AMETEK®
PROGRAMMABLE POWER

VTI Instruments

EX1403

16-CHANNEL BRIDGE AND STRAIN GAUGE INSTRUMENT

FEATURES

- 16-channel Strain, Bridge and Voltage Measurements
- 24-bit ADC per Channel
- 102.4 ksamples/second/channel Sample Rate
- Built-in Selectable Bridge Completion that supports 1/4 (120, 350, 1K and User defined), 1/2, and Full-Bridge Types
- Built-in Programmable Excitation
- TEDS Support
- RJ-45 Input Connectors
- Built-in Shunt Calibration
- LXI Ethernet Interface
- IEEE-1588 Synchronization
- Power over Ethernet (PoE) or 10–50 V DC input
- Built-in Parallel Data Streaming
- Full-featured Embedded Web Interface
- Compact 1U Half-rack Form Factor

RELIABLE DATA   FIRST TIME   EVERY TIME

Overview

The EX1403 Precision Bridge and Strain Gauge Instrument sets a new standard for strain and bridge measurements, delivering the highest performance measurements possible while controlling overall test hardware costs.

Sixteen channels of strain or voltage, independent 24-bit ADCs per channel, extensive software-selectable filtering, and independent signal conditioning paths deliver exceptional accuracy and reliability.

Built-in signal conditioning, programmable excitation, and selectable bridge completion, all integrated into the instrument and configurable on a per-channel basis, greatly simplify setup and configuration. With unmatched performance, accuracy and reliability, the EX1403 is the "go-to" solution for the most complex structural test applications worldwide.

A single system that can provide high-quality static or high-speed strain measurements:

- Airframe structural and fatigue test
- Rocket and satellite structural test
- Wind tunnel flight load test
- General purpose bridge measurements
- Load frame materials testing

Scalable for High-Speed Synchronized Data Acquisition

In addition to its core set of features, the EX1403 integrates Extended Functions as defined in the LXI specifications to provide box-to-box synchronization to correlate acquired data precisely. Time-stamping of data and LAN Event Messaging that simplify intermodule communication and flexible triggering options over Ethernet; this eliminates the overhead normally attributed to application software running on the host controller.

The EX1403 supports easy integration and synchronization of multiple devices through the IEEE-1588 v2 Precision Time Protocol standard for synchronization, providing an architecture that can be scaled from tens to thousands of channels.
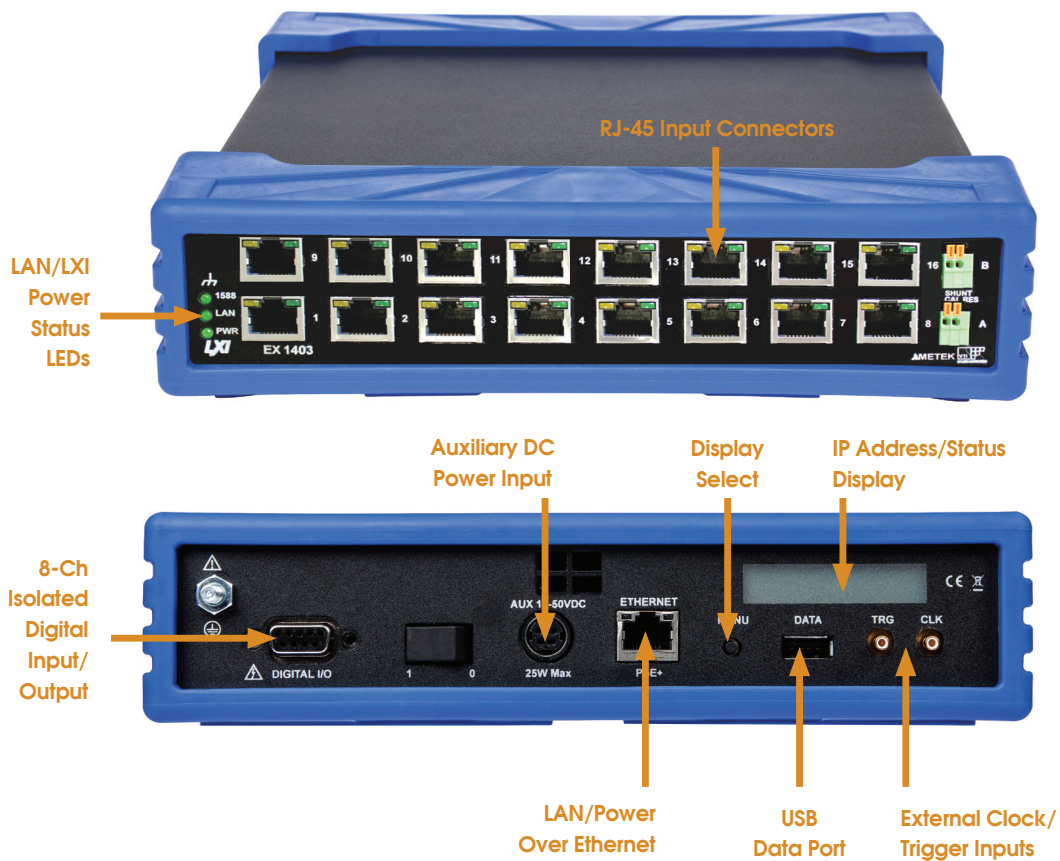
Multiple instruments can be easily distributed extremely close to the measurement points of interest, reducing the run length of analog cabling and minimizing errors induced by noisy environments.

Additionally, Power Over Ethernet (PoE) enables a single cable to be used for both power and data capture. All measurement data is returned with IEEE-1588 timestamp codes with typical accuracies of <200nS, ensuring that acquired data is tightly correlated across the test article.

Confidence

Manufacturing and test environments of today are dynamic, dictating minimal downtime of test systems in order to meet increasing product throughput demands. Ensuring that acquired data is reliable and that instrument calibration can be turned around quickly are keys to the success of any production team. VTI embeds intelligence into the EX1403 to facilitate maximum system "uptime" and increase manufacturing efficiency.

Built-in self-test can be invoked under software control prior to each critical test. A simple pass-fail result will be returned after completing system health diagnostics, including temperature and voltage level measurements of the on-board processor; this result can be used to prevent a test from running in the event of a failure.

RJ-45 Input Connectors

LAN/LXI Power Status LEDs

Auxiliary DC Power Input

Display Select

IP Address/Status Display

8-Ch Isolated Digital Input/Output

LAN/Power Over Ethernet

USB Data Port

External Clock/Trigger Inputs

Connectivity

Created in 2004 and adopted by the test and measurement industry in 2005, LXI (LAN Extensions for Instrumentation) defines a core set of capabilities that ensure compliant devices interact consistently in an instrumentation network. As an LXI-certified device, the EX1403 provides the convenience of LAN communications and control with features such as an embedded web page for monitoring and control and a consistent means of identification on the network. Connect the device directly to your network using industry-standard cables with the assurance that it will be a trusted and proven "network citizen."

General Specifications

Channels	16
Sample Rate	102.4 ksamples per second
ADC	24-bit delta-sigma
Input Connector	RJ-45
Input Type	Differential
	Single-Ended: Input needs to be connected to GND externally
Input Range	Voltage: ±10Vpk, ±1Vpk, ±0.1Vpk
	Strain ¼ Bridge: ±19.5k µε including imbalance for 10V Excitation, GF=2
Accuracy	Typical 100 SPS
	Voltage: (±0.1% ±60ppm/°C) Reading (±0.02% ±2µV/°C) Range
	Strain ¼ Bridge: (±0.1% ±60ppm/°C) Reading (±5 µε ±1 µε /°C) for 10V Excitation, GF=2
Input Coupling	DC
Input Impedance	10 MΩ Typical each input to ground
Common Mode Rejection, DC Coupling	-120dB Typical, <100Hz
	-100dB Typical, 100Hz – 1kHz
	-90dB Typical, 1kHz – 10kHz
Channel-to-Channel Crosstalk	-120dB Typical, <1kHz
	Overdriving one channel does not affect performance of other channels
Input Protection	ESD: ±12V Bidirectional TVS IEC61000-4-2, ±30kV Contact, ±30kV Air
Bridge Balance	Software nulling
Bridge Types	Full, Half (½), Quarter (¼)
1/4 Bridge Completion	Software Selectable: OFF, 120Ω, 350Ω, 1000Ω
1/2 Bridge Completion	10k-10k thin film RNET; Ratio Accuracy: 0.1%;
	Ratio Stability: ±25 ppm/°C; Ratio Drift: ±20 ppm/year
	DC Bias = Vexc * (0.5 ±0.1%)

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Dynamic

Gain (% Reading) Accuracy in Passband	DC Coupling: ±0.10% ±60ppm/°C ±100ppm/year
Analog Bandwidth (Anti-Alias Filter)	-86dB @ 5MHz
	±1% @ 65kHz; ±0.1% @ 10kHz
Slew Rate: 10% to 90% of FS Range	> 10 V/µs
Digital Bandwidth	No filter: Sample Rate * 0.453
	High Performance Filter: Sample Rate / 2.56
	Medium Latency Filter: Sample Rate / 3.0
	Low Latency Filter: Sample Rate / 3.333
Maximum Input Voltage	-10V to +10V, ESD protected
Input Impedance	>10MΩ

Protection

ESD	±12V Bidirectional TVS IEC61000-4-2, ±15kV Contact, ±30kV Air
External	Protected if driven by external voltage source: -0.3V to +12V
Crosstalk	Short does not affect Excitation accuracy in other channels

Excitation Voltage

Levels	+0.5V, +1V, +2V, +5V, +10V; selectable per channel
Stability	±30ppm/°C ±12µV/°C ±50ppm/year
Load Regulation	<0.2% for load change <30mA
Current Limit	30mA; Output Impedance: <0.1Ω
Noise	20 µVRMS Typical, 50kHz bandwidth

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Current

Levels	Selectable 1mA, 5mA; ±0.2%
Stability	±230ppm/°C ±50ppm/year
Load Regulation	<0.01% for Load change 0V to 5V
Compliance Voltage	>4.8V; Output Impedance: >10MΩ, DC to 20kHz
Noise	<3nA RMS 10Hz to 40kHz

TEDS (Transducer Electronic Data Sheet)

Protocol	MicroLAN
Baud Rate	9600 Baud (default)
Electrical Specifications	5V
Driver type	Maxim Integrated DS2480B
Capacitance Loading (1-Wire input)	<2000pF

Health Monitoring

Self-Test	Yes
Transducer Input Wire Resistance	Yes
Temperature	Yes

Trigger Input

Maximum Input Voltage	-0.5V to 5V, ESD protected
Input Impedance	Signal is pulled high by a 4.7k Ohm resistor
Minimum Input Pulse Width Detection	1 μs
VIL	<0.5V
VIH	>2.5V

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Output

Level	0V to 5V
Input Impedance	Signal is pulled high by a 4.7k Ohm resistor
Output Pulse Width for trigger event	1µs
Output Drive	Can drive 50 Ohm coax. Source series termination for 50 Ω

Clock I/O

Level	0V to 3V
Duty Cycle	40% to 60%
Frequency	10MHz phase locked to the ADC sample rate
Enable/Disable	Software control

Network / Data Port

Connection	10/100 Base-T (auto MDI-X)
Connector	RJ-45
USB Interface	USB 2.0 full speed (480Mbps)
Connector	USB type A

Power

POE+	IEEE 802.3at
Auxiliary Power	+10VDC to +50VDC
Max. Input Power Requirements	25 Watt (includes 7W max. to Bridge Transducer)
Power Input Protection	+32VDC & Reverse polarity protection
Power Control	POE+ type 2 PSE or AUX power
Ripple	<1% pk-pk

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Environmental

Temperature	Operating Temperature: 0°C to +50°C without loss of accuracy or reliability
	Storage Temperature: -40°C to +71°C MIL-PRF-28800 Class 3
Relative Humidity, non-condensing	Operating: 10%-90%
	Storage: 5%-95%
	MIL-PRF-28800F Class 3
Vibration & Shock	MIL-PRF-28800F Class 3
Altitude	4600M, MIL-PRF-28800 Class 3
CE Compliant	Yes

Physical

Dimensions	9.81" x 9.22" x 2.27"
Weight	3 kg

Ordering Information

Model	Description
70-0655-000R	EX1403, 16-channel Strain / Bridge Instrument
70-0626-900R	Rack Mount Kit
56-0739-000	Power Supply, AC/DC, Desktop, 24V, 60W

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