

# Hummingbird<sup>32</sup>



**HGL**  
Dynamics

32 Channel Rugged Data Acquisition System



Connect | Condition | Acquire

## Key Features

- Low Environmental Pressure Operation
- 16/24-bit ADC, >114dB SNR, 5-256kHz Sample Rates
- Gigabit Ethernet Connectivity
- Conduction Cooled, Milled Unibody Chassis
- Modular Architecture, Scalable to >1000 Channels
- Multiple Signal Conditioning Options
- Multi-unit Synchronisation (GPS, IRIG, LVDS, IEEE-1588)

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## 32 Channel Rugged Data Acquisition System

### Introduction

Hummingbird is a rugged 32 channel data acquisition system designed to provide a world class, highly flexible solution for dynamic data measurement.

The Hummingbird series features gigabit Ethernet connections, allowing control from remote laptops or PCs, as well as data streaming for monitoring / archiving. The system can also operate in extreme environments, operating at pressures down to 4.8 kPa with temperatures from -25 to 65 C.

The Hummingbird has proven itself worldwide in numerous flight tests with engine and air frame manufacturers; has seen service worldwide for vibration monitoring in the power generation industry; and operates in wind tunnels that simulate high altitude conditions.

### Hardware Overview

#### Unibody Chassis

Rugged, milled aluminium housing for use in close proximity to the test article. External cooling fins are milled into the body to aid in heat dissipation. All internal PCBs mounted to thermal pads integrated into the chassis,

#### Connector Compatibility

Standard options available are BNC, Fischer LEMO, or 15-way D-Type. HGL can also provide customer specific connectors on request.



#### No Moving Parts

All components are securely mounted internally directly to the unibody chassis. No fans. No rotating storage. Solid State electronics.

#### Independent Inputs

Equipped with 32 channels  
One Sigma-delta ADC per channel.  
Multiple Conditioning Options.  
Simultaneous Sampling.  
>120 dB SNR.

32CH



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## 32 Channel Rugged Data Acquisition System

### Hardware Overview

#### LVDS Synchronisation

- LVDS (Low Voltage Differential Signalling) Synchronisation Interface
- <10nS Unit to Unit
- 0-200m Unit to Unit cable lengths
- Daisy-Chain, Star or mixed

#### Networking

Gigabit data stream. All command and control performed over Ethernet. Long distance communication easily accomplished using fiber optic media converter.

#### IEEE1588 Synchronisation

Internal switches are IEEE1588 compatible.

#### IRIG (or GPS) Synchronisation

Dedicated IRIG-B / GPS input for synchronization with external systems.



#### 1/4" Conditioned Air Supply Connection

- External cooling (or heating) air can be provided to enable operation in extreme environments. Steady internal temperatures can also improve the quality of the measurements. Air supply pressures up to 100 psi are supported.

#### Calibration

Hummingbird facilitates quick on-board correction with the use of standard bench signal generators/ multi-meters.



### Software Options

HGL Dynamics provides multiple software platforms for Hummingbird Acquisition systems; these range from low level Network APIs, Windows<sup>®</sup> DLL, LabVIEW<sup>™</sup> Drivers, Single Instrument Applications (Apps), and full Measurement System software. This flexibility allows users to choose the best platform for their particular applications and / or increases the utilisation of the hardware for multiple uses.

#### External Integration Protocols

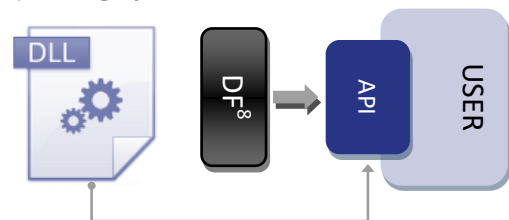
Integrating HGL's software into a third party system has never been easier. HGL Dynamics offers multiple ways to communicate with the Acquisition Software suites. Communication options include DDS subscriber / publisher, OPC client / server and Modbus (over ethernet) client / server.

#### Network API

All HGL Dynamics hardware modules are Ethernet connected to each other and their host PC(s); a fully documented Programmer's API is available for integrators / customers who wish to access the modules at this level or need to integrate the modules with a non-Windows operating system.

#### Microsoft Windows DLL

HGL provides (as standard) a Windows DLL with every Hummingbird Acquisition System; for Microsoft Windows users this provides a simpler method to access all the functions of the hardware.



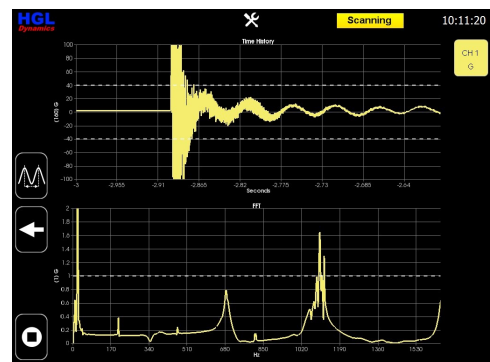
#### LabVIEW<sup>™</sup> Driver

HGL can provide a LabVIEW<sup>™</sup> driver for the Hummingbird Acquisition System; this driver allows full access to the functionality of the hardware, and is available for the Microsoft Windows Operating System.

#### Single Instrument Apps

HGL has developed a number of Single Instrument Apps, primarily for its Firefly system. These apps can be operated on a Hummingbird and Laptop / PC system equally well. The Apps are intended to provide a family of simple, easy to use applications which turn the Hummingbird into a single instrument, examples include:

- FFT Analyser
- Oscilloscope
- Chart Recorder
- Rotating Machinery Analyser
- Trim Balance
- Power Dip & Rise  
(requires isolation amplifier hardware)



#### Full Measurement System Software

For the past 15 years, HGL has providing a fully integrated, modular, network distributed Dynamics Measurement System; this software is intended for wide variety of applications and for systems ranging from small portable units to large multi-site systems with hundreds or thousands of channels.

The System comprises four main parts, Acquisition, Monitoring, Analysis and Data Management, and is focused on providing robust, flexible, fixed or mobile operation with ease of use as a primary consideration.

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## 32 Channel Rugged Data Acquisition System

### Software Suites

#### Data Acquisition - Hawk

HGL's Hawk acquisition software provides everything a user needs to configure, calibrate and acquire data from the acquisition hardware. Full control and feedback of the system is provided by the Hawk GUI Client application; this provides an intuitive instrument-like interface that allows even novice users to operate large channel count systems, even from remote locations.



#### Real-Time Monitoring - Hawkeye



Hawkeye allows one or more users to monitor the signals being acquired in real-time (<0.1s latency).

Fully customisable displays such as FFTs, Waterfalls, Oscilloscopes, Numerical, Speed and Tracked-orders, Phase, Bode, Orbit, n<sup>th</sup> Octave etc, provide a rich monitoring environment.

Hawkeye also provides Time, Frequency, Order and Phase domain alarming facilities for all channels simultaneously, with support for many different alarms types per channel. Hawkeye is also client / server based with the 'thin' Hawkeye Client allowing local or remote monitoring (performance dependent on network infrastructure).

#### Analysis - Aurora

Aurora provides an in-depth analysis tool for acquired data; this is usually required post-test, but can be operated simultaneously with testing if useful. Post-test analysis can pinpoint areas of interest / problems to be further investigated, and for this purpose Aurora provides a range of client / server based tools to analyse, investigate, mine, summarise and report on acquired data.

Multiple users can use Aurora simultaneously, and in common with HGL software portfolio access is via a network connected thin-client (Aurora Client) application, thus allowing both local and (potentially widely) remote users to access data simply and efficiently.



#### Data Storage & Archiving - Hercules



Prolonged or large-scale data acquisition generates a lot of data, 10's and 100's of TBytes are not unusual for large enterprises. Data is expensive to collect and the functionality to efficiently store and retrieve legacy data is essential for

in-service investigations, product development etc.

HGL's Hercules software provides an integrated, low-cost, yet highly scalable and safe data management solution for any sized data acquisition operation. The key to the system's success is support for virtually any common media type (SD cards, HDD/SSDs, LTO tapes etc.) combined with a unique database architecture providing simple, yet highly efficient data storage information, and a client/server architecture which allows data to be managed across multiple remote sites from a single intuitive Graphical User Interface.

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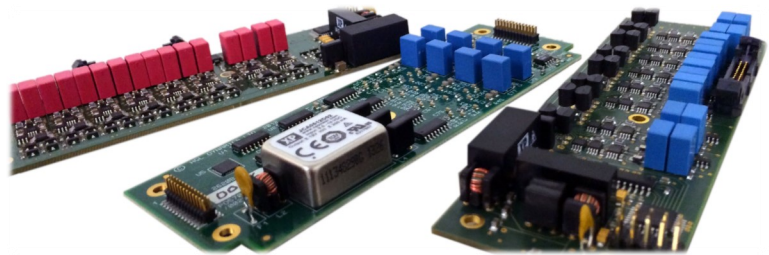


## 32 Channel Rugged Data Acquisition System

### Condition

#### Signal Conditioning

The Hummingbird<sup>32</sup> module can be fitted with a wide range of internal signal conditioning cards which further extend the Hummingbird's capabilities. Single or multiple conditioning functions are possible depending on card choice.



HGL has designed a set of conditioning cards that fulfil most industry standard requirements. However more cards are developed as clients' requirements change. The signal conditioning options currently available for the Hummingbird<sup>32</sup> module are:

- FE-1404-DFY: Voltage, IEPE, and Proximeter Probe conditioning card.
- FE-1407-IA: 4-Channel High voltage isolation amplifier.
- FE-1408-APC: All-purpose conditioning card including Voltage, IEPE, Bridge, Dynamic Strain, and Charge. On-board sensor health check and buffered dual analogue outputs.
- FE-1409-DFY: Voltage and IEPE (ICP) multi-range conditioning card. On board sensor health check and buffered analogue outputs. Charge inputs can optionally be supported.
- FE-1410-BRG / DYN: Voltage & Bridge Only and IEPE & Dynamic Strain only variants of FE-1408-APC card.
- FE-1411-MIC: Voltage, IEPE & 200V Excited Microphone Conditioning.
- HGL-HiZ: AC/DC voltage only conditioning with gain.

Cond. Card	Voltage		IEPE	Bridge	Dynamic	Charge	Temperature	Proximeter Probe	Speed
	AC	DC	Accel / Mic	Strain (¼, ½, full)	Strain (SG, Press)	Accel	Therm. & PT100		
FE-1404-DFY	✓	✓	✓					✓	✓
FE-1407-IA	✓	✓							✓
FE-1408-APC	✓	✓	✓	✓	✓	✓	✓#		✓
FE-1409-DFY	✓	✓	✓						✓
FE-1410-BRG	✓	✓		✓		✓	✓#		✓
FE-1410-DYN	✓		✓		✓	✓			✓
FE-1411-MIC	✓	✓	✓			✓			✓
HGL-HiZ	✓	✓							✓

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## 32 Channel Rugged Data Acquisition System

### Specification

#### General

Dimensions (W x H x D):	435 x 167 x 123 mm
Weight:	7.0 kg (typical)
Supply Voltage:	12 V DC
Power:	55 W (typical)

#### Input Configuration (with standard 1408 signal conditioning card)

Input Channels:	32
ADC Type:	Sigma-Delta
Quantization:	24-bit / 16-bit*
Input Ranges:	$\pm 10$ V, $\pm 1$ V, $\pm 0.1$ V *
DC Offset:	$\pm 0.15$ mV
Input Coupling:	AC, DC *
Input Impedance:	$> 100$ k $\Omega$
SNR:	$> 120$ dB
Anti-aliasing:	$< -100$ dB
Sample Rate:	5 - 256 kHz *
Frequency Response:	DC to $> 100$ kHz $\pm 0.1$ dB
Dynamic Range:	140 dBFS / $\sqrt{\text{Hz}}$ , 114 dB (broadband)
Inter-Channel $\Delta$ Phase:	$< 20$ nS ( $< 0.36^\circ$ @ 10 kHz output signal)
Crosstalk:	$< 100$ dB @ 5 kHz, $< 95$ dB @ 10 kHz, $< 87$ dB @ 20 kHz, $< 82$ dB @ 40 kHz, $< 70$ dB @ 100 kHz
Distortion:	$< -80$ dB, 0 to 80 kHz
DC Linearity:	$< 0.01\%$
Drift:	$< 25$ ppm/ $^\circ\text{C}$ (with no correction applied)

\*Software configurable parameter



#### Synchronisation

LVDS:	10 ns per unit
LVDS (max distance)	200 m <sup>#</sup> (node to node)
IRIG A/B:	$\pm 100$ ns
GPS:	$< 5$ ns

<sup>#</sup>If longer distances are require please contact HGL

#### Environmental

Operating Temp.:	-25 to 65 $^\circ\text{C}$
Operating Pressure:	Above 4.8 kPa (limit 24 hrs)
Storage Temp.:	-40 to 85 $^\circ\text{C}$
Relative Humidity:	$< 95\%$ RH non condensing

#### Other Inputs (using any standard input)

IRIG-A and IRIG-B  
Tachometer / Flow meter

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## 32 Channel Rugged Data Acquisition System

### Training

#### Training

HGL Dynamics offers a wide variety of training workshops and courses. Workshops are conducted at one of our global offices or at the client's site by our training team, all of whom have many years' of industry experience and knowledge.

Typical training courses include: Vibration Fundamentals, Signal Processing, Rotating Machinery, Advanced use of HGL Software and Analysing Large Datasets.



### Information

#### About HGL Dynamics

HGL Dynamics is a world-leading supplier of services and high specification equipment for the integrated capture, monitoring, analysis, storage and management of high bandwidth data.

#### Purchasing & Availability

The HGL Dynamics Hummingbird<sup>32</sup> Data Acquisition Module is now available for purchase or lease. Please contact one of our HGL Dynamics offices below for further information or to request a quote.

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