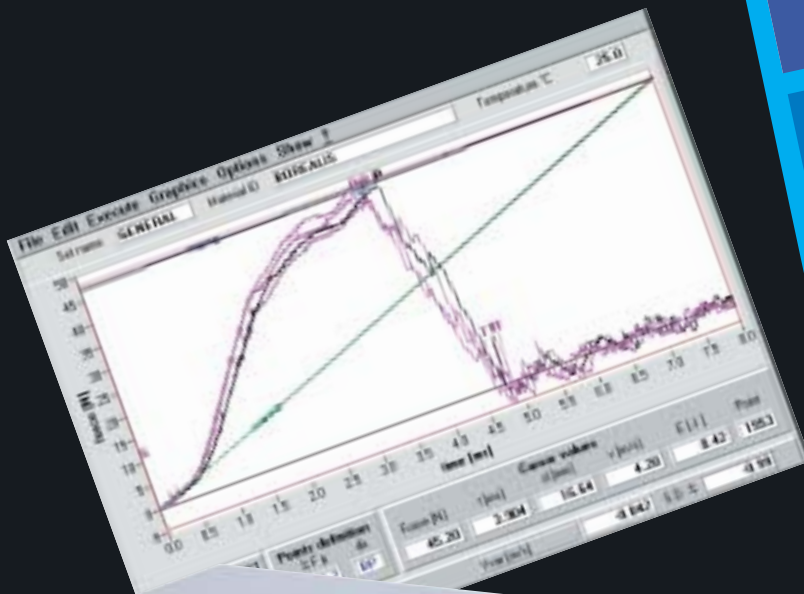


DAS 8000 WIN



DESIGN AND PRODUCTION OF
INSTRUMENTS AND APPARATUS
FOR QUALITY CONTROL
ON MATERIALS



These instruments are made in
compliance with CE health
and safety requirements



NEW

Designed to be managed by PC to provide signal acquisition and conversion from the instrumented components of all CEAST pendulums and falling weights instruments, **the advanced CEAST Data Acquisition System has been updated to a standard acquisition capability of 16000 points.**

This fundamental part of the instrumented test apparatus has thus doubled its ability to record data from the different types of sensors (strain gauges, piezoelectric, load cell and accelerometers).

Twice the time length for acquisition or twice the sampling frequency can be now achieved.

The 8-channel architecture (1-channel for the Junior version) and the other characteristics of the hardware remain the same, as well as the great software versatility, also thanks to the new VisuallIMPACT software and the optional software packages.

Designed to be managed by PC to provide signal acquisition and conversion from the instrumented components of all CEAST pendulums and falling weights instruments.

"Due to the continuous development policy of CEAST's Research and Development Department, changes may be introduced without notice"



www.ceast.com



CEAST S.p.A. • Via Airauda, 12 • 10044 Pianezza (TO) Italy
 • Tel: (+39) 011.966.40.38 (10 lines) • Fax: (+39) 011.966.29.02
 E-MAIL: Int. Sales: Infoltaly@ceast.com - Int. after sales: aftersalestech@ceast.com

CEAST USA Inc. • 4816 Sirius Lane, Charlotte, NC 28208
 • Tel. 704-423-0042 • Fax 704-423-0081
 E-MAIL: USA Sales: salesusa@ceast.com - USA Service: Keith@ceast.com

CEAST GmbH • Bunsenstr. 5, D-82152 Martinsried
 • Tel. ++49 (0) 89/85 90 28 12 - 89 50 18 10 • Fax ++49 (0) 89/89 94 98 51
 E-MAIL: Sales and Service: info.germany@ceast.com

Data Acquisition System

General Introduction

The new DAS 8000 WIN is CEAST's innovative Data Acquisition System for instrumented impact tests. It represents one of the most advanced solutions proposed by the market in its specific field of application.

It is the most powerful and sophisticated product of the DAS Family.

The DAS 8000 is designed to record data during rapid events such as impact tests and to control some instruments prior to and during test execution.

The DAS 8000 is designed to be used in conjunction with the CEAST instruments listed below:

- Pendulums (with instrumented hammer) RESIL 5.5, code 6844.000; RESIL IMPACTOR JUNIOR, codes 6963.000; RESIL IMPACTOR, codes 6967.000 - 6956.000 - 6957.000 - 6958.000 - 6959.000 - 6960.000;
- Hobbit, code 6887.000 with instrumented tup.
- Fractovis Plus, codes 7520.000 - 7521.000 - 7524.000 - 7525.000 with instrumented tup

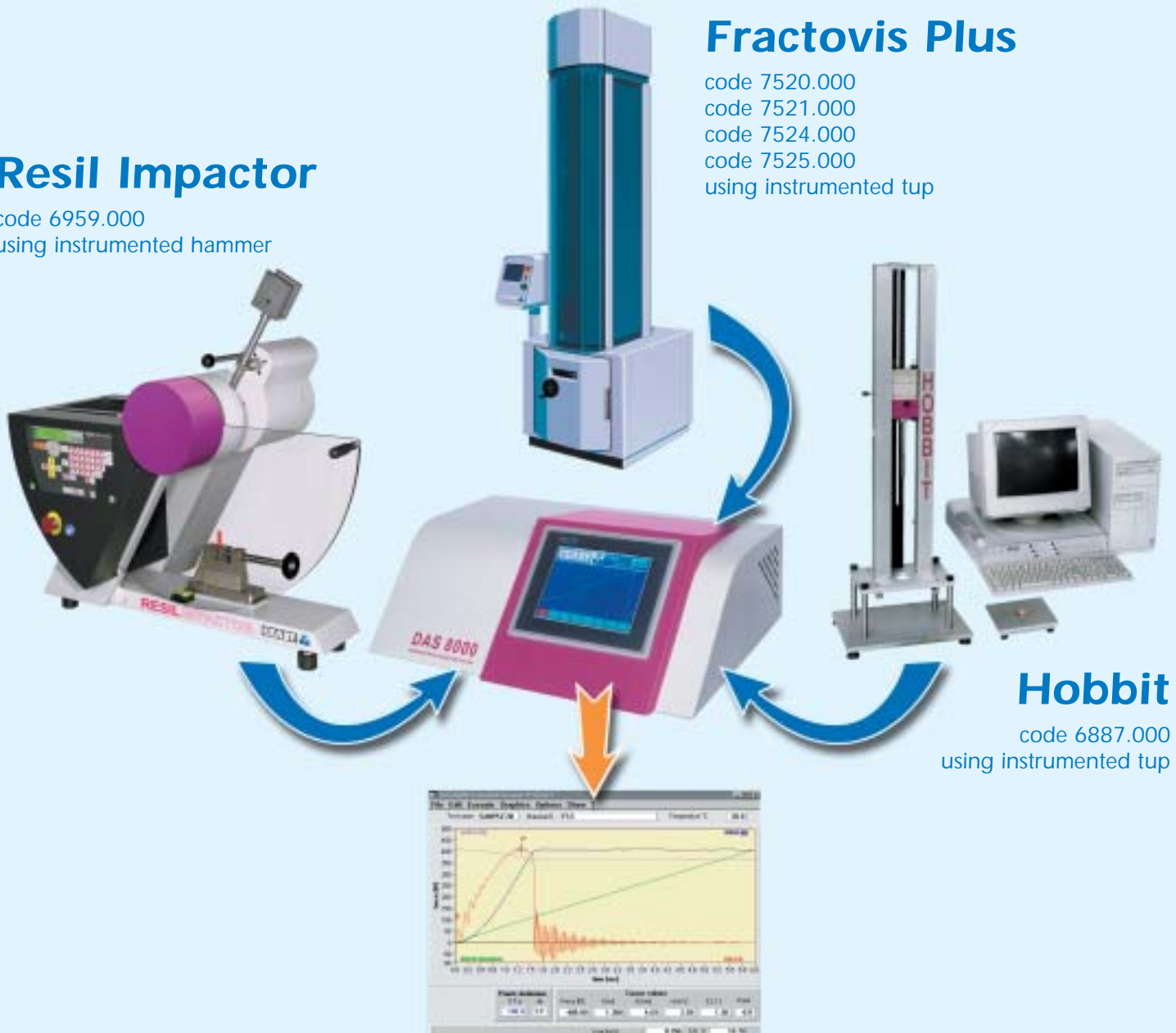
DAS 8000 Win in conjunction with CEAST impact family.

Resil Impactor

code 6959.000
using instrumented hammer

Fractovis Plus

code 7520.000
code 7521.000
code 7524.000
code 7525.000
using instrumented tup



Hobbit

code 6887.000
using instrumented tup

The new DAS 8000 is based upon a modular structure which allows the acquisition of several simultaneous events: DAS 8000 has a main CPU board and it can be equipped with up to 8 independent acquisition boards. Each board, which corresponds to one single channel, has its own system for acquisition: 2 MHz A/D converter and the memory which guarantees the storage of 8000 (optionally 16000) data points. The 8 channels are synchronized and the acquisition starts at the same instant: the trigger system is the same for all the acquisition channels. The DAS 8000 allows also to choose among three different trigger types in order to fulfil the different requirements of the customers.

The acquisition boards available are of several types in order to allow the acquisition of signals coming from different types of sensors (strain gauges, piezoelectric, load cell and accelerometers). The instrument configuration, in terms of acquisition boards installed, can be completely chosen by the customer according to the specific sensors he requires.

The modular structure described above makes this system for acquisition of instrumented impact data very versatile and suitable to the different needs of advanced laboratories which are interested not only in monitoring the force during the impact event but also in the analysis of other specific aspects involved in the impact test.

DAS 8000 WIN - "HARDWARE" Developed by CEAST

The main characteristic of the hardware are:

- Electronics based on a 32 bit microprocessor.
- High speed A/D converter with a 14 bit resolution.
- Up to 8 independent acquisition channels.
- Sampling rate up to 2 MHz in each channel (minimum sampling rate of 1 KHz).
- Up to 8000 (which can be expanded to 16000) data points collected during each test in each channel.
- External impact speed detection system via photo-cell.
- 3 programmable triggering methods:
 1. internal, based upon the signal of one of the channels activated;
 2. external, based upon an external analogical input;
 3. photo-cell, based upon the detection of the speed at impact beginning.
- Pretrigger selectable by the operator.
- Signal acquisition of: strain gauge sensors, piezoelectric sensors, load cells and accelerometers.
- Communication interface:
 1. one connection USB 1Mbit/sec;
 2. one connection RS232 / RS485 serial line (selectable by jumper).

DAS 8000 WIN - "SOFTWARE" Philosophy

The basic and modules software developed by CEAST for the DAS 8000 WIN are a very advanced data analysis software for instrumented impact testing applications.

The results and data processed by the software make it the best tool for quality control and research on materials resistance under impact conditions, at low and high speed.

The possibilities offered by DAS 8000 WIN software can surely satisfy any user requirement regarding test operation and test results.

These software follows the most recent international standards and new test procedures under standardization:

- Determination of Puncture Impact Behaviour of Plastics - ISO 6603-2, ISO 7765-2;
- High Speed Puncture Properties of Plastics using Load and Displacement Sensors - ASTM D 3763;
- Instrumented Puncture Test - DIN 53443;
- Determination of Izod Impact Strength - ISO 180;
- Determination of Charpy Impact Strength - ISO 179-2;
- Determination of Charpy Impact Strength of Rigid Materials - BSI 2782. Method 359;
- Determination of Izod Impact Strength of Rigid Materials - BSI 2782. Method 350;
- Determination of compression after impact - BOEING 7260;
- Determination of damage tolerance of composites - NASA ST-1;

and other equivalents.

Main Software and Additional Modules

The DAS 8000 Win software consists of :

D8EXTWIN main module to manage the instrumented impact test and to analyse the results.

Plus a number of additional analysis modules:

WLEFMHR to determine the stress intensity factor (K_{Ic}) and the energy release rate (G_{Ic}) at high test speed

D8WFILT to analyse and eliminate the plastic oscillation due to resonance vibrations

D8WTTA to analyse the impact test results performed at different temperatures in order to evaluate the fragility index

DAS8CLW to perform instrumented striker static calibration

DAS8DYN to perform instrumented striker dynamic calibration

DAS4WINA to control the Automatic Fractovis



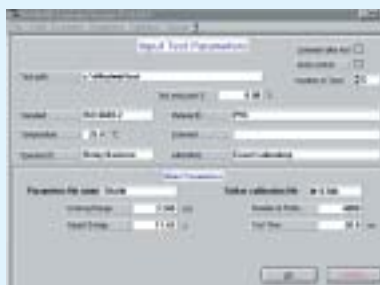
Main module

D8EXTWIN - code 0700/451

Test execution

- Possibility to perform single tests or sets of tests (up to 36 tests in each set)
- Equipment selection: Resil 5.5
 - Resil Impactor Junior
 - Resil Impactor
 - Hobbit
 - Fractovis Plus
- Automatic loading of striker calibration curve (supplied on floppy disk)
- Full management of test parameters and instrument parameters
- Impact velocity measurement using the photo-detector
- Immediate visualization of test curves after impact.

Parameter pages used by the programs

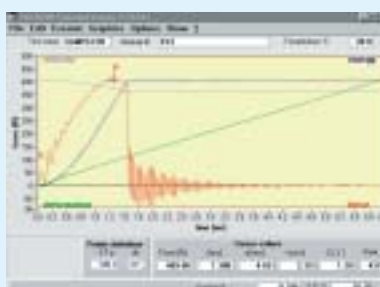


Input test parameters panel

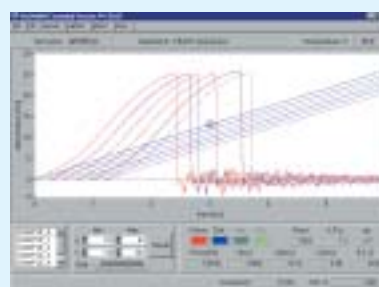


Intrument parameters panel

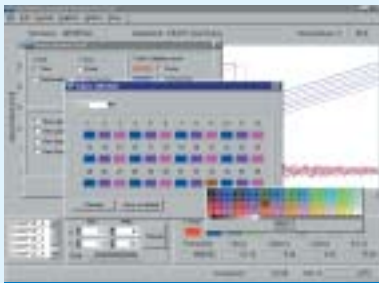
Test behaviours shown by the programs



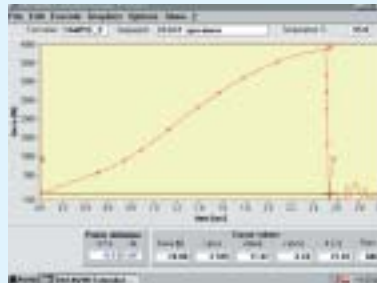
Single test curve



Statistic set curves and shift



Set-up of graphic report



Test curve with twelve marker points



Set-up of limit values

Single test or set of tests evaluation

- Visualization of a single test in any combination of curves (force/energy/velocity/deformation VS time/deformation);
- Visualization of overlaid curves; up to 36 tests can be displayed at once in any combination of curves;
- Interactive zoom of the graph;
- Capability of setting the colour of each curve of a set of test;
- User defined translation of curves along the X axis (shift);
- Magnification of a specific part of the graph;
- Selection of up to 12 marker points on the impact curves (6 points selectable as % of Peak Force, 6 manually selected points);
- Statistic data calculation (min, max, mean...) on start, peak, total and selected points for the set of curves;
- Editing of start, peak and total points to move the points on the graph;
- Absorbed energy evaluation (brittle/ductile);
- Numerical values at the position of cursor (force, time, velocity, displacement, point number);
- Calculation of slope (using polynomial fitting), stiffness and yield force of the selected part of the curve;
- Export of data in EXCEL, LIMMS and ASCII format;
- "Copy & Paste" of the graph, to include it in other Windows application for presentation of reports;
- Output report or export customization to choose which data are printed on the test report or exported to LIMMS;
- Rebound test visualization;
- Limit control for the following parameters: Peak Force, Time at Peak Force, Deformation at Peak Force, Energy at Peak Force, Velocity at Peak Force, Total Deformation and Total Energy;
- Method test option to create and save customized test procedures and parameters.

Test Name	Peak Force	Time at Peak	Deformation at Peak	Energy at Peak	Velocity at Peak	Total Deformation	Total Energy
Test 1	10.12	0.015	0.005	0.001	0.002	0.010	0.005
Test 2	15.23	0.020	0.008	0.002	0.003	0.015	0.008
Test 3	20.34	0.025	0.010	0.003	0.004	0.020	0.010
Test 4	25.45	0.030	0.012	0.004	0.005	0.025	0.012
Test 5	30.56	0.035	0.015	0.005	0.006	0.030	0.015
Test 6	35.67	0.040	0.018	0.006	0.007	0.035	0.018
Test 7	40.78	0.045	0.020	0.007	0.008	0.040	0.020
Test 8	45.89	0.050	0.022	0.008	0.009	0.045	0.022
Test 9	50.90	0.055	0.025	0.009	0.010	0.050	0.025
Test 10	56.01	0.060	0.028	0.010	0.011	0.055	0.028
Test 11	61.12	0.065	0.030	0.011	0.012	0.060	0.030
Test 12	66.23	0.070	0.032	0.012	0.013	0.065	0.032

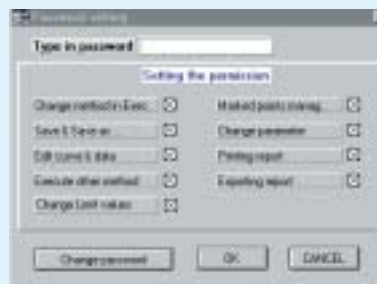
Table of peak values



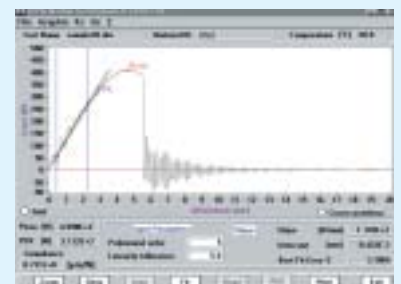
Preview for test selection



Export set-up



Password set-up



Stiffness and yield point calculation page

Password protected access to the following functions

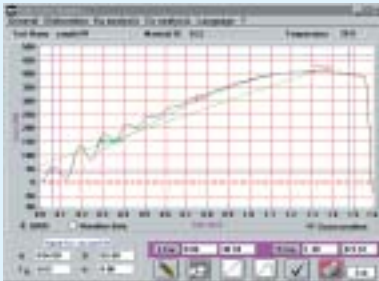
- Change method in execution (test methods);
- Save & Save as... (to save tests manually);
- Edit curve and data;
- Execute other method (Single test, Statistical set, Method test);
- Marked points management;
- Change parameters;
- Print report;
- Export report;
- Limits control management.

WLEFMHR - CODE 0700.413

One of the main questions of material application, particularly in safety-critical situations, concerns the conditions of crack initiation and propagation; the science that study initiation and growth crack conditions is the Fracture Mechanics (FM). Accidents can be avoided with the advanced knowledge of materials fracture characteristics. George Irwin, the father of Fracture Mechanics, is well known for his contributions to linear elastic fracture mechanics, especially the development of the crack-tip field approach and the use of the crack-tip stress intensity factor, K . The birth of the modern fracture mechanics is often credited as beginning with the 1957 Journal of Applied Mechanics paper of Dr. Irwin.

In order to predict the behaviour of a real component (in terms of fracture toughness), has been tried to apply, by several researchers, the Irwin's Stress Intensity Factor also to the polymeric materials.

The group "Polymers and Composites" of ESIS (European Structural Integrity Society) studied and developed a procedure, based on Linear Elastic Fracture Mechanics, able to determine fracture toughness at high loading rates. This test method, accepted by ISO for standardization, allows to determine the Critical Stress intensity Factor (K_{Ic}) and the Fracture Energy (G_{Ic}). The basic concept of these studies was to isolate material's inherent fracture characteristics from the geometry and dimensions of the actual part. So the designer has a powerful tool for an accurate determination of its fracture toughness, simply comparing the stress intensity factor of his part (computed with usual CAD tools and depending on shape and size) with the critical stress intensity factor obtained by this new method. WLEFMHR is CEAST's software implementation of this test method: it determines fracture toughness starting from impact data obtained by DAS 8000 system.



WLEFMHR page



Kq calculation panel



Validity check panel

The main features of this program are:

- Display of the force-deformation curve;
- Magnification of chosen part of curve;
- Linear regression of chosen part of graph;
- Determination of critical stress intensity factor - K_{Ic} ;
- Determination of fracture energy - G_{Ic} ;
- Work with the curve of each test to obtain the Kq parameter;
- Determination of the value of U and $BW \emptyset$.

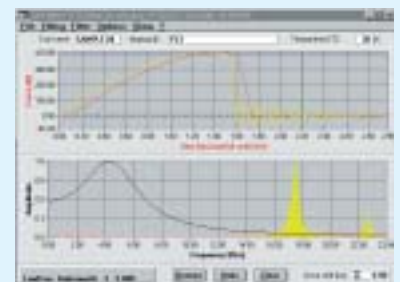
D8WFILT - code 0700.453

It is a curve filtering program, developed to analyze and eliminate the plastic oscillations caused by resonance vibrations of the measurement system.

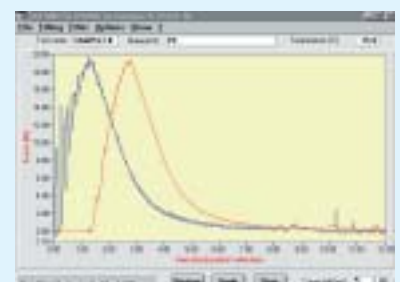
The main features are:

Test evaluation

- Frequency spectrum of curve or selected part of the curve;
- Four types of digital filters: Butterworth, Chebyshev, Inverse Chebyshev, Elliptic; in four applications: lowpass, highpass, bandpass, bandstop;
- Original and filtered curve and their frequency spectrum in overlaid and dual window mode,
- Shift curve correction;
- Fitting of curve or selected part of the curve using polynomial equations;
- Magnification of specific parts of curve;
- Recalculation of filtered curve and saving in a new test file;
- Logarithmic and Linear scale options;
- Full filtering history of selected curve can be viewed at any time.



D8WFILT dual window



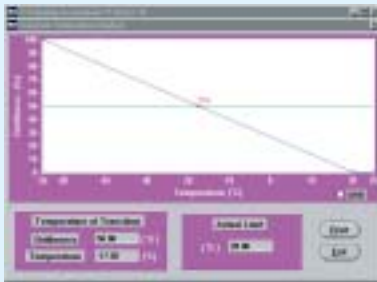
D8WFILT overlaid window

D8WTTA - code 0700.452

This program was created to analyze the temperature transition phenomena of the material fracture properties.

The main features are:

- Determination of the fragility index on up to 36 tests (set) for each temperature;
- Possibility to load up to 200 points;
- Automatic determination of the temperature corresponding to the 50% brittle-ductile failure;
- Cursor inspection of the TTA curve with visualization of numerical values.



D8WTTA transition temperature curve

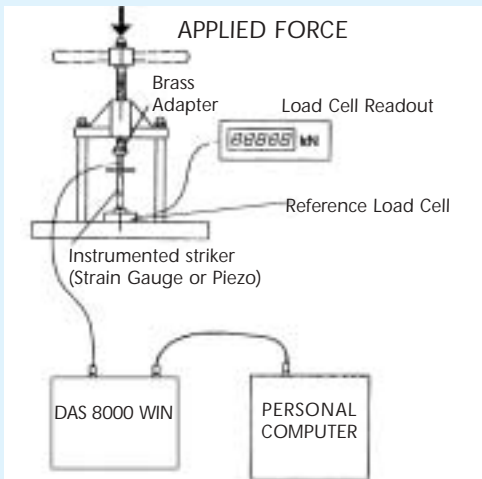
DAS8CLW - code 0700.454

This program allows the customer to perform the static calibration of strikers, both with piezo-electric and strain-gauge transducers.

The main features of the program are:

Calibration execution

- Static calibration using DAS 8000 hardware and accessories or inserting calibration data manually;
- Visualization of the calibration curves;
- Saving and loading of calibration files;
- Immediate display of the striker voltage output.



Static calibration for instrumented striker

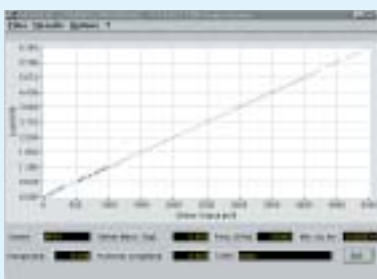
DAS8DYN - code 0700.455

This program allows the customer to perform the dynamic calibration of strikers, both with piezo-electric and with strain-gauge transducers.

The main features of the program are:

Calibration execution

- Dynamic calibration using DAS 8000 hardware;
- Visualization of the calibration curves;
- Saving and loading of calibration files.
- Immediate display of the striker voltage output.



Instrumented striker calibration curve

This program was created for full control of AUTOMATIC FRACTOVIS code 6849.000.

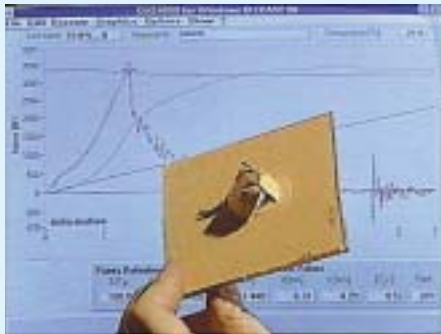
The main features of this program are:

- The possibility to perform automatically up to 10 sets of tests (each set can include up to 36 single tests);
- Automatic loading of striker calibration curve;
- Selection of test parameters and specimen dimensions for each set;
- Immediate visualization after impact;
- Automatic test saving.

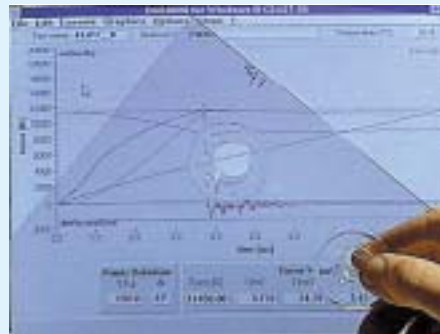


DAS4WINA page

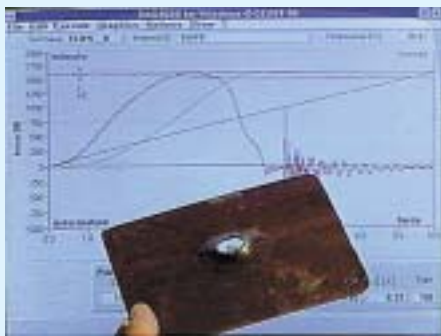
Application example of impact testing using instrumented "Fractovis", "DAS 8000 WIN" and "D8EXTWIN" software



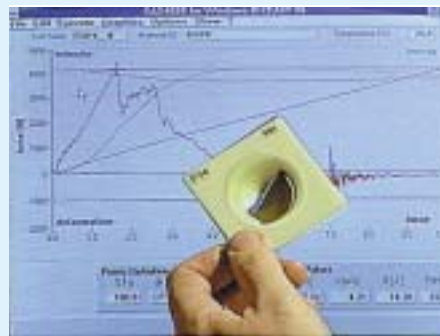
Impact on hard compressed paper



Impact on polycarbonate



Impact on ductile polyethylene



Impact on ABS

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CEAST S.p.A. • Via Airauda 12 - 10044 Pianezza - TO - Italy
• Tel. +39 011 966.4038 (10 lines) - Fax +39 011 966.2902 (10 lines)
CEAST USA Inc. • 4816 Sirius Lane, Charlotte, NC 28208
• Tel. 704-423-0042 - Fax 704-423-0081
E- Mail: Int. sales: InfItaly@ceast.com - Int. after sales: aftersalestech@ceast.com
USA Sales: salesusa@ceast.com - USA Service: Keith@ceast.com - <http://www.ceast.com>