m+p VibPilot

Vibration Controller, Dynamic Signal Analyzer and DAQ System

8-channel m+p VibPilot

Introduction

The m+p VibPilot is m+p international's 4/8-channel front-end specifically designed for advanced vibration testing, noise and vibration analysis and dynamic data measurements. For portable applications in the field and in the lab it can be equipped with a battery. It is based on the latest generation of IC technology resulting in high-precision measurement ability and impressive real-time performance in signal analysis. With 24-bit sigma-delta A/D converters with up to 204.8 kHz sampling rate the m+p VibPilot allows for alias protected measurements in a frequency range up to 80 kHz and more than 120 dB spurious-free dynamic range.

m+p VibPilot integrates seamlessly with our software products: m+p VibControl for vibration testing on a shaker, m+p Analyzer for noise and vibration analysis and m+p Coda for data acquisition, signal analysis and condition monitoring.

Thanks to its dust-proof, rugged design it can be operated indoors or outdoors under harsh conditions. As the m+p VibPilot is fanless, it is also ideally suited for noise measurements requiring a quiet environment. 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 the operator to use additional channels (e. g. 2 x 8 input channels) or to combine vibration tests and dynamic signal acquisition applications with ease.

Key Features

- 4 or 8 analog input channels - expandable
- 204.8 kHz simultaneous sampling
- IEPE sensor conditioning
- TEDS support
- 2 source output channels
- Power loss protection
- Safety shutdown for source channels
- Battery option for mobile applications
- AC/DC supply, only 20 W power consumption
- 2 tacho inputs
- 8 digital inputs and 8 digital outputs
- DSP powered real-time processing
- Multiple m+p VibPilot synchronisation
- Ethernet and USB host interfaces
- Compact, dust-proof, rugged housing
- Fanless, noise-free operation

Applications

m+p VibPilot is our high-precision and powerful front-end exactly tailored to the requirements of vibration control, dynamic signal analysis and data acquisition applications. It supports the proven m+p VibControl, m+p Analyzer and m+p Coda software products giving the m+p VibPilot hardware a multiple use. With its battery option, it is perfectly suited for mobile applications.

It covers the full functionality of the m+p VibControl shaker control software and all test modes that are used in vibration testing nowadays, everything from simple ESS random testing to mixed mode gunfire simulation.

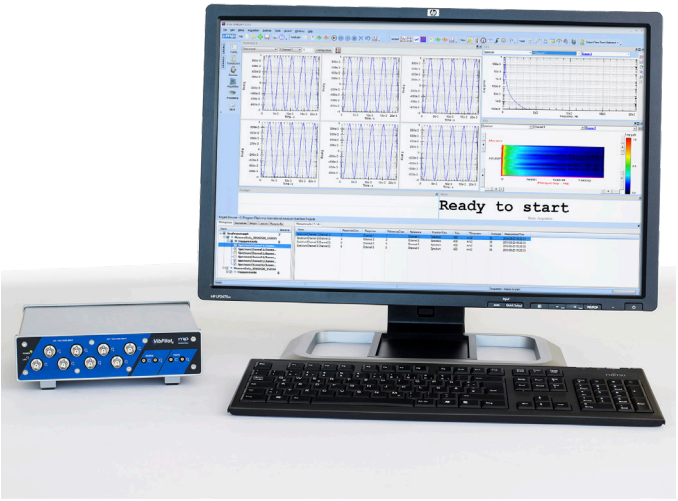
With the m+p Analyzer, m+p VibPilot provides all the hardware features in one box for the widest range of applications in dynamic signal analysis: real-time FFT and time history data acquisition, modal analysis, impact testing, rotating machinery testing, acoustic measurements as well as environmental testing.

When used with m+p Coda software, m+p VibPilot is a compact and universal DAQ system that acquires data from all common types of sensors. Applications include performance and functional tests, experimental structural testing as well as all kind of monitoring tasks.

Multiple m+p VibPilot instruments can be used in parallel to extend the number of input channels. With the external clock in/clock out circuitry the measurements of all instruments will be triggered at the same time and exactly synchronized allowing for correct measurements and analysis over the whole structure under test.

The optional battery enables mobile applications. Two of these batteries, with a nominal capacity of 49 Wh each, can be taken with you into the passenger cabin of an aircraft.

Sychronization of m+p VibPilot front-ends



m+p VibPilot for vibration control, NVH testing, data acquisition and monitoring

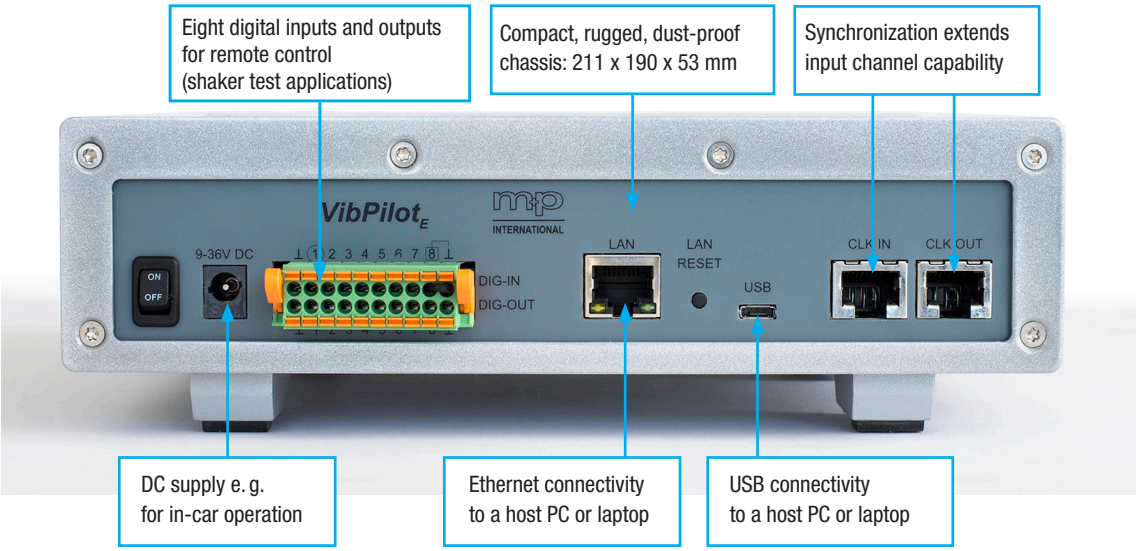
Chassis

The m+p VibPilot chassis is a single-board box in a dust-proof design for industrial use. Compact and rugged, it has a robust look and feel and a clearly arranged front panel that can be angled for ease of connection access to the front panel BNCs. The fanless, noise-free operation enables noise measurements for which a quiet environment is mandatory. m+p VibPilot is operated by a 240 V AC, a 12-16 V DC power supply or by an optional internal battery.

m+p VibPilot provides Ethernet and USB connectivity to a host PC or a laptop.

4-channel m+p VibPilot

8-channel m+p VibPilot



m+p VibPilot rear view

m+p VibPilot Chassis Specifications

General Characteristics	
Dimensions (w x d x h), mm	211 x 190 x 53
Weight, kg	1.57
Housing material	Steel painted, aluminium blend frames
Design specials	Rugged, dust-proof, fanless operation
Connectors, Front Side	
Analog input channels	4 or 8 BNC
Analog output channels	2 SMB
Tacho input channels	2 SMB
Connectors, Rear Side	
DC input	Jack socket
Digital input/output	20-pole Combicon
Host interfaces	RJ-45 socket, 100Base-T Ethernet, 100 Mbit/s Micro-A/B connector, USB 2.0, 480 Mbit/s
Clock in/out	2 RJ-45
Switches, Rear Side	
Power on/off	Yes
LAN reset	Yes
Indicators, Front Side	
Power	1 LED, green: on, red: battery operation
LAN	1 LED, green: signal, red: error, off: no signal
Input signal conditioning per channel	4 or 8 LEDs, green: IEPE operation, red: IEPE enabled or broken cable
External Power Supply	
Dimensions (w x d x h), mm	114.5 x 49.5 x 29.5
Weight, g	280
Rated input voltage	100 V/240 V
Input voltage range	90 – 264 V AC
Input frequency range	47 – 63 Hz (± 1 Hz)
Input current	≤ 1.5 A
Rated output voltage	19 V
Output current	0 – 3.42 A
Power cord length, m	3.3 (AC and DC side)
Mains plug	Per country approved version
DC to chassis connector	Jack plug
Direct DC input	12 (9) – 36 V DC
Power consumption	20 W
Battery (Option)	
Total battery capacity (nominal)	3,300 mAh, 49 Wh
Battery autonomy	4 h when equipped with 8 channels ICP
Operating temperature	0 – 45 °C
Charge operating limits	max. 0 – 35 °C, recommended 25 °C

Data Acquisition, Signal Conditioning and Signal Processing

The m+p VibPilot data acquisition and signal processing unit features four- or eight-channel analog input, two-channel analog output, two-channel tacho input as well as 16-channel digital I/O.

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 over-sampling on each input, both analog and digital filtering is used for full anti-aliasing protection and they provide excellent low-level signal-to-noise performance and differential linearity.

Two analog outputs are available together with power loss protection as well as hardware shutdown circuitry which ramps down the source signals in a controlled manner in case of emergency.

Signal conditioning for the analog input channels provides source capabilities for IEPE sensors including cable break indicators as well as an interface for accessing standardised Transducer Electronic Data Sheets (TEDS). TEDS support is a very useful tool for vibration control applications as it allows automatic frontend and analyzer setup based on information stored in the transducer, e.g. sensitivity, calibration and serial number.

Two tacho inputs are included with 32-bit high-speed up/down counters for measuring synchronous signals on rotating machines.

m+p VibPilot has two floating-point dynamic signal processors: one for data acquisition, tacho inputs, addressing the A/D converters and downsampling and a second DSP for signal processing, configuration and communication with the host PC.

For channel expansion, the clock in/clock out circuitry enables synchronization of two or more m+p VibPilot devices without compromising their performance. This allows the engineer to use additional channels (e.g. 2 x 8 input channels), to operate a second shaker from the same host PC or to combine vibration tests and dynamic signal applications.

Data Acquisition, Signal Conditioning and Signal Processing Specifications

Analog Input	
Number of channels	4 or 8; multiple unit daisy chain
Channel type	Voltage mode: single-ended or fully differential, selectable per channel IEPE mode: single-ended or pseudo-differential, selectable per channel
Analog-to-digital converter type	Sigma-delta
Resolution	24 bits
Sampling rate per channel	40 to 204.8 kHz
Input voltage range	± 1 V and ± 10 V peak full scale, selectable per channel
Overload protection	40 V
Input impedance	1 MΩ, capacitance: 45 pF
Coupling	AC/DC, switchable per channel
AC coupling	0.3 Hz 6 dB/oct. and 10 Hz 6 dB/oct., selectable per channel
Signal-to-noise ratio	At 102.4 kHz sampling: > 100 dB in 1 V range > 105 dB in 10 V range
Amplitude accuracy	± 0.06 dB (at 1 kHz)
Amplitude flatness	± 0.015 dB (DC to 80 kHz, relative to 1 kHz)

Data Acquisition, Signal Conditioning and Signal Processing Specifications

Spurious-free dynamic range	120 dB (typically 130 dB)
Cross-channel phase match	< 0.1 deg (at 1 kHz)
Channel crosstalk	< - 100 dB at 1 kHz
Frequency response	DC coupled: 0 Hz to 0.4 * fs: 0.1 dB calibrated AC coupled: 10 Hz: 70 Hz to 0.4 * fs - 0.1 dB 0.3 Hz: 2 Hz to 0.4 * fs - 0.1 dB
Total harmonic distortion	At 102.4 kHz sampling, 1 kHz signal -1 dBFS: < -90 dBFS in 1 V range < -100 dBFS in 10 V range
Alias protection	> 110 dB between 0.49 * fs and 31.5 * fs > 60 dB above 6 MHz
DC offset	≤ 1.5 mV calibrated
IEPE power supply	4 mA, 24 V, switchable per channel
Self-calibration	Automatic zero adjustment at start of measurement
TEDS support	Yes, class 1, switchable per channel
Tacho Input	
Number of channels	2
Channel type	Single-ended or fully differential
Coupling	DC
Trigger threshold	- 10 to + 10 V, programmable
Hysteresis	0 to 1 V, programmable
Input voltage range	± 10 V peak
Overload protection	40 V
Input impedance	1 MΩ, capacitance: 15 pF
Counter	32-bit resolution, 1/(256 * sampling frequency), max. 38 ns
Analog Output	
Number of channels	2
Channel type	Single-ended or fully differential
Coupling	DC
Resolution	24 bits
Sampling rate	Synchronized with analog inputs up to 102.4 kHz or synchronous to fs/2
Output voltage range	± 10 V, max. 10 mA
Output impedance	50 Ω
Signal-to-noise ratio	≥ 100 dB
DC offset	≤ 5 mV calibrated
Self-calibration	Automatic zero adjustment at start of measurement
Frequency range	0 to 80 kHz (- 3 dB)
Signal shutdown	Yes
Power-on protection	Yes

Data Acquisition, Signal Conditioning and Signal Processing Specifications

Signal Shutdown	
Number of I/Os	16 (8 inputs, 8 outputs)
Trigger input	1 digital input
Level	TTL (H: > 2.4 V, L: < 0.8 V)
Output current	- 25 to + 10 mA
Dynamic Signal Processors	
Number of DSPs	2 x Texas Instruments TMS320C6747 floating-point processor
DSP 1	Adressing the converters, offset correction, down-sampling, tacho inputs
DSP 2	Signal processing, configuration, communication with host PC
Multiple Mainframe	
Clock out	Master clock and synchronization pulse output
Clock in	Master clock and synchronization pulse input
Master/slave	Configured in software

Environmental and Safety Specifications

Environment	
Operating temperature	0 °C to + 50 °C
Storage temperature	- 25 °C to + 70 °C
Humidity	0 to 95 % rel. humidity, non-condensing
Standards	
EMC compliance	Certified with DIN EN 55011, DIN EN 61000-4 (-2, -3, -4, -5, -6, -11), FCC Part 15 B, ICES-003: Issue 4
External Power Supply	
Operating temperature	0 °C to + 40 °C
Storage temperature	- 20 °C to + 80 °C
Humidity	20 to 80 % rel. humidity
Short circuit protection	The adapter can withstand continuous short at DC output without damage, it will enter into normal condition if the fault condition is removed.
Over-current protection	The max. output current will be 5.5 A while output is constant resistor mode.
EMI compliance	Certified with FCC.DOCKET 20780. PART 15J. CLASS B; CISPR22 : 1993/EN55022(1994): CLASS B (conducted emission); VCCI CLASS II (radiated emission)
Safety approval	UL/CUL, TÜV/GS, NEMKO+CB, PSE, CSA, FCC, CCC, BSMI, QAS, C-TICK, CE

Warranty, Calibration and Repair Services

Warranty	
	12 months, optional 24 or 36 months
Calibration	
	m+p VibPilot device is calibrated before delivery and delivered with calibration certificate; factory re-calibration (return to m+p) and on-site calibration is provided
Repair	
	Return to m+p repair service; 24 hours back-to-operate guarantee (option)

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