EMX-4350

"SMART" PXI EXPRESS 625 KSA/S
4-CHANNEL DIGITIZER MODULE

APPLICATIONS

Dynamic Signal Analysis

High Speed Data Acquisition

Modal Analysis

Ground Vehicle Testing (GVT)

Acoustic Analysis

Pyro Shock / Impact Test

Order Analysis

Vibration Control / Analysis

FEATURES

System Level Functionality

- FPGA-based Synthetic Instrument Customization
- Corporate-wide Cloud Data Management / Access
- Comprehensive Runtime Health Monitoring
- Runtime Self-calibration / Embedded NIST Calibration
- Precision Distributed Measurement Synchronization
- Data Streaming at Full Acquisition Rates on All Channels over PXI Express Backplane

Analog Performance

- 625 kSa/s/channel, 24-Bit ADC, 4-Channel
- True Differential, IEPE or Voltage, AD/DC Inputs
- -125 dB Spurious Free Dynamic AC/DC Inputs
- Programmable IEPE Excitation: 0 mA to 20 mA
- Cross Channel Phase Matching <0.01°
- Auto-ranging ±100 mV to ±20 V Inputs

Software

- X-Modal III
- EXLab
- SO Analyzer
- Open Source Drivers

VTI Instruments

www.vtiinstruments.com

Analog Performance

The EMX-4350 Smart Dynamic Signal Analyzer incorporates best-in-class analog design methodology to deliver industry-leading measurement accuracy. This instrument is ideal for a wide range of applications including noise vibration, and harshness (NVH), machine condition monitoring, rotational analysis, acoustic test, modal test, as well as general purpose high speed digitization and signal analysis.

625 k samples / second /channel data rates extend the operational capabilities of DSA analyzers to new levels by ensuring sampling and bandwidth performance is capable of accurately capturing all critical frequency domain information, while delivering the flexibility needed for general purpose applications.

- Best-in-class sampling rates
- Best-in-class bandwidth performance
- DC performance for measurement of all signal types
- Exceptional anti-alias signal rejection (>110 dB typical)
- Flexible analog and user defined digital filter combinations
- Ideal for DSA and general purpose, high speed parallel acquisition

Aggressive anti-aliasing filter performance (user selectable / definable analog and digital filter combinations) eliminates power spectrum of unwanted signals that contribute to measurement errors delivering confidence.

True differential inputs deliver superior common mode performance reducing unwanted noise and interference, due to differences in ground points, far beyond levels capable with other implementation approaches. While the latest 24-bit analog-to-digital converter (ADC) technology delivers exceptional signal resolution, especially when combined with multiple input ranges.

- Best-in-class noise immunity
- Exclusive balanced AC coupling implementation
- Exclusive low frequency common mode trimming implementation
- Highest quality instrumentation grade ADC's outperform commonly used audio grade ADC's

Industry-leading -125 dB spurious free dynamic range (SFDR) is a key measure of the superior measurement fidelity provided by this instrument, thus ensuring that the strength ratio of the fundamental signal of interest to the strongest spurious signal is exceptional.

- Best-in-class -125 dB SFDR
- Ensures unwanted signal artifacts are greatly attenuated
- Essential performance metric for accurate frequency domain measurements
- Essential for frequency domain performance where distortion typically increases with frequency

Analog Performance

Uncompromised excitation flexibility, programmable IEPE excitation from 2 mA to 20 mA, maximizes transducer performance and response by delivering the exact excitation level independent of external cabling.

- Unparalleled fully programmable excitation (2 mA to 20 mA)
- Maximizes transducer life with lower excitation levels for shorter transducer cables
- Maximizes bandwidth and dynamic range with higher excitation levels for longer cables

Cross channel phase matching ±0.01° delivers the uncompromised phase response required for accurate single and cross channel measurements common in most DSA applications.

- Exceptional cross channel phase matching <0.01°
- Deterministic channel-to-channel, card-to-card, and chassis-to-chassis phase response
- Ensures phase accuracy of all channels relative to the tachometer, trigger and other channels

Auto-ranging ±100 mV to ±20 V inputs maximize signal resolution by automatically selecting the correct input range for the signal. Software selectable, this function can be used during setup and configuration to identify the most appropriate gain level.

- (4) Different gain ranges
- 20 V input range for high level signals and transducers
- Unmatched DC performance essential for DC-coupled transducers
- Lowest distortion in the industry (< -98 dB: 20Hz to 20KHz, 0.001 dB Flatness)

System-level Functionality

FPGA-based synthetic instrument customization extends traditional hardware performance by combining nearly unlimited user-defined computational, processing, and control possibilities to deliver unmatched measurement performance and flexibility.

- Maximizes hardware performance and measurement flexibility
- Supports custom intellectual property algorithm implementation
- Closed loop multi-module control and data transfer optimization
- Simultaneous parallel channel data decimation and manipulation
- User-defined filters, data manipulation, and analysis on-board the instrument

Industry-standard Matlab and Simulink design tools simplify implementation, maximize re-usability, and provide access to hundreds of standard filters and analysis algorithms.

System-level Functionality

Corporate wide cloud data management delivers advanced data access, security and storage services throughout the organization, accessible from web browsers and other applications, on desktop and mobile devices.

- Simplified, next generation user data services
- Corporate-wide data access and security
- Dynamically scalable data management services
- Accessible on a wide range of traditional and mobile devices
- Eliminates need for knowledge of the physical location or configuration of the system

Comprehensive runtime health monitoring provides test system confidence and peace of mind by ensuring that the complete instrumentation measurement path is functional and performing the most accurate results possible.

- Ensures runtime instrument performance and accuracy
- Performed without disconnecting external transducer cabling
- Delivers exceptional runtime convenience and measurement confidence
- Instrument performance is verified utilizing precision internal voltage references

Runtime self-calibration ensures that instruments deliver the most accurate results possible by compensating for ambient temperature fluctuations, without the need to disconnect field wiring.

- Maximizes measurement accuracy
- Performed across the entire measurement path
- Precision internal voltage sources validate and adjust coefficients
- Eliminating inaccuracies generated by internal circuitry temperature gradients

Embedded NIST traceable calibration eliminates lengthy test system down-time, simplifies calibration processes, and reduces spare equipment requirements.

- Maximizes facility up-time and utilization
- Completely automated embedded process
- Supports multiple portable calibration standards
- Performed in-place without removing instrumentation

Precision distributed measurement synchronization ensures that all test data is time correlated whether the instrumentation is centrally located in the laboratory or distributed around a test article.

- Enables widely distributed system level performance
- Utilizes embedded IEEE 1588 precision time protocol
- Precise synchronization across multiple instrumentation modules and chassis
- Synchronization achieved over-the-wire (Ethernet), with complete user transparency

RELIABLE DATA   FIRST TIME   EVERY TIME

Software

Software

Open-source SDRL X-Modal III experimental modal analysis software features intuitive task oriented user interfaces, extensive modal parameter estimation algorithms, parallel display capabilities, flexible data management, and unparalleled channel expandability.

- MATLAB®-based open-source programming environment
- Multiple live parameter estimation windows displayed in parallel
- Task oriented, easy-to-use user interface always "one-click" away
- Simplified "cut & paste" data management and unit's unification tool

EXLab is an easy to use, turn-key, data acquisition solution featuring intelligent configuration capabilities, automatic device discovery, extensive time and frequency domain data visualization, and post-acquisition display and analysis tools.

- Intuitive setup and control
- Remote client monitor and control
- Advanced filtering, analysis, and modeling
- Waterfall, video, images, scatter, 3D model and SRS diagrams

SO Analyzer delivers comprehensive, intuitive, DSA support for modal, shock, rotating machinery, and acoustics test in a single environment featuring real-time FFT acquisition, analysis and reporting with import/export, time history recording, and off-line post processing.

- Guided impact, geometry and ODS
- Stepped sine on-line analysis wizard
- Shock response post processing analysis
- Acoustic intensity measurement and analysis wizard

Open Source, industry-standard, drivers and programming interfaces provide the flexibility and freedom of choice to select the application programming environment best suited for the application and specific development requirements.

- Support for all major programming environments
- Software interoperability, maintainability, and reusability
- Common development environment and interface across all instrumentation types

General Specifications

FORM FACTOR	PXI Express (3U)
NUMBER OF CHANNELS	4
INPUT CONNECTOR	BNC (floating shell configured as differential low)
AMPLITUDE RESOLUTION	24 bits
INPUT TYPE	Fully Differential
FREQUENCY SAMPLING RATE	User programmable
	Maximum 625 kSa/s, Minimum 2 Sa/s
	Decimate by 5 and 2 filters provide lower sample rate settings
	External sampling allows continuous settings from 625 kSa/s
FREQUENCY BANDWIDTH	Maximum 270 kHz (0.432*Sample rate)
	Flexible PLL sample rate configuration (409.6 kHz, 524.88 kHz)
SPURIOUS FREE DYNAMIC RANGE	-125 dBfs (typical) (includes spurs, harmonic distortion, intermodulation distortion, alias products)
THD	< -98 dB, 20 Hz to 20 kHz
NOISE	20 nV / sqrt (Hz)
ALIASED RESPONSES	< -110 dB (typical)
ANTI-ALIAS FILTER	5-Pole linear phase
	-3.0 dB at 1.4 MHz
DIGITAL ANTI-ALIASING FILTER	Programmable
CROSSTALK	<-110 dB (typical) at 1 kHz
	Terminated into 50 Ω, other channels driven @ -0.5 dB FS
DC OFFSET	<50 uV (100mV range within 24 hours and 5 °C of self calibration temperature)
AC COUPLING 3 DB CORNER FREQ	< 0.5 Hz, 1 pole
TRIGGER MODES	Input (level / edge), external (front panel SMB), PXIe, LXI, software, timer, external, source, RPM
RANGES (V PK)	100 mV, 1 V, 10 V, 20 V
INPUT IMPEDANCE	Differential 2 MΩ nominal
	Either side-to-chassis 1 MΩ, 35 pF nominal
COMMON MODE REJECTION RATIO	DC coupled, DC to 1 kHz > 80 dB
	AC coupled, 10 Hz to 1 kHz > 80 dB
	1 kHz, full scale signal on selected range
OVER-VOLTAGE PROTECTION	40 V pk
IEPE EXCITATION CURRENT	2 mA to 20 mA, programmable
	Nominal resolution of 50 µA
IEPE COMPLIANCE	≥22 V @ 4 mA
OPEN/SHORT IEPE TRANSDUCER DETECTION	Front Panel LED and Software
TEDS	IEEE 1451.4
AMPLITUDE ACCURACY AT 1 KHZ	±0.006 dB
AMPLITUDE MATCH	±0.02 DB UP TO 100 KHZ
AMPLITUDE FLATNESS	0.001 dB to 20 kHz
	< 0.1 dB to 300 kHz
CHANNEL-TO-CHANNEL PHASE MATCH	Applies to any EMX-4350 module in the same mainframe, ±0.01° at 1 kHz
PHASE LINEARITY	±0.05° up to 300 kHz
PHASE ACCURACY (RELATIVE TO TACH)	<0.1° at 1 kHz (typical phase accuracy to EMX-1434)
EMBEDDED HEALTH MONITORING	Internal temperature, open/short IEPE transducer detection
BUILT-IN SELF-TEST (BIST)	Yes
EMBEDDED SELF-CALIBRATION	Yes
EMBEDDED NIST TRACEABLE CALIBRATION	Yes
FPGA CUSTOMIZATION	Mathworks (MATLAB and Simulink) development environment
ONBOARD MEMORY	256 Mbyte

RELIABLE DATA FIRST TIME EVERY TIME

Mechanical Specifications

IEEE 1588 CLOCK SPECIFICATIONS

CLOCK OSCILLATOR ACCURACY	±50 ppm
SYNCHRONIZATION ACCURACY	Reports "synchronized" when < ±100 ns of the 1588 master clock
TIMESTAMP ACCURACY	As good as time synchronization down to 50 ns
RESOLUTION	25 ns

IEEE 1588-BASED TRIGGER TIMING

ALARM

TRIGGER TIME ACCURACY	As good as time synchronization down to 50 ns
TIME TO TRIGGER DELAY	50 ns

RECEIVE LAN [0-7] EVENT

TRIGGER TIME ACCURACY	As good as time synchronization down to 50 ns
TIME TO TRIGGER DELAY	
Future timestamp	50 ns typical
Past/zero timestamp	1 ms maximum

HARDWARE TRIGGER TIMING

DIO BUS

TIME TO TRIGGER DELAY	57 ns typical

Environmental Specifications

TEMPERATURE

OPERATING	0 °C to +50 °C
STORAGE	-40 °C to +70 °C
RELATIVE HUMIDITY	5% – 95% (non-condensing)
ALTITUDE	3000 m
RANDOM VIBRATION	10 Min per Axis, MIL-PRF-28800F Class 3
SINUSOIDAL	5 to 55hz Resonance Search per MIL-PRF-28800F Class 3, each Axis
SHOCK	30g/Axis, 11mS half Sine pulse per MIL-PRF-28800F Class 3

Notes:

1) All specifications are typical unless otherwise stated as a minimum or maximum.

2) For current detailed specification please refer to the on-line manual at www.vtiinstruments.com.

3) All specifications subject to change without notice.

4) All specifications assume within 24 hours and 5°C of self-calibration temperature unless otherwise specified.

Ordering Information

EMX-4350	4-channel 625 kSa/s Smart PXI Express Digitizer
SOFTWARE	
X-MODAL III	Modal Analysis Software
SO ANALYZER	Acoustics/Impact/Rotational/Shock Software
EXLAB*	General Purpose DAQ Software
*Multiple configurations available	
RELATED PRODUCTS	
EMX-1434	4-Channel, 192k Sa/s Arbitrary Waveform Source
EMX-4250	16-Channel, 204.8 kSa/s Digitizer
EMX-4250-8	8-channel, 204.8 kSa/s Digitizer
EMX-4380	4-channel 625 kSa/s Digitizer (charge inputs)
EMX-6010	8-Channel, 10M Sa/s, 1MHz BW Pyroshock Digitizer
EMX-6010-4	4-Channel, 10M Sa/s, 1MHz BW Pyroshock Digitizer
EMX-6050	8-Channel, 10M Sa/s, 5MHz BW Digitizer
EMX-6050-4	4-Channel, 10M Sa/s, 5MHz BW Digitizer