

Guide Specifications

SElect 7/27/02

SElect[®]

Selenium-Enhanced
Suppression
Filter System



1.0 GENERAL

1.1 SUMMARY. These specifications describe the electrical and mechanical requirements for a hybrid electrical transient surge suppression filter system integrating both transient voltage surge suppression (TVSS) and electrical high frequency noise filtering for exposure locations as defined in ANSI/IEEE C62.41-1991.

The unit shall be designed for parallel connection to the facility's wiring system. The suppression filter system shall be designed and manufactured in the USA by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacture of such products for a minimum of five (5) years.

These specifications are based on Current Technology's selenium-enhanced™ SElect suppression filter systems. Other manufacturers shall provide detailed compliance or exception statements, along with required test documentation, to all provisions of this specification fourteen (14) days prior to bid.

1.2 STANDARDS. The specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:

ANSI/IEEE C62.41-1991 and C62.45-1992;
ANSI/IEEE C62.1 and C62.11;
Canadian Standards; (CUL);
Federal Information Processing Standards Publication 94 (FIPS PUB 94);
National Electrical Manufacturers Association (NEMA LS1-1992 Guidelines);
National Fire Protection Association (NFPA 70 [NEC], 75, and 78);
Underwriters Laboratories UL 1449 Second Edition and 1283;
Underwriters Laboratories UL 489 and UL 198

The unit shall be **UL 1449 Second Edition Listed** and **CUL Approved** as a Transient Voltage Surge Suppressor and **UL 1283 Listed** as an Electromagnetic Interference Filter.

1.3 ENVIRONMENTAL REQUIREMENTS.

1.3.1 Storage Temperature. Storage temperature range: -40° to +85° C (-40° to +185° F).

1.3.2 Operating Temperature. Operating temperature range: -40° to +60° C (-40° to +140° F).

1.3.3 Relative Humidity. Reliable operation with 5% to 95% non-condensing relative humidity.

1.3.4 Operating Altitude. Capable operation up to 13,000 feet above sea level.

1.3.5 Audible Noise. The unit shall not generate any audible noise.

1.3.6 Magnetic Fields. No appreciable magnetic fields shall be generated. Unit shall be capable of use in computer rooms without danger to data storage systems or devices.

2.0 ELECTRICAL REQUIREMENTS

2.1 Unit Operating Voltage. The nominal unit operating voltage and configuration shall be as indicated on the drawings. For voltage configurations not listed, contact factory.

Model Number	Voltage	Poles	Configuration
SELxxx-120/240-2G	120/240	2	Grounded Neutral
SELxxx-120/208-3GY	120/208	3	Grounded WYE
SELxxx-220/380-3GY	220/380	3	Grounded WYE
SELxxx-277/480-3GY	277/480	3	Grounded WYE
SELxxx-347/600-3GY	347/600	3	Grounded WYE
SELxxx-120/240-3GHD	120/240 x 208	3	Grounded "High-Leg" DELTA
SELxxx-240-3DG	240	3	DELTA
SELxxx-480-3DG	480	3	DELTA
SELxxx-600-3DG	600	3	DELTA

2.2 Maximum Continuous Operating Voltage (MCOV). The MCOV shall be greater than 115% of nominal voltage for all SElect products. All Current Technology suppression filter systems maximum continuous operating voltages are in compliance with test and evaluation procedures outlined in NEMA LS 1-1992, paragraphs 2.2.6 and 3.6.

2.3 Operating Frequency. Operating frequency range shall be 47 to 63 Hertz.

2.4 Protection Modes. All protected modes are defined per NEMA LS-1-1992, paragraph 2.2.7. Following IEEE Standard 1100-1992, section 9.11.2 recommendations, SElect units shall provide protection in all modes. WYE configured systems shall provide Line-to-Neutral, Line-to-Ground, Line-to-Line and Neutral-to-Ground protection. DELTA configured systems shall provide Line-to-Line protection and Line-to-Ground protection.

2.5 Rated Single Pulse Surge Current Capacity. The rated single pulse surge current capacity, in amps, for each mode of protection of the unit shall be no less than as follows:

Rated Single Pulse Surge Current Capacity					
Model	L-N	L-G	N-G	L-L	Per Phase
SEL300*	300,000 A	300,000 A	300,000 A	300,000 A	600,000 A
SEL250*	250,000 A	250,000 A	250,000 A	250,000 A	500,000 A
SEL200	200,000 A	200,000 A	200,000 A	200,000 A	400,000 A
SEL150	150,000A	150,000A	150,000A	150,000A	300,000A
SEL100	100,000A	100,000A	100,000A	100,000A	200,000A

* NOTE: See section 2.6 below

2.6 Tested Single Pulse Surge Current Capacity. In compliance with NEMA LS-1-1992, paragraphs 2.2.9 and 3.9, Current Technology suppression filter systems are single pulse surge current tested in all modes at rated surge currents by an industry-recognized independent test laboratory. Single pulse surge current capacities of 200,000 amps or less are established by single-unit testing of all components within each mode. Due to present industry test equipment limitations, single pulse surge current capacities over 200,000 amps are established via testing of individual components or sub-assemblies within a mode. The test shall include a UL1449 Second Edition surge defined as a 1.2 X 50 μ sec, 6000V open circuit voltage waveform and an 8 X 20 μ sec, 500A short circuit current waveform to benchmark the unit's suppression voltage, followed by a single pulse surge of maximum rated surge current (for units rated over 200,000A per mode, components or sub-assemblies are tested) magnitude with an approximated 8 X 20 μ sec waveform. To complete the test, another UL1449 surge shall be applied to verify the unit's survival. Survival is achieved if the suppression voltage measured from the two UL1449 surges does not vary by more than $\pm 10\%$.

2.7 Minimum Repetitive Surge Current Capacity. Per ANSI/IEEE C62.41-1991 and ANSI/IEEE C62.45-1992, all Current Technology suppression filter systems are repetitive surge current capacity tested in every mode utilizing a 1.2 x 50 μ sec, 20 KV open circuit voltage, 8 x 20 μ sec, 10 KA short circuit current Category C3 bi-wave at one minute intervals without suffering either performance degradation or more than $\pm 10\%$ deviation of clamping voltage at the specified surge current.

Repetitive Surge Current Capacity-Number of Impulses	
Model	# of Impulses
SEL300	> 15,000
SEL250	> 14,000
SEL200	> 13,000
SEL150	> 12,000
SEL100	> 11,000

2.8 NEMA LS-1-1992 Clamping Voltage Data. All Current Technology suppression filter system clamping voltages are in compliance with test and evaluation procedures outlined in NEMA LS-1-1992, paragraphs 2.2.10 and 3.10. Maximum clamping voltages for SElect units without and with an integral disconnect are as follows in tables following 2.9.

2.9 Unit UL1449 Second Edition Suppressed Voltage Ratings. The UL 1449 Second Edition listed suppressed voltage ratings are listed in the following tables as assigned by Underwriters Laboratories utilizing the test procedure described in section 4.3 of this document titled UL 1449 Second Edition Suppression Voltage Performance Testing.

SEL300, SEL 250, SEL200					
System Voltage	Mode	B3 Ringwave	B3/C1 Comb. Wave	C3 Comb. Wave	UL 1449 Second Edition
120/240 120/208	L-N	300 / 350	400/425	625/750	400/400
	L-G	375 / 425	400/475	625/800	500/500
	N-G	325 / 325	450/450	725/725	500/500
	L-L	375 / 475	750/825	925/1225	700/700
277/480	L-N	525 / 575	850/875	1100/1200	800/800
	L-G	825 / 850	825/875	1050/1200	1000/1000
	N-G	675 / 675	875/875	1200/1200	900/900
	L-L	625 / 725	1625/1700	1925/2175	1500/1500

NOTE: Clamping voltage values shown without / and with integral disconnect. Consult factory for voltage configurations not shown.

SEL150, SEL100					
System Voltage	Mode	B3 Ringwave	B3/C1 Comb. Wave	C3 Comb. Wave	UL1449 Second Edition
120/240 120/208	L-N	300 / 325	400/425	600/700	400/400
	L-G	375 / 425	400/450	600/725	500/500
	N-G	350 / 350	450/450	725/725	500/500
	L-L	350 / 450	750/825	950/1175	700/700
277/480	L-N	500 / 525	850/900	1125/1175	900/900
	L-G	825 / 850	825/850	1050/1150	1000/1000
	N-G	675 / 700	875/875	1175/1175	800/800
	L-L	650 / 700	1650/1700	1925/2150	1500/1500

NOTE: Clamping voltage values shown without / and with integral disconnect. Consult factory for voltage configurations not shown.

2.10 High Frequency Extended Range Power Filter. All Current Technology SElect suppression filter systems EMI-RFI noise rejection or attenuation values are in compliance with test and evaluation procedures outlined in NEMA LS-1-1992, paragraphs 2.2.11 and 3.11.

Attenuation Frequency	50KHz	100KHz	500KHz	1MHz	5MHz	10MHz	50MHz	100MHz
SEL300, 250, 200	53dB	41dB	32dB	31dB	32dB	35dB	47dB	53dB
SEL150, 100	50dB	44dB	34dB	33dB	34dB	36dB	47dB	53dB

NOTE: Standardized insertion loss data obtained utilizing MIL-STD-220A 50 ohm insertion loss methodology. Noise source path = 100' to model maximum average circuit distance, filter connection distance = 6".

The SElect suppression filter system shall function in conjunction with other suppression filter devices of the same manufacturer via coordinated filters within the facility-wide MasterPLAN® suppression filter system that provide minimum noise attenuation as follows:

Attenuation Frequency	50KHz	100KHz	500KHz	1MHz	5MHz	10MHz	50MHz	100MHz
MasterPLAN	85dB	83dB	68dB	68dB	68dB	67dB	78dB	84dB

NOTE: Standardized insertion loss data obtained utilizing MIL-STD-220A 50 ohm insertion loss methodology, based on a minimum of 100 ft. of #4 AWG conductor between the two devices. Noise source = 100' to model maximum average circuit distance, filter connection distance = 6".

2.11 Overcurrent Protection

2.11.1 Each suppression element shall be fused such that the failure of a single component or the operation of a single fuse element remains isolated and does not render the entire mode, or product, deficient by more than the following percentages:

Model	Maximum Deficiency Percentage
SEL300, SEL250, SEL200	< 5%
SEL150, SEL100	<10%

2.11.2 For systems utilizing a hybrid technology, each element type shall be fused.

2.11.3 Every current carrying conductor associated with a component shall be fused such that every fault is isolated at the point of the fault or at the component level.

2.11.4 Fusing shall be present in all modes, including Neutral-to-Ground.

2.11.5 All overcurrent / fault current protection shall be UL-Recognized as a stand-alone fuse.

2.11.6 All fusing must be UL-Recognized and tested at 200kAIC. Testing shall be inclusive of all available product voltages.

2.11.7 All fuses and overcurrent / fault current protection devices shall consist of self-arc-quenching, sand-encapsulated UL-Recognized fuse arrays. Each fuse shall be individually sealed in a manner that eliminates cross arcing.

2.11.8 The device shall be capable of withstanding the full single pulse surge current capacity for every mode without the operation or failure of overcurrent / fault current protection or fuses.

2.9 Transient Conduction Path. All full magnitude transient current shall be conducted on low-impedance solid copper bussing. If printed circuit boards are utilized in surge current paths, no single trace shall be allowed to conduct more than the proportional current share of the connected TVSS component.

3.0 DOCUMENTATION.

3.1 Equipment Manual. The manufacturer shall furnish with the submittal and with each unit delivered an equipment manual that details the installation, operation and maintenance instructions for the specified unit.

3.2 Drawings. Electrical and mechanical drawings shall be provided by the manufacturer with the submittal and with each unit delivered that show unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.

3.3 UL1449 Second Edition Listing / Clamping Voltages. The manufacturer shall provide data showing UL 1449 Second Edition product listing. The manufacturer shall also submit certified documentation of applicable Location Category Testing in full compliance with NEMA LS 1-1992, paragraphs 2.2.10 and 3.10.

3.4 Single Pulse Surge Current Capacity Testing. Certified documentation of the unit's Single Pulse Surge Current Capacity Testing shall be included in the submittal.

3.5 Minimum Repetitive Surge Current Capacity Testing. Certified documentation of the unit's Minimum Repetitive Surge Current Capacity Testing shall be included in the submittal.

3.6 Diagnostic Signature Card. The unit shall include a Diagnostic Signature Card listing factory-established benchmark suppression voltage values for all modes of protection. The suppression voltage values shall be established during final production line testing utilizing the DTS-2 Diagnostic Test Set. This Diagnostic Signature Card shall provide space for subsequent field testing allowing comparison of the initial factory benchmark testing with subsequent field testing suppression voltage values.

4.0 TESTING

4.1 Single Pulse Surge Current Capacity Testing. In compliance with NEMA LS-1-1992, paragraphs 2.2.9 and 3.9, each design configuration shall have the maximum single pulse surge current capacity per mode verified through testing. The test shall include a UL1449 Second Edition surge defined as a 1.2 X 50 μ sec 6000V open circuit voltage waveform and an 8 X 20 μ sec 500A short circuit current waveform to benchmark the unit's suppression voltage, followed by a single pulse surge of maximum rated surge current magnitude with an approximated 8 X 20 μ sec waveform. To complete the test, another UL1449 surge shall be applied to verify the unit's survival. Survival is achieved if the suppression voltage found from the two UL1449 surges does not vary by more than $\pm 10\%$.

4.2 Minimum Repetitive Surge Current Capacity Testing. Each design configuration shall have a repetitive surge current capacity rating which shall be verified through testing. The test shall include a UL1449 Second Edition surge defined as a 1.2 X 50 μ sec 6000V open circuit voltage waveform and an 8 X 20 μ sec 500A short circuit current waveform to benchmark the unit's suppression voltage, followed by a repetitive number of ANSI/IEEE C62.41-1991 Category C3 surges defined as a 1.2 X 50 μ sec 20,000V open circuit voltage waveform and an 8 X 20 μ sec 10,000A short circuit current waveform. To complete the test, another UL1449 surge shall be applied to verify survival. Survival is achieved if the suppression voltage resulting from the two UL1449 surges do not vary by more than $\pm 10\%$. Proof of such testing shall be the test log generated by the surge generator.

4.3 UL 1449 Second Edition Suppressed Voltage Performance Testing. Each design configuration shall have a UL 1449 Second Edition Suppressed Voltage Rating that has been tested and assigned by Underwriters Laboratories utilizing the following waveforms and procedure. The test shall be initiated with a surge of 6,000V / 500A, using waveshapes defined within ANSI/IEEE C62.41-1991 as a 1.2 X 50 μ sec open circuit voltage waveform and an 8 X 20 μ sec short circuit current waveform, to benchmark the unit's suppression voltage. The unit shall then be subjected to 10 positive polarity and 10 negative polarity 1.2 X 50 μ sec 6,000V open circuit voltage waveforms and an 8 X 20 μ sec 3,000A short circuit current waveforms. For comparison with the initial benchmark voltage reading, another ANSI/IEEE surge defined as 1.2 X 50 μ sec 6000V open circuit voltage waveform and an 8 X 20 μ sec 500A short circuit current waveform shall be applied. Deviation from initial to final clamping value may not exceed $\pm 10\%$. Upon successful completion, an appropriate UL 1449 Second Edition Suppression Voltage Rating is assigned by Underwriters Laboratories.

4.4 Short Circuit Fuse Testing. Each design configuration shall be short circuit tested in accordance with the type of fusing utilized in the suppression path. Testing shall include application of a sustained overvoltage that causes the unit to enter a bolted fault condition. This bolted fault condition shall occur with the full rated AIC current of the fuse available. The fuse shall fail in a safe manner with no physical or structural damage to the unit and any failure shall be self-contained within the unit.

4.5 Surge Current Fuse Testing. Each design configuration shall be surge tested with fusing in series to verify that a transient of maximum surge current capacity magnitude is fully suppressed without fuse failure, operation, or degradation.

4.6 MCOV (Maximum Continuous Operating Voltage) Testing. Each unit shall be factory tested at the applicable MCOV to assure proper field operation.

4.7 Quality Assurance Testing. Each unit shall be thoroughly factory tested before shipment. Testing of each unit shall include, but shall not be limited to, UL manufacturing and production-line tests, quality assurance checks, MCOV and clamping voltage verification tests.

4.8 Start-Up Testing. Upon completion of installation, a factory-authorized local service representative shall provide testing services. The following tests shall be performed: (a) voltage measurements from Line-to-Ground, Line-to-Neutral, Line-to-Line and Neutral-to-Ground (no neutral in DELTA configurations) at the time of the testing procedure, (b) impulse injection to verify the system suppression voltage tolerances for all suppression paths. Impulse testing shall be completed while the unit is off-line to isolate the unit from the distribution system. Test results should be recorded and compared to factory benchmark test parameters supplied with each individual unit. A copy of the start-up test results and the factory benchmark testing results shall be supplied to the engineer and the owner for confirmation of proper suppression filter system function. In addition, the integrity of the neutral-ground bond should be verified through testing and visual inspection. A Ten-Year Limited Warranty shall initiate after the owner has accepted the testing results and taken possession of the equipment.

5.0 WARRANTY. The manufacturer shall provide a Ten-Year Limited Warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

6.0 PRODUCT.

6.1 High Performance Suppression System. The unit shall include an engineered solid-state high performance suppression system utilizing a predetermined number of selenium cells and arrays of non-linear voltage dependent metal oxide varistors with similar operating characteristics. To maximize current density the device shall contain sufficient thermal mass allowing the device the ability to dissipate large amounts of average power that may be caused from sustained over voltage events and voltage swells as well as repetitive transient impulses.

SEL300 Series					
System Voltage	120/240	120/208	220/380	277/480	347/600
Thermal Mass per enhanced mode	440 in ²	440 in ²	860 in ²	1,029 in ²	1,365 in ²

SEL250 Series					
System Voltage	120/240	120/208	220/380	277/480	347/600
Thermal Mass per enhanced mode	437 in ²	437 in ²	857 in ²	1,025 in ²	1,361 in ²

SEL200 Series					
System Voltage	120/240	120/208	220/380	277/480	347/600
Thermal Mass per enhanced mode	254 in ²	254 in ²	494 in ²	590 in ²	782 in ²

SEL150 Series					
System Voltage	120/240	120/208	220/380	277/480	347/600
Thermal Mass per enhanced mode	250 in ²	250 in ²	490 in ²	586 in ²	778 in ²

SEL100 Series					
System Voltage	120/240	120/208	220/380	277/480	347/600
Thermal Mass per enhanced mode	247 in ²	247 in ²	487 in ²	583 in ²	775 in ²

The suppression system components shall optimally share surge currents in a seamless, low-stress manner assuring maximum performance and proven reliability. The suppression system shall not utilize gas tubes, spark gaps, silicon avalanche diodes or other components which might short or crowbar the line, thus leading to interruption of normal power flow to or system upset of connected loads.

6.2 Excessive MCOV Withstand (Swell Voltage Rating). Under excessive Maximum Continuous Operating Voltage (MCOV) conditions, the device shall be capable of dissipating large amounts of average power that may be caused by overvoltage events and voltage swells as well as repetitive transient impulses. This data shall be published in accordance with NEMA LS-1-1992, section 2.2.6.

SEL300, SEL250						
% Overvoltage	160%	170%	180%	190%	195%	200%
Line impedance of power system = 0.1 ohms						
# of cycles	>3600	200	40	8	5	4
Line impedance of power system = 0.3 ohms						
# of cycles	>3600	>3600	700	125	80	30
Line impedance of power system = 0.7 ohms						
# of cycles	>3600	>3600	>3600	>3600	>3600	>3600

SEL200, SEL150, SEL100						
% Overvoltage	160%	170%	180%	190%	195%	200%
Line impedance of power system = 0.1 ohms						
# of cycles	1000	60	12	5	4	3.5
Line impedance of power system = 0.3 ohms						
# of cycles	>3600	300	60	20	15	11
Line impedance of power system = 0.7 ohms						
# of cycles	>3600	>3600	500	200	80	60

6.3 High Frequency Extended Range Power Filter. The unit shall include a high frequency extended range power filter and shall be UL 1283 listed as an Electromagnetic Interference Filter. The filter shall reduce fast rise-time, high frequency, error-producing transients and electrical line noise to harmless levels, thus eliminating disturbances, which may lead to electronic system upset. The filter shall provide minimum noise attenuation as specified in section 2.10 of this specification.

6.4 Internal Connections. All full magnitude transient current shall be conducted utilizing low-impedance copper bus bar. No plug-in component modules or quick-disconnect terminals shall be used in surge current-carrying paths.

6.5 Field Connections. The unit shall include mechanical or compression lugs for each phase, neutral and ground, if applicable. Recommended wire size range is as follows:

Model	Phase Conductor Wire Size	Neutral Conductor Wire Size	Ground Conductor Wire Size
SEL100 -150	1/0 - #6 AWG Copper - With Disconnect	1/0 - #6 AWG Copper - With Disconnect	1/0 - #6 AWG Copper - With Disconnect
SEL 200-300	1/0 - #2 AWG Copper - Without Disconnect	1/0 - #2 AWG Copper - Without Disconnect	1/0 - #2 AWG Copper - Without Disconnect

6.5.1 If an overcurrent protection device is used to connect the phase conductors, it is recommended to use a 100 amp fuse or breaker. If a non-fused external disconnect or molded case breaker is used, a 100 amp rating is recommended.

6.5.2 For connecting the phases, neutral, and ground of the device, it is recommended to use #2 to 1/0 AWG copper conductors.

6.6 Field Installation. The unit shall be installed as close as practical to the facility's wiring system in accordance with applicable national/local electrical codes and the manufacturer's recommended installation instructions.

6.7 Unit Phase Indicators. The unit shall include long-life, solid state, externally visible phase indicators that monitor the on-line status of each phase of the unit.

6.8 Enclosure

6.8.1 Standard Enclosure. The unit shall be supplied in a NEMA 4 metallic enclosure. Enclosure sizes and weights are as follows:

Model	Enclosure Size/Weight
SEL200-300	38"H x 22"W x 12"D / 150 lbs.
SEL100-150	27"H x 22"W x 12"D / 100 lbs.

6.8.2 Optional Open-Frame. The unit shall be optionally available in an open-frame configuration to facilitate installation within a switchgear cubicle, electrical enclosure, or other barriered section. Open-frame space requirements are as follows:

Model	Disconnect	Space Required for Mounting
SEL200-300	With	34.75"H x 20.5"W x 11.88"D / 150 lbs. (max)
SEL100-150	With	25.25"H x 20.5"W x 10.25"D / 100 lbs. (max)
SEL200-300	Without	28"H x 20.5"W x 9"D / 150 lbs. (max)
SEL100-150	Without	20"H x 20.5"W x 9"D / 100 lbs. (max)

7.0 FEATURES / OPTIONS.

7.1 Disconnect.

7.1.1 The device shall have optionally available a NEMA designed and certified safety interlocked integral disconnect switch located within the unit with an externally mounted metal manual operator.

7.1.2 The switch shall disconnect all ungrounded circuit conductors from the distribution system to enable testing and maintenance without interruption to the facility's distribution system.

7.1.3 The switch shall be rated for 600Vac.

7.1.4 The TVSS device shall be UL1449 Second Edition listed with the integral disconnect switch and the UL1449 Second Edition Suppression Voltage Ratings shall be provided.

7.1.5 The integral disconnect switch shall be capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.

7.2 PRIMARY Monitoring Option.

7.2.1 Dual Form "C" Dry Contacts. The SElect product with the Primary monitoring option shall be provided with 2 sets of form "C" dry contacts (normally open and normally closed) to facilitate connection to a building management system or other remote monitoring system. The contacts shall be normally open or normally closed and shall change state upon failure of the suppression filter system or power loss in any of the phases.

7.3 ADVANCED Monitoring Option. The SElect product shall be provided with the an integral monitoring option as specified below:

7.3.1 Dual Form “C” Dry Contacts. The SElect product with the Advanced monitoring option shall be provided with 2 sets of form “C” dry contacts (normally open and normally closed) to facilitate connection to a building management system or other remote monitoring system. The contacts shall be normally open or normally closed and shall change state upon failure of the suppression system or power loss in any of the phases.

7.3.2 Display Event Counter. The SElect product with the Advanced monitoring option shall be provided with a display event counter, which records the cumulative number of transients to which the device has been subjected. The detection circuitry must be current sensing to eliminate erroneous counts that may be produced from stray voltages and noise signals, both conducted and radiated.

7.3.3 Battery Powered Audible Alarm and LED Indicators. The SElect product with the Advanced monitoring option shall be provided with a battery powered audible alarm that detects and provides notification of single or multiple phase failure of the suppression filter system. The alarm shall have a silence switch as well as a test switch for ensuring positive function and an alarm LED that illuminates when the alarm is disabled. The monitoring unit shall have an easily replaceable, commonly available battery for backup to ensure audible alarm function in the event of a total power failure. The unit shall have a battery backed-up monitor LED that shall illuminate when battery requires replacement.

7.4 MasterMIND Monitoring Option. The SElect product shall be provided with an integral multifunction power monitor analyzer. The monitoring system shall provide real-time product performance data along with distribution system power analysis via multiport visual status indicators (LEDs) and a touchpad accessible LED data display. It shall include the following features:

7.4.1 Enhanced Status Indicators. The SElect product with the MasterMIND[®] monitoring option shall be provided with enhanced status indication allowing for visual inspection of the online status of all hybrid elements: selenium, MOVs, and capacitors. Such indication shall be provided for each phase.

7.4.2 Dual Form “C” Dry Contacts. The SElect product with the MasterMIND monitoring option shall be provided with 2 sets of form “C” dry contacts (normally open and normally closed) to facilitate connection to a building management system or other remote monitoring system. The contacts shall be normally open or normally closed and shall change state upon failure of the suppression system or power loss in any of the phases.

7.4.3 Display Event Counter. The SElect product with the MasterMIND monitoring option shall be provided with a display event counter that makes available the cumulative number of transients to which the device has been subjected. The detection circuitry must be current sensing to eliminate erroneous counts that may be produced from stray voltages and noise signals, both conducted and radiated.

7.4.4 Battery Powered Audible Alarm. The SElect product with the MasterMIND monitoring option shall be provided with a battery-powered audible alarm that detects and provides notification of single or multiple phase failure of the suppression filter system. The alarm shall have a silence switch as well as a test switch for ensuring positive function and an alarm LED that illuminates when the alarm is disabled. The monitoring unit shall have an easily replaceable, commonly available battery for backup to ensure audible alarm function in the event of a total power failure. The unit shall have a battery backed-up LED which shall illuminate when battery requires replacement.

7.4.5 % Protection Available. The SElect product with the MasterMIND monitoring option shall provide numeric display of the available surge protection online. Sensing each hybrid element's fuse, the microprocessor-based circuitry shall be capable of calculating the amount of protection still active in the circuit and displaying a percentage amount.

7.4.6 Neutral-to-Ground Current Sensing. The SElect product with the MasterMIND monitoring option shall detect and digitally indicate current flowing in the neutral-to-ground protection path within the device (WYE, split phase, and high leg delta systems only). This indication might signal neutral-ground bonding problems within the distribution system.

7.4.7 Neutral-to-Ground Voltage Sensing. The SElect product with the MasterMIND monitoring option shall provide digital display of the voltage across the neutral and ground. This indication might signal neutral-ground bonding or asymmetrical load problems within the distribution system.

7.4.8 True RMS Voltage Monitor. The SElect product with the MasterMIND monitoring option shall provide true RMS voltage monitoring for all phases along with neutral-to-ground.

7.4.9 Voltage Sag Detection. The SElect product with the MasterMIND monitoring option shall provide visual indication and count of all voltage sags < 90% of nominal.

7.4.10 Voltage Swell Detection. The SElect product with the MasterMIND monitoring option shall provide visual indication and count of all voltage swells > 110% of nominal.

7.4.11 Power Dropout Detection. The SElect product with the MasterMIND monitoring option shall provide visual indication and count of all power dropouts < 1 cycle.

7.4.12 Power Outage Detection. The SElect product with the MasterMIND™ monitoring option shall provide visual indication and count of all power outages > 1 cycle.

8.0 APPROVED VENDORS.

8.1 DANAHER POWER SOLUTIONS

Current Technology Products

5900 Eastport Blvd., Richmond, VA 23231-4453 USA

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