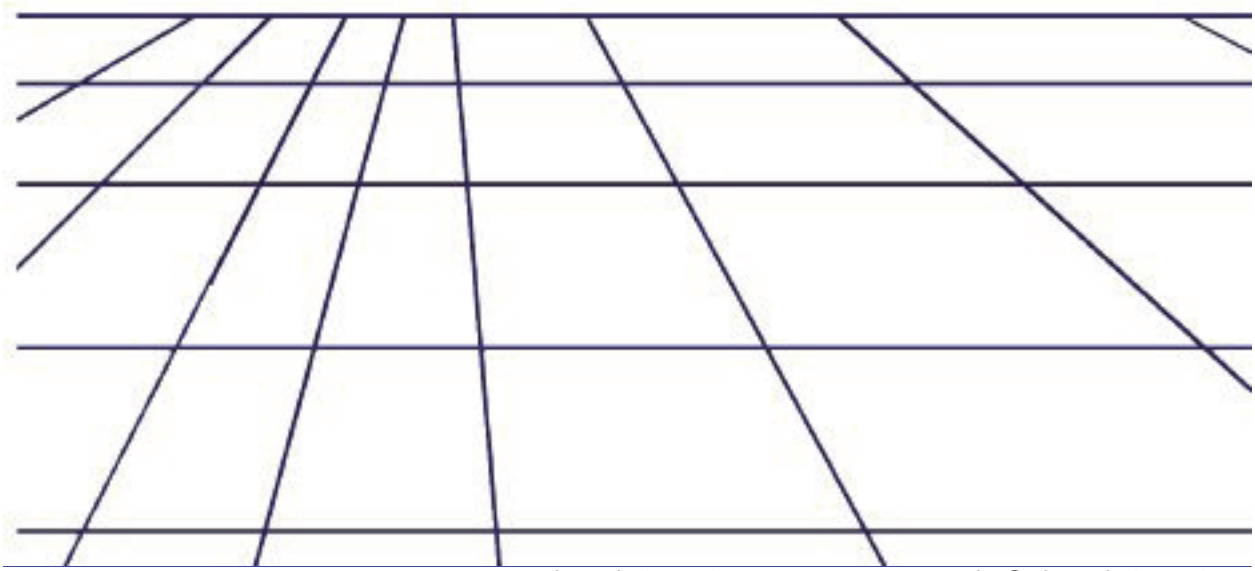
Mechanical Test

- High Strain Rata Material Test Equipment
- Material Creep Test Equipment
- Stress Corrosion Cracking (SCC) Test Equipment
- Universal Electromechanical Materials Test Equipment
- Mechanical Analysis
- Mechanical & Material Application Tester



A6 Series Lever Arm Creep Testing Machines

Features:

- Wide-frame construction
- Easy operation
- Four-position hardened knife edges
- Precision drawhead guide assembly
- Automatic beam leveling
- Weightless specimen loading
- Durable vibration isolator
- Vee-block supports
- Tool steel knife edges, easy replacement
- Hot-step loading, stress relaxation, constant stress, and more via A6-DAS frame control data logging system with A6-AP Win application software
- Option Weightless Loading Module

Applications:

- Creep tests
- Creep rupture tests
- Stress rupture tests
- Stress relaxation tests
- Constant stress tests
- Creep crack tests
- ISO 204:1997, ASTM E 139-06
- Definition of individual step less sequences of temperature
- Ambient or elevated temperature
- For long term tests (reaching more than 10.000hrs)
- Machine test and laboratory

Description:

A6 Series Lever Arm Creep Testing Machines is make up of modern creep and stress rupture test frames. After decades of hard work, these sturdy and durable systems have been tested by our clients, their consistent accuracy and reliability have been consistently confirmed by researchers and users.

The powerful standalone A6-DAS frame control data logger system and A6-AP Win application software, are frames that meet virtually all of creep testing requirements, both now and in the future.

A6 Series Creep Test Frame system is fully developed and designed by AI and third parties engineering team. From mechanical hardware to measuring tools and electronic equipment, controllers and software, we possess and pride ourselves of having high reputation on the performance accuracy of the equipment and can support customers with various testing requirements. Existing AI own and third parties equipment upgrade and modifications are also highly accepted by our customers. For more information and many other capabilities, please refer to the details on A6-DAS frame control data logger system.

A6 Series Creep Test Frame are servo control precision knife-edge lever arm testers with optional advanced Weightless Loading Module, SSRT Module, UTM Module, etc that can incorporate many of advanced design features.

A6 Series Lever Arm Creep Testing Machines

Specification: A6 Load Lever Arm Load Frames

AI A6 Lever Arm Creep Test Systems are enhanced by a wide range of optional accessories and frame configurations. These features and components include:

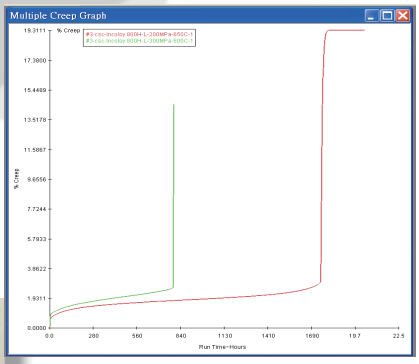
- Frame accessories: Load Train Compartments with Alignment Couplings, Adaptors, Specimen Grip, Compression Test Fixtures, etc.
- Environmental Test Equipment: Furnaces, Ovens/Cooling Chambers, Retorts.
- Instrument accessories: Extensometer Frames, Displacement Sensors, Signal Conditioner, etc.
- Test Control modules: Weightless Loading Module, Stress Relaxation Module, Constant Stress Module, etc.

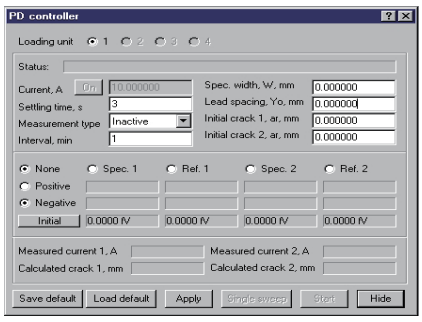
	A6 Creep Testing Machine Frame			
Model	A6-30M	A6-50M	A6-100M	A6-200M
Capacity	30kN	50kN	100kN	100kN
*Lever Arm Rations	30:1	50:1	100:1	100:1
*Colum Width	480 mm	560 mm	560 mm	770 mm
Approximate Dimension W x D x H (mm)	900x520x2150	1170x520x2250	1250x620x2300	1550x620x2450
Drawhead Drive Speed	2.5-30.5 mm/min, Travel: 130 mm			
Load Accuracy	0.5% (down to 1% of Capacity, with certificate of calibration)			
Power Requirements	115 or 230 Vac, 50/60 Hz			
*Custom frames with varying size, draw head and arm ratios ects are provides.				
**AI also provide many kind Direct Load Testing, If any needed contact with us.				

- Calibrated load weights

Available Sizes (Metric Units, kgw or N)

0.5 ± 0.0005 N,	25.0 ± 0.0075 N
1.0 ± 0.0008 N,	50.0 ± 0.012 N
2.5 ± 0.0014 N,	100.0 ± 0.019 N
5.0 ± 0.0026 N,	150.0 ± 0.024 N
10.0 ± 0.0048 N,	200.0 ± 0.029 N





A6 Series Lever Arm Creep Testing Machines

Specification: A6 Load Train Accessories

A6 Lever Arm Creep Test Systems has a wide range of selective components, frame accessories and frame configurations, these accessories are precision-machined to meet toughest international standards.

Load Train Components include:

- Couplings (Alignment)
  Quick-Change Coupling
  Spherical Bearing Coupling
  Quick-Change Spherical Bearing Coupling
  Double Knife-Edge Alignment Couplings
  Electrical Isolation Alignment Couplings
  High-Temperature Alignment Couplings

- Adaptors
  Pull Rods
  Threaded Adaptors
  Studs

- Specimen Grips
  Threaded Couplings (Rod Specimen)
  Button-head Couplings (Rod Specimen)
  Clevis Couplings (Sheet/Rectangular Specimen)
  Wedge Couplings (Sheet/Rectangular Specimen)
  Compact Tension Test Clevis (CT Specimen) ASTM E399

- Compression Test Fixtures
  3 point bend test fixtures
  4 point bend test fixtures
  Ring on Ring bend test fixtures

- High-Temperature Components Materials:
  17-4 PH Stainless Steel
  High temperature Alloys, 713C, MAR-M246, Inco 718, etc.

- Weight elevators
  Motor Drive, Air/Hydraulic drive
  Manual lead screw drive

A6 Series Lever Arm Creep Testing Machines

Specification:

Extensometer frames / Displacements Sensors / Sensor Conditioners

AI designs and manufactures standard as well as custom-made extensometer frames for a wide choice of creep hot tensile/compression test applications.

- Creep Testing Extensometer Frame
  (Maximum Temperature: 1100℃)
  - T112 Extensometer Frame
    Interchangeable specimen inserts
    Four-rod construction
  - T114 Extensometer Frame
    Cone pointed set screws for specimen attachment
    Four-rod construction
  - T121 Extensometer Frame
    Interchangeable specimen inserts or cone pointed set screws
    Dual Rod in tube construction

- Creep Testing Averaging Extensometer Frame
  (Maximum Temperature: 1100℃)
  - T124 Averaging Extensometer Frame
    Interchangeable specimen inserts
    Dual rod in tube construction
    Dual gauging platforms that provide adjustable gauge lengths
    12 to 100 mm
  - T128 Averaging Extensometer Frame
    Interchangeable specimen inserts
    Six rod construction
    Dual gauging platforms that provide adjustable gauge lengths
    12 to 100 mm

- CT Crack Length Testing Extensometer Frame
  (Maximum Temperature: 1100℃)
  - T122 CTT Extensometer Frame
    Crossheads designed to attach to CTT Specimen groove
    Single rod in tube construction

- Tensile testing Testing Extensometer Frame
  (Maximum Temperature: 1100℃)
  - T112-T Extensometer
    Interchangeable specimen inserts
    Four-rod construction

- Test on Retort Testing Extensometer Frame
  (Maximum Temperature: 1100℃)
  - T115 Extensometer
    Designed for high temperature creep testing within Retort
    Interchangeable specimen inserts
    Four-rod construction

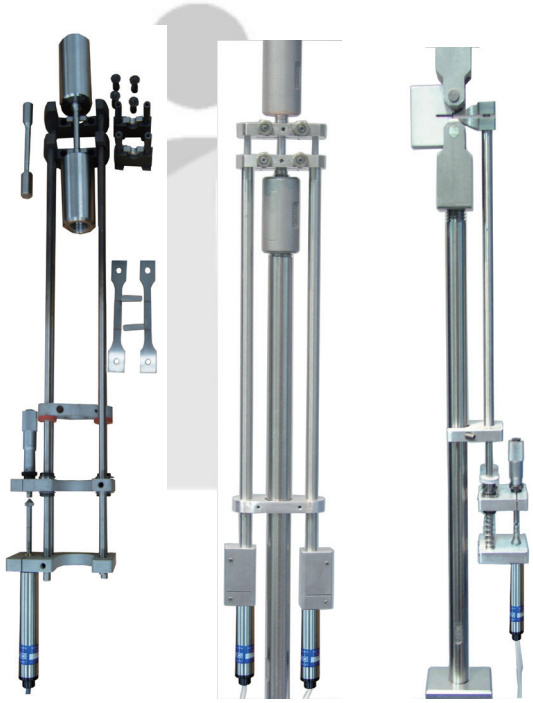
- Plastic Creep Testing Testing Extensometer Frame
  (Maximum Temperature: 425℃)
  - T311 Extensometer
    Designed for creep testing of plastic and similar materials
    Dual Rod in tube construction

- Testing and Aligment Checking Frame (Room Temp.)
  - T116 Creep Testing and Aligment Checking Extensometer

All Extensometer Frame Gauging (Sensors) Platforms designed for various types of displacement transducers or clip on extensometer.

- Displacement Sensors
  Force Displacement Sensor , LVDT, Digital Encoder, SLVC,
  Digital Dial Gage, Analog Dial Gage,
  Axial Extensometer (Tensile testing) etc..
  Crack measurement instrument, DC/AC PD

- Displacement Sensors Signal Conditioner
  All kind of displacement sensor conditioner modules for data logger system.



A6 Series Lever Arm Creep Testing Machines

Specification: A6-DAS frame control data logger system and A6-AP Win application

A6-DAS frame control data logger system and A6-AP Win application software, are frames that meets virtually all of creep test requirements, both now and future.

A6-DAS frame control data logger system consists an embedded controller, a touch-screen display, a precision measurement unit, and a temperature control unit.

Each creep machine has an independent control unit and recording unit. It can be completely offline upon set up and operated by the touch screen display.

The A6-DAS frame control data logger system is an integrated system designed to replace cumbrous, time consuming and error-prone manual operating procedure, control equipment set-up, and data collection methods on test equipment adjustment controls inherent in long-term tests.

A6-DAS is equipped with modern touch-based embedded and decentralized control systems. It has complete testing machine control and data acquisition functions with real-time drawing functions.

The LCD touch panel displays essential test information and operator instructions, and are equipped with controls for frame, temperature controller, data logger, weight elevator operation, etc.

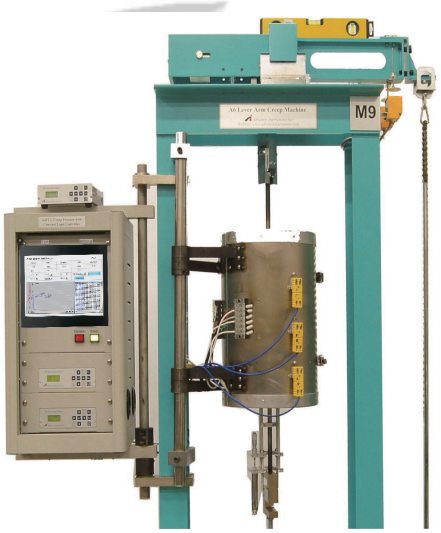
It's high capacity 128GB FLASH MEMORY is completely designed for various types of long time mechanical tests. This feature has standalone independent embedded control and data recorder.
The recording device is designed to adapt to various conditions such as power interruptions encountered during long-term tests. It has the best security on long-term reliability and accuracy.

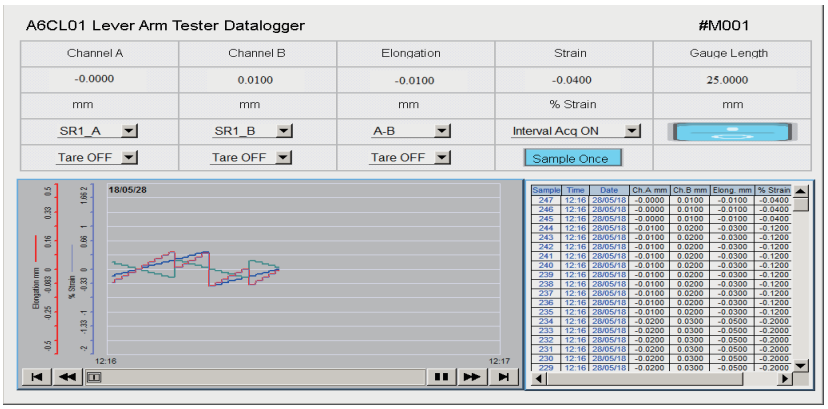
The A6-DAS has network TCP/IP communication capabilities. It can be link to hundreds of testing machines with the network system, and monitoring the status of each test at the remote site. Optional camera can also be installed to monitor overall machines performance. While with the use of TCP/IP, the whole test monitoring, including weight elevator; temperature control; accessories calibration; data acquisition control; etc. can be done remotely.

A6-DAS with A6-AP software can be use to perform post and aft analysis functions such as measurement, recording and curve mapping.

The A6-AP software package operates on a PC compatible computer running on Windows"' NT, Win7 operating system.

The A6-DAS consoles also provide TCP/IP reliable interface between frame hardware, accessories, and the host computer.





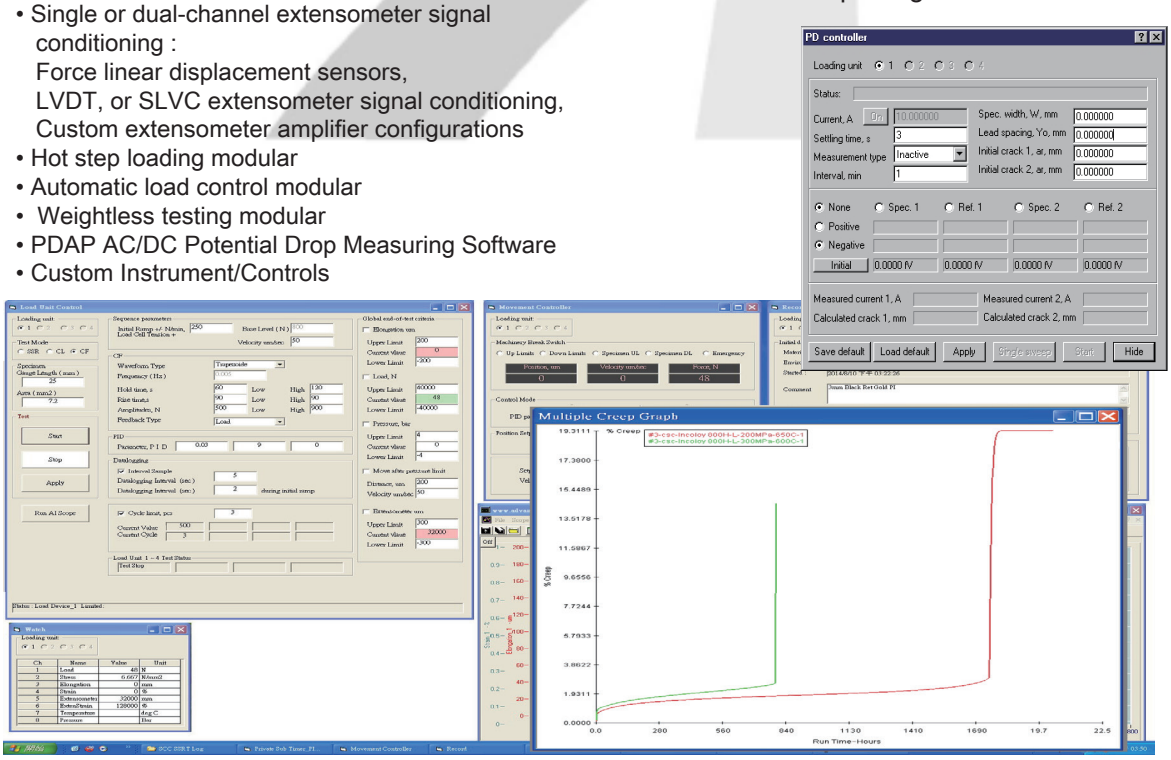
A6 Series Lever Arm Creep Testing Machines

Specification: A6-DAS frame control data logger system and A6-AP Win application

- A6-DAS frame control data logger
  - A6-DAS (Standard Interfaces/Controls)
    - User Interface
      - 7" or 10" color LCD Touch Panel
      - HD 128GB FLASH
      - TCP/IP
    - Frame Controls
      - Automatic inch-down or drawhead control
      - Specimen break detection.
      - Elevator control
    - Extensometer (Displacements)
      - Adaptor to LVDT, SLVC, Laser, custom extensometers
      - Can be both channels from averaging extensometers
    - Furnace temperature control
      - 4 thermocouple input channels
      - One, two, or three zone furnace temperature control
      - Furnace power control
      - PID power control system
      - High-resolution thermocouple A/D
      - Multi-zone PID algorithms for precise temperature control.
    - High-level inputs
      - 4 input channels
      - Extensometer, temperature transmitter, etc.
    - Alarm
      - Furnace control
      - Automatic shutdown
    - Data log for all input channels

  - A6-DAS (Optional Instrument/Controls)
    - Single or dual-channel extensometer signal conditioning :
      - Force linear displacement sensors,
      - LVDT, or SLVC extensometer signal conditioning,
      - Custom extensometer amplifier configurations
    - Hot step loading modular
    - Automatic load control modular
    - Weightless testing modular
    - PDAP AC/DC Potential Drop Measuring Software
    - Custom Instrument/Controls

- A6-AP Win application software
  - Test Specifications
    - Test editor for creating and modifying procedures
    - ASTM standards E4, E8, E83, E139, E292, and ISO
  - Instrument Calibration
    - Extensometer calibration to ASTM E83
    - Thermocouple calibration correction.
  - Data Logger
    - Identification frame serial number maintains
    - Export all data associated with each trial
    - Instant access and reporting
    - Data is ASC II (*.csv)
  - Graphs/Plot
    - Creep, creep modulus, creep rate
    - Cold load, hot load; temperature
    - Multiple-specimen
  - Reports
    - Short/long form, Events
    - Calibration data for extensometers and thermocouples
    - Cold load, Hot load
    - Test specification
    - Creep data
    - System setups
  - Security
    - Multi-level password protection determines each user's privileges



High Temperature Split Tube Furnace

Features:

- Machine Test and Laboratory
- Faster heat up
- Longer element life
- Lower shell temperatures
- Complete line of accessory
- Low watt-density heating elements
- Low K-factor vacuum-cast ceramic fiber i nsulation
- Wide variety of diameters, lengths, sizes, and configurations
- Easy replacement of failed elements
- Precise, Efficient, and Reliable
- Made to Customer Specifications
- Saving you time and money
- Heating elements Nichrome: 1850° F (1000° C)
- Optional elements Kanthal A1: 2200° F (1200° C)

Applications:

- General laboratory
- Machine Test
- Use for testing to ASTM standards
- Universal testing machines
- Creep/stress rupture test
- Stress corrosion cracking test
- High strain rate material test
- Bend fatigue test machines

Description:

Advance Instrument Inc. (AI) Series 4110 Tube and 4210 Split Tube Furnaces have been carefully designed and refined over many years to make them one of the most reliable and efficient laboratory furnaces available on the market today.

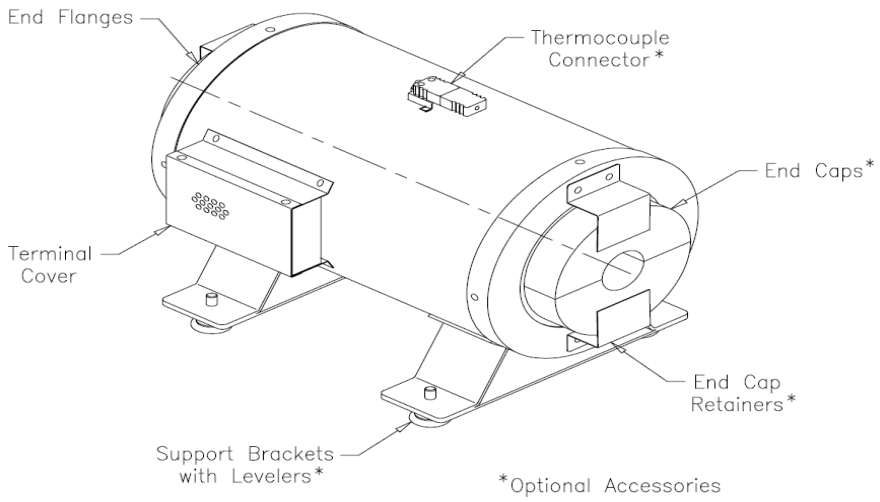
Standard construction features include low K-factor vacuum cast ceramic fiber insulation for superior energy retention and rigid structure, stainless steel shell and end flanges for both durability and appearance, and laboratory-replaceable heating elements manufactured under strict quality-controlled conditions in our own factory.

All Series 4110/4210 furnaces are built-to-order to your specific requirements, with a wide selection of available diameters, lengths, mounting arrangements, and accessory equipment, in a variety of configurations, including isothermal, gradient, adiabatic, and others.

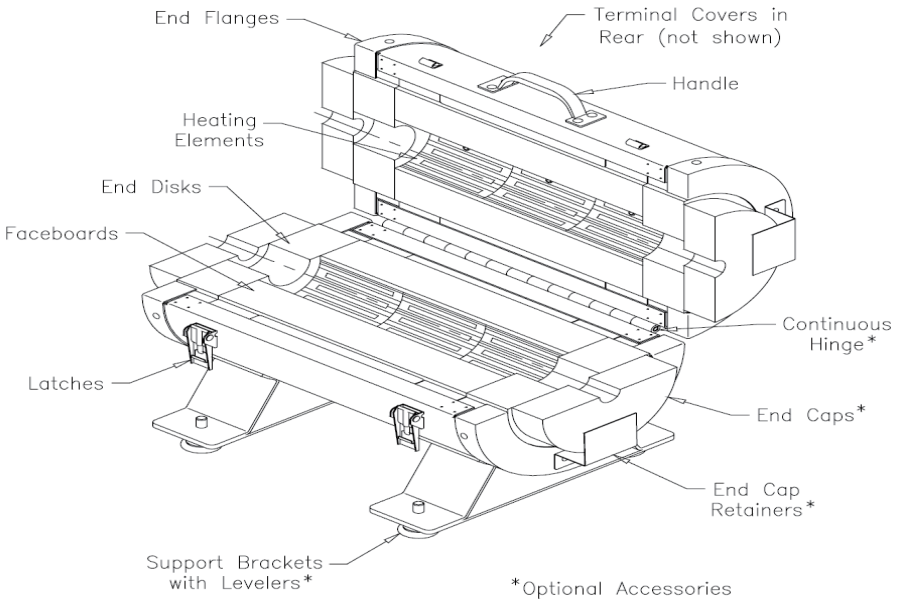
Available options and accessories include heat-equalizing liners, extensometer slots and mounting flats, thermocouples, end caps, view ports, gas ports, cast bronze or brass heating elements, retorts, and more.

High Temperature Split Tube Furnace

Specification: Series 4110/4210 Furnace



Series 4110 Tube Furnace 1100° C Maximum



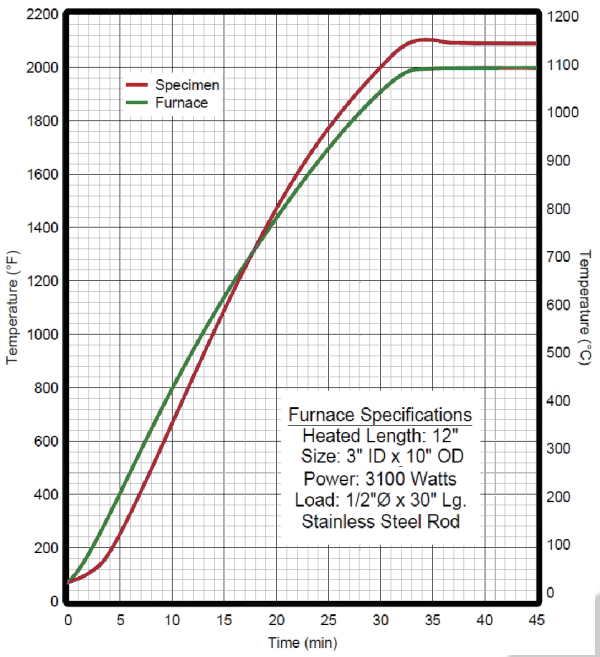
Series 4210 Split Tube Furnace 1200° C Maximum

High Temperature Split Tube Furnace

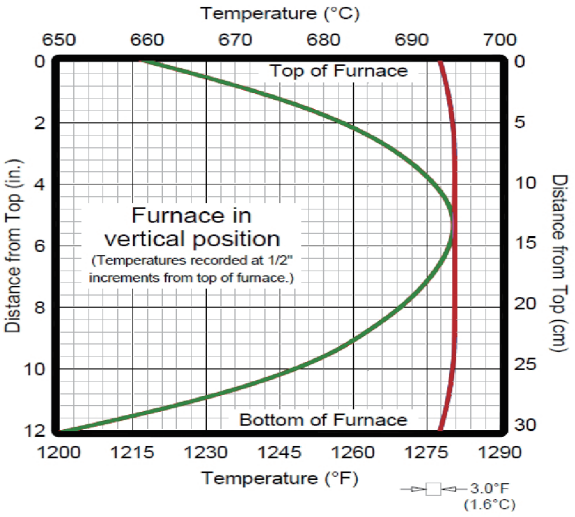
Specification: Series 4110/4210 Furnace

- Creep Testing Furnaces For the ultimate in precise temperature control and uniformity, AI furnaces can be combined with our exclusive computer creep system.
  This industry-leading hardware/software package automates every aspect of the creep testing process, including control, data acquisition, archiving, analysis, report generation, and much more.

Typical Heatup Curve



Uniformity Curves
(Isothermal and Gradient Furnaces)



Isothermal curve: Three-zone furnace in a creep testing setup under digital control.

Gradient curve: Large gradient achieved with three-zone furnace and appropriate control system.

Other sizes supplied on request Length & zone construction made to order Heating elements and temperature range:
Nichrome: 1850° F (1000° C)
Kanthal A1: 2200° F (1200° C)

Typical 4110/4210 Furnace Sizes		
For service to	For service to	For service to
1650° F (900° C)	2000° F (1100° C)	2200° F (1200° C)
"ID" x "OD"	"ID" x "OD"	"ID" x "OD"
19.1mm x 152.4mm	19.1mm x 203.2mm	19.1mm x 254.0mm
25.4mm x 152.4mm	25.4mm x 203.2mm	25.4mm x 254.0mm
31.8mm x 152.4mm	31.8mm x 203.2mm	31.8mm x 254.0mm
41.1mm x 203.2mm	41.1mm x 254.0mm	41.1mm x 304.8mm
50.8mm x 203.2mm	50.8mm x 254.0mm	50.8mm x 304.8mm
60.5mm x 203.2mm	60.5mm x 254.0mm	60.5mm x 304.8mm
76.2mm x 203.2mm	76.2mm x 254.0mm	76.2mm x 304.8mm
95.3mm x 254.0mm	95.3mm x 304.8mm	95.3mm x 355.6mm
127.0mm x 254.0mm	127.0mm x 304.8mm	127.0mm x 355.6mm
139.7mm x 304.8mm	139.7mm x 355.6mm	139.7mm x 406.4mm
152.4mm x 304.8mm	152.4mm x 355.6mm	152.4mm x 406.4mm
177.8mm x 304.8mm	177.8mm x 355.6mm	177.8mm x 406.4mm
209.6mm x 406.4mm	209.6mm x 457.2mm	209.6mm x 508.0mm
304.8mm x 508.0mm	304.8mm x 558.8mm	304.8mm x 609.6mm

High Temperature Split Tube Furnace

Accessories : End Caps & Port Plugs, Temperature Sensors

- End Caps & Port Plugs

AI furnaces are commonly supplied with removable and replaceable ends caps or port plugs.

These relatively inexpensive accessory items extend furnace life by absorbing “wear and tear” caused by the movement of fixtures, reactors, pull rods, etc., thereby preventing damage to the furnace insulation, which is considerably more expensive and time-consuming to replace.

AI end caps and port plugs are also useful in situations where a number of different-sized bore diameters are required.

They can be easily interchanged, allowing a variety of possible configurations for a single furnace.

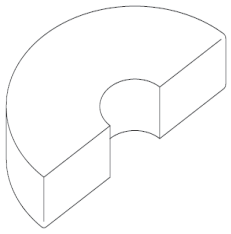


Fig. 1: End Caps

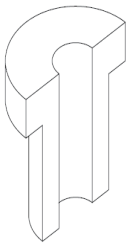


Fig. 2: Port Plugs

- Temperature Sensors

Furnaces from AI can be equipped with a number of different thermocouple types in a variety of mounting configurations.

Thermocouple connectors feature standard ANSI color coding and are available in types J, K, B, R, S, and Platinel-II.

Common mounting configurations include single connector with mounting bracket, duplex connector with mounting bracket, spring loaded for constant contact with a reactor or other vessel, and sealed for use in controlled-atmosphere furnaces, retort

T/C Type	Alloy Combination (+/−)	Max. Temperature	Limits of Error	Comments
ANSI "J"	Fe/Cu−45% Ni	1100°F (590°C)	2.2°C or 0.75%	Reducing, vacuum, inert. Limited use in oxidizing at high temperatures. Not recommended for low temperatures.
ANSI "K"	Ni−10% Cr/ Ni−2% Al−2% Mn−1% Si	2200°F (1200°C)	2.2°C or 0.75%	Clean oxidizing and inert. Limited use in vacuum or reducing. Wide temperature range. Most popular calibration.
ANSI "B"	Pt−30% Rh/Pt−6% Rh	3272°F (1800°C)	0.5% above 800°C	Oxidizing or inert. Do not use in metal tubes. Beware of contamination. High temperature. Common use in glass industry.
ANSI "R"	Pt−13% Rh/Pt	2700°F (1480°C)	1.5°C or 0.25%	Oxidizing or inert. Do not use in metal tubes. Beware of contamination. Precision high temperature.
ANSI "S"	Pt−10% Rh/Pt	2700°F (1480°C)	1.5°C or 0.25%	Oxidizing or inert. Do not use in metal tubes. Beware of contamination. Precision high temperature.
Platinel−II	Platinel−II/Platinel−II	2200°F (1200°C)	1.0%	More stable but more expensive substitute for type "K" thermocouples.

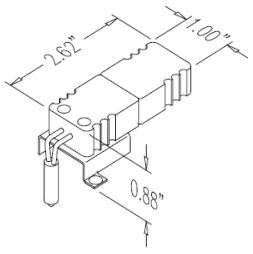


Fig. 3: Single Bracket

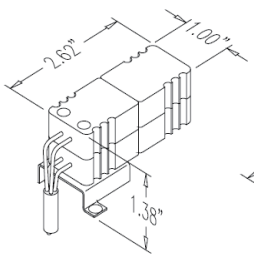


Fig. 4: Duplex Bracket

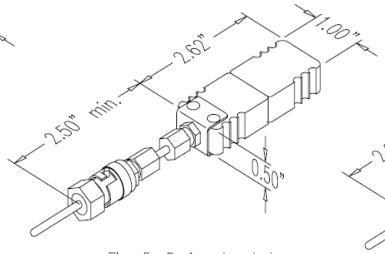


Fig. 5: Spring-Loaded

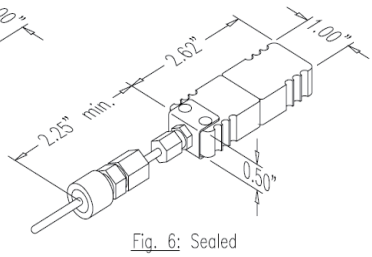


Fig. 6: Sealed

High Temperature Split Tube Furnace

Accessories :

Extensometer Flats & Slots, High Temperature Sample Supports, Zone Dividers

- Extensometer Flats & Slots

When performing creep, stress-rupture, and other tests, it is often necessary to have one or more precision extensometers in place to record dimensional changes that occur in a specimen throughout the process.

While some extensometers are designed to hang vertically from a specimen to take these measurements, many are intended to contact a specimen from one side, requiring a specially-configured furnace to provide clearance for the extensometer and, in some cases, to also provide support for it.

AI has extensive experience in designing such furnaces to suit extensometers from nearly every major supplier. When ordering, please have the information shown in Figure 1 (right) available:

a) distance from surface of fl at to center of furnace;
b) height of fl at;
c) size (width & height) of access slot;
d) sizes & locations (if necessary) of tapped holes for mounting of the extensometer. If available, please also provide the manufacturer and model number of the extensometer being used.

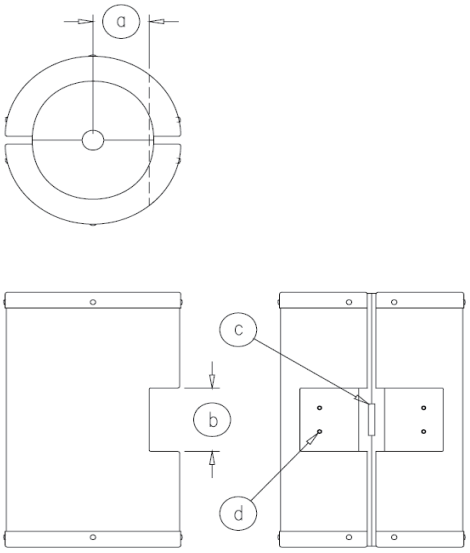


Fig. 1:
Split tube furnace constructed for extensometer mounting

- High Temperature Sample Supports

For laboratory tests or industrial procedures that do not involve test frames, it is often necessary to have some method of providing support for samples or products that must be heated. AI meets this need with custom sample supports, specimen holders, and high-temperature pallets made from stainless steel or Inconel for use with fork trucks.

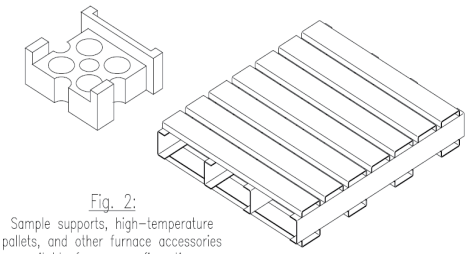


Fig. 2:
Sample supports, high-temperature pallets, and other furnace accessories suitable for any configuration.

- Zone Dividers

Some heating applications involving gasses, liquids, or other substances require a sharp temperature gradient between furnace heating zones.

In such cases, AI furnaces can be constructed with insulating zone dividers to accommodate the required temperature difference

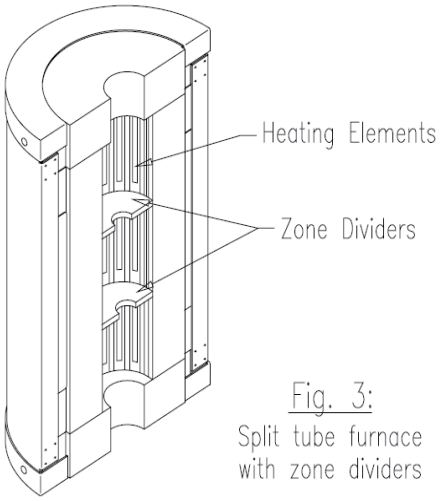


Fig. 3:
Split tube furnace with zone dividers

High Temperature Split Tube Furnace

Accessories : Element Protection Shields, Sealed Terminal Covers, Perforated Heat Shields, Heat Equalizing Blocks, Access Ports

- Element Protection Shields

Upon breakage, some specimens or samples can create flying debris inside a furnace chamber.
Other processes involve reactor vessels with high-pressure liquids or gasses, creating the possibility of pipe rupture.

In such cases, internal element protection shields are recommended to prevent damage to furnace heating elements.

Al tube and split tube furnaces can be supplied with either solid or perforated sheet metal shields, or they can be constructed with embedded ceramic tubes.
Contact Al to discuss the best option for your application.

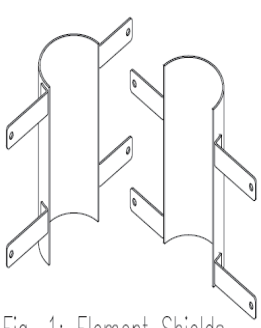


Fig. 1: Element Shields
(for split tube furnaces)

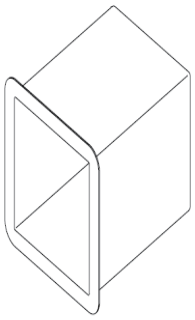


Fig. 2: Protective Liner

- Sealed Terminal Covers

When heating processes are being conducted in hazardous or corrosive environments, or where required by safety codes, Al furnaces can be supplied with sealed terminal covers. Sealed covers feature high-temperature silicone rubber gaskets and are supplied in either cast aluminum or formed stainless steel, depending upon the size, type, and power rating of the furnace.

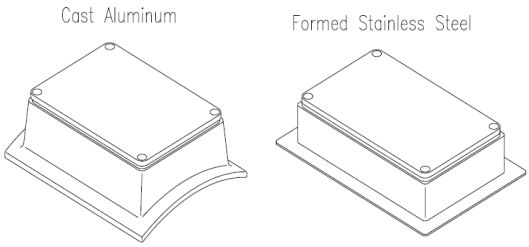


Fig. 3: Sealed Terminal Covers

High Temperature Split Tube Furnace

Accessories : Element Protection Shields, Sealed Terminal Covers, Perforated Heat Shields, Heat Equalizing Blocks, Access Ports

- Perforated Heat Shields

AI furnaces are designed for maximum efficiency and low external shell temperatures.

However, those who have experience working with high-temperature equipment know that any furnace will be relatively hot on the outside during operation and that appropriate safety precautions must be taken.

While this situation is acceptable in most laboratory environments, many manufacturing facilities that use AI equipment must meet stringent safety requirements for the protection of their workers.

To satisfy this need, AI furnaces can be supplied with external perforated sheet metal screens, which significantly reduce an operator's exposure to hot surfaces on the furnace shell.

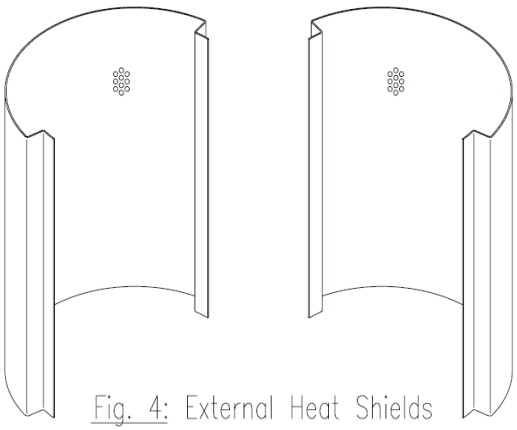


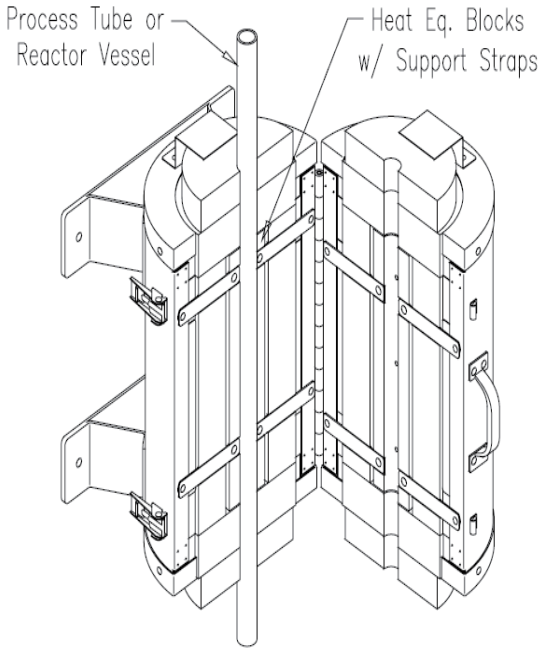
Fig. 4: External Heat Shields
Available for tube or box furnaces, solid or split, in a variety of configurations.

High Temperature Split Tube Furnace

Accessories : Element Protection Shields, Sealed Terminal Covers, Perforated Heat Shields, Heat Equalizing Blocks, Access Ports

- Heat Equalizing Blocks

Some applications require extreme temperature stability. Achieving this goal requires the addition of a stabilizing thermal mass, or core, to the inside of a heat zone.



AI furnaces can meet this need with the addition of heat equalizing blocks to help ensure that maximum temperature uniformity is maintained, either in a single furnace zone or along the entire length of a furnace. Though virtually any metal can serve as a core material, the most common alloy used in AI furnaces is AMPCO-18 cast aluminumbronze, chosen for its relatively high operating temperature (1100 ° F/600 ° C maximum) and its excellent thermal conductivity. Other materials that have been or could be used depending upon the process involved include stainless steel, aluminum, copper, nickel alloys such as Inconel, and others.

Common applications for heat-equalizing blocks include petrochemicals research, pilot plant development, gas and liquid pyrolysis, calibration, viscosity testing, and crystal growth. Custom blocks can be designed for use with any AI furnace and can include such additional features as thermocouple ports, cooling ports, removable blocks with lifting handles, etc.

- Access Ports

Because all AI furnaces are built-to-order, nearly any variety or type of access port can be placed wherever necessary to suit your requirements.

Types of ports include gas inlets and outlets, purging ports, cooling and vent ports, thermocouple ports and thermowells, load train ports, metal-lined ports, or whatever else your specifications demand.

High Temperature Split Tube Furnace

Mounting: Test Frame Mounting Assemblies, Structural Frames, Vertical Support Columns, UTM Baseplate

- Test Frame Mounting Assemblies

AI offers a number of standard test frame mounting assemblies, as shown on the following pages.

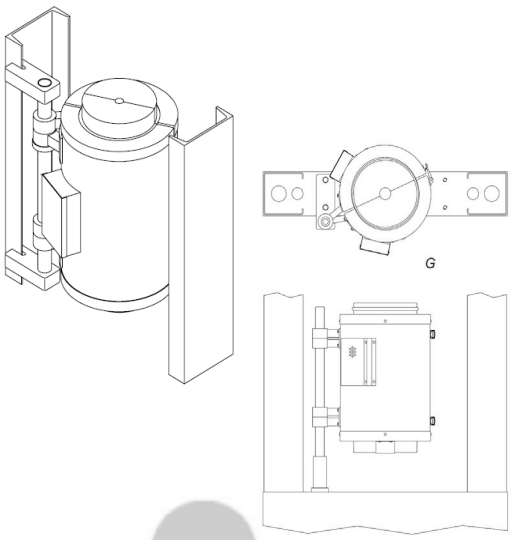
Mounting assemblies are suitable for use with tube, split tube, and split box furnaces and can be reversed for either left-hand or right-hand operation.

The accompanying diagrams demonstrate two-column test machines, but each assembly can easily be adapted to fit four, six, or any number of test frame support beams or columns.

As always, custom mounting inquiries are welcome.

- UTM Baseplate

Many universal testing machines do not provide a suitable means of mounting a furnace.
In such cases, a miniature baseplate with furnace bar can be mounted to the lower crosshead of the machine, as shown in figure G.



G) UTM Baseplate Mounting Assembly:
Shown is a single pivot mounting assembly with a baseplate bracket. Any of the mounting assemblies on this page can be accommodated in this way.

High Temperature Split Tube Furnace

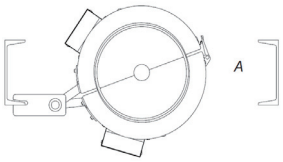
Mounting: Test Frame Mounting Assemblies, Structural Frames, Vertical Support Columns, UTM Baseplate

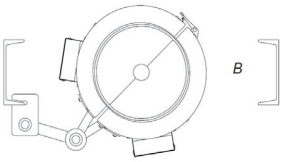
- Structural Frames

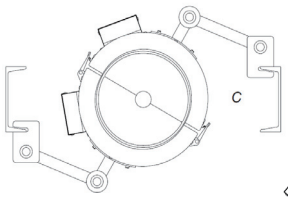
Many systems, including creep testing frames, industrial support structures, and “homemade” laboratory test frames, use structural steel beams in their design.

AI produces a wide array of structural frame clamps, furnace bar brackets, and mounting brackets to fi t such configurations.

These components form the basis for mounting assemblies A, B, and C, shown at left.



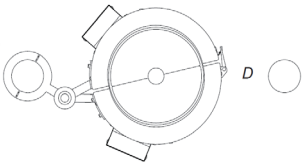


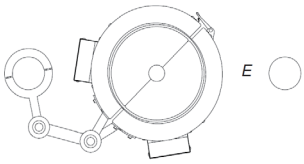


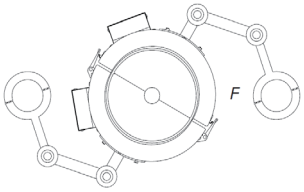
A) Single Pivot Mounting Assembly:
This is the simplest and least expensive option for vertical mounting of a furnace on a structural frame.

B) Double Pivot Mounting Assembly:
Offering more versatility than a single pivot mounting assembly, this option allows some adjustment in the location of the furnace centerline, and it allows the furnace to easily swing out of the way when not in use.

C) Dual Double Pivot Mounting Assembly:
With both furnace halves able to move freely, this mounting assembly offers maximum versatility in setting up load train components and tests.
This configuration is also sometimes the only suitable option in restricted-space situations.







- Vertical Support Columns

Universal testing machines, fatigue testers, and other systems often feature vertical columns in their design.

AI produces mounting assemblies for these machines which are similar to the structural frame mounting options on the preceding page.

Vertical-column mounting assemblies are shown at left in figures D, E, and F.

D) Single Pivot Mounting Assembly:
Similar to figure A on the previous page.

E) Double Pivot Mounting Assembly:
Similar to figure B on the previous page.

F) Dual Double Pivot Mounting Assembly:
Similar to figure C on the previous page.

High Temperature Split Tube Furnace

Accessories : Temperature Control Systems

- Complete Temperature Control Systems:
  Shown above are examples of complete single and multi-zone furnace temperature control systems. Available features include cabinets with rack-mount panels, transformers, SCR units, gas/cooling supply systems, and other options.

  Whatever your specific application may be, AI has the knowledge and experience to build a control system to suit all of your needs.
  PC software for computerized configuration.

- Temperature Control Systems
  It is obvious that a furnace can only be as precise as its control system.
  Since the beginning, therefore, AI has placed great emphasis on providing complete, accurate temperature control systems using only the highest-quality components.

  AI currently specializes in control systems using the three units shown below, which have been selected for their accuracy, versatility, and reliability.

  Custom control systems are also available using any major-brand temperature controller, including Honeywell, Watlow, SHIMAX, OMRON, and others. Consult an AI sales engineer to discuss your ideal temperature control system.

- SHIMAX MAP6A / MAC6A Series Digital Controller (96 x 96 mm)
  - •High Accuracy 0.1%Fs + 1 digit.
  - •Program MAX 96steps 8patterns. (MAP6A)
  - •MAX 4zone PID control.
  - •Universal input. (Thermo couple RTD, DC voltage, DC current)
  - •Sampling Period 50msec, 166.7msec, 250msec, 500msec.
  - •PV-SV multi points compensation. (MAX11 points)
  - •Space-saving Design : Panel depth 65 mm

MAC6A (W96×H96mm) MAP6A (W96×H96mm)

CE

High Temperature Split Tube Furnace

Accessories : Temperature Control Systems

- OMRON E5CN-H (48 x 48 mm)
  Advanced Digital Temperature Controller
  A New High-performance Controller: High Resolution, High Speed, andHigh Input Accuracy.
  Logic Operations and Preventive Maintenance Function.
  - High-resolution display with 5 digits/0.01° C display in a compact Controller (48 x 48 mm).
  - High-speed sampling cycle of 60 ms.
  - High Accuracy Thermocouple/Pt input: ± 0.1% of PV, Analog input: ± 0.1% FS
  - Universal inputs on all models (thermocouple, PT, or analog input) to handle various sensors with one Controller.
  - A PV/SV-status display function can be set to automatically alternate between displaying the status of the Temperature Controller (auto/ manual, RUN/ STOP, and alarms) and the PV or SV.
  - Flexible contact outputs with logic operations (AND, OR, and delays) set from the Support Software (CX-Thermo Ver. 4.0)
  - Preventive maintenance for relays in the Temperature Controller using a Control Output ON/OFF Counter.

48 × 48 mm
E5CN-H

DCPD-U50 Ultra Precision DCPD Crack Growth Monitor

Features:

- Continuous DCPD
- Pulsed DCPD as standard
- Ultra Precision Differential signal amplifier with high bandwidth up to 10k Hz
- Gain Accuracy ± 0.1%,
- Gain : 20 ~ 50,000 by rotary switch, Accuracy 1%
- Triggering function, peak, trough, time interval and mid-point of load cycle waveform input.
- High Current O/P, up to 50A.
- Plug-in module
- Automatic bridge balance, with EEROM to preserve balance without power
- Built-in with four-pole Bessel low-pass filter with cutoff frequencies of 1 Hz, 10 Hz, 100 Hz, 1k, 10k Hz and wide-band
- Variable DC offsets and auto balance for the removal of standing voltages
- Two channels as standard, reference and specimen.

Applications:

- Dynamic Material Test
- Strain/Stress Analysis
- Dynamic Material Elasticity Testing
- Fatigue crack initiation
- Dynamic crack growth studies
- Condition monitoring
- Crack closure studies
- Stress corrosion testing
- Slow crack growth
- Crack initiation
- Crack sizing

Description:

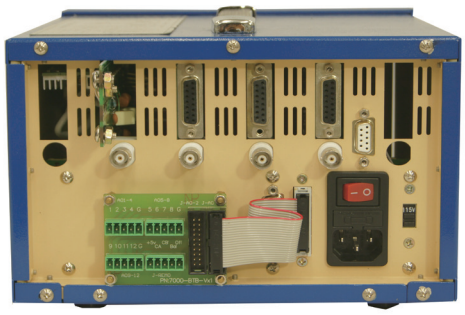
The DCPD-U50 is a modern microprocessor based instrument for measuring crack depth in metals undergoing materials testing. Building on the success of the DCPD-U50 this new unit takes on board customer comments and suggestions, as shown in its impressive features list.

It utilises the pulsed direct current potential drop method (DCPD) which is an established technique covered by the ASTM 647 standard. The technique involves passing a constant current through the metal under test and measuring the resultant voltage drop that is created across the specimen. The presence of a growing defect will alter this voltage and by suitable calibration, a measure of the defect depth can be obtained.

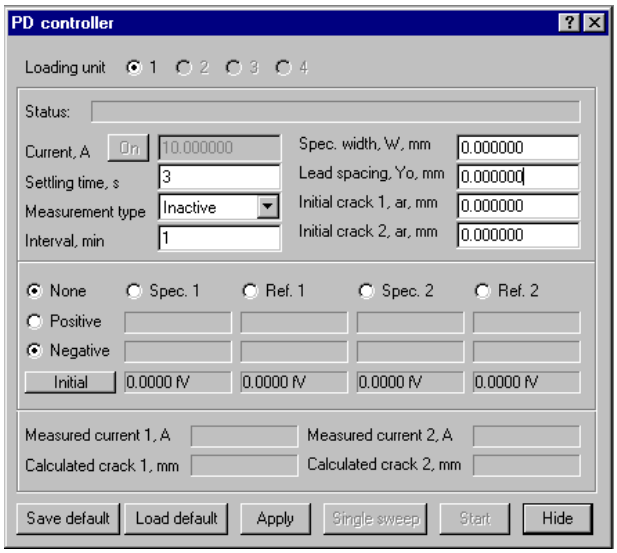
DCPD-U50 Ultra Precision DCPD Crack Growth Monitor

Specification:

- Fatigue Pre Crack Initiation Measuring Performance:
  - CT Specimen, Steel, 20mm(W), 1.6mm(t)
  - Resolution < 0.02(mm)
  - Accuracy < 0.2(mm)
- Input:
  - Voltage Amplification Gains 20~ 5,000,000, Acc <1%
  - Drift 60nV/1000hrs (RTI)
  - Noise 100nV (RTI, 0.1~10Hz)
  - Stability is 0.01%
  - A/O Output, +/-5V real time
- Current Source:
  - 0~50A
  - Voltage: 2.5V max
  - Current Acc, 0.5%
  - Continuous Mode
  - Pulsed Mode, Synch with Peak Hold, duration 1~100sec
- Peak Hold:
  - Synch Input (TTL)
  - Reset : Synch Input (TTL) or Load Cycle Auto Reset (0.5~1kHz) or Time Interval Reset
  - +/-5V Output: A/O Max, A/O Min, A/O Average, A/O Continuous
- SR1 RS-232 Data logger
  - Data logger
  - 24bits Sinc^3
  - Display 6 digital resolution
  - Time Interval 0.05 Sec~24 hr。
  - Data Export Format *.csv
- Balance
  - Method: Manual / Automatic
  - Ranges (Auto ranging): ± 7.5 mV/V Resolution 0.0012 mV/V
  - Balance time: 8 seconds
  - Manual vernier balance range: 0.1 V/Step, Max ± 5 V
- Amplifier
  - Input Impedance : 100M Ω
  - Input Common Voltage : ± 30Vpp
  - Gain Step : 1, 10, 100, 1000 by rotary switch setting, Accuracy ± 0.1% Max
  - Gain Linearity : < 0.01% Max
  - Common mode rejection: @ Gain = 1,000
  - DC to 10 kHz, >100 dB
  - Frequency response versus all gain (1~1,000), 10kHz @ -3 dB
  - Rise Time <0.1µsec
  - Stability (gain over X 100)
  - ± 5 µV/° C, max, RTI (referred to input)
  - Noise (gain over X 100, all outputs)
  - 0.01 to 10 Hz: 25Vp-p RTI
- Filter
  - Characteristics
  - Low-pass active four-pole Butterworth standard
  - Frequencies (-3 ± 1dB): 1 Hz, 10 Hz, 100Hz, 1k, 10kHz and wide-band
- Input & Output
  - Output : Low impedance terminal analog output
  - Out contact for Crack Alarm
- Operational Environment
  - Operation temperature: -10° C ~ 60° C
  - Storage: -20° C ~ 70° C
  - Humidity: Below 95% RH, non-condensing
- Power Requirement
  - Input: 110 / 220Vac ± 10% 5 A
- Dimensions & Weight
  - Panel: 1.3” X 5.2” (33.4 X 133.3 mm)
  - Amplifier depth behind panel: 10.6” (270 mm)
  - Weight: 1.32 Lb (0.6 Kg)
- Optional Accessories
  - 6006C. 6- Modules enclosure with power supply.
  - 6012C. 12- Modules enclosure with power supply.



SCC-PDAP Potential Drop Measuring Software



Applications:

- Fatigue Initial Crack length measuring
- Fatigue Crack length measuring
- SCC Initial Crack length measuring
- SCC Crack length measuring
- Creep Initial Crack length measuring
- Creep Crack length measuring
- Inline Process crack length measuring

Description:

SCC-PDAP measurement uses a current flowing thought the specimen to cause voltage drop, that can be measured and used to calculate crack length. The program controls a power-supply, that supplies constant current thought the samples in either polarity, and a voltage meter with scanner, that measures the voltage drop from the specimen. In continuous mode, after measuring all voltages of single specimen, crack length is calculated using following formula:

It is important to realize that there are possible input values to variables that make the result a complex number, which is not logical. Therefore, in the program, all input values causing complex crack length are checked and if found, cause negative crack length value.
The single-specimen measurement cycle is as follows:
1. Connect positive polarity
2. Wait current settling time, defined by user in seconds
3. Measure positive specimen voltage-drop and reference
4. Measure current
5. Calculate crack length if continuous measurement mode (not single sweep)

$$\frac{W}{\pi}\cos^{-1}\left[\frac{\cosh\left(\frac{\pi}{W}Y_0\right)}{\cosh\left[\frac{V}{V_R}\cosh^{-1}\left[\frac{\cosh\left(\frac{\pi}{W}Y_0\right)}{\cos\left(\frac{\pi}{W}a_R\right)}\right]\right]}\right]$$

A single sweep always measures both specimens, so the previous measurement cycle is executed twice. The measured voltages are shown on the dialog. In continuous mode, there is a user-defined interval between measurements (equal to a single-sweep), and during this interval current is flowing through a short-circuit - the specimens are fully isolated from supply.
Measurement mode can be either static or dynamic. Static mode simple means that the measurements are executed as described above. In dynamic mode, the program waits after 2 and 5 for trigger before measuring voltages. The trigger comes from sequence-controller, and enables the measurement of crack length at peak of cyclic-fatigue waveform.

On: Switches current flow through the specimens on/off.
Initial: Sets the current voltages as the initial voltages for reference and crack.
Apply: acquires entered parameters from fields.
Single sweep: Reads all voltages once, but does not calculate crack. This is to be used for determining initial values.
Start/Stop: Starts or stops continuous measurement.