

SURE-TRIP, INC.

PRODUCT EVALUATION

SOLID-STATE RETROFIT KIT

PRODUCT DESIGN PARAMETERS:

All products are designed to meet or exceed NEMA, UL, ANSI and IEEE Standards. As standards change we make changes to comply.

PRODUCT DESIGN TEST SPECIFICATIONS:

1. MECHANICAL:

1.1. CIRCUIT BOARD MATERIALS

All circuit board material must meet NEMA grade FR-4 or G-10 glass epoxy as a minimum and meet UL 796 usage. Circuit board material must also meet UL 94V-O flammability standard.

1.2. CIRCUIT BOARD SPACINGS:

All circuit board conductor spacing must meet UL 489, paragraph 11, table 11.2, and UL 840 Insulation Coordination.

1.3. OPERATING TEMPERATURE RANGE:

All components must be capable of operating at -20 to +70 degrees Celsius with no damage.

1.4. VIBRATION:

All units shall be tested for damage from vibration per UL 991, paragraph 20, table 20.1, Level D.

2. ELECTRICAL:

2.1. RF SUSCEPTABILITY:

All units shall be tested with 5 watts of RF energy at a distance of 6 inches over a frequency range of 30 Mhz to 460 Mhz. Test shall be conducted with power on and unit at 95% full load.

Units shall be subjected to fields with both horizontal and vertical orientations. No abnormal operation should be observed.

2.2 SURGE SUSCEPTABILITY:

All units shall be able to withstand a 3Kv x 50 uSec. surge on the AC input and meet ANSI C37.9 Standards.

2.3 OPERATING FREQUENCY:

All units shall be able to operate at either 50 or 60 Hertz.

2.4 OVER-VOLTAGE:

All units shall operate normally when operated at 110% of nominal operating voltage.

2.5 UNDER-VOLTAGE:

All units shall operate normally when operated at 85% of nominal operating voltage.

2.6 ELECTRICAL NOISE:

All wiring entering and leaving the unit shall be subjected to a showering arc test per NEMA ICS-2-230.

3. CURRENT TRANSFORMER INPUTS:

All units shall be capable of withstanding a current/voltage waveform consistent with that which the intended CT system is capable of delivering at the following limits:

Input 125% 3-phase current with tripping disabled until a stable temperature is reached. There should be no heating of components in excess of 50% of their rated value.

Input 600% 3-phase current for the maximum Long-Time delay (tolerance included) plus 25%, tripping disabled.

Input 1200% 3-phase current for the maximum delay (either Long-Time or withstand Short-Time) plus 10%, tripping disabled.

Input the maximum current with the control set to the maximum withstand delay, tripping enabled.

In all cases, there should be no damage of the current carrying path or electronic components.

4. FLUX-SHIFTER OUTPUT:

All units shall be capable of delivering a current/voltage waveform that is, at a minimum, 125% of that stated to be the maximum current required by the flux-shifter. To be considered is the maximum current required at the intended delivered voltage and the time duration required, to insure proper operation of the flux-shifter. Flux-shifter must have a minimum of 5 pounds holding force to prevent false tripping or shock out tripping.

5. INTER DEVICE PERFORMANCE CONFORMANCE:

All units shall have their operating performance specifications (trip curves, etc.) carefully reviewed against the intended breaker frames' performance characteristics to determine if there are any areas of critical conformance or non-conformance.

Critical Conformance is any area where the trip unit will allow the time-current product to exceed 90% of the breaker frame's maximum time-current limit.

Non-Conformance is any area where the trip unit will allow the time-current product to exceed 100% of the breaker frame's maximum time-current limit.

PERFORMANCE FEATURES:

All trip units must have the following features:

Targets for fault indication.

Long-Time pickup indication.

I squared T short-time function.

Sealed metal enclosure to shield against noise, magnetic interference and contaminants.

RMS measurement, of sinusoidal and non-sinusoidal current, capability.

Circuit design that allows switch adjustments while the breaker is in operation, without tripping the breaker.

Circuit design for protection against RF noise, transient voltage, and harmonic problems.

Sealed, gold contact, rotary switch adjustments that provide precise repeatable settings.

Preferred two year manufacturers product warranty that covers the complete kit.

The finished circuit breaker must be tested and confirmed per the published manufacturers time/current curve through the full range of the logic control settings.

Ground Fault function that works at a definite current pick-up, not a percentage of the current transformer rating.

All power for the retrofit kit must be supplied by the current transformers.

QUALITY ASSURANCE SYSTEM

PURCHASING PROCEDURES:

VENDORS:

All vendors are carefully screened by our Purchasing Department Manager, as to their ability to provide us product for the design life of our unit. Vendors that provide proprietary parts must have a valid security system in place.

MATERIALS:

All materials shall be ordered from approved vendors and from engineering bill of materials. The date codes on all materials must be within one year of the order date. Date codes on all integrated circuits must be within nine months of the order date.

RECEIVING DEPARTMENT INSPECTION:

All materials are visually inspected to insure they conform to the specifications on the purchase order. All materials that conform are forwarded to manufacturing. The receiving department retains a copy of the purchase order and the packing slip for their files.

MANUFACTURING:

MANUFACTURING MATERIALS INSPECTION:

All materials received in manufacturing are randomly tested for quality. All test data is recorded and files are kept in manufacturing. All critical components are tested 100%.

ASSEMBLY PROCEDURES:

All units are assembled per engineering assembly drawings. All units shall be inspected for general construction techniques and adhere to the appropriate IPC Workmanship Standards. All units will have suitable mechanical support for PC Boards, transformers, and large electronic components.

SUB-ASSEMBLY INSPECTIONS:

PRINTED CIRCUIT BOARDS:

Loaded printed circuit boards are visually inspected for defects and then cleaned. After cleaning, all circuit boards are conformal coated and sent to final assembly.

CURRENT TRANSFORMERS:

All current transformers are wound to engineering specifications for each specific breaker application. After winding, all current transformers are 100% electrically tested before being encapsulated.

LATCH ASSEMBLY:

All flux-shifter coils are wound to engineering specifications and tested electrically prior to assembly. All magnets are measured for mechanical fit in the latch frame assembly prior to assembly.

FINAL PRODUCTION TESTING:

SOLID STATE LOGIC CONTROLS:

All logic controls, after assembly, go through a four hour burn-in period. After burn-in, the logic control is placed in a vibration environment for two minutes to ensure the unit will withstand transport and mechanical stress in the field. This vibration test exceeds vibration standards set by UL 991. Upon completion of the vibration test, the unit is 100% electrically tested to engineering specifications. After final testing, the unit will receive a serial number. The serial number is affixed to the logic control and meets standard UL marking regulations. All test data and serial numbers are recorded and retained in manufacturing files.

CURRENT TRANSFORMERS:

All current transformers, after encapsulation, are visually inspected and 100% electrically tested for output. After testing, all current transformers are placed in finished goods. All test data is recorded and retained in manufacturing files.

LATCH ASSEMBLIES:

All latches, after assembly, are electrically and mechanically tested to UL 991, Power Cycling Test, sections 25, 26, and 27.