

C3008 Data Acquisition

Imatek data acquisition systems are based around the C3008 controller and a PC running the ImpAcqt software.

This is a general-purpose system for analysing the results of high-speed tests, such as impact testing and high-speed servo-hydraulic testing.



The C3008 has the following specifications:

Analogue channels	4 as standard, 16 optional. All channels sampled simultaneously at the maximum sample rate
Digital channel	Quadrature encoded input in addition to analogue channels
Resolution	16-bit (1 in 65536), no missing codes
Sample rate	3,000,000 samples per second (maximum)
Sample depth	Up to 32,000 samples per channel
Gain	Input range $\pm 10V$, $\pm 5V$, $\pm 2.5V$, $\pm 1.25V$ software selectable
Input mode	Differential, bi-polar or uni-polar, selected per channel.
Bandwidth	1.5MHz
Signal to noise	<2 bit system noise
Gain error	$\pm 0.1\%$ maximum
Trigger	By optional velocity-measurement laser, external TTL trigger in, analogue channels (trigger level configurable). Rising/falling edge. 0% to 100% pre-triggering Trigger output.
Timing	Velocity measurement by time-of-flight, 20ns resolution
Digital input	26 channel opto-isolated input
Digital output	18 channel NPN output, short-circuit and over-current protected.
High speed camera	Camera trigger output and lighting controller output to interface to high-speed video systems. See separate data sheet for details.

Charge amplifier module

Integral Kistler charge amplifier module option for use with a wide range of quartz transducers.

Bandwidth: DC – 50KHz, -3dB

Range: ± 100 to $\pm 999,000pC$

Output voltage: $\pm 10V$

Linearity: $< \pm 0.1\%$

Accuracy: $\pm 0.5\%$

Auto-zero function: automatic zero of force signal output applied as part of test cycle

Voltage amplifier module

External (Fylde) voltage amplifier module option for use with a wide range of strain gauge transducers.

Bandwidth: DC – 50KHz, -3dB

Range: switched 10mv, 100mv, 1v for full output

Output voltage: $\pm 10V$

Linearity: $< \pm 0.2\%$

Accuracy: $\pm 0.5\%$

Auto-zero function: automatic zero of force signal output applied as part of test cycle

T1000 Laser Trigger

High precision laser/detector trigger option interfaces directly to the C3008 data acquisition hardware. The T1000 can provide a trigger to the data acquisition when the optical path between the laser and the detector is obscured, and with a suitable target can provide highly accurate, low noise velocity measurement.

Method: time of flight of target through laser/photo-diode detector

Timing resolution: 25ns

Target dimensions accuracy $< 0.1\%$

Overall accuracy: $\pm 0.1\%$

DDS1 - Dynamic displacement

The dynamic displacement system option provides an additional channel of data acquisition that measures and records the displacement of the impact mass throughout the experiment.

This provides the software with directly measured displacement data to replace that which would be normally calculated from integrating the acceleration data. Dynamic displacement offers increased accuracy in test applications where the impact involves a large change in velocity.

Type: non-contact optical linear encoder

Range : 10mm to 150mm full scale

Resolution: 10 μm

Maximum speed: 15m/s

Sample rate: 3,000,000 samples per second (Maximum)

Cumulative error: 10 μm per metre

Temperature co-efficient: 22 $\mu m/m/^{\circ}C$

ImpAcqt Software

The ImpAcqt software is a single package that is used to configure the data acquisition hardware and to analyse the resulting data. It may also be used in stand-alone mode for offline analysis.

The software is designed for high productivity and includes many ease-of-use features and very powerful analysis and reporting. The user interface is highly configurable to let the customer work in the way required.

A series of user levels can be defined to restrict access to certain features of the software so that less advanced users can use the software without the risk of producing invalid results.

Imatek Test Systems – data capture & analysis

Platform	Windows XP Pro/7
Recommended system	Minimum specification of Pentium Dual Core processor, 2Gb RAM, 21" LCD monitor, 320Gb Hard Drive, CD/DVD drive, Ethernet port.
Transducer database	Details of all transducer configurations, including calibration information, is held in a database, so working with multiple transducers is made more convenient. The software contains routines to assist with static calibration (single or multi-point) and dynamic calibration (single point)
Markers	Markers identify points within the captured data. Markers are initially positioned automatically by the software and may be repositioned manually. An arbitrary number of markers may be defined, for example peak force, peak displacement, sample failure.
Single value analysis	Single values may be extracted from the data and reported. Simple examples include peak force, energy to fail or maximum displacement. There is no limit to the number or complexity of results that may be defined, so analysis can be tailored to specific applications. The software provides a rich set of functions for manipulating measured and calculated data, markers and documentation fields to produce results.
User defined curves	In addition to calculated results, the software also allows you to use the measured data to calculate your own curves. This is most commonly used to calculate engineering stress and strain, but again arbitrarily complex equations can be defined to calculate just about any useful information.
Units	The software allows for working in whatever units required – it provides by default SI, cgs and US units, but also allows you to define your own. All numeric quantities (measured data and documentation information) are recorded along with their units, and when results are calculated their resulting units are calculated too, ensuring consistency and greatly reducing the potential for errors.
Documentation	Two types of documentation information are saved along with the test data: automatically recorded documentation (data acquisition parameters for example), and user-entered documentation. Documentation fields are configurable depending on your particular requirements, and fields can be made mandatory to ensure that critical information is recorded for every test.
Graphs	Graphs are used for displaying measured data and calculated curves. Multiple tests and multiple quantities may be displayed on the same graph. Highly configurable appearance including colours, automatic or manual axis scaling, linear or logarithmic scaling, user-defined or automatic labelling. Graphs may be zoomed to examine the data in detail. Markers are displayed on graphs and may be used to extract quantitative information.
Tables	Tables are used to display single calculated results or documentation information. The results from multiple tests may be displayed in the same table. Flexible formatting includes colours, fonts, column headings, units and the format of numeric results.

Imatek Test Systems – data capture & analysis

Data export	Data can be exported to Microsoft Excel (Office 95 onwards) in native file format. There is also the facility to export data in CSV (comma separated values) format, compatible with almost all numeric analysis packages. The software also includes a graphical editor to prepare curves for publishing.
Filtering	<p>The software includes powerful filtering to remove noise and remove resonances. Filtering is non-destructive, so that the original data is always retained. Three types of filter are available in different strengths: Butterworth, Bessel and FFT. Both low-pass filters and notch filters may be applied. To help you choose the right filter the software includes a tool that allows you to examine data in the frequency domain both before and after the filter is applied, and also shows you the transfer function of any filter you define.</p> <p>Filter settings may be named and saved for repetitive tasks, and data acquisition channels may have default filters defined.</p>
Test database	Test data may be saved either in individual files, or in a test database (Microsoft Access format). Multiple databases may be created, for different users or different applications. Test data stored in files may be copied into the database and <i>vice versa</i> . A powerful search tool can be used to interrogate the database and find tests that match particular criteria: for example, by the date of the test, the type of sample or the peak force seen during the test.
Auto-save	An auto-save facility ensures that data from a test is never lost, and also imposes a consistent naming scheme for data files. Data can be automatically saved to files or to the test database.
Integrated high speed video	Support for the high-speed video option is fully integrated into the software, including camera set-up and the display of video data from within the software either as still images, moving images, or linked to a graph marker to correlate captured data and video. It also lets you extract calibrated measurements from the video data.
Motion analysis	Additional high speed video features with automatic 2-D tracking of unlimited number of points, automatic 1-D tracking of edges. Extraction of velocity, angular and displacement data. Lens calibration. Data export in Excel, DIAdem, Matlab.
User levels	The software provides for three password-protected user levels. The software functions available to each level may be defined, preventing access to sensitive operations that might affect the accuracy of the data.
Saving settings	Entire software configurations, or partial configurations, may be saved and later restored. This facility is useful both as a back-up mechanism and also to allow quick switching between different test types (for example, compression testing and tensile testing).
Documentation	Full context sensitive help is available, together with a printed and an on-line manual.