

# Experts in Vibration

## Measurement Hardware m+p Vibxx



# Precision Instrumentation Built to Your Specific Needs



We tailored our measurement hardware specifically for the requirements of noise and vibration analysis, vibration testing and dynamic data acquisition: m+p VibPilot is a compact 4/8-channel instrument, the high-channel count m+p VibRunner can be used as desktop instrument or mounted into a 19" rack and the multi-channel m+p VibMobile combines channel density and robustness with versatile signal conditioning.

There is an m+p system for every application. Configure your measurement hardware exactly to your needs.

Our solution-oriented approach provides outstanding performance at an excellent price-performance ratio. Measurement hardware from m+p international achieves the highest reliability and system longevity.

Designed to be used with our proven m+p VibControl, m+p Analyzer and m+p Coda software solutions, m+p international hardware covers a wide range of applications:

- Vibration testing on electrodynamic and hydraulic shakers
- Multi-axis vibration testing
- Multi-channel vibration data acquisition including data recording and continuous time history recording
- Noise and vibration testing
- Structural testing
- Modal analysis and impact testing
- Rotating machinery analysis
- Data acquisition
- Experimental stress analysis
- Temperature measurements
- Process and condition monitoring
- Acoustic control in a reverberant chamber or direct field environments
- Test stand engineering



High-precision 24-bit D/A converter

*To keep you ahead of your competition, our measurement hardware is designed to put your products at the forefront for performance, durability and quality.*

*“m+p was selected because of the flexibility offered by the modular controllers, intuitive front-end and the excellent support received from m+p over recent years.”*

Richard Thompson, Environmental Test Manager at TÜV SÜD Product Service Ltd, Fareham, UK

# Compact 4/8-Channel Front-End m+p VibPilot



## KEY FEATURES

- 4 or 8 analog input channels
- 204.8 kHz simultaneous sampling
- IEPE sensor conditioning user selectable on each channel
- TEDS support
- 2 source output channels
- Safety shutdown and power loss protection for source channels
- 2 tacho inputs
- Digital I/O's for remote control, e.g. climatic chamber control
- DSP powered real-time processing
- Synchronization of multiple m+p VibPilot front-ends
- Ethernet and USB host interfaces
- Dust-proof, rugged housing
- Battery option
- Fan-less, noise-free operation
- AC/DC supply floating or grounded, only 20 W power consumption

With the 4/8-channel m+p VibPilot, m+p international sets a new standard for affordable performance in vibration control and dynamic signal analysis. m+p VibPilot is based on the latest generation of IC technology resulting in high-precision measurement ability and impressive real-time performance in signal analysis.

### Operation Indoors and Outdoors

Compact and rugged, m+p VibPilot has a robust look and feel and a clearly arranged front panel with four or eight BNC connectors. Thanks to its dust-proof design, you can operate it indoors or outdoors even under harsh conditions. m+p VibPilot provides both Ethernet and USB connectivity to a host PC or laptop and is operated by either an external AC mains power supply or by a DC supply, e.g. for in-car operation. The fan-less, noise-free operation facilitates noise measurements requiring a quiet environment.

Battery operation enables portable applications in the field and in the lab: Whether you want to take professional on-site measurements, do some quick troubleshooting in the field or place the instrument close to the specimen and sensors to minimize cable runs and noise. The optional battery is helpful in all test environments where no power supply is available.

### Support of Multiple Front-Ends

To extend input channel capability, m+p VibPilot devices can be synchronized via the clock in/clock out circuitry

without influencing their excellent measurement performance. This allows you to use additional channels (e.g. 2 x 8 input channels) or to combine vibration tests and dynamic signal acquisition applications with ease. m+p Analyzer for noise and vibration analysis supports up to six m+p VibPilot devices with a total of 48 input channels.

m+p VibPilot. Small in size. Huge in performance.

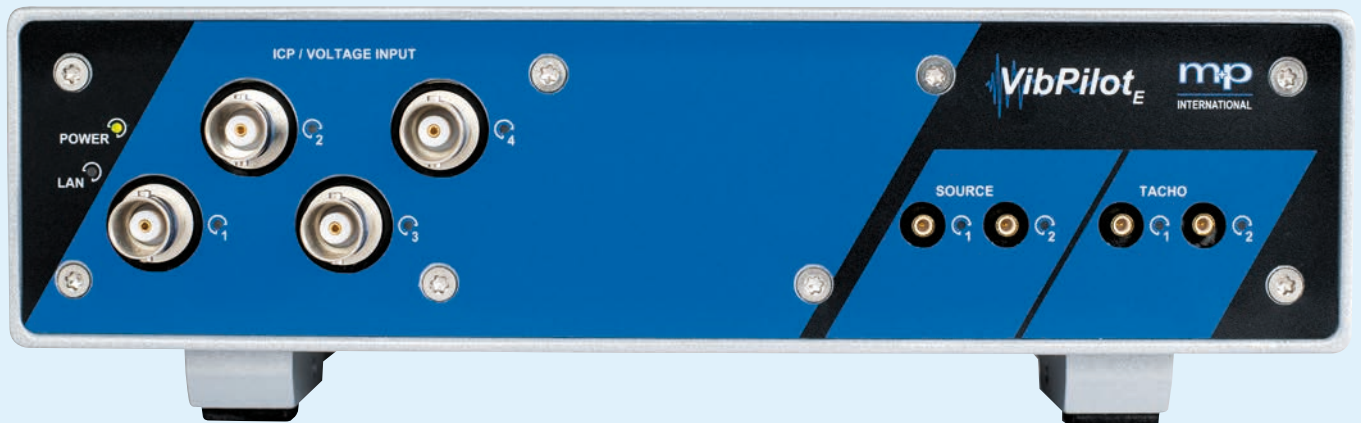


### Input/Output Channels

Equipped with 24-bit sigma-delta A/D converters with up to 204.8 kHz sampling rate, m+p VibPilot allows for alias-protected measurements in a frequency range up to 80 kHz and with more than 120 dB spurious-free dynamic range. The analog input circuits have advanced sigma-delta converters which offer advantages such as simultaneous sampling by independent A/D converters on each input, reduced noise and improved accuracy due to 64 times oversampling on each input. Both analog and digital filtering are used for full aliasing protection and they provide excellent low-level signal-to-noise performance and differential linearity. The input voltage range of  $\pm 1$  V and  $\pm 10$  V peak full scale is selectable per channel.

As well as normal differential voltage inputs with AC/DC coupling, signal conditioning for the analog input channels also provides source capabilities for IEPE sensors, including cable break indicators, and an interface for accessing standardized Transducer Electronic Data Sheets (TEDS). TEDS support allows automatic front-end setup based on information stored in the transducer, e.g. sensitivity, calibration data and serial number.

Two precision low-noise analog outputs are available together with hardware shutdown circuitry which ramps down the source signals in a controlled manner in case of emergency.



4-channel m+p VibPilot



8-channel m+p VibPilot

### Tacho Inputs

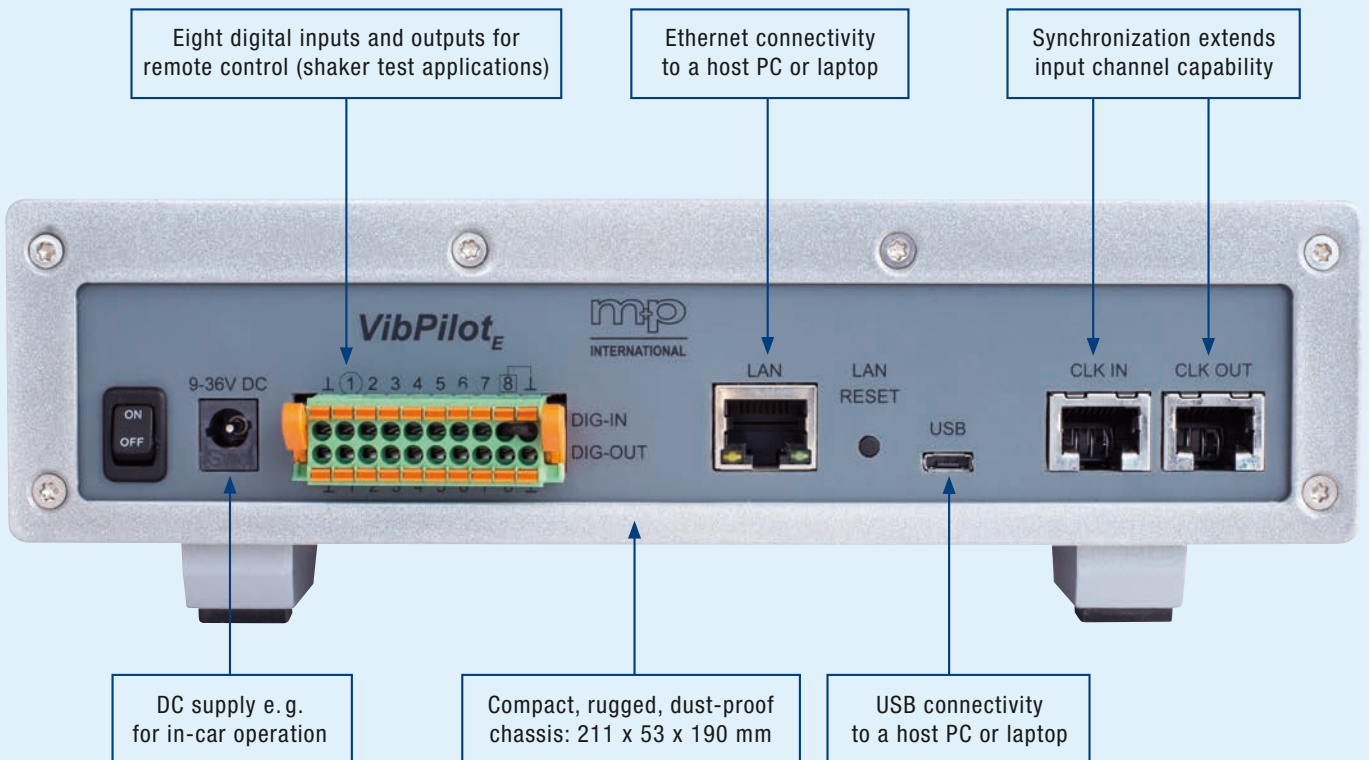
Two tacho inputs are included with 32-bit high-speed up/down counters for rotational vibration measurements or for use as COLA synch inputs for shaker sine reduction applications.

### Digital Inputs/Outputs

Eight digital inputs and eight digital outputs enable engineers to directly execute control functions for combined environmental tests (climatic chamber control) or for parallel functional tests of the specimen. Individual tests can be easily combined in any complexity of nested loops.

### Dynamic Signal Processors

Two 300 MHz floating-point dynamic signal processors in each m+p VibPilot pre-process the data, thus guaranteeing the high performance and short control cycles.



# High-Channel Count Hardware Platform m+p VibRunner





## KEY FEATURES

- Desktop instrument or 19" rack-mounted system, 1U high
- AC and DC power supply, multi-range, silent operation, temperature-controlled fan
- Precise synchronization of multiple m+p VibRunner instruments
- DSP powered real-time processing and 1 Gbit/s Ethernet host interface
- Up to 24 analog input channels, 24 bits, 204.8 kHz max. sampling rate per channel, voltage, IEPE, bridge sensor conditioning
- Tacho inputs, source channels with emergency shutdown, digital I/O

m+p VibRunner is our measurement hardware platform for higher channel counts, designed for the specific needs of noise and vibration engineering and general data acquisition such as strain and temperature measurements. This solution-oriented approach provides superb performance at an excellent price-performance ratio.

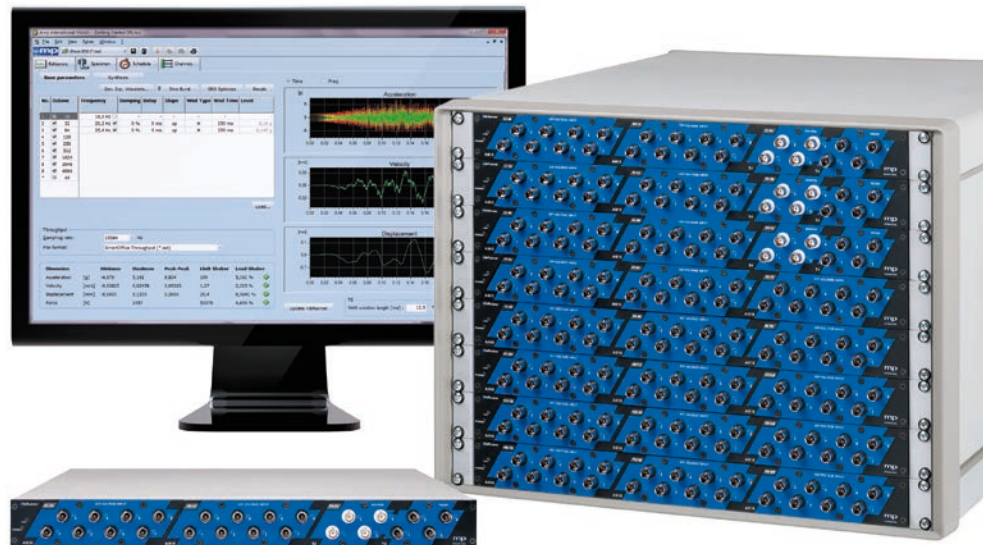
The hardware platform is ideal for projects such as engine test cells, where high data throughput is important; large structures where distributed inputs reduce sensor cabling; large channel count requirements such as sensitive satellite pre-flight testing; or simply where a wide range of testing needs demand the ultimate flexibility in test system configuration.

It integrates seamlessly with our m+p VibControl, m+p Analyzer and m+p Coda software products.

### Desktop or Rack Mounted

m+p VibRunner provides maximum modularity. The basic unit is a 19" mainframe that houses up to three front-mounted functional modules. The 1U mainframe can be equipped with feet for use as a desktop instrument or with mounting brackets for 19" rack mounting.

m+p VibRunner is equipped with multi-range AC and DC power supply. Cooling is performed by a high-quality, silent

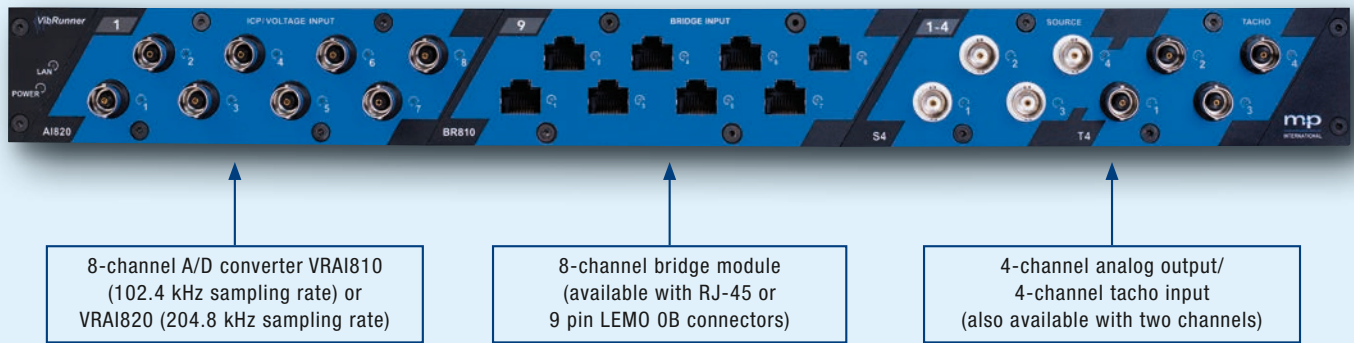


Configure m+p VibRunner to your precise needs.

fan whose speed is temperature-controlled. For sensitive noise measurements the fan can be turned off from the host PC.

### Scalability and Synchronization

For applications requiring a high number of measurement channels, data acquisition over multiple m+p VibRunner systems will be exactly synchronized. This is made possible by making the master clock available to all slave mainframes. For measurements of large objects, the m+p VibRunner systems can be placed close to the measuring points which minimizes costly transducer cabling.



### Digital Inputs/Outputs

Each instrument has a digital interface with 8 inputs and 8 outputs (5 V TTL). These inputs/outputs enable engineers to directly execute control functions for combined environmental tests or for parallel functional tests of the specimen.

### Power of Ethernet

The 1 Gbit/s Ethernet interface is used for communications with the host PC. To ensure safe and fast communication even with many input channels, the m+p VibRunner hardware is integrated into its own, independent subnet. High channel counts increase the required data rates considerably, but m+p international's choice of the Ethernet standard means that the host PC system can be configured using common off-the-shelf technology, including very powerful server systems.

### Input Channels

m+p VibRunner provides high-precision measurement capability and outstanding real-time performance. With 24-bit sigma-delta A/D converters with up to 204.8 kHz sampling rate, it allows for alias-protected measurements in a frequency range up to 80 kHz and more than 120 dB spurious-free dynamic range. Input ranges are selectable from 100 mV to 20 Vpk, low noise and selectable high-pass input filtering allow for versatile acoustic measurements and pyro-shock capture. The input channels can be switched between single-ended and full differential mode, thus allowing potential-free measurements such as those required on bridge circuits. TEDS (Transducer Electronic Data Sheet) support is a time-saving tool to automatically enter information stored in the transducer, e.g. sensitivity, calibration and serial number. Operators can individually switch the IEPE power supply for every input channel.

### Strain Measurements

The 8-channel bridge module VRBR810 enables experimental stress analysis and structural testing. It contains quarter-, half-, and full-bridge support. The built-in bridge excitation and completion is individually programmable for each channel, thus making time-consuming hardware re-configuration of different gauge types unnecessary.

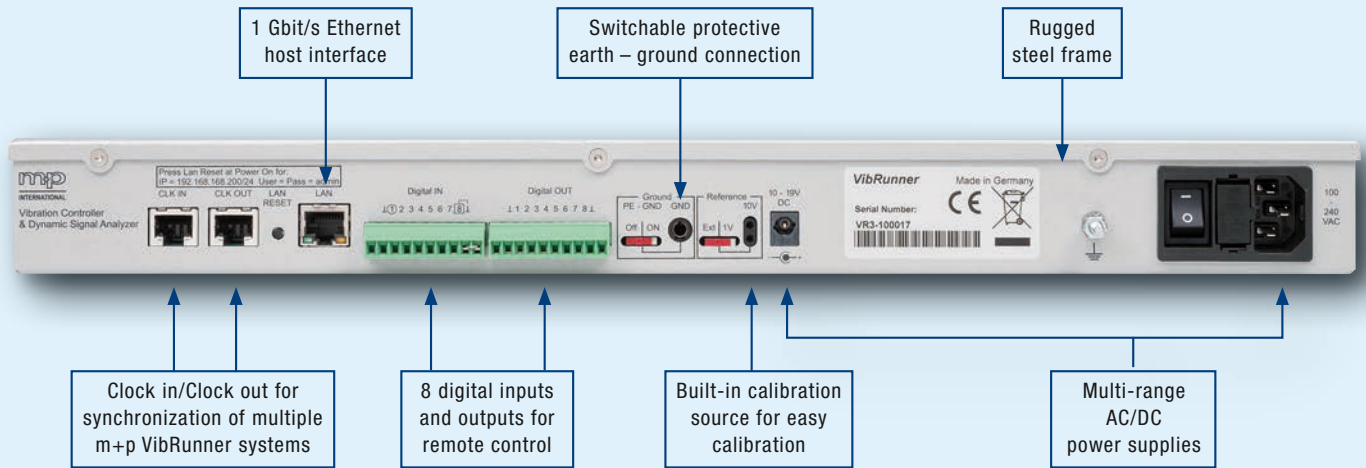
The BR3205RJ (BR1605RJ) is a bridge instrument for strain gauge measurements, offering 32 (16) programmable input channels. It covers a large range of test and measurement applications from 16 to hundreds of input channels.

### Output Channels

Additional m+p VibRunner modules provide analog outputs for vibration testing or modal analysis applications requiring a drive signal for the shaker. And here again, m+p VibRunner is optimally tuned to meet the specific requirements: high-precision 24-bit D/A converters are sampled by the master clock in the same way as the A/D converters on each input to ensure the excellent phase stability of the measurements. In case of emergency (for example, at power failure or when the connection to the host PC is lost), the source signal will be ramped down in a controlled manner to avoid damage to the specimen or the test equipment. This automatic, analog shutdown circuitry guarantees the highest safety possible during the test.

### High-End Solutions for Data Acquisition and Signal Analysis

Based on our powerful software platforms we offer m+p VibRunner hardware configurations tailored to the specific needs of high-performance and multi-channel measurement applications.

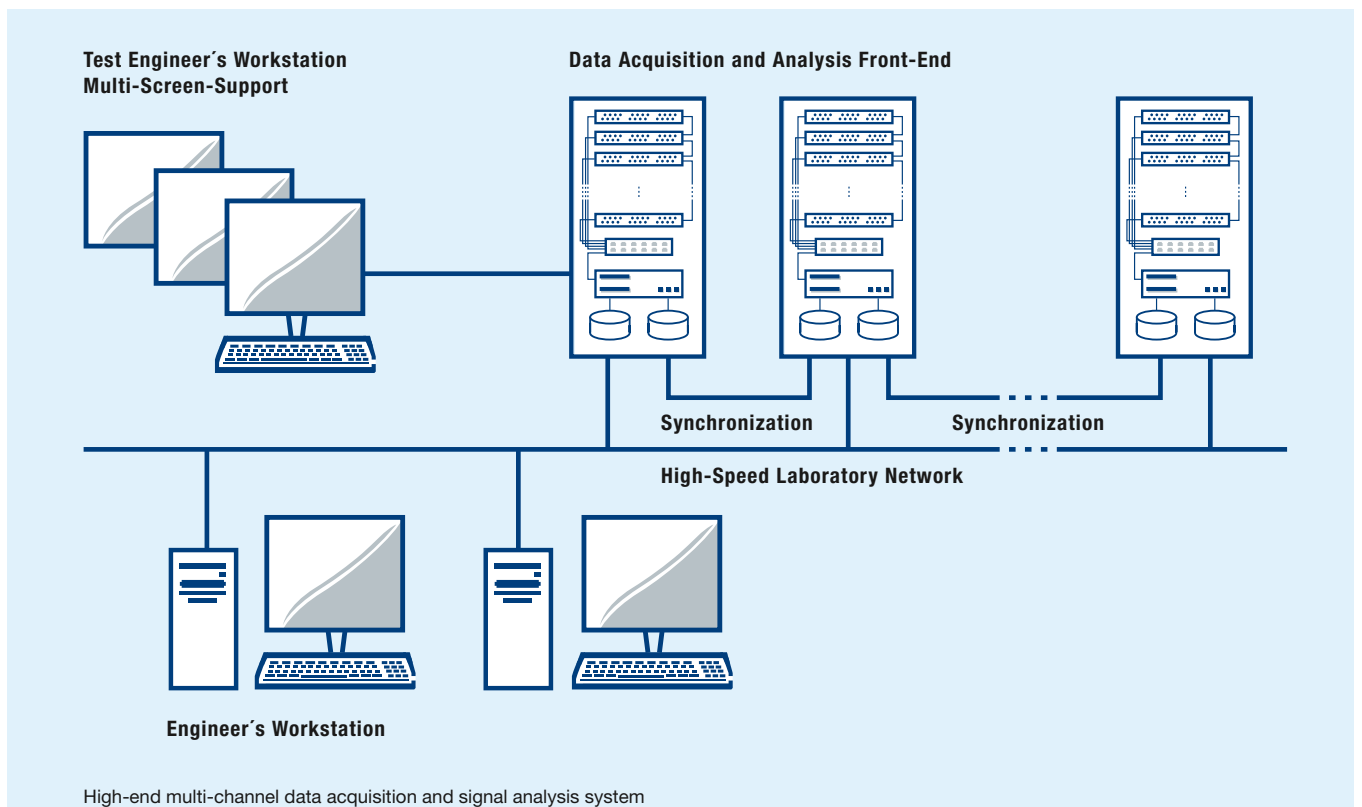


The 24-channel m+p VibRunner front-ends are installed in a 19" cabinet to make up a 256-channel data acquisition system. For high-speed data processing and continuous data recording, a powerful data server is supplied with the data acquisition system. This data server can be equipped with terabyte disc storage to guarantee high-speed recording and fast data access.

If even higher channel counts are required, e. g. for sophisticated aerospace testing applications, several

systems can be combined. The measurement systems can be placed close to the measuring points and be synchronized over several hundred metres, thus minimizing transducer cabling and increasing flexibility of the test system configuration.

The data model ensures access to all input channels during setup, online monitoring and post-test analysis, no matter on which hardware unit within the network the channel is located.



High-end multi-channel data acquisition and signal analysis system

# Mobile Multi-Channel Front-End m+p VibMobile



## KEY FEATURES

- **Portable, for field and laboratory use, battery option, rugged housing, silent operation**
- **Embedded CPU i7 2.4 GHz, QuadCore, 8 GB DDR3L, 2 x GBit Ethernet, one of them supporting IEEE 1588 precision time protocol, SATA 6G Raid controller for 2 onboard SSD discs, Windows 7 embedded operation system**
- **Counter timer module for clock generation, trigger I/O, synchronization of multiple devices, incl. 2 sources, 2 tacho ports and 4/4 digital I/O ports**
- **12-slot mainframe for up to 8 m+p proprietary I/O boards and up to 4 industry-standard CompactPCI® Serial boards opens almost unlimited choice of analog and digital I/O, communication interfaces and storage devices**

m+p VibMobile was engineered for the requirements of mobile multi-channel noise and vibration measurements and dynamic signal analysis as well as demanding data acquisition and monitoring applications. Including multi-range AC and DC power supply and battery option, the front-end is ideal for portable use in the field or mounted in vehicles as well as for use in the lab.

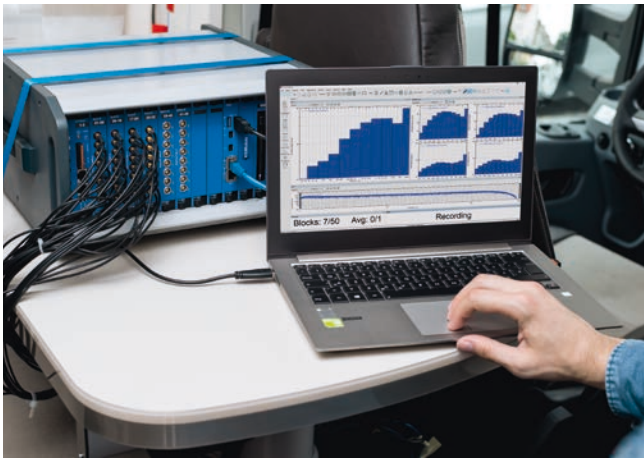
A wide choice of m+p proprietary analog I/O boards for high-speed data acquisition, simultaneous sampling, signal conditioning for voltage inputs, IEPE sensor supply and bridge measurements together with DSP powered real-time processing makes it ideally suited for all kind of measurement and signal analysis tasks. Up to four CompactPCI® Serial boards can be used additionally in the mainframe allowing for the free selection of industry standard I/O, interface and storage solutions.

The m+p VibMobile can be used as a front-end together with a remote PC or laptop or standalone by having all application software installed on the powerful embedded CPU with monitor, keyboard and mouse connected directly to the CPU. For very high channel counts and distributed measurements over long distances, several mainframes in a master-slave configuration can be used and all of them will be precisely synchronized by the master clock.

Just take your measurements, do online analysis, review the results, store raw data and results, share the results with colleagues and continue your work in the lab or in the office using the field data. m+p VibMobile fulfills both the robustness and channel density criteria needed for optimal test and measurement productivity.



Networking of three m+p VibMobile instruments housed in 19" wide shock-proof boxes



Data analysis directly in the field



Monitor, keyboard and mouse connected to CPU for standalone operation

### Use in the Field, in Vehicles or in the Lab

The new m+p VibMobile with its compact form factor, robust design, embedded CPU and storage media and optional battery power is made for portable or standalone operation. The silent temperature-controlled fans make it ideally suited for acoustic measurements. With a broad selection of analog input and output boards and appropriate signal conditioning modules, it can be used in all kinds of dynamic and quasi-static measurement fields: noise and vibration, modal analysis, experimental strain and stress analysis, engine testing, functional testing, process monitoring etc.

### Reliable Acquisition in Harsh Environments

The conditions under which you have to take measurements are sometimes tough. The robust steel housing qualifies the m+p VibMobile for operation under harsh ambient conditions and for high temperatures.

Lightweight polyurethane side panels provide extra protection if you carry your device. For very high shock and vibration exposure, for example during test runs in vehicles, we offer a shock-isolated mount in a strong steel box which has vapour-tight front and rear covers – also perfect for protected transport to the site.

You get reliable, accurate measuring data – anytime and anywhere.

### Networking of Multiple Systems

For channel expansion and distributed measurements multiple m+p VibMobile front-ends can be combined to act as one system. The daisy-chained master-slave configuration makes it possible to place the front-ends close to the measuring points, resulting in reduced transducer cabling and much higher measurement quality. Fully synchronized, precise data from all devices are transferred via GBit Ethernet lines to the host PC and stored consistently in one measurement file.

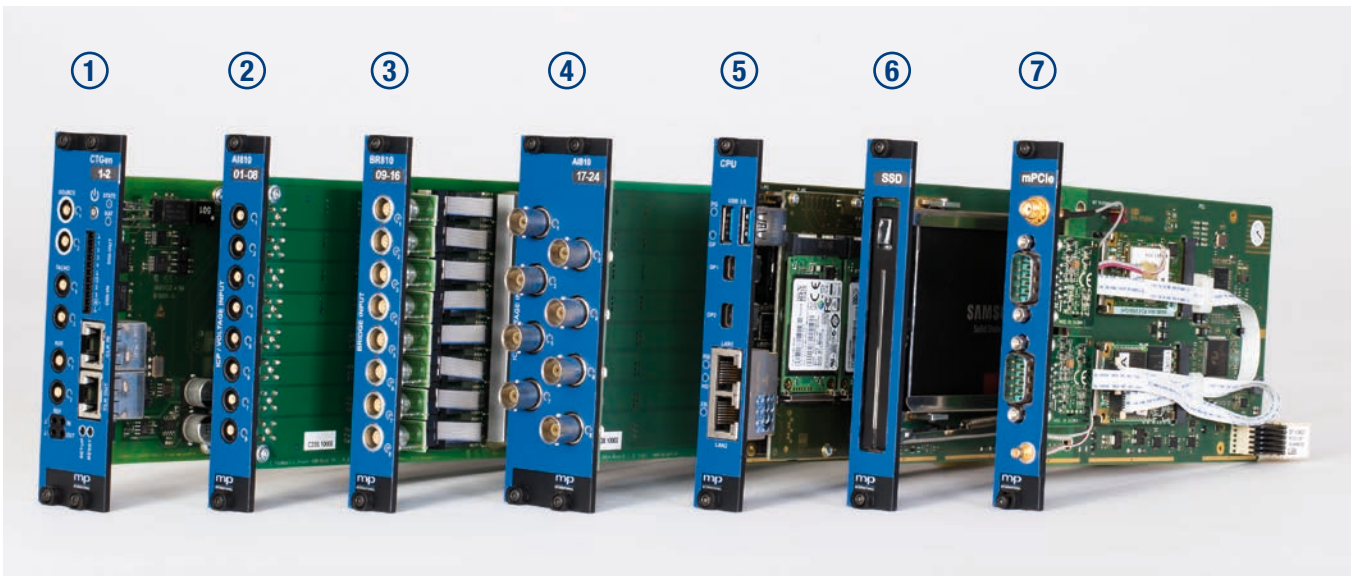
### Analog and Digital I/O Boards and Signal Conditioning

For NVH test and measurement applications we offer two sigma-delta A/D converters, 102.4 or 204.8 kHz sampling rate, each with 8 channels, configurable input architecture and gain as well as multiple clocking and trigger options. The switchable input voltage ranges provide improved sensitivity for very low level vibration signals and microphone measurements as well as higher voltage sources such as tach sensors. 24-bit resolution, full anti-aliasing protection and more than 120 dB spurious-free dynamic range make these digitizers high-precision instruments for measurements in frequency ranges up to 40 or 80 kHz. The channel type can be switched between full differential and single-ended, thus enabling potential-free measurements. Other functions include TEDS support, IEPE sensor conditioning, cable break and overload detection.

The 102.4 kSa/s per channel bridge module is perfect for dynamic strain measurements, experimental stress analysis



Removable disc for data storage



- ① Control unit CTGen incl. two analog outputs, two tacho channels, two auxiliary digital inputs
- ② 8-channel A/D converter VMAI810 (102.4 kHz SR) or VMAI820 (204.8 kHz SR), SMB connectors
- ③ 8-channel bridge module (available with 9 pin LEMO 0B or 7 pin LEMO 1B connectors)
- ④ 8-channel A/D converter VMAI810BDBW (102.4 kHz SR) or VMAI820BDBW (204.8 kHz SR), BNC connectors
- ⑤ Embedded CPU
- ⑥ Removable disc drive
- ⑦ Two-port CANbus and GPS receiver

and fatigue testing of mechanical structures. It enables connection of eight strain gauges in full-, half-, or quarter-bridge configurations. Up to 64 channels, all precisely synchronized, can be connected to one m+p VibMobile. Robust, reliable LEMO connectors are used for the 6-pin wiring. All channels support TEDS for fast and secure system set-up.

A 24-bit D/A converter provides four analog outputs for vibration testing or modal analysis applications requiring drive signals for the shakers. Control circuitry is implemented on all source channels for a controlled shutdown of the output voltage signal in case of emergency or power failure ensuring safe operation of the test system.

Tacho inputs with 32-bit high-speed up/down counters allow for rotating machinery testing. Digital inputs and digital outputs support various testing tasks such as combined environmental tests (climatic chamber control) or parallel functional tests.

### CompactPCI® Serial Boards

m+p VibMobile covers many of your day-to-day data acquisition and dynamics testing tasks. And we will add more and more I/O boards to complete our offer for even more application ranges. For special requirements the m+p VibMobile has four slots of the industry-standard CompactPCI® Serial bus for freely selectable, 3<sup>rd</sup> party boards like mega-sampling high-speed transient recorders, GPS receivers, RS-232 or RS-485 serial interfaces, Fieldbus, CANbus, IRIG or ARINC time protocol interfaces and also fixed or removable disc modules with terabytes of storage space. We offer a selection of these boards as standard solutions, supported by our application software suites. Other boards may require a tailor-made solution which will be integrated on demand.



## INTERNATIONAL

### **m+p international**

Founded in Hannover, Germany in 1980, m+p international develops and manufactures test and measurement systems for vibration testing, dynamic signal analysis, multi-channel data acquisition and monitoring and test stand engineering. Our product reputation and broad experience coupled with valuable user feedback have led to significant market share in numerous key industries worldwide.

The company has its headquarters in Hannover, Germany with sales/marketing subsidiaries in New Jersey (USA), England, France and China, along with representatives and agents in many countries.

Learn more on the full range of m+p international products and services and their applications. Select the m+p literature library on our website and download the desired product literature.

m+p VibControl, m+p Analyzer, m+p Coda, m+p VibPilot, m+p VibRunner, m+p VibMobile, m+p HFDST-3000-E and m+p ACON are products of m+p international.

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[www.mpihome.com](http://www.mpihome.com)

### **Germany**

#### **m+p international**

#### **Mess- und Rechnertechnik GmbH**

Thurnithstraße 2  
30519 Hannover  
Phone: (+49) (0)511 856030  
Fax: (+49) (0)511 8560310  
[sales.de@mpihome.com](mailto:sales.de@mpihome.com)

### **USA**

#### **m+p international, inc.**

271 Grove Avenue, Bldg. G  
Verona, NJ 07044-1705  
Phone: (+1) 973 239 3005  
Fax: (+1) 973 239 2858  
[sales.na@mpihome.com](mailto:sales.na@mpihome.com)

### **United Kingdom**

#### **m+p international (UK) Ltd**

Mead House  
Bentley, Hants  
GU10 5HY  
Phone: (+44) (0)1420 521222  
Fax: (+44) (0)1420 521223  
[sales.uk@mpihome.com](mailto:sales.uk@mpihome.com)

### **France**

#### **m+p international Sarl**

5, rue du Chant des Oiseaux  
78360 Montesson  
Phone: (+33) (0)130 157874  
Fax: (+33) (0)139 769627  
[sales.fr@mpihome.com](mailto:sales.fr@mpihome.com)

### **China**

#### **Beijing Representative Office of m+p international**

Room 1006, Jin Ma Office  
Building B Seat  
Xue Qing Road No. 38  
Hai Dian District, Beijing  
Phone: (+86) 10 8283 8698  
Fax: (+86) 10 8283 8998  
[sales.cn@mpihome.com](mailto:sales.cn@mpihome.com)