



LET'S BE PACIFIC

September 2012

Volume 12 Number 7

Federal Pacific Gains Another First – UL® Listing for 25kV Pad-Mounted Switchgear Plus Additional UL® Listings for 15kV Models

Building upon the successes of the industry's first Underwriters Laboratories, Inc. (UL®) listed 15kV class pad-mounted switchgear (both live-front and dead-front), Federal Pacific has once again raised the bar with UL® listings for 27kV (25kV class) live-front and dead-front pad-mounted switchgear to 25kA symmetrical. In addition, Federal Pacific has expanded the UL® listings for 15kV class pad-mounted switchgear line to include the 25kA RMS symmetrical short-circuit rating, as well as adding UL® listing for most of the additional commonly used fuses.

UL® listing for 27kV switchgear follows independent laboratory testing, witnessed by UL® inspectors, to confirm Federal Pacific's conformance with IEEE/ANSI Standard C37.74, "IEEE Standard Requirements for Subsurface, Vault, and Pad-Mounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems up to 38 kV". In every case, the Federal Pacific switchgear met or exceeded the demanding test series requirements set forth in IEEE/ANSI C37.74. In addition, the testing encompasses compliance with IEEE/ANSI C57.12.28 "IEEE Standard for Pad-Mounted Equipment - Enclosure Integrity."

Once again, Federal Pacific's Auto-jet®II switch and fuse interrupters, utilizing puffer-style load-break technology, proved equal to the task, this time at the more demanding 27kV level, while still avoiding the inherent limitations of ablative



Figure 1 . Federal Pacific now has UL® Listed 15kV and 25kV Pad-Mounted Switchgear in both Dead-Front PSE (pictured) and PSI/II Live-Front Models.

interrupter technologies used by most other manufacturers. As mentioned in previous newsletters, the puffer technology uses the natural, environmentally friendly, renewable resource of air to extinguish the arc, rather than relying on the inherently diminishing synthetic ablative materials used by others or other alternatives such as the even more problematic mineral oil or ozone-depleting SF6, along with the hazardous by-products. The Auto-jet®II switch provides a 3-time fault close rating of 25kA symmetrical (40kA asymmetrical) at 17.5kV (65kA peak) and at 27kV (65kA peak).

With the 15kV class pad-mounted switches having been tested to 17.5kV, it will provide a cost effective, UL® listed, solution for some applications that may have at one time required the more expensive 27kV class switches.

In addition to the overall pad-mounted switchgear listings, Federal Pacific also has gained UL® listings for the following fuse types at both 15.5kV and 27kV (nominal ratings):

S&C SMU-20 (power fuses)

S&C SML-4Z (power fuses)

Cutler-Hammer DBU (power fuses)

Cooper NX (current-limiting fuses)

Cooper X-Limiter (current-limiting fuses)

A summary of the electrical tests, as specified in IEEE/ANSI Standard C37.74, and the levels of performance applicable to Federal Pacific UL® Listed pad-mounted switchgear, is provided in Table 1 through Table 5. The mechanical tests required in IEEE/ANSI Standard C37.74 and the enclosure security requirements specified in IEEE/ANSI C57.12.28 are summarized in Table 6. The coating system tests, as required by IEEE/ANSI C57.12.28 are summarized in Table 7.

By obtaining these UL® listings, Federal Pacific has gone more than the "extra mile" to prove its commitment to providing industry-leading, reliable, cost-effective, environmentally responsible pad-mounted switchgear for today's market.



Figure 2. End Fittings with Federal Pacific, Eaton DBU or (as pictured) with S&C SMU-20 Power Fuses.

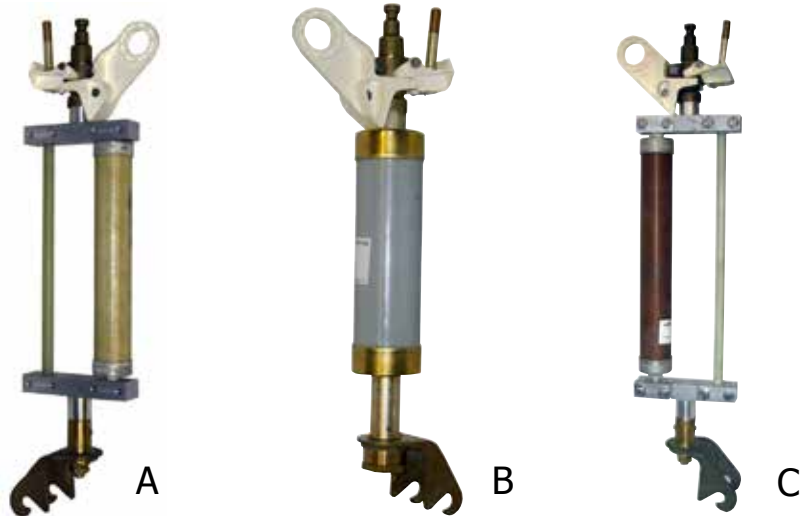


Figure 3. Federal Pacific End Fittings with a variety of current-limiting fuses, which can be used in Live-Front and Dead-Front Federal Pacific Pad-Mounted Switchgear. The fuses at A and at B are two varieties of X-Limiter Current Limiting Fuses, while the fuse at C is an NX style Current Limiting Fuse.



Figure 4. SML-4Z fuse holder.

**UL® LISTED RATINGS ACHIEVED — PER IEEE STANDARD C37.74 — 2003
(September 2012 Revision)**

TABLE 1 — OVERALL UNIT — PREFERRED RATINGS

Three Phase DSG - Rated Maximum Voltage (Voltage Class) Rating	15.5 kV	27 kV
Test Description		
Rated Power Frequency	60 Hz	60 Hz
Tested Maximum Voltage	17.5 kV Gnd Y (1)	27 kV Gnd Y
Rated Lightning Impulse Withstand Voltage	95 kV BIL	125 kV BIL
Rated Power-Frequency Withstand Voltage	35 kV	60 kV
Rated Short-Circuit Current, Symmetrical (1 second)	14kA / 25 kA	25 kA
Rated Peak Withstand	36.4kA / 65kA	65kA
Rated 3-Time Fault-Making Current (Symmetrical)	14kA / 25kA	25kA
DC Withstand Voltage (5 minutes)	53 kV	78 kV

TABLE 2 — SWITCHED WAYS — PREFERRED RATINGS

Three Phase DSG - Rated Maximum Voltage (Voltage Class) Rating	15.5 kV	27 kV
Test Description		
Tested Maximum Voltage	17.5 kV Gnd Y	27kV Gnd Y
Rated Continuous Current	600 Amperes	600 Amperes
Rated Load Switching Current	600 Amperes	600 Amperes
Rated Loop Switching Current	600 Amperes	600 Amperes
Rated Cable-Charging Current	10 Amperes	15 Amperes
Rated Transformer-Magnetizing Switching Current	21 Amperes	21 Amperes
Rated Peak Withstand Current	36.4kA / 65kA	65 kA
Rated Short-Time Current (Symmetrical, 1 second)	14 kA	25 kA
Rated 3-Time Fault-Making Current (Symmetrical)	14kA / 25kA	25 kA
Rated Interrupting Current	600 Amperes	600 Amperes

TABLE 3 — FUSED WAYS (Refers to PSE, see Note 2) — PREFERRED RATINGS

Three Phase DSG - Rated Maximum Voltage (Voltage Class) Rating	15.5 kV (Note 3)	27 kV (Note 4)
Test Description		
Tested Maximum Voltage	15.5 kV Gnd Y	27 kV Gnd Y
Rated Continuous Current	200 Amperes	200 Amperes
Rated Short-Circuit Withstand Current (Symmetrical)	14kA	25kA
Rated Interrupting Current	See Table 4A	See Table 4A

TABLE 4 — FUSED LOAD-BREAK WAYS (Refers to PSI/II see Note 5) — PREFERRED RATINGS

Three Phase DSG - Rated Maximum Voltage (Voltage Class) Rating	15.5 kV (Note 3)	27 kV (Note 4)
Test Description		
Tested Maximum Voltage	15.5 kV Gnd Y	27 kV Gnd Y
Rated Continuous Current	200 Amperes	200 Amperes
Rated Load Switching Current	200 Amperes	200 Amperes
Rated Loop Switching Current	200 Amperes	200 Amperes
Rated Cable-Charging Current	10 Amperes	15 Amperes
Rated Transformer-Magnetizing Switching Current	21 Amperes	21 Amperes
Rated Peak Withstand Current	36.4kA / 65kA	65kA
Rated Short-Circuit Current (Symmetrical)	14 kA / 25kA	25kA
Rated 3-Time Fault-Making Current	See Table 4A	See Table 4A
Rated Interrupting Current, Symmetrical	See Table 4A	See Table 4A

Notes:

- (1) Maximum voltage for the switchgear will be 15.5kV when fuses are included.
- (2) Refers to ways that contain fuses without any switching device. Applicable to fuse compartments in PSE Dead-Front Models.
- (3) 8.9 kV Single Phase to Ground / 15.5 kV Three-Phase Grounded-Wye Systems
- (4) 15.5 kV Single Phase to Ground / 27 kV Three-Phase Grounded-Wye Systems.
- (5) Refers to ways that contain fuses with an integral load interrupting device. Applicable to fuse compartments in PSI/II Live-Front Models.

UL® LISTED RATINGS ACHIEVED — PER IEEE STANDARD C37.74 — 2003 (September 2012 Revision)

TABLE 4 A— UL® LISTED FUSE APPLICATIONS (Note 5) — PREFERRED RATINGS

Three Phase DSG - Rated Maximum Voltage (Voltage Class) Rating	15.5 kV (Note 2)	27 kV (Note 3)
Fuse Type (3-Time Fault Making, Asym)		
S&C SMU-20	22.4 kA	20 kA
SML-4Z	20 kA	20 kA
Eaton DBU	22.4 kA	20 kA
Cooper NX	40 kA	40 kA
Cooper X-Limiter	40 kA	40 kA

TABLE 5 — BUSSED WAYS (Note 6) — PREFERRED RATINGS

Three Phase DSG - Rated Maximum Voltage (Voltage Class) Rating	15.5 kV	27 kV
Test Description		
Tested Maximum Voltage	17.5 kV Gnd Y	27 kV Gnd Y
Rated Continuous Current (Note 7)	200/600 Amperes	200/600 Amperes
Rated Peak Withstand	65kA	65kA
Rated Short-Circuit Current (Symmetrical, 1 second)	25kA	25kA

TABLE 6 — MECHANICAL TESTS

Test Description	Number of Operations	Cycle
Mechanical Operations after Switching Tests	50	Close/Open
Mechanical Operations after Short-Circuit Tests	200	Close/Open
Mechanical Operations after Thermal Runaway Tests	200	Close/Open
Prying Test — Apply 50 lbs. axial and 900 in-lbs pry force	Alternatively	Until No Relaxation
Wire Probe Test	Insert after Pry and Pull Tests	Until Entry Stops
Pull Test — 150 lbs.	Continuous Application	Until No Relaxation
Deflection Test — 100 lbs.	Continuous Application	All Surfaces
Operation Test	One	Unlock/Open/Close/Lock

TABLE 7 — COATING SYSTEM TESTS

Test Description	Test Parameters	Results
Salt-Spray Test (5% Salt)	Three Sample Panels ASTM D 1654 ASTM D 1654 Procedure A, Method 2 ASTM 1654-92, Table 1	1500 Hours Scribe Evaluate Samples Rating Less Than 6
Crosshatch Adhesion	One Sample Panel ASTM D3359 Method B	Rating of 5B 100% Adhesion
Humidity Test	Two Sample Panels ASTM 14585 45°C + or - 1°C	No Blistering <1 Pencil Hardness Change No Color Change Noted
Impact Test	One Sample Panel — ASTM 2794 24 Hour Salt Spray — ASTM B117	80-inch Pounds No Visible Rust at Impact Point
Ultraviolet Accelerated Weathering Test	Two Sample Panels — ASTMG53 FS-40 Bulb — 4 hrs UV/4hrs Condensation	<50% Loss of Gloss No Cracking or Cracking
Ultraviolet Accelerated Weathering Test (QUV) and Simulated Corrosive Atmospheric Breakdown (SCAB)	Three-Sample Panels per Appendix 1 ASTM 1654 Procedure A, Method 2 ASTM 1654 Table 1	15 Cycles of SCAB No Blisters Average Rating <6
Abrasion Resistance Test	One Sample Panel, CS-10 Wheel 1000 Gram Weight Per ASTM D4060 24 Hours Salt Spray Per ASTM B117	3000 Cycles No Visible Rust
Gravelometer Test	Two Sample Panels Per ASTM D3170 24 Hours Salt Spray Per ASTM B117 Evaluate Per SAE J400	Minimum 4B Rating

Notes:

- (6) Refers to ways that contain only bus in live-front PSI/II Models for connection of conventional skirted terminators, and to ways containing only bushings or bushing wells in dead-front PSE Models for connection of appropriately rated separable insulated connectors. Separable connectors, terminators, or cables may not have short-circuit withstand capabilities as high as the rating of the pad-mounted switchgear and could limit its application.
- (7) Rating is 200 amperes for Federal Pacific bushing wells and 600 amperes for bushings.

