**SureImage**

 Imaging and Treatment Series

**Power Conditioner Model Ultra-K/M**

**75K(i) – 225K(i)**

Power Conditioning for Medical Imaging & Treatment Equipment

**Guide Specifications**

 **1.0 General**

This specification defines the electrical and mechanical characteristics that are required for a medical imaging and treatment power conditioning system. The power conditioning system as specified herein includes all the components required to meet the basic power requirements of medical imaging and treatment equipment. The system’s transformer shall be three phase, K13 rated, constructed using all copper windings, triple-shielded, and provided with an output voltage surge protection device (SPD) and high frequency filter. The power conditioning system’s output impedance shall be 2% typical and shall be continuous duty cycle rated and intermittent duty cycle rated, 600 volt class, convection cooled. The power conditioning system’s transformer shall meet and exceed U.S. Department of Energy (DOE) 2016 high efficiency standards identified under DOE 10 CFR Part 431, and comply with the Canadian Energy Efficiency Standard C802.2-12.

1. **Standards**

The power conditioning system shall be designed in accordance with applicable portions of the following standards:

1. U.S. Department of Energy (DOE) 2016 high efficiency standards identified under DOE 10 CFR

 Part 431

1. Canadian Energy Efficiency Standard C802.2-12
2. American National Standards Institute (ANSI C57.110 & C62.41-1991)
3. Institute of Electrical and Electronic Engineers (IEEE 519-1992)
4. National Fire Protection Association (NFPA) 70, National Electrical Code (NEC)
5. Federal Information Processing Standards Publication 94 (FIPS Pub 94)
6. UL Listed to Standard 1561
7. C-UL listed to CSA Standard C22.2, No. 47-13
8. RoHS compliant

**3.0 Submittals**

1. The manufacturer shall supply documentation for the installation of the system, including wiring

 diagrams and cabinet outlines showing dimensions, weights, BTUs, input/output connection

 locations and required clearances.

1. The manufacturer shall be ISO 9001:2015 “Quality Assurance Certified” and shall upon request

 furnish certification documents.

1. The manufacturer shall be a United States based manufacturer with at least 5 years of experience in

 the design and fabrication of power quality equipment for medical imaging and treatment.

1. Factory test results shall be provided to show compliance with the requirements. The manufacturer

 shall include test documentation which demonstrates compliance with the specified requirements

 at continuous and intermittent rated kVA load.

1. The supplier shall furnish (6) equipment submittal copies. Submittals shall be specific for the

 equipment furnished and shall include as-built information.

1. **Manufacturer**

The equipment specified is the SureImage Power Conditioner, Model Ultra-K/M, manufactured by Controlled Power Company.

**5.0 Manufactured Units**

The power conditioning system shall be designed to meet IEC 601-1, Medical Electrical Equipment – Part 1: General Requirements for Safety.

1. Input Specifications
2. The nominal AC input voltage rating of the power conditioner shall be (600 VAC) (480 VAC) (240 VAC) (208VAC) 3 phase with sufficient margin to sustain a constant input of +10% without saturation.
3. The nominal operating frequency shall be 60 hertz + 5%.
4. The power conditioning system primary shall be configured in a three phase delta.

(Transformers rated 75K(i) to 150K(i) shall include full capacity taps at 2.5% increments, two (2) above and four (4) below the nominal voltage tap.)

or

(Transformers rated 225K(i) at 208 VAC or 240 VAC shall include full capacity taps at 5% increments, one (1) above and two (2) below the nominal voltage tap.)

or

(Transformers rated 225K(i) at 480 VAC or 600 VAC shall include full capacity taps at 2.5% increments, two (2) above and four (4) below the nominal voltage tap.)

1. When energized, the current inrush shall not exceed a maximum of 10 times the full load input current for a 1/2 cycle.
2. Output Specifications
3. The nominal AC output voltage rating of the power conditioning system shall be (480 VAC) (208 VAC) wye derived, 60 hertz.
4. The output impedance of the power conditioning system shall be 2% typical at 50% of rated load.
5. The power conditioning system shall be K-13 rated.
6. Performance Specifications
	* 1. Dynamic load voltage regulation shall be 4% or lessfrom no load to intermittent rating and < 2% from typical steady state load to intermittent power demand.
		2. The intermittent kVA rating of the power conditioning system shall be for 15 seconds when followed by a steady state load of < 80% of the continuous KVA rating for 2 minutes, repeated use. Lower steady state load conditions shall allow for a longer Intermittent kVA duration.
		3. The overload rating of the power conditioning system shall be 500% for 10 seconds, and 1000% for 1 cycle (non-repetitive).
		4. The power conditioning system shall add no more than 1% total harmonic distortion to the output voltage waveform at continuous full load rating.
		5. Load generated triplen harmonics shall be attenuated at the primary.
		6. Output voltage shall remain sinusoidal with no flat topping when high crest factor (3.0 : 1), non-linear loads are present at the output.
		7. The power conditioning system’s transformer shall meet and exceed U.S. Department of Energy (DOE) 2016 high efficiency standards. All efficiency values shall be at 35% of nameplate-rated load with a transformer operating temperature of 75C, determined according to the DOE Test Method for Measuring the Energy Consumption of Distribution Transformers under Appendix A to Subpart K of 10 CFR part 431.
		8. The audible noise of the power conditioning system shall be less than 50dB measured at 1 meter.
		9. The power conditioning system’s transformer shall incorporate 3 solid copper foil electrostatic shields to minimize inner winding capacitance and noise coupling between primary and secondary windings.
		10. Common mode noise attenuation shall be 146dB.
		11. Transverse mode noise attenuation shall be 3dB down at 10K Hertz, decaying 40dB per decade.
		12. An integral, fused, 3 phase, secondary connected, 6 mode surge protection device (SPD) shall be provided. The SPD shall be a transient voltage suppression network comprised of high energy metal oxide varistors with less than a 5 nanosecond response time and a maximum peak current handling capability of 40,000 amps (8x20μsec) per mode. The suppression network shall remain functional when subjected to ANSI/IEEE C62.41 Category B-3 waveforms. The SPD shall include a high frequency noise filter that increases the transverse mode noise attenuation to 3dB down at 10kHz, decaying 40dB per decade. A single status indicator light shall be provided to show that the SPD and filter are fully operational and functioning properly.
7. Output Power Ratings
8. 225K(i): The power conditioning system shall be rated for 225kVA repeated

 intermittent use and 112.5kVA for continuous use.

1. 150K(i): The power conditioning system shall be rated for 150kVA repeated

 intermittent use and 75kVA for continuous use.

1. 112.5K(i): The power conditioning system shall be rated for 112.5kVA repeated

 intermittent use and 75kVA for continuous use.

1. 75K(i): The power conditioning system shall be rated for 75kVA repeated

 intermittent use and 45kVA for continuous use.

**6.0 Construction**

1. Main Transformer
2. The transformer windings shall be all copper conductor construction with separate

primary and secondary isolated windings. The transformer shall conform to NEC article 250-5D, that specifies a separately derived power source. The neutral conductor shall be provided at 2 times the ampacity of the phase conductor

1. Copper bus connections shall be provided for isolated three phase output conductors, neutral conductor, and ground.
2. Output neutral shall be bonded to ground via a removable jumper wire or bus bar.
3. All leads, wires and terminals shall be labeled to correspond with the circuit wiring diagram.
4. Basic impulse level shall be no less than 10,000 Volts.
5. Mean Time Between Failure (MTBF) shall be no less than 200,000 hours.
6. Grain oriented, M3 grade, silicon transformer steel with miter cut joint construction shall be utilized. Flux density shall not exceed 15k gauss. Core losses shall be limited to 0.4% or less of the continuous KVA rating.
7. Class N, 200C insulation system shall be utilized throughout with a temperature rise above ambient of 115C, not exceeding 135°C under non-linear loading per UL 1561 standard.
8. The transformer shall be designed for natural convection cooling.

1. Cabinet
2. The cabinet shall be a NEMA type 2 general purpose, floor mounted, indoor enclosure.
3. Cabinets shall be manufactured from 14 gauge steel with base sub-structure suitable for fork lifting.
4. The cabinet shall have a baked on powder coat paint finish with proper pre-treatment.
5. Input and output power connections shall be hardwired to copper bus located behind

 the front panel of the transformer cabinet. Input and output landing locations shall be

 available on either side of the transformer cabinet.

**7.0 Environment**

1. Operating Conditions
2. Temperature: The power conditioning system shall be required to operate without

 overheating in an ambient temperature range of -25°C to +40°C.

1. Humidity: The power conditioning system shall operate in a relative humidity of 0 to

 95% non-condensing.

1. Altitude: The power conditioning system shall operate up to 5000 feet above sea level

 without de-rating.

1. Audible noise: Maximum allowable noise level shall not exceed 50dBA when

 measured at a 1 meter distance.

1. **Options**
2. Options Included
3. SPD with peak surge current capacity rating of 100kA per phase, UL 1449 Listed,

 Type 2, shall be provided. The SPD shall have a nominal discharge current rating of

 20kA, and a short circuit current rating (SCCR) of 200kA. The SPD shall include

 EMI/RFI filtering, Form C relay contacts rated for 2 amps at 30VDC or 250VAC, and

 LED protection status indicators.

1. Main input or output circuit breaker: A molded case, 3 pole circuit breaker shall be

 provided in a separate NEMA 1 enclosure for external mounting and installation.

1. High temperature / over temperature alarm contacts: Thermal warning alarm contacts

 shall be provided within the enclosure for customer hardwired connection. Thermal

 sensors shall be at 180°C and 200°C.

1. IR scanning window: Infrared transparent polymer IR window(s) shall be provided on

 the enclosure for safe routine thermal scanning of transformer connections under load,

 without exposing personnel to arc flash hazards. The IR window(s) shall be industrial-

 grade with a patented reinforced grill, shall be fully impact-resistant, and shall be UL

 and C-UL Listed.

**Engineer’s Note:** IR scanning window option adds 2” to the depth of the 225K(i) enclosure.

1. Lug kit: Mechanical (screw-type) lugs shall be shipped loose for installer convenience.

**Engineer’s Note:** Consult factory for number of conductors per lug and wire range.

 **9.0 Warranty**

The manufacturer shall warrant the transformer (core and coil) to be free from defects in material and workmanship for a period of 1 year full, and an additional 24 years prorated. All other unit components shall be covered by a 2 year full replacement warranty. The warranty periods shall commence following the original factory ship date.