CEAST 9000 Series

Pendulum Impact Systems



INSTRON®



CEAST 9000 Series

Pendulum Impact Systems

MAKE A SWING

Impact resilience is one of the most important properties and cost-effective evaluations for material producers, both with respect to product development and quality control. As components could fail at stress levels well below the critical fracture stress, accurate determination of impact damage propagation is necessary.

With the combined experience of CEAST, Instron® has more than 50 years experience in designing pendulum impact testing systems.

4 | What are you testing?

The CEAST 9000 Series is designed to perform your Charpy, Izod, Tensile Impact, and Dynstat tests on a wide range of samples, from bars/dumbbell to pipes, in accordance with specific standards.

6 | What is your expected resilience?

It's critical to determine the energy value necessary to break the specimen under certain conditions, such as specimen size, notch shape, and hammer impact energy.

8 | Notching your specimens

Accurate notching is key for pendulum impact testing. Instron® has solutions to meet your requirements

10 | Which model is right for you?

Our Pendulum series offers fully manual or pneumatic and motorized options. Choose the version that meets your needs.

14 | Will you perform tests at different temperatures?

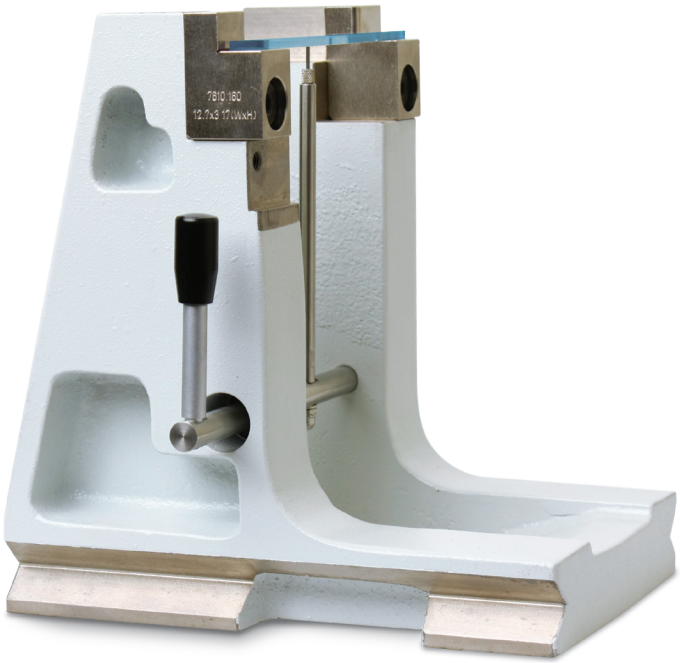
When choosing a pendulum impact system, comprehensive impact characterization with tests at different temperatures can be important for a material application.

16 | Which result do you need?

From quality control on resilience results to automated result calculation and visual curve displays, pendulum impact systems can be equipped with instrumentation to fit your needs.

TEST TYPES

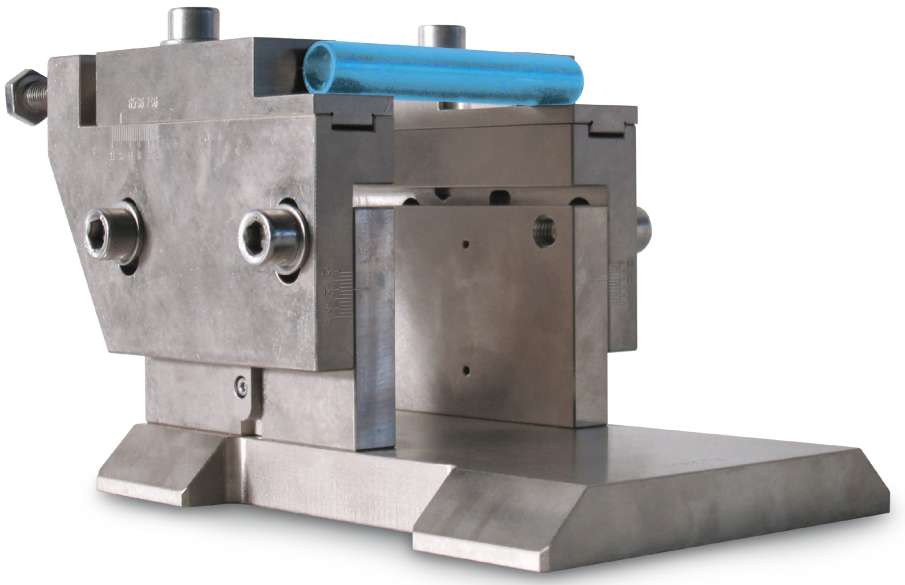
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Charpy

This 3-point bend test that requires a standard notched or unnotched bar is impacted on either the wide or narrow face of its cross-section. The energy required to break the specimen is recorded and the subsequent impact strength is calculated. Specimen and fixture dimensions, impact speed, and hammer dimensions are all defined in the test standard being followed, including ISO 179, ASTM D6110, DIN 53453, DIN 53753, and BS 7413.

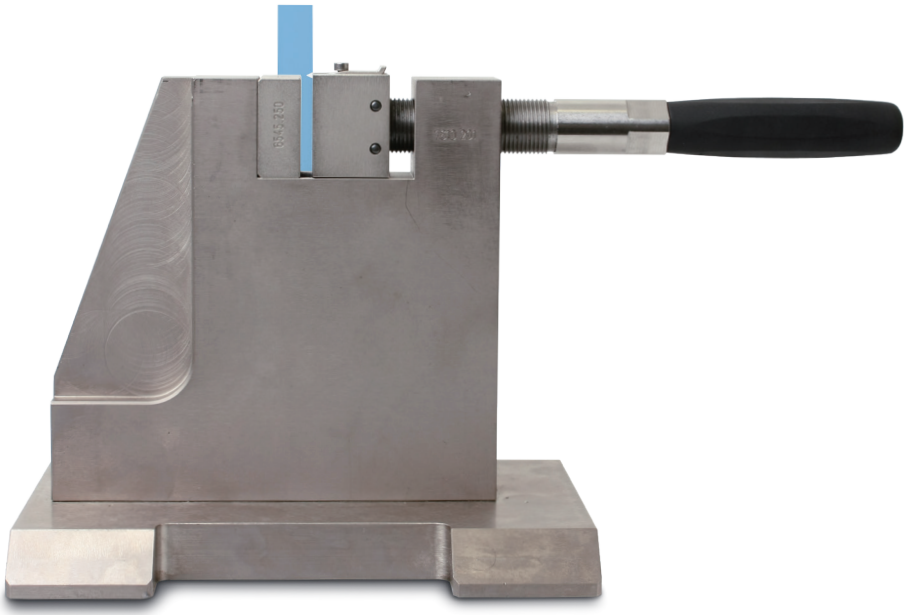
Metals can be tested according to DIN 50115 and ASTM E23 standards. Hammer energies are available from 0.5 - 50 J (0.37 - 36.9 ft-lbs). The Charpy vice can be fitted with alignment devices for notched, unnotched, and double notched specimens in either the edgewise or flatwise orientation.



Pipe Testing

Scientific research on the material of pipes or the examination of pipe sections and tubing impact strength are suitable to yield information on the fracture behavior under service conditions. According to the ISO 7628 and ISO 9854, either complete segments or small sections of pipes tested on a pendulum in a 3-point bend configuration similar to the Charpy tests.

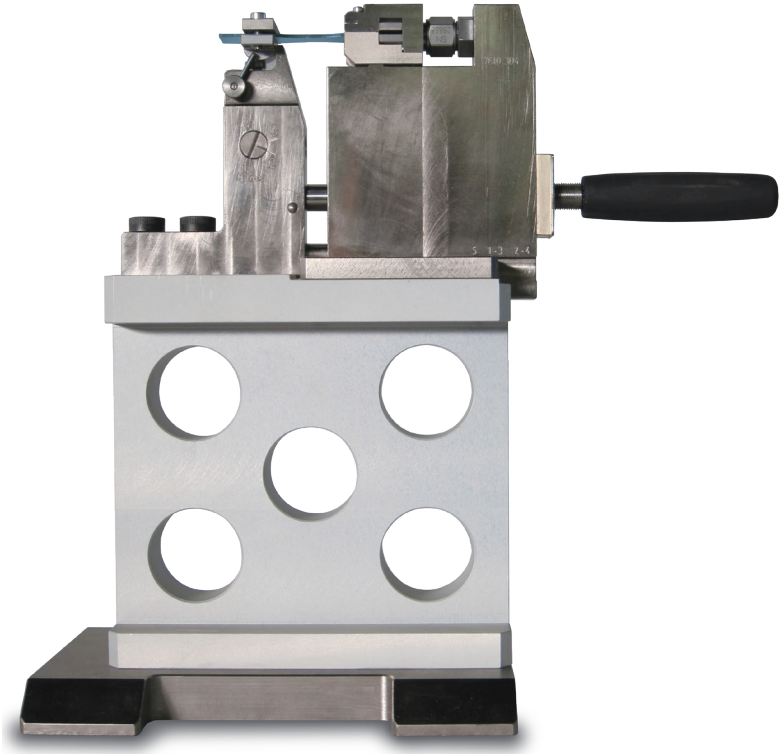
Sample diameter dimensions up to 25 mm (0.98 in) can be tested with hammer energies of 7.5 - 15 J (5.6 - 11.1 ft-lbs) or 50 J (36.9 ft-lbs), as defined in the ISO standards.



Izod

For the Izod test, the specimen is impacted in a cantilevered position with the fixed end clamped into the vice. This testing method generates a more severe stress test than the Charpy mode. Energy required to break the specimen is recorded and the subsequent impact strength calculated. Specimen dimensions, hammer geometry, and impact speed are defined by the test standards, the most common of which are ISO 180, ASTM D256, and ASTM D4812.

To more accurately adjust and control the clamping force, the Izod vice can be used with a torque wrench or fitted with a foot-operated pneumatic clamping system. It may be necessary to control the clamping force.



Tensile Impact

Tensile impact tests are conducted on materials that are either too thin or exhibit a high elongation before fracture. Hammer geometry, impact energy, specimen shapes, and dimensions are defined in test standards such as ISO 8256 Method A, ISO 8256 Method B, and ASTM D1822.

The specimen is either held in the stationary anvil (ISO 8256 Method A) or attached directly to the pendulum hammer (ISO 8256 Method B and ASTM D1822). Hammer energies are available from 0.5 - 50 J (0.37 - 36.9 ft-lbs) depending on the type of the test. The Tensile Impact vice can be fitted in the crosshead with an optional device to ensure specimen alignment.

IMPACT TESTING IS ALL ABOUT ENERGY

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How much energy does it take to fully break a specimen?
How little energy does it take to begin a failure mode in the specimen?
How much energy did the specimen absorb during impact?

The CEAST 9000 Series tabletop pendulums offer impact energies up to 50 J with a range of options available from basic manual testers to semi-automatic systems that include pneumatic release of the hammer and motorized hammer re-positioning.

CEAST 9050 | Manual Model

Energy Range: 0.5 - 50 J (0.37 - 36.9 ft-lb)

Hammer Positioning: Manual

Hammer Release: Manual (pneumatic optional)

Braking Mechanism: Manual



$E = m \cdot g \cdot L \ (\cos \alpha_I - \cos \alpha_0)$

Energy is equivalent to the hammer's momentum per difference between impact and starting angle

The greater the mass the higher the impact energy. The lighter the mass the lower the impact energy. Our pendulum systems use hammer energies ranging from 0.5 - 50 J (0.37 - 36.9 ft-lbs) and velocities from 1 - 3.80 m/s (3.2 - 12.4 ft/s).

Regardless of your energy requirements, we have the system that meets your needs.

CEAST 9050 | Motorized Model

Energy Range: 0.5 - 50 J (0.37 - 36.9 ft-lb)

Hammer Positioning: Motorized

Hammer Release: Pneumatic

Braking Mechanism: Pneumatic



NOTCHING YOUR SPECIMENS

CEAST 9000 Series

Proper preparation of the specimen is a critical process for accurate material characterization. An appropriate preparation of the specimen, as well as an adequate notching procedure affects the final test results, generating reliable outcomes in the finish product performances.

This is accomplished by several specimen preparation techniques, making them particularly suitable to select the most appropriate material and failure results analysis.

WHY IS THE NOTCH REQUIRED?

- Notching of the specimen drastically reduces the energy loss due to the deformation
- It provides a stress concentration area which promotes a brittle rather than a ductile failure.

WHY IS ACCURATE NOTCH PREPARATION IMPORTANT?

The notch properties are effected by:

- A slight variation in the radius and depth affects the impact strength results
- Cutting speed, sharpness of the knife, pass depth, quality of notching machine

KNIVES

The notching machines use interchangeable knives and are available to meet the following standards:

ISO 179	ASTM D256
ISO 180	ASTM D6110
ISO 8256	DIN 53435
BS 2782-359	DIN 53453

MANUAL AND MOTORIZED NOTCHING MACHINES

- The manual and motorized Notching Machines are designed to notch thermoplastic and reinforced thermo plastic specimens
- A notch, with dimension according to the requirement of the main international standards, is obtained by means of a constant profile knife with an alternating linear movement
- Choice of analog or digital depth measurement

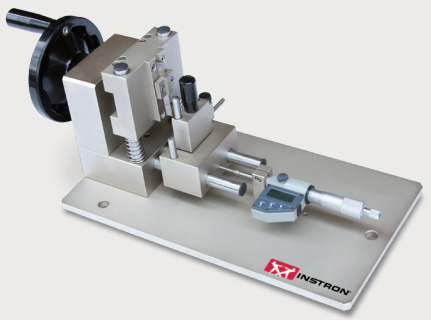
Manual Model

Manual knife movement, speed and cutting depth

Up to 18 m/min cutting speed

Analog or digital feed measurement

Up to 4 specimens notched simultaneously



Motorized Model

Motorized knife movement and speed

Manual cutting depth

Up to 12-42 m/min cutting speed

Analog or digital feed measurement

Up to 10 specimens notched simultaneously



CEAST AN50 – AUTOMATIC NOTCHING MACHINE

The CEAST AN50 is designed for laboratories which need to perform a large number of impact tests. Up to 50 specimens can be notched in a single cycle with the key parameters stored for later use. The optional knife cooling system, double notch loader and an adjustable cutting speed allow for consistent time saving and accurate notching operations at the same time.



FEATURES

Programmable motorized knife movement and speed from 1 to 21m/min

Single pass depth, programmable from 0.01 to 0.25mm



Up to 50 specimens notched simultaneously



Optional slicing device for cutting dumb-bell specimens to a rectangular shape



Optional knife cooling system



Option to double notch specimens for Charpy or Tensile Impact applications

CEAST 9050

CEAST 9000 Series

The CEAST 9050 is an advanced pendulum tester that performs uninstrumented to semi-automatic instrumented tests. Hammer energies range from 0.5 - 50 J (0.37 - 36.9 ft-lbs) and are available for Charpy, Izod, Tensile Impact, Dynstat, and Pipe testing standards.

STANDARD FEATURES INCLUDE:

- Monolithic cast iron frame
- Intuitive touch panel operation
- Automatic hammer identification and verification
- Angular encoder measuring to 0.05° resolution
- Quick-change hammers and specimen supports
- Hammer disc brake system

OPTIONAL FEATURES INCLUDE:

- Increased height safety enclosure for Manual Model
- Slip ring and Trigger for instrumented hammer data acquisition
- Accessories to facilitate operations

ISO 179	ASTM D6110	DIN 53453
ISO 180	ASTM D256	DIN 53753
ISO 8256	ASTM D1822	DIN 50115
ISO 9854	ASTM E23*	
ISO 7628	BS 7413	

*For indirect verification to ASTM E23 only low energy reference specimens may be used.



Manual Model

The CEAST 9050 manual model has manual hammer repositioning and disc braking. The hammer release has a two-handed operation that is standard but can be specified as pneumatic.

FEATURES

Standard Safety Guards

A fully protective safety guard on both sides of any pendulum version allows safe operation according to the compulsory CE directive.

Hammer Brake System

The hammer disk brake is characterized by a double braking surface that assures high-braking torque with low effort and smooth operation, even for the heaviest hammers. The brake is manually operated on the Manual Model or pneumatically operated in the Motorized Model.

Hammer Angle Measurement

Using a non-contacting magnetic encoder allows for virtually zero friction and a resolution of 0.05°.

Hammer Identification System

This system automatically recognizes the mounted hammer and retrieves all the relevant data (code, test standard, nominal energy, and impact speed) from the internal database. Repetitive data input and the risk of error is completely eliminated.



Motorized Model

The CEAST 9050 motorized model is equipped with a pneumatically operated hammer release and disc braking system that is standard. The hammer repositioning eases use and increase the output in tests. A data acquisition trigger is included.

Touch Panel

A high-resolution 6.5-inch color display with touch-screen technology allows the most flexible and intuitive use of the instrument.

Embedded-PC Technology

Allows an Ethernet connection to PC Networks (LAN), data exchange through a removable USB stick, and direct printing on standard USB printers.

Quick Change Hammers

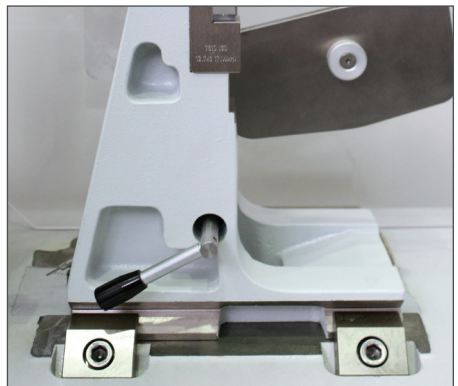
Equipped with an ergonomic quick-change mechanism, the hammers can be easily changed without the use of tools or screws and the innovative wedge system assures a firm fixing.

Quick Change Supports and Fixtures

Through an ergonomic fixing system, vices for all test types, can be easily and quickly changed and positioned.



Complete range of Hammers



Quick Change Supports/Fixtures



Monolithic Cast Iron Frame

HAMMERS

CEAST 9000 Series

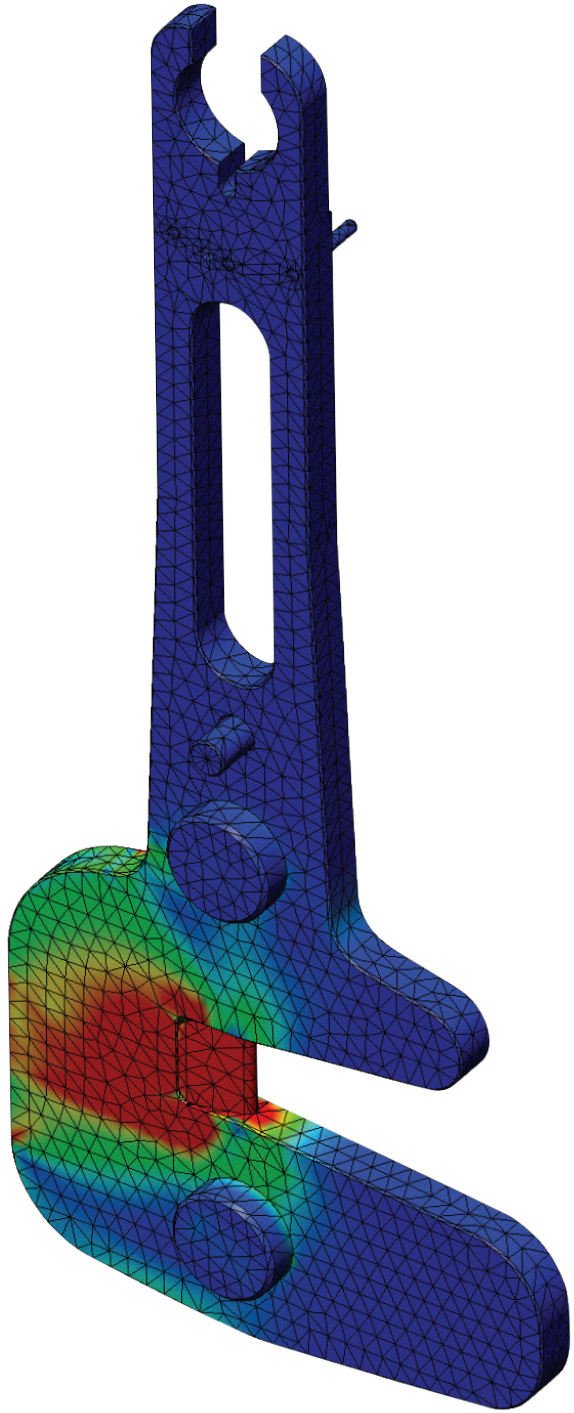
This innovative hammer line evolved from two primary needs: accuracy and rigidity. The patented* hammer structure, machined from one piece of metal alloy plates, ensures incomparable rigidity, a solid connection to the encoder shaft, and negligible vibrations. Furthermore, the flattened shape minimizes energy lost due to wind friction.

3D CAD design and Finite Element Modeling (FEM) calculations have been employed for the optimal arrangement of mass, position of the center of gravity, and reduced length. Due to this solid design the manufacturing accuracy is by far the best with respect to traditional hammers made of several assembled parts.

Each hammer is equipped with a system that allows fine adjustments of the reduced length, of its weight at 90°, and of its vertical position during the calibration process.

The auto-recognition is the most innovative feature of the hammer and ensures no operator error. This system consists of three pins that are positioned on the hammer and are read by the photocell system of the instrument. The hammer is recognized during calibration and throughout the test.

To view our range of accessories please visit:
www.instron.com/accessories



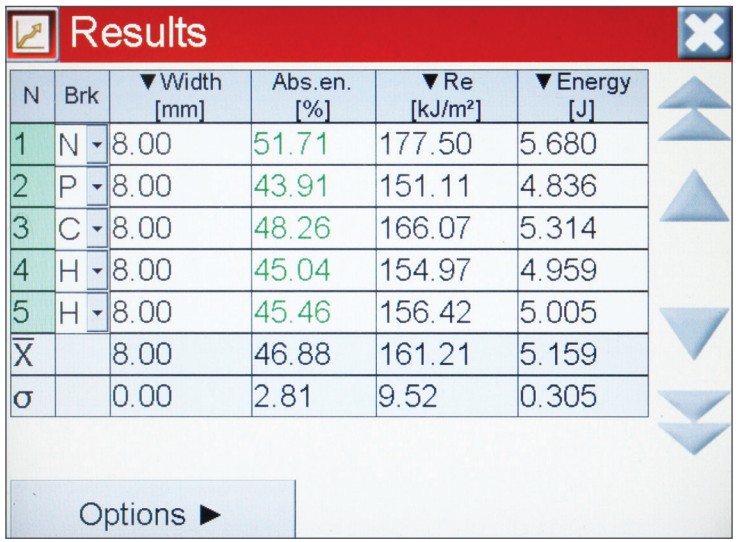
*Covered by US Pat. No. 7726173, owned by Illinois Tool Works Inc.

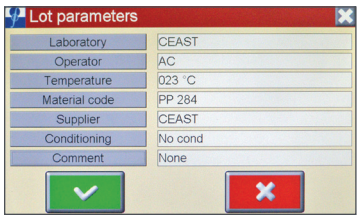
TOUCH-SCREEN INTERFACE

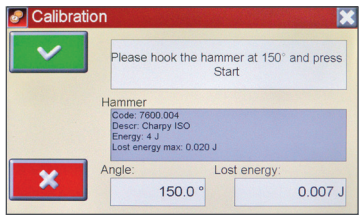
WINDOWS® BASED

The instrument is equipped with an advanced interface, based on a powerful embedded-PC with a high-resolution, 6.5-inch color display.

The touch-screen technology allows the most flexible and intuitive use of the instrument, while the embedded-PC technology provides an open architecture, allowing Ethernet connection to PC Networks (LAN), data exchange through a removable USB and direct printing on standard USB printers. Through the LAN connection hundreds of results can be stored and easily exported to LIMS systems.









TESTING AT NON-AMBIENT TEMPERATURES

CEAST 9000 Series

Impact properties are dramatically influenced by temperature. Plastic materials usually show a brittle behavior at low temperatures and a more ductile behavior as the temperature increases. Finding a brittle-ductile transition temperature can be of critical interest for many polymer applications.

Comprehensive impact characterization with tests at different temperatures becomes possible with a series of options for the CEAST 9050 pendulum.

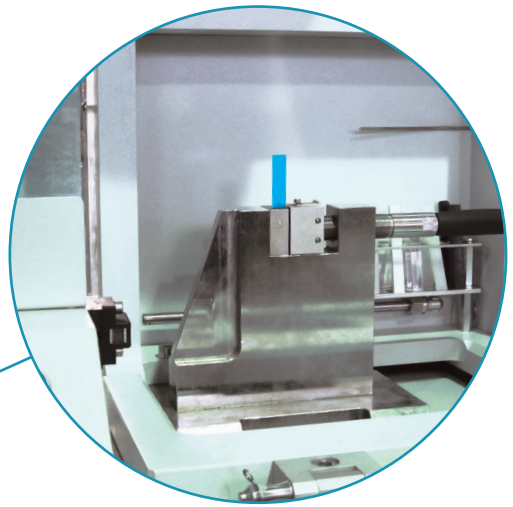


Cryobox

Cooling system: Liquid Nitrogen
Temperature range: Ambient to -60 °C (-76 °F)

The Cryobox is a thermal conditioning cell mounted directly onto the CEAST 9050 and positioned to enclose the specimen vice. This optional system is able to condition up to 11 specimens for below-zero tests. Izod, Charpy, or Tensile Impact vice and clamped specimens are jointly conditioned. Through a separate electrical cabinet for temperature control, it's possible to set the cryobox inside temperature before impact.





Suitable for cooling specimens to the following standards:

ISO 179	ASTM D6110	DIN 53453
ISO 180	ASTM D256	DIN 53753
ISO 8256	ASTM D1822	DIN 50115
ISO 9854	ASTM E23	
ISO 7628		

To view our range of accessories please visit:
www.instron.com/accessories

THE RESULTS ARE IN

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Do you need to know more than the absorbed energy for your pendulum test?
Would seeing the load-time curve help understand your results?



UNINSTRUMENTED

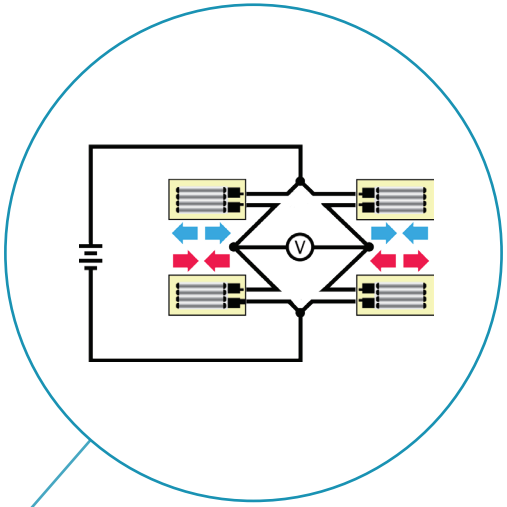
Uninstrumented pendulum tests provide the energy taken to break the specimen and allow the impact resistance to be calculated. Different materials may have the same absorbed energy while failing in different ways. This information can only be collected by instrumenting your test.

INSTRUMENTED

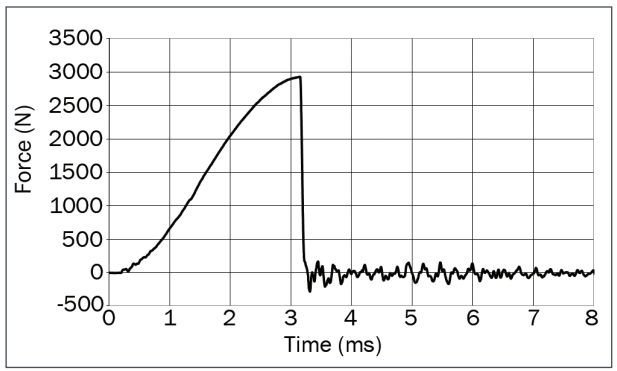
The addition of an instrumented hammer and Data Acquisition System (DAS) allow the engineer to “see” types of information that were previously unknown, including failure type and ductile-brittle behavior.

With instrumentation, the load on the specimen is continuously recorded as a function of time and gives a more complete representation of the test than a single energy value collected during uninstrumented tests.









Instrumentation

To acquire the force signal during impact, a strain-gauge sensor bridge is placed inside the striker body. The deformation acting on the striker during impact will be acquired by a separate Data Acquisition System (DAS) as an electric signal, which is directly transformed into a force value. The instrument can be equipped with a miniaturized slip ring to transmit the electric signal with the lowest friction and easiest connection.

GLOBAL PRESENCE, LOCAL TO YOU

CEAST 9000 Series



When You Need Us, We're There

Founded in 1946, Instron® has established itself as a leading supplier of materials testing equipment and solutions. Operating with 25 offices in 18 countries and more than 1200 employees, we have a global infrastructure that is local to you and remain committed to advancing materials and components testing techniques.



Maximize Uptime

The Instron world-class service organization is committed to deliver high-quality installation, calibration, training, maintenance, and technical support throughout the life of your system.

We help ensure that your systems are there when you need them.



Quality Standards You Can Trust

Operating under ISO 9001 quality standards and with an extensive list of accreditations, Instron employs a product design philosophy where our customers' data integrity, safety, and protection of investment are paramount. We strive to ensure that our customer satisfaction is second to none.

TECHNICAL HIGHLIGHTS

CEAST 9000 Series



CEAST 9050 Manual



CEAST 9050 Motorized

Hammer Energy Range	J ft-lb	0.5 – 50 0.37 - 36.9	0.5 – 50 0.37 - 36.9
Hammer Release	-	Manual (Pneumatic Optional)	Pneumatic
Hammer Braking	-	Manual	Pneumatic
Hammer Recovery	-	Manual	Motorized
Hammer Identification	-	Automatic	Automatic
Electrical Supply	-	100 - 240 V 50 - 60 Hz	100 - 240 V 50 - 60 Hz
Compressed Air Supply	bar psi	5 72.5	5.5 79.8
Machine Dimensions (w × d × h)	mm in	1035 × 430 × 880/1190 40.8 × 16.9 x 34.6/46.9	1035 × 510 × 1190 40.8 × 20.1 × 46.9
Machine Weight	kg lbs	220 (330 with 50 J Plate) 485 (725 with 50 J Plate)	270 (380 with 50 J Plate) 595 (838 with 50 J Plate)
Safety Guards	-	Standard (Full Enclosure Optional)	Full Enclosure

THE WORLD STANDARD

We stake our reputation on the integrity of data. From the measurement of primary test data to result generation, we design and manufacture the full data integrity chain (e.g. load cells, sensor conditioning, and software). Additionally, we calibrate more than 90,000 of these sensors annually with the lowest accumulated uncertainty.

30,000+

We service and calibrate more than 30,000 Instron systems in active use worldwide every year.

96%

96% of the Fortune 100 list of the world's largest manufacturing companies use Instron test systems.

18,000+

Instron systems have been cited in more than 18,000 patents since 1975.

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