Omni Testing Ltd.

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PRODUCT EVALUATION SUMMARY

FOR: John Kringle
HORTON AUTOMATICS
4242 Baldwin Blvd.
Corpus Christi, TX 78405

REPORT DATE: October 6, 2003
TEST DATE: August 25-26, 2003
REPORT NUMBER: 162-03

OBJECTIVE: To measure and record the airborne contamination levels produced by an automatic sliding door during normal operation, as well as its sub assemblies, and calculate their level of cleanroom compatibility.

UNIT UNDER TEST (UUT): Horton Automatics Sliding Door, Series 2000 Linear Drive, 84"

TEST SETUP: Unit under test was installed in a raised floor Class 1 cleanroom. The doorframe was kept vertical and stabilized by attaching it to two triangular pieces of plywood, with a '2x4 under the door. The wood was then covered with plastic and sealed with cleanroom tape in order to isolate these materials and prevent them from contaminating the cleanroom and door assembly. Before testing commenced, the door's drive motor (C4011-1, unsealed) was removed and replaced with a newer model (C4011-2, sealed) at the request of Horton Automatics. The cleanroom and door assembly was then wiped down with an IPA/water solution to ensure their surface cleanliness. The drive block and rod were not cleaned.

INITIAL TESTS:

1. Cleanroom Background Test: The cleanroom background tests showed that the room is cleaner than Class 1 @0.1μm and provides an excellent environment for testing components for cleanroom compatibility.

2. Door Test (At-Rest): Samples taken with the door At-Rest showed that particles were not being shed from the door materials and it was cleaner than Class 1 @0.1μm.

3. Motor Drive Cleanliness Test: Samples taken below the motor housing with the door cycling showed that few particles were being shed from this area and it was compatible with Class 1 @0.1μm.

4. Door Cycling Test: Samples taken near the slide mechanism showed that the fixed sidelite was compatible with Class 1 @0.1μm and the sliding side was compatible with Class 1,000 @0.5μm.

5. Door "Sniff" Test: Since the highest concentration of particles was found at the linear drive (moving) bearing block, samples were taken near the top edge of the door with the probe

attached to the far end of the fixed sidelite doorframe. This assembly was compatible with Class 10,000 @0.5μm while cycling. It was also found that many particles continued to be shed at this location after the door was set At-Rest. An additional test, which temporarily added vacuum to the upper left opening of the door frame to exhaust the particles being generated, resulted in a significant increase in cleanliness and it was then found to be compatible with Class 1 @0.1μm.

INITIAL RESULTS/CONCLUSION: Cleanliness tests of the door system showed that it is compatible with Class 1,000 @0.5 μm in the Operational Mode, however, much of the door assembly is compatible with Class 1 @0.1μm. Sniff tests with the particle counter probe showed that the bearing block, which slides along the motor-driven rod, sheds many particles. As the door slides open, these particles are "pumped" to the far end of the fixed sidelite panel, flow downward, and contaminate the surrounding cleanroom area.

FOLLOW-UP TESTS:

In an attempt to improve the overall cleanliness of the door system, the linear drive block was removed. An oil-impregnated piece of felt (one on the top side of the block; there was none on the bottom) was removed and the entire block and rod were cleaned with IPA and reinstalled.

FINAL RESULTS/CONCLUSION: Repeating the Door Cycling Test of the door system showed that it is compatible with Class 1 @0.1μm in the Operational Mode. The conditions required to achieve these results were:

a. No lubricants used on the linear drive block.
b. Use of sealed motor (#4011-2)

TESTED BY:

PETER J.B. TEAGUE
CONTAMINATION CONTROL ENGINEER

*The results and information presented in this report are certified to be accurate and complete to the extent possible by equipment and procedures used throughout this test. **OMNI Testing, Ltd.** warrants that the cleanroom and cleanroom system evaluated during this test were operating at the specified levels as shown within this report at the time, and only at the time the tests were conducted. **OMNI Testing, Ltd.** makes no other warranties stated or implied, concerning the continued performance, operation, or safety in the future use of this equipment.*