INSTRON®

The difference is measurable®

DROP TOWER IMPACT TESTING

Tensile-Impact Test

With an increase in the use of Thermoplastics, Composites and Metal Alloys as high-performance materials offering light-weighting solutions in Automotive, Aerospace and Defense applications, the need to improve efficiency in product development processes and confirm agreement between simulation and test results is extremely important.

FEATURES AND BENEFITS

- Can achieve high strain rates due to ability to provide impact velocities up to 22 m/s
- Can be equipped with sensors of 2.2-30 kN for tensile tests on Plastics, Thin-film, Composites, Metal Alloys
- Possibility to test with the tensile impact fixture from -50 +120 °C (for standard piezo sensor)
- Bluehill Impact software for a quick set up, simple and error-free testing
- Frictionless linear guidance system to minimize loss of energy and improve data reproducibility
- Wide transparent panels around the test area to allow High Speed Camera recording
- Combine the use of the drop tower (optional on 9440 model) with High Speed Camera acquisition for full control of the material's failure mechanism
- Easy synchronization of the video images and the force signal
- DIC analysis for evaluation of the longitudinal strain of the specimen when impacted under tensile-impact conditions

APPLICATION RANGE

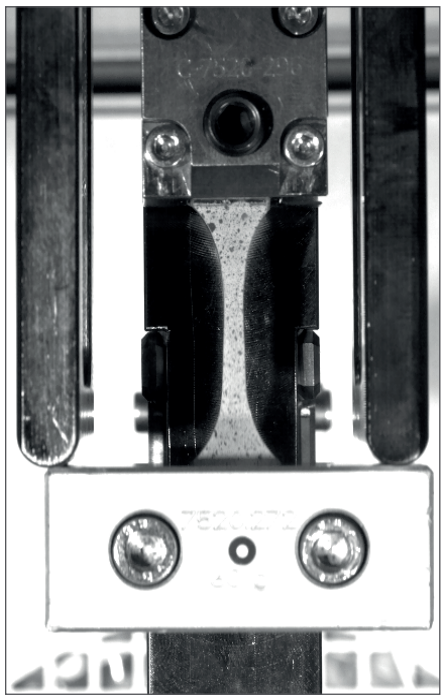
Impact drop towers can be used to perform not only puncture and incipient damage tests but can also be used for compression, three-point bending and tensile tensile-impact tests.

When working with CAE simulations, personnel involved in the evaluation of mechanical properties at strain rates equivalent to impact-loading phenomena, want to be able to:

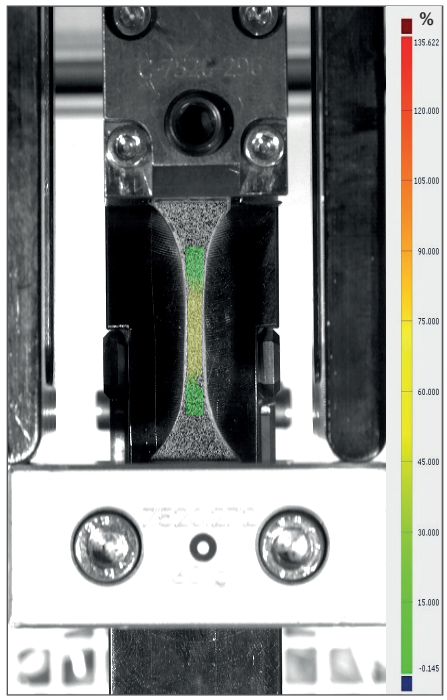
- Perform tensile-impact tests at high velocities.
- Understand how strain and strain rate is distributed throughout the specimens.

Static machines, primarily used for tensile tests, cannot reach moderate or high velocities and the only alternative for testing at high-speeds is to use servo-hydraulic testers. Since these systems often require significant support infrastructure and maintenance, the Impact Drop Towers of the 9400 Series can be a valuable option.

Vice and Tup for tests on Plastics



High-Speed Camera Acquisition



DIC Analysis

PRINCIPLE OF OPERATION

The drop tower impact mass is adjusted to keep the velocity as well as the strain rate as constant as possible throughout the elongation of the specimen during the impact event.

The tensile impact fixture includes a solid base with a piezoelectric (standard solution) or strain-gauge (special solution) force sensor connected directly to a fixed upper grip. The specimen is attached to this grip with a crosshead clamped to the other end of the specimen. A dedicated tup is released at a certain speed, impacting the crosshead and elongating the specimen to failure.

INSTRON 9450

GENERAL PERFORMANCES

Instrument Model		9450	9450 High Energy
Impact Energy	J lb-ft	3.29 - 757 0.44 - 558	0.59 - 1800(2) 0.44 - 1330(2)
Impact Velocity	m/s ft/s	0.77 - 4.65 2.53 - 15.3	0.77 - 24(2) 2.53 - 78.7(2)
Drop Height	mm in	0.03 - 1.10 1.18 - 43.3	0.03 - 29.4(2) 1.18 - 1160(2)
Mass Range (1) (2)	kg lbs	2 - 70 4.41 - 154	2 - 70 4.41 - 154
Machine Dimensions (W x D x H)	mm in	1015 x 866 x 2720 40 x 34 x 107	1015 x 866 x 3180 40 x 34 x 125.2
Machine Weight	kg lbs	550 1212	775 1708
Electrical Supply		220-240V 50-60Hz 100-120V 50/60Hz	220-240V 50-60Hz 100-120V 50/60Hz

TENSILE-IMPACT FIXTURE SPECIFICATIONS

Testing Material		Plastics	Plastics	Metals and Composites
Catalogue Number		C-7520-290	CP120050	CP128792
Maximum Load	kN lbf	2.2 495	15 3372	30 6744
Tup Hoder Required		Light or Standard	Standard	Standard or Reinforced
Maximum Impact Velocity	m/s ft/s	22 or 18(3) 71.2 or 60(3)	17(3) 55.8(3)	15 or 14(3) 49.2 or 46(3)
Maximum Strain-rate	1/s	363 or 732(4)	696(4)	785 or 730(4)
Maximum Elongation (4)	mm in	116 4.56	116 4.56	95 3.74
Maximum Strain (4)	%	464	464	475
Thermostatic Chamber Compatibility		Yes	Yes	CP129157 (230V) CP131196 (115V)

CROSS-HEAD AND SPECIMEN SPECIFICATIONS

Crosshead Mass	kg lbs	0.030 to 0.120 0.066 to 0.264	0.173 0.381	1.115 2.458
Specimen Shape(3)		Bar or Dumbbell	Bar or Dumbbell	Bar or Dumbbell
Specimen Dimensions (Width and Depth/Height)	mm in	All ISO 8256 Types	ISO 8256 Type 2 and 4	15 to 25 / 120 to 165 0.59 to 0.98 / 4.72 to 6.50
Specimen Thickness	mm in	3 to 4 0.12 to 0.16	2 0.08	1 to 6 0.04 to 0.24

Notes:
(1) Includes an average tup weight
(2) Depending on the test masses
(3) Depends on the tup holder used and the test masses
(4) Specimen dependent value

INSTRON 9440

GENERAL PERFORMANCES

Instrument Model		9440
Impact Energy	J lb-ft	0.3 - 405 0.22 - 299
Impact Velocity	m/s ft/s	0.77 - 4.65 2.53 - 15.3
Drop Height	mm in	0.03 - 1.10 1.18 - 43.3
Mass Range (1) (2)	kg lbs	1.0 - 37.5 2.2 - 82.7
Machine Dimensions (W x D x H)	mm in	985 x 610 x 2620 38.7 x 24 x 103
Machine Weight	kg lbs	340 749
Electrical Supply		220-240V 50-60Hz 100-120V 50/60Hz

TENSILE-IMPACT FIXTURE SPECIFICATIONS

Testing Material		Plastics	Metals and Composites
Catalogue Number		C-7520-290	CP120726
Maximum Load	kN lbf	2.2 495	15 3372
Tup Hoder Required		Light or Standard	Standard
Maximum Impact Velocity	m/s ft/s	4.5 14.8	4.5 14.8
Maximum Strain-rate	1/s	180(4)	180(4)
Maximum Elongation (4)	mm in	101 3.97	101 3.97
Maximum Strain (4)	%	404	404
Thermostatic Chamber Compatibility		Yes	Yes

CROSS-HEAD AND SPECIMEN SPECIFICATIONS

Crosshead Mass	kg lbs	0.030 to 0.120 0.066 to 0.264	0.173 0.381
Specimen Shape		Bar or Dumbbell	Bar or Dumbbell
Specimen Dimensions (Width and Depth/Height)	mm in	All ISO 8256 Types	ISO 8256 Type 2 and 4
Specimen Thickness	mm in	3 to 4 0.12 to 0.16	2 0.08

Notes:
(1) Includes an average tup weight
(2) Depending on the test masses
(4) Specimen dependent value

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