

## Life Test and Method of Capable Controls 9X Series Ignition Controls

October 16, 2013

Test Start date: 04/01/2013

Test Type: Elevated Temperature Life, 120 °F, 48.9°C.

Product: 9X Series. (DSI type)

Population: ten (10) controls.

Duration 3.8 x10<sup>6</sup> operations minimum, or until failure(s).

3.8 x10<sup>6</sup> operations, equivalent to approximately 10 years in customer equipment.

### Test Method:

Wire ten (10) 9x controls so that they may be cycled and monitored within a temperature chamber, cycling control is to be provided by a PLC allowing independent control of each device under test.

Devices are to be powered by a multiplicity of power transformers to avoid loading affects causing a reduction of applied voltage to the controls under test. No more than two (2) controls are to operated by a single power transformer.

Each device under test is to operate a single gas valve (Honeywell type VR8205) during cycling.

A simulated electronic flame circuit is to be substituted for an actual flame during testing.

The PLC control it to provide ten (10) continuously visible counters that display the total current operations (cycles) for each control under test. The PLC is to also monitor each control for indications of a malfunction of operation, and indicate a fault detected and the operations count at the time of the fault.

### Test Sequence:

- 1). PLC applies power (25 Vac) to a module.
- 2). Spark generation begins, gas valve is operated.
- 3). PLC applies electronic simulated flame to 'Sense' input of control.
- 4). Sparking is terminated, gas valve remains on. Control remains operating for one (1) second.
- 5). The PLC removes power to the control, all control outputs are off.
- 6). Steps 1 – 5 are repeated for each control under test



Far left: PLC power unit and power connections.

Third from left: Siemens PLC w/ counter displays.

Fourth to Eighth from left: PLC controlled power relays. Sequence power to ignition controls.

Below power relays: Power transformers for gas controls.

Bottom array: ten (10) VR8205 gas valves (loads)

#### **Frymaster 9X life test set-up**



Life test shown prior to testing with all controls wired and ready for preliminary test system review.

**Frymaster 9X life test set-up and temperature chamber**

**Current test status:** Controls are all functioning nominally, operation count is approximately  $3.3 \times 10^6$ . Test termination is scheduled at  $3.8 \times 10^6$ , or longer at customers request.

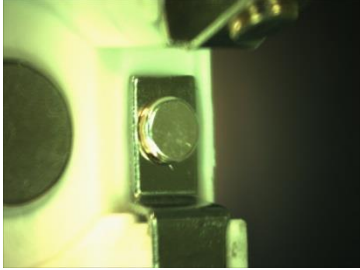
**At Conclusion:** All controls will be tested for timing accuracy, flame sensitivity, Hi-Lo AC line specifications, and general condition. Gas valve relays will be opened and Photomicrographs' will be taken of relay contacts to determine overall durability of the devices.

Customer to be sent final test results with accompanying photos. Sample parts will mad available for inspection, if requested.

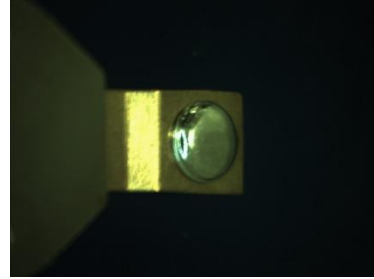
Life Test of Capable Controls 9X Series Ignition Controls, Final Results

November 19, 2013

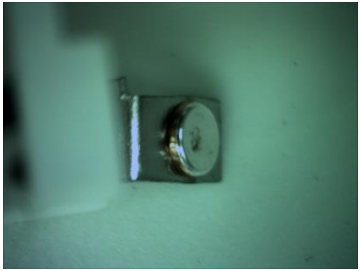
As of Monday November 19, all (10) 9X series controls reached  $4 \times 10^6$  operating cycles at an elevated temperature of  $120^\circ\text{F}$ . No failures of any type were detected during the testing. Additionally, power switching relays (Zettler 942 type) show minimal wear as demonstrated by the photomicrographs 0 through 6.



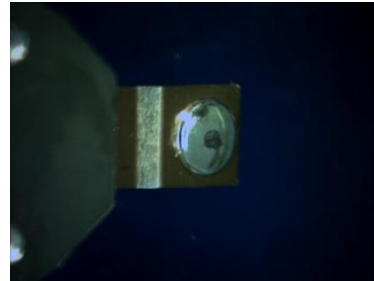
NO of new relay



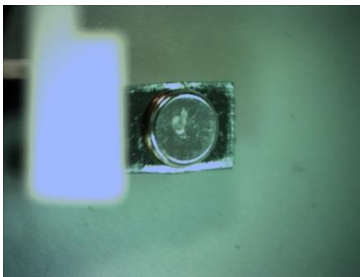
Moving contact new relay #1



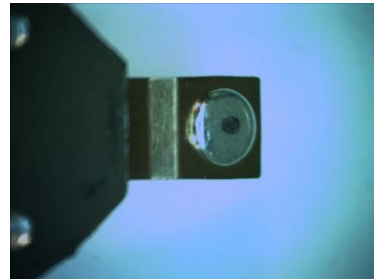
NO of test relay #1



Moving contact of test relay #1



NO of test relay #2



Moving contact of test relay #2

A new Zettler type 942 relay is shown (top most photos) for comparison, as can be seen there is little contact wear displayed in the test relays. Only two samples were photographed as other devices show similar contact wear. All test relays are available for inspection.

Conclusion: Positive results were shown in all facets of the testing process, resulting in zero faults. Power switching relays show minimal wear, it appears that, considerably more cycles could be run without failure.