

DATA SHEET



EMX-4380

CHARGE AND IEPE PXI EXPRESS 625 KSA/S
4 CHANNEL DIGITIZER

APPLICATIONS

High Speed Data Acquisition
Modal Analysis
Ground Vehicle Testing (GVT)
Acoustic Analysis
Pyro Shock / Impact Test
Order Analysis
Vibration Control / Analysis



www.vtiinstruments.com

FEATURES

Analog Performance

- 24-Bit, 625 kSa/s/channel, 4-Channel
- Only data acquisition instrument that supports True Differential IEPE, charge, or voltage inputs
- -100 dB Spurious Free Dynamic Range
- Cross Channel Phase Matching <math><0.01^\circ</math>
- Auto-ranging ± 100 mV to ± 20 V Inputs

System Level Functionality

- Supports all standard Piezo accelerometer types (IEPE/Charge)
- FPGA-based Synthetic Instrument Customization
- Corporate Wide Cloud Data Management / Access
- Comprehensive Runtime Health Monitoring
- Run-time Self-calibration / Embedded NIST Calibration
- Precision Distributed Measurement Synchronization
- Data streaming at full acquisition rates on all channels over
- PXI Express backplane

Software

- X-Modal III
- EXLab
- SO Analyzer

Specifications contained within this document are subject to change without notice

Analog Performance

MOST POWER DATA ACQUISITION SOLUTION FOR NVH TESTING

The EMX-4380 Smart 4-channel dynamic signal analyzer and digitizer is the first and only instrument that supports Charge, IEPE, or Voltage inputs allowing it to support any piezo transducer. 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.

With the flexibility to support all piezo transducer types, the EMX-4380 eliminates the need to have multiple types of modules or external signal conditioners. This helps reduce setup time and eliminate setup errors. Users are able to leverage one system to control configurations and support a wider range of testing requirements and transducer types.

Combining the flexibility in transducer types with industry leading analog performance, the EMX-4380 offers the most power data acquisition solution for NVH testing providing high accuracy, reliable measurements in the widest range of applications.

UNMATCHED BANDWIDTH

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
- 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.

EXCEPTIONAL NOISE IMMUNITY

True differential inputs and 25V Ch-to-Ch isolation delivers superior common mode performance reducing unwanted noise and interference, due to differences in ground points. While the latest 24-bit analog-to-digital converter (ADC) technology delivers exceptional signal resolution, especially when combined with multiple input ranges.

- Balanced AC coupling implementation
- Low frequency common mode trimming implementation
- Highest quality instrumentation grade ADC's outperform commonly used audio grade ADC's

Analog Performance

DYNAMIC RANGE

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

- -100 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

FLEXIBLE PROGRAMMABLE EXCITATION

Programmable IEPE excitation from 0 mA to 20 mA, maximizes transducer performance and response by delivering the exact excitation level independent of external cabling.

- 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

DETERMINISTIC PHASE MATCHING

Cross channel phase matching $\pm 0.01^\circ$ delivers the uncompromised phase response required for accurate single and cross channel measurements common in most DSA applications.

- Cross channel phase matching $\pm 0.01^\circ$
- 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

MULTIPLE INPUT RANGES

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
- 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.

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 (BIST: Built-in Self-test) provides test system confidence and peace of mind by ensuring that the complete instrumentation measurement path is functional and delivering the most accurate results possible.

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

System-level Functionality

Runtime self-calibration 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 / component aging

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

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

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 0.15625 Sa/s Decimate by 5 and 2 filters provide lower sample rate settings External sampling allows continuous settings from 625 kSa/s Maximum 270 kHz (0.432*Sample rate) Flexible PLL sample rate configuration (409.6 kHz, 524.88 kHz) |
| FREQUENCY BANDWIDTH | |
| SPURIOUS FREE DYNAMIC RANGE | -100 dBfs (typical) (includes spurs, harmonic distortion, intermodulation distortion, alias products) |
| THD | < -98 dB, 20 Hz to 20 kHz |
| NOISE | Charge: Typical 0.01 pC + 0.001 pC per 1000 pF of source capacitance. Source Resistance > 50 MΩ IEPE/Volts : 30 nV / sqrt (Hz) Typical |
| 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 | <0.1 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 | IEPE/Volts: 100 mV, 1 V, 10 V, 20 V Charge: 100 pC, 1k pC, 10k pC |
| INPUT IMPEDANCE | IEPE/Volts: 3 MΩ with AC coupling HPF @ 0.2 Hz Charge: 500 MΩ with AC coupling HPF @ 0.32 Hz Either side-to-chassis 1 MΩ, 35 pF nominal |
| COMMON MODE REJECTION RATIO | 60 dB (typical) |
| 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 | IEPE/Volts: ±0.1% Charge: ±0.5% |
| AMPLITUDE MATCH | ± 0.02% UP TO 100 KHZ |
| AMPLITUDE FLATNESS | IEPE/Volts: < 0.1 dB upto 300 kHz Charge: < 0.1 dB upto 100 kHz for Source Capacitance < 2nF |
| CHANNEL-TO-CHANNEL PHASE MATCH | Applies to any EMX-4380/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) |

General Specifications

EMBEDDED HEALTH MONITORING
 BUILT-IN SELF-TEST (BIST)
 EMBEDDED SELF-CALIBRATION
 EMBEDDED NIST TRACEABLE CALIBRATION
 FPGA CUSTOMIZATION
 ONBOARD MEMORY

Internal temperature, open/short IEPE transducer detection
 Yes
 Yes
 Yes
 Mathworks (MATLAB and Simulink) development environment
 2 GB

Mechanical Specifications

IEEE 1588 CLOCK SPECIFICATIONS

CLOCK OSCILLATOR ACCURACY
 SYNCHRONIZATION ACCURACY
 TIMESTAMP ACCURACY
 RESOLUTION

±50 ppm
 Reports "synchronized" when < ±100 ns of the 1588 master clock
 As good as time synchronization down to 50 ns
 25 ns

IEEE 1588-BASED TRIGGER TIMING

ALARM

TRIGGER TIME ACCURACY
 TIME TO TRIGGER DELAY

As good as time synchronization down to 50 ns
 50 ns

RECEIVE LAN [0-7] EVENT

TRIGGER TIME ACCURACY
 TIME TO TRIGGER DELAY

As good as time synchronization down to 50 ns

Future timestamp
 Past/zero timestamp

50 ns typical
 1 ms maximum

HARDWARE TRIGGER TIMING

DIO BUS

TIME TO TRIGGER DELAY

57 ns typical

Environmental Specifications

TEMPERATURE

OPERATING
 STORAGE

0 °C to +50 °C
 -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-4380 44-Channel, 625 kSa/s Smart Dynamic Signal Analyzer
with IEPE, Charge, and Voltage inputs

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-4350 4-Channel, 625 kSa/s Smart Dynamic Signal Analyzer
with IEPE, Charge, and Voltage inputs

EMX-4250 16-Channel, 204k Sa/s DSA Digitizer

EMX-4251 8-Channel, 204k Sa/s DSA Digitizer

EMX-1434 4-Channel, 204k Sa/s Arbitrary Waveform Source