

SmartBypass Models⁽⁸⁾

Model	Mass		Continuous Current Rating (A RMS) ⁽⁹⁾	Maximum 2-Hour Emergency Current (A RMS)	Fault Current Rating (kA RMS for 1 s) ⁽¹⁰⁾	Peak Fault Current (kA) ⁽¹¹⁾	
	Ibs	kg				60 Hz	50 Hz
SmartBypass 2000-63	2615	1186	2000	2200	63.0	164.0	158.0
SmartBypass 2000-50	2520	1143	2000	2200	50.4	131.0	126.0
SmartBypass 2000-38	2424	1100	2000	2200	38.0	98.8	95.0
SmartBypass 2000-25	2329	1056	2000	2200	25.2	65.0	63.0
SmartBypass 2000-12	2329	1056	2000	2200	12.6	32.0	31.5
SmartBypass 4000-63	2875	1304	4000	4320	63.0	164.0	158.0
SmartBypass 4000-50	2780	1261	4000	4320	50.4	131.0	126.0
SmartBypass 4000-38	2685	1218	4000	4320	38.0	98.8	95.0
SmartBypass 4000-25	2590	1175	4000	4320	25.2	65.0	63.0
SmartBypass 4000-12	2590	1175	4000	4320	12.6	32.0	31.5

Notes:

1. All wired connections between the SmartBypass, Bypass Filter and SmartValve are at line potential.
2. Unless noted otherwise, all specs apply to both SmartBypass and the Bypass Filter
3. In Monitoring Mode, the SmartBypass bypasses the SmartValve across its terminals so no reactance is injected.
4. In Injection Mode, the SmartBypass allows the SmartValve to inject its reactance across its terminals in series with the line.
5. Devices delivered in Q4 of 2020 or later will be able to enter injection mode at 100 A RMS.
6. SmartValves, SmartBypasses and Bypass Filters are deployed with a variety of methods. They can be deployed in multiple unit pods, which are then mounted on top of insulators in banks or deployed as part of the Mobile SmartValve Unit. They also can be mounted as one pair per phase on dedicated transmission towers.
7. Applies to SmartBypass only.
8. The Bypass Filter meets all specs for SmartBypass Model 4000-63 other than the mass.

9. The SmartBypass 2000-XX Models can operate continuously at 2200 A RMS at 5°C.
10. Fault current ratings for other durations can be provided upon request.
11. 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.

About Smart Wires

Based in the San Francisco Bay Area, with offices in 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 191010

Regulatory Compliance User Notice:

FCC:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.