SIGMA TESTING SYSTEM

Overview

The new **SIGMA** Testing System is yet another giant leap forward in Creep and Stress Rupture testing from Applied Test Systems. The new system encompasses new machines, control hardware and WinCCS software.

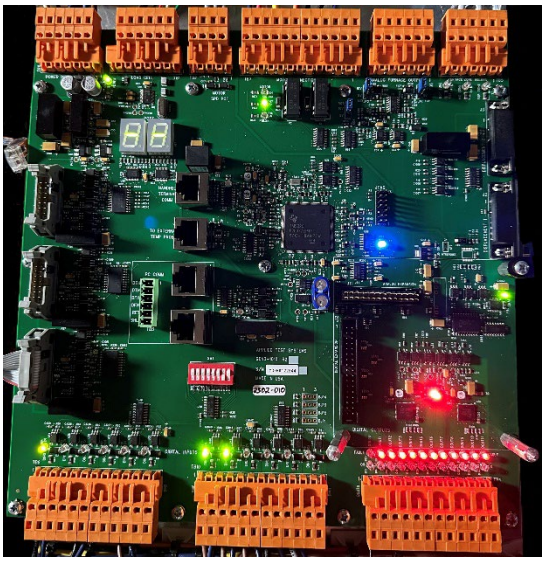
Gen 3 Hardware:

Faster Microcomputer: Faster single chip microcomputer with built in memory and program storage flash memory. The new processor is over 100 times faster than the GEN1 / GEN2 processors. This improves all aspects of the controller's operation.

Advanced Speed Controls: Previous systems had the manual load speed potentiometer connected to an external motor controller. This led to many test issues where customers did not reset the manual potentiometer back to normal running position when starting a test. The new system has a direct input for the manual load speed potentiometer, so the software determines when to use the input from it. This prevents any issues with operator error.

Temperature and Humidity Sensor: A tester mounted laboratory NIST traceable temperature and humidity monitor has been added which is automatically logged by the system with the test data, so users have a continuous record of the laboratories temperature and humidity embedded in their test data. This same sensor is used to capture the ambient conditions during calibration and verification procedures.

Improved Thermocouple Measurement: These new units also have a faster thermocouple reading rate of 30 readings per minute versus GEN1 / GEN2 one reading per minute. This significantly improves furnace response after transient events, such as short-term power failures.



Cold Stepped Loading: Cold Stepped Creep loading has been added which allows an operator to cold load the specimen at any time before a test is started and obtain a report. This allows the operator to evaluate the extensometry setup before starting the test. This cold load may also be specified as part of the actual test as a further check of extensometer setup.

Stepper Motor Drive: New integrated Stepper Motor control for more precise load control and hot / cold stepped loading. The new stepper motor control is a huge leap in load control capabilities allowing precise load control and stress relaxation tests to be handled on the same machine.

Improved Load Measurement: Improved load cell measurement system which allows faster load control adjustments.

Sampling rate: Improved data sampling rates 60 per minute or once per seconds.

Super Capacitor: The new hardware uses a super capacitor instead lithium battery for calendar clock backup. This means no batteries to replace, and no shipping restrictions placed on the actual hardware. By removing Lithium batteries, the control boards can now be shipped via air anywhere and spare boards do not have a battery shelf life.

Solid State Memory: Solid state ferro magnetic FRAM is utilized for reading and test parameter memory instead of lithium battery backup RAM. This provides a far better storage mechanism for readings in the event of a PC failure. Note: This memory is used for reading storage when the host computer is offline.

Fault Display: Digital onboard fault display provides advanced diagnostics enabling faster troubleshooting.

32-bit Encoder I/F: New 32-bit optical digital encoder measurement interface, that future proofs the hardware for longer and/or higher resolution optical digital encoders.

Analog Outputs: Analog outputs for furnace control used for high temperature furnaces with analog power controls.

Light Bar: Manufacturing style light bar to clearly show the machine and/or test status from most locations throughout the lab.

Cyclic Stress Testing Option: Allows the user to specify a cyclic unloading of the specimen during the test. The operation can be specified to be for the entire test or a specific number of cycles. This option combined with the **SIGMA** controller allows for higher speed data acquisition during the actual load and unload of the specimen so that an accurate profile can be graphed of the load on the specimen.

Stress Relaxation Option: Performs Constant Stress, Constant Strain or Constant Strain per ASTM E328. The new **SIGMA** Controller with it's higher speed computing, data acquisition and stepper load train control allow for precise controls in stress and strain mode previously unattainable.

Gen 3 Portable Display:

OLED Display: High resolution OLED display improves visibility in all lighting conditions.

Jog Controls: Machine Jog Controls with indicator LEDs.

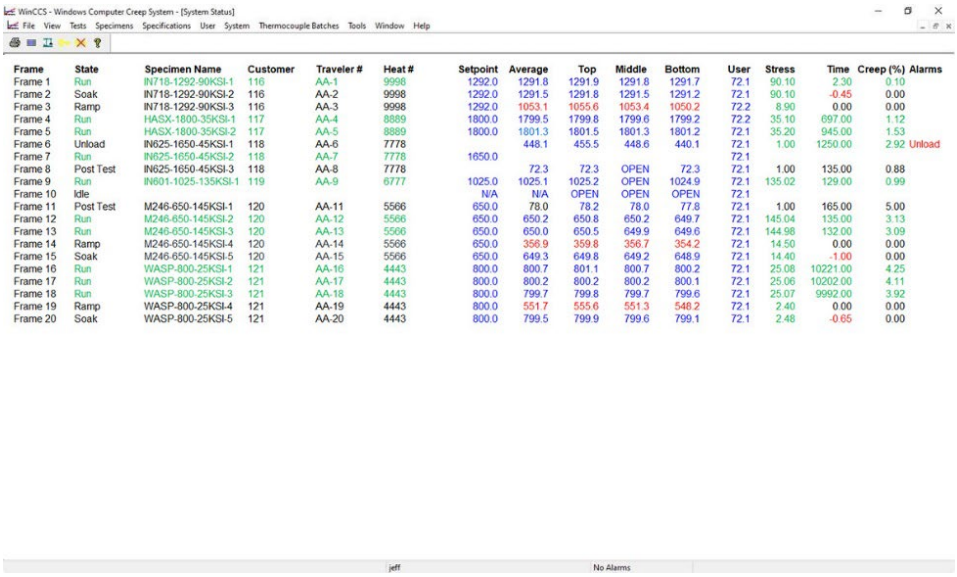
Faster Microcomputer: Faster processor for smoother display operation.

Backwards Compatible: Works with GEN2 and GEN3 controllers.

Languages: Directly supports many language fonts.

Version 8 WinCCS

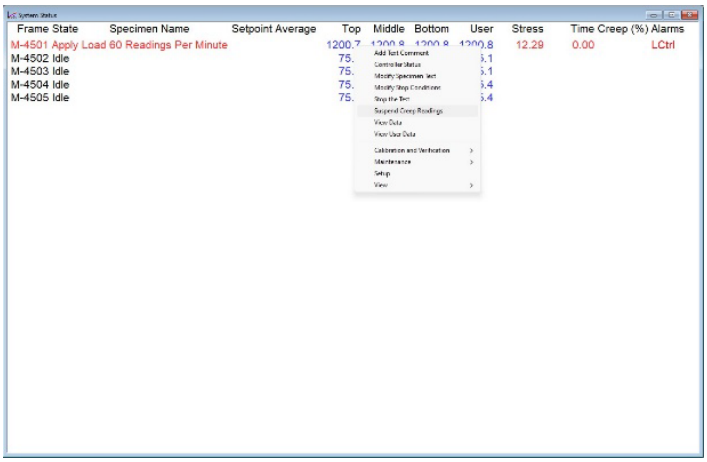
Optional LIMS Integration: An optional Laboratory Information Management System (LIMS) integration feature has been added to the WinCCS system. This allows a customer's LIMS system to import specimen, test specification, specimen measurements, thermocouple batch information, etc. to the WinCCS system and also export complete test records to the LIMS. All of the data exchange is via XML data files to ease implementation. The LIMS integration also supports bar code scanning of specimen bags to reduce errors.

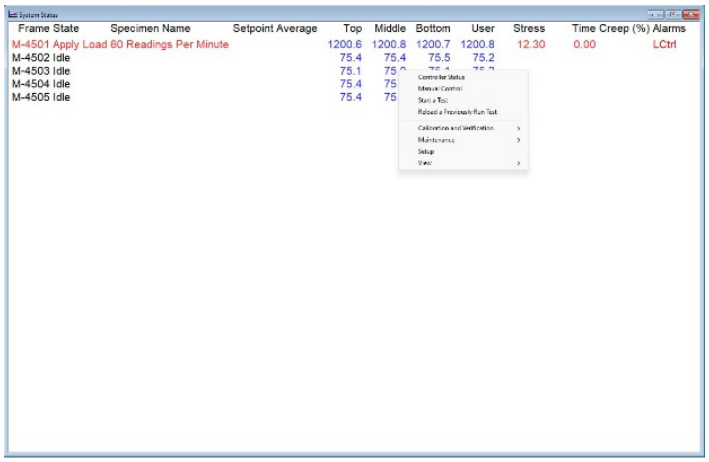


Frame	State	Specimen Name	Customer	Traveler #	Heat #	Setpoint	Average	Top	Middle	Bottom	User	Stress	Time	Creep (%)	Alarms
Frame 1	Run	IN718-1292-90KSI-1	116	AA-1	9998	1292.0	1291.8	1291.9	1291.8	1291.7	72.1	90.10	2.30	0.10	
Frame 2	Soak	IN718-1292-90KSI-2	116	AA-2	9998	1292.0	1291.5	1291.8	1291.5	1291.2	72.1	90.10	-0.45	0.00	
Frame 3	Ramp	IN718-1292-90KSI-3	116	AA-3	9998	1292.0	1053.1	1055.6	1053.4	1050.2	72.2	8.90	0.00	0.00	
Frame 4	Run	HASX-1800-35KSI-1	117	AA-4	8889	1800.0	1799.5	1799.8	1799.6	1799.2	72.2	35.10	697.00	1.12	
Frame 5	Run	HASX-1800-35KSI-2	117	AA-5	8889	1800.0	1801.3	1801.5	1801.3	1801.2	72.1	35.20	945.00	1.53	
Frame 6	Unload	IN625-1650-45KSI-1	118	AA-6	7778		448.1	455.5	448.6	440.1	72.1	1.00	1250.00	2.92	Unload
Frame 7	Run	IN625-1650-45KSI-2	118	AA-7	7778	1650.0					72.1				
Frame 8	Post Test	IN625-1650-45KSI-3	118	AA-8	7778		72.3	72.3	OPEN	72.3	72.1	1.00	135.00	0.88	
Frame 9	Run	IN601-1025-135KSI-1	119	AA-9	6777	1025.0	1025.1	1025.2	OPEN	1024.9	72.1	135.02	129.00	0.99	
Frame 10	Idle					N/A	N/A	OPEN	OPEN	OPEN	72.1				
Frame 11	Post Test	M246-650-145KSI-1	120	AA-11	5566	650.0	78.0	78.2	78.0	77.8	72.1	1.00	165.00	5.00	
Frame 12	Run	M246-650-145KSI-2	120	AA-12	5566	650.0	650.2	650.8	650.2	649.7	72.1	145.04	135.00	3.13	
Frame 13	Run	M246-650-145KSI-3	120	AA-13	5566	650.0	650.0	650.5	649.9	649.6	72.1	144.98	132.00	3.09	
Frame 14	Ramp	M246-650-145KSI-4	120	AA-14	5566	650.0	356.9	359.8	356.7	354.2	72.1	14.50	0.00	0.00	
Frame 15	Soak	M246-650-145KSI-5	120	AA-15	5566	650.0	649.3	649.8	649.2	648.9	72.1	14.40	-1.00	0.00	
Frame 16	Run	WASP-800-25KSI-1	121	AA-16	4443	800.0	800.7	801.1	800.7	800.2	72.1	25.08	10221.00	4.25	
Frame 17	Run	WASP-800-25KSI-2	121	AA-17	4443	800.0	800.2	800.2	800.2	800.1	72.1	25.06	10202.00	4.11	
Frame 18	Run	WASP-800-25KSI-3	121	AA-18	4443	800.0	799.7	799.8	799.7	799.6	72.1	25.07	9992.00	3.92	
Frame 19	Ramp	WASP-800-25KSI-4	121	AA-19	4443	800.0	551.7	555.6	551.3	548.2	72.1	2.40	0.00	0.00	
Frame 20	Soak	WASP-800-25KSI-5	121	AA-20	4443	800.0	799.5	799.9	799.6	799.1	72.1	2.48	-0.65	0.00	

HTML Reports: HTML Reports, which allows easy report export to clients. HTML formatting is a recognized standard for documents that allows the reports to be easily emailed and viewed in a web browser.

Status Display: New system status display with context sensitive menus allows faster navigation to control functions by testing machine.





Furnace Logging: New furnace logging routines with additional parameters logged.

"Date","Avg Tmp","Ctrl T/C","S.P.","Rate","Err","Pwr","P Term","I Term","D Term","% STop","% SMid","% SBot","% Top","% Mid","% Bot","Top T/C","Mid T/C","Bot T/C","Wall T/C","ACV","Iso Tmp"

Running Test Modifications: Modify test termination parameters on a running test.

Creep Loading Validation: Additional checking has been added to the Hot and Cold Loading reports to programmatically determine if a test may have extensometer setup or binding issues. After the test is hot stepped loaded the system will evaluate the loading data and if any issues are detected it will show the test frames data in red, indicating an issue and display an “Hid” in the Alarms column. The test will continue normally, but this alerts the operator that this test should be examined to determine if it should be continued.

Elongation Methods: Added the 4D, 4W, 5D, 5W, and two custom elongation methods.

Time Resolution: Increased time resolution from seconds to mS to allow for the faster data acquisition rates of the **SIGMA** Hardware.

Compatibility: Fully supports all previous and current WinCCS hardware.

Languages: New language support features that integrate the language prompts into the code base thereby eliminating the prompt file issues of having version mismatches in the prompt files. The new language capability also supports multiple languages. This same method is also incorporated into the GEN3 hardware firmware eliminating the need for long prompt file downloads.

Setup: System setup improvements that allow frame setups to be copied to ease large system deployment.

Load Calibration and Verifications: Improved load calibration / verification routines that allow for multiple runs as required in ASTM E4.

Test Specifications: Improve the test specification editor to clarify the shutdown and pass-fail requirements for discontinue tests.

System Status: New system status file. The previous versions wrote a system status file in CSV format every minute for external systems to use for reporting test status. Version 8 adds three types of system status files as detailed below:

Pre Version 8 CSV Format:

Lab Number, State, Average Temperature, Time in Hours, % Creep

New CSV Format:

Frame, Lab Number, State, Average Temperature, Time in Hours, % Creep, Load, Top, Middle, Bottom and User.

Version 8 XML Format:

System Status: The system status file allows user systems to access the system status. Previous versions had a simple CSV format with limited parameters. Version 8 allows the choice of the original, enhanced CSV or and XML file. The XML file contains the most amount of information and should be used for any new implementations.