

# SIGMA

## TESTING SYSTEM

## Advantages of the SIGMA WinCCS System

### *Specifications*

The WinCCS system is a complete creep / stress rupture laboratory testing system that most users rely on to perform all aspects of the laboratory management and testing. Not only does the software fully understand and implement all facets of testing required now, but with a proven track record of continuous development and continuing updates in functionality, it will protect you from obsolescence in the future.

### **WinCCS Meets or Exceeds**

- ASTM E4 Force Verification of Testing Machines. This applies to weight based and load-control testing machines.
- ASTM E8 Tension testing of Metallic Materials. Tube area calculations only.
- ASTM E74 Calibration of Force-Measuring Instruments for Verifying the Forces Indication of Testing Materials. Partial compliance for force measurement in the load control processes of the WinCCS hardware.
- ASTM E83 Verification and Classification of Extensometers.
- ASTM E139 Conducting Creep, Creep-Rupture and Stress Rupture Tests of Metallic Materials.
- ASTM E230 Temperature-Electromotive Force (EMF) Tables.
- ASTM E292 Conducting Time-for-Rupture Notch Tension Tests of Materials.
- ASTM E633 Use of Thermocouples in Creep and Stress Rupture Testing to 1800°F in air.
- ITS-90 International Temperature Scale 1990 revision.
- Pratt Whitney K-72 and K-164.
- GE S-400 in Creep and Stress Rupture testing sections, except for GE's axiality testing.

### **Complete Multi Zone Furnace Control**

The WinCCS control hardware incorporates full independent multi zone temperature control for up to three zone furnaces. The system controls temperature directly from the specimen monitoring thermocouples and automatically adjusts the zone differentials to maintain a uniform temperature across the specimen. Specimen temperatures are continuously logged throughout the test. The temperature measurement meets the requirements of ASTM 633 with its stated accuracy of +/- 0.5°C or 0.9°F on J and K thermocouples, over an ambient temperature range of 15°C to 35°C / 60°F to 95°F.

### **Full Load Control for Stress Rupture and Creep**

The full load control options of the WinCCS system allow you to upgrade existing frames by the addition of a load cell plus relatively simple hardware modifications.

The following benefits are realized by this WinCCS full load-control system.

- Specimen loading occurs immediately after the specimen has soaked for the requested soak period. This means that at times when the laboratory isn't staffed, at lunch or too busy the test will be loaded and started immediately. This represents time savings from several minutes to hours or days.
- The creep hot stepped loading procedure is performed automatically, without the potential for slipped weights causing excessive plastic strain, thereby invalidating the test.
- Stress rupture uploads are performed automatically by the system whether operators are present or not.
- This capability has been in use since 1998 at various laboratories using the WinCCS system. The newest feature is constant stress, constant strain and stress relaxation testing support. This adds compliance with ASTM E328 for stress relaxation testing.

### **Support for Notched, Plain & Combination or Combo Specimens**

- When testing notch specimens with associated plains, the specifications usually allow for termination of the notch based on plain hours. This saves considerable testing time and the complete understanding of these interrelated tests is built into the WinCCS system. When a notch specimen is started on the system it may be referenced to the associated plain specimen by either test ID, frame number or actual plain specimen hours. The notch may then be terminated when it reaches the associated plain specimen's hours. The data may be called up as combined or a single report.
- The system is designed to directly handle all of the aspects of combination specimen testing. When a combination specimen terminates the operator is asked for a rupture location. If the specimen has a notch rupture the operator is asked if they wish to rethread and continue the specimen. If the operator decides to have the specimen rethreaded, this specimen is automatically queued into the specimen restart queue. The specimen would go to the machine shop, be rethreaded and returned to the laboratory. The specimen can be selected and started on any frame in the laboratory for completion. On completion, a complete record of the related tests is generated. Reference ASTM E292 Conducting Time-for-Rupture Notch Tension Tests of Materials.

### **Notch and Associated Plain Specimens Can Be Split Between Two Frames**

The system allows the user to split an associated plain and notch specimen, into two tests on separate frames. These two frames are cross-referenced in the software. See section 1.4.

### **Data Accuracy and Integrity**

The standard WinCCS hardware has a high-speed creep data acquisition rate of up to sixteen readings per second. This allows testing of very high creep rate specimens or accurate tracking of the initial creep of a specimen. The acquisition rate is user controlled and has two settings: A first or initial creep rate, followed by a secondary creep rate. A user-defined time to remain in the initial creep rate is also accessible in the test specification. The standard onboard battery backed up RAM of the WinCCS frame controller buffers in excess of 9000 readings for transmission to the host computer. Memory expansion is available to increase that to over 35000 readings or 36 minutes at 16 readings per second. This same reading buffering technology saves the readings in the battery backed up RAM during power failures. Assuming a more reasonable reading rate of one per minute is used, this means that a standard WinCCS frame controller has enough RAM to buffer up to six days of readings without host intervention. See section 1.2.

### **Built-in Check for Smooth Loading**

A built-in algorithm, which separates plastic from creep strain, enables tests to be rejected where operators have not loaded the specimen with sufficient care. This may be examined real time and a long-term test halted if badly loaded. This saves valuable testing time and potential embarrassment.

The WinCCS system fully supports step loading of creep tests right from the initial loading of the specimen. During this loading operation the individual stress and strain application steps are recorded and saved in the test file. Once the

loading operation is complete, the specimen modulus is completed and the data examined for yielding of the specimen. If yielding is detected, then the amount of plastic deformation is recorded and saved. The system maintains the plastic deformation during loading as a separate value from the creep and therefore can provide either creep or total plastic strain data at any time. Excessive plastic strain values and nonlinear stress / strain loading curves are flagged to the operator when the specimen is loaded to let them know that there was a problem detected.

### **Data Protected From Computer Crashes**

The distributed processor architecture ensures data cannot be lost or misplaced. Data buffers on each frame allows up to six days' worth of data to be captured before downloading to the PC. Even if the six days is exceeded than the data buffer management is such that the test data is not lost, but may still be downloaded to the PC with a loss of time-based resolution. If a PC fails the system will still log data and control the tests for up to six days to get another PC restored and running. See section 1.5.

### **Local Hardware Interface For Each Frame.**

A fully functional hardware is available at each test frame. This helps minimize errors of frame identification and saves the operator time in not having to walk back and forth to the PC to carry out routine tasks. In addition, help is available on the panel at each frame.

### ***The Software and Architecture are Proven Reliable***

#### **Large Existing Customer Base**

WinCCS systems are in active use by aircraft engine manufacturers, metals suppliers and independent testing laboratories throughout the world. Many of these organizations have benefited from the ongoing development of the product and have been able to progressively upgrade their systems.

#### **What You Need is Already Written and De-Bugged**

The WinCCS system is a complete creep / stress rupture testing package, that has many thousands of hours of testing and a large user base. This means that you can install the system in your laboratory and be testing on a proven system immediately.