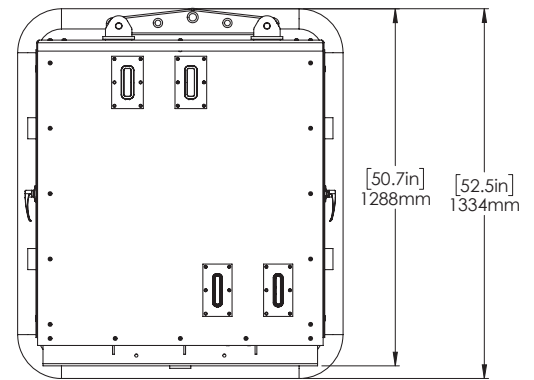
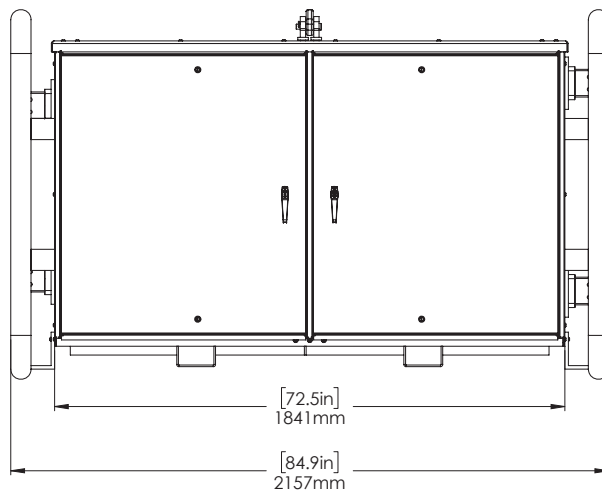
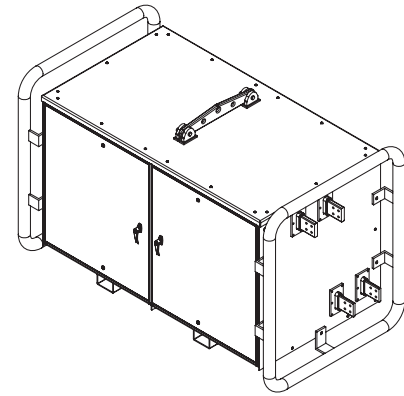
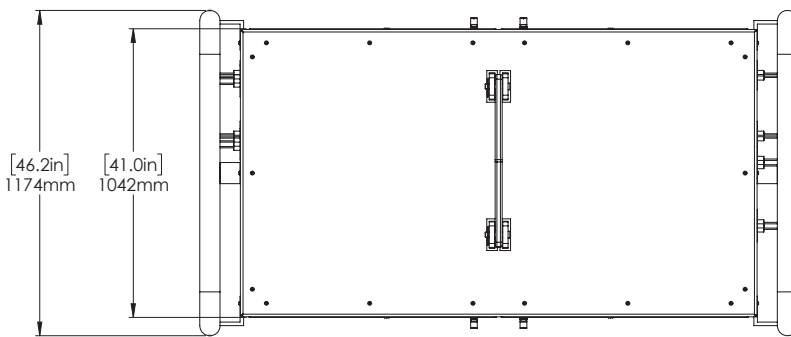


The SmartBypass™ builds upon the proven success of the bypass systems used in the PowerLine Guardian® and Power Guardian™ 390 products. The SmartBypass provides rapid protection during fault conditions for SmartValve™ Models that do not have integrated bypass capability. Under normal operation, it enables 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⁾.



Technical Specifications

Electrical

Maximum Continuous Current See Model Table Below

Maximum Emergency Current See Model Table Below

Maximum Operating Voltage ≤550 kV RMS line-to-line (Corona-Free)

Operating Frequency Range 47.5 Hz to 60.6 Hz

Power Powered by line current

Physical

Mass See Model Table Below

Maximum Fault Current See Model Table Below

Peak Fault Current See Model Table Below

Maximum Blocking Voltage at Terminals 4000 V_{peak}

Minimum Current for Monitoring Mode⁽²⁾ 50 A RMS

Minimum Current for Injection Mode^(3, 4) 200 A RMS

Environmental

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

Physical Continued

Dimensions	See Figure Above
Conductor Size Capacity	Agnostic
Mounting ⁽⁵⁾	Deployed in a pod of multiple SmartValves or suspended from structure via insulator

Communications

Communication Architecture	EMS integration via PowerLine Gateway™ located at substation
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%
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SmartBypass Models

Model	Mass		Continuous Current Rating (A RMS)	Maximum 2-Hour Emergency Current (A RMS)	Fault Current Rating (kA RMS for 1 s) ⁽⁶⁾	Peak Fault Current (kA) ⁽⁷⁾	
	lbs	kg				60 Hz	50 Hz
	<i>SmartBypass 2000-63</i>	2343				1060	2000
<i>SmartBypass 2000-50</i>	2240	1020	2000	2160	50.4	131.0	126.0
<i>SmartBypass 2000-38</i>	2136	970	2000	2160	38.0	98.8	95.0
<i>SmartBypass 2000-25</i>	2032	920	2000	2160	25.2	65.0	63.0
<i>SmartBypass 2000-12</i>	1928	870	2000	2160	12.6	32.0	31.5
<i>SmartBypass 4000-63</i>	2645	1200	4000	4320	63.0	164.0	158.0
<i>SmartBypass 4000-50</i>	2542	1150	4000	4320	50.4	131.0	126.0
<i>SmartBypass 4000-38</i>	2438	1110	4000	4320	38.0	98.8	95.0
<i>SmartBypass 4000-25</i>	2334	1060	4000	4320	25.2	65.0	63.0
<i>SmartBypass 4000-12</i>	2230	1010	4000	4320	12.6	32.0	31.5

Notes:

1. All wired connections between the SmartBypass and SmartValve are at line potential.
2. In Monitoring Mode, the SmartBypass bypasses the SmartValve across its terminals so no reactance is injected.
3. In Injection Mode, the SmartBypass allows the SmartValve to inject its reactance across its terminals in series with the line.
4. Devices delivered in Q2 of 2020 or later will be able to enter injection mode at 100 A RMS.
5. SmartValves and SmartBypasses 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.
6. Fault current ratings for other durations can be provided upon request.
7. 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.

Environmental Continued

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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Smart Wires Inc.
3292 Whipple Rd
Union City, CA 94587
Tel: (415) 800-5555
www.smartwires.com

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