

Date: June 9, 2008

To: Whom It May Concern

Subject: Manufacturing Quality Assurance Procedures for the Altivar 61 & Altivar 71 AC Drives

This document provides information regarding the quality assurance processes and procedures that are in place for the manufacturing of Altivar 61 (ATV61) and Altivar 71 (ATV71) AC drives. Schneider Electric utilizes quality assurance processes and procedures to verify the integrity of components and the assembly process. Data is gathered on each unit and tracked via the unique serial number of each unit. This document provides a summary of these processes and procedures.

Outline of Test Process and Procedures

Printed circuit board testing, dielectric testing, preliminary memory and functional test, unit operation with burn-in testing, and final verification testing are conducted at various points in the manufacturing process for each drive. All aspects of these tests during the assembly are logged electronically. Each unit is checked and product conformance status is recorded at each test station. Appropriate conformance information is carried in nonvolatile memory within certain printed circuit boards in the unit. The sequence of testing is monitored. Each test station requires a successful bar code scan on entry to ensure each drive has successfully completed any prerequisite test stations.

Printed Circuit Board Testing

Printed circuit boards used in the assembly of the ATV61 and ATV71 under go testing as a part of the board assembly. These tests include:

- In-circuit, component level testing
- Functional power-on testing
- Thermal-cycle stress testing
- High-potential test applied to high voltage boards

Dielectric Testing

This test verifies the dielectric withstand between customer connection points and ground to ensure required isolation barriers are intact. Isolation barriers are typically tested for a duration of one (1) second during which a high voltage is applied according to IEC 61800-5-1 standard.

This station is also used to verify placement of the power circuit connections and verification of the EMC filter.

Preliminary memory and functional testing

During this test, the unit's on-board communication port is utilized to read internal memory and set aside a portion of memory to track the processes performed on the drive and its main components. Each tracked process must have been completed successfully to proceed. These include:

- Supplier performed tests of printed circuit boards with on-board memory.
- Successful drive hi-pot test.

This preliminary memory testing station:

- Verifies product rating verification - comparing the intended rating of the drive as encoded on the barcode label to the rating stored in the drive power board.
- Proper software is installed via the revision levels and checksum value

A product self-test is run to verify functionality of the following drive circuits:

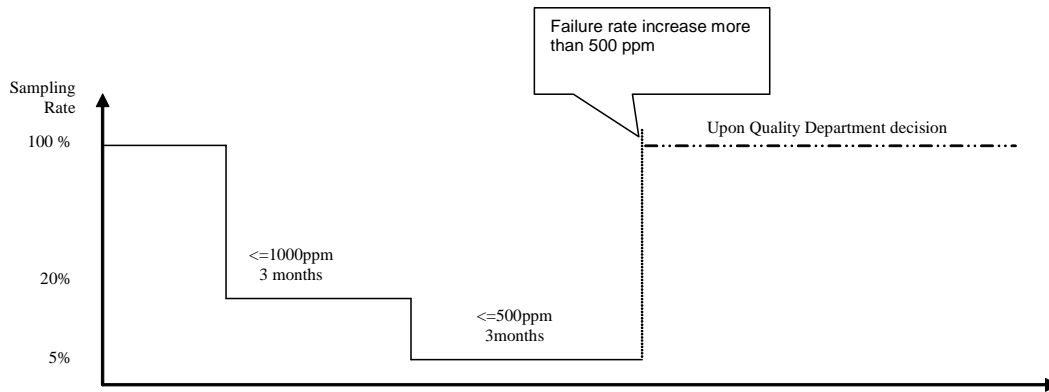
- Pre-charge or soft-start charge circuitry
- Output power transistor stages, including the dynamic braking transistor, when present.
- Bus measurement circuitry
- Output current measurements
- Digital logic inputs and outputs
- Analog inputs and outputs
- Relays
- Power removal circuit function

Unit operation and burn-in testing

Burn-in testing involves four aspects - (I) sample plan, (II) thermal profile, (III) electrical cycling, and (IV) load cycling. Each will vary slightly by the equipment available at each production facility and by the current quality results experienced by each production facility.

(1) Sample Plan

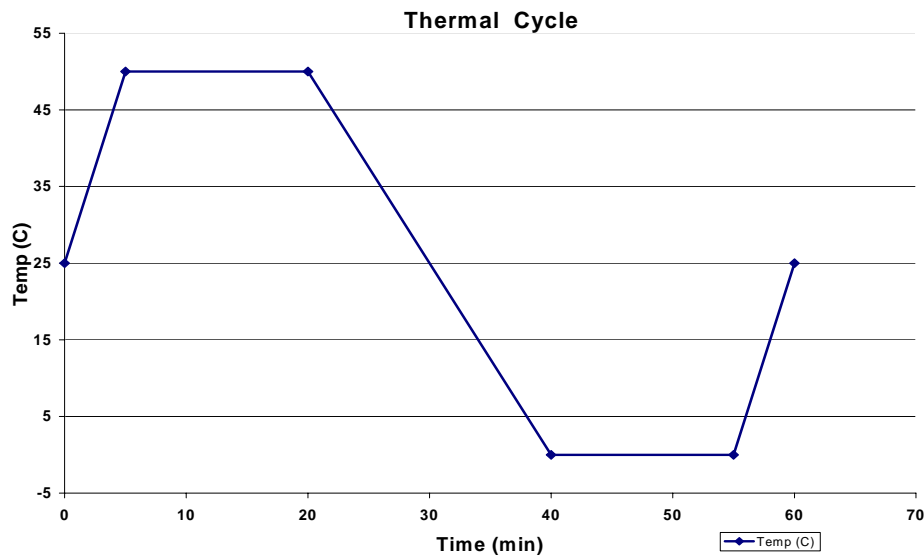
Burn-in is sampled at a rate that varies from 5% to 100%. The rate is based on current quality results for each production facility. Each production facility is required to burn-in at sample rates determined by the following model



(II) Thermal Profile

Two different thermal profiles may be utilized during the burn-in test.

- 1) Constant elevated temperature of 50°C for one (1) hour during which the drive is subjected to electrical cycling for the entire duration of the thermal profile.
- 2) Thermal cycle between 50°C and 0°C for a one (1) hour period during which the drive is subjected to electrical cycling at all times except during the hot to cold transition (to ensure thermal rates are maintained). This thermal cycling profile is as follows:



(III) Electrical Cycles

The electrical cycle runs as defined by the thermal profile allows. An electrical cycle energizes and de-energizes the drive by connecting and removing AC input power. The drive is energized for the duration of a load cycle (typically 160 seconds) and de-energized to allow the drive power supply to shut down (typically 30 seconds). This cycle repeats continuously during the portions of the thermal profile indicated above. This cycle is repeated continuously according to the constraints of the thermal profile.

(IV) Load Cycles

Drives are connected to an inertial motor load during burn-in. When the drive is energized, the drive is cycled between high speed forward and reverse operations. Load cycles are made at a minimum interval of 10 seconds. Acceleration and deceleration rates are 0.1s (minimum). The rates are selected to maximize transition stress such that a functioning drive will perform the profile without generating unexpected faults.

Monitoring during burn-in cycle

The drive fault register and drive speed are monitored conditions during the load cycle. A fault or failure to attain commanded speed results in a failure.

Final verification testing

This test ensures proper operation after burn-in and prepares the drive settings for customer shipment. The following checks are made:

- Process indications that customer terminal analog IO calibrations were performed;
- Verify / re-calibrate bus voltage;
- Verify / re-calibrate output current channels
- Verify / re-calibrate output voltage measurements based on drive configuration
- Instantaneous current fault protection
- Ground fault trip and output phase to phase short circuit detection
- Phase loss detection
- Brake operational check (dependant on drive configuration);
- Drive operation with a motor;
- Fan operation
- Verification of final shipment settings

In addition to the processes and procedures detailed above, test stations have instructions for visual quality check list. This check list includes a physical inspection for proper connections, power component polarities, proper assembly torques, mechanical integrity and proper documentation.

This document provides information regarding the quality assurance processes and procedures that are in place for the manufacturing of Altivar 61 and Altivar 71 AC drives. These are in place to monitor and confirm the quality of the product line that has been designed in from the outset.

Regards,



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