HEAD acoustics

DATA SHEET

labV12-O4 II

labV12-O4 II is a combined HEADlab input and output module for structural dynamic examinations featuring the HEADlink 2.0 transmission protocol. It combines the features of a 12-channel data acquisition module with those of a 4-channel output module for shaker excitations, adding another compact component to the structural analysis portfolio from HEAD acoustics.

OVERVIEW

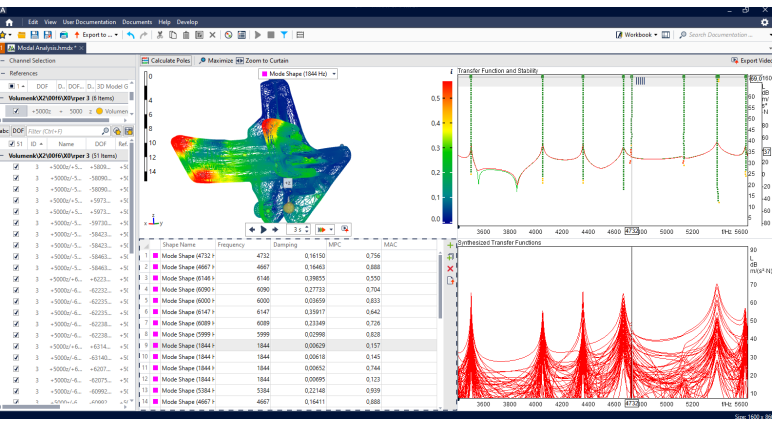
*lab*V12-O4 II

Code 3759

*lab*V12-O4 II provides 12 inputs for voltage or IEPE/ICP sensors and 4 analog outputs in a rugged and compact case. The module therefore enables a structure to be excited with 4 shakers and the responses to be measured at the same time - using 4 triaxial sensors, for example.

*lab*V12-O4 II is connected to a controller to form a HEAD*lab* system, for example. Depending on requirements, the system can be supplemented with additional input and supply modules (to ensure self-sufficient power supply), for example.

The controller is connected to a computer, and the system is controlled by the Recorder of ArtemiS SUITE. The ArtemiS SUITE software also provides tools for further processing of the measurements, structural dynamic analysis, and much more.



KEY FEATURES

Combined HEAD*lab* input and output module with HEAD*link* 2.0 transmission protocol

Connection to a *lab*CTRL II.1 controller, *lab*COMPACT12 II, or *lab*COMPACT24 II, for example

Power supply via HEAD*link* (controller)

Rugged; compact design; noiseless (without fan)

Configuration and control using the Recorder of ArtemiS SUITE

Additional manual control (Out Control switch)

- 12 inputs for triax and other sensors
  - Maximum sampling rate of 204.8 kHz
  - Switchable coupling: DC, AC, ICP, ICP-DC
  - Measurement ranges: 0.01 V_P to 30 V_P
  - Favorable lower cutoff frequency: 0.14 Hz
  - High input impedance: 1 MΩ
  - Electric strength: max. 60 V
- 4 outputs for shaker excitation
  - Low, flat output impedance covering the entire frequency range: 6 Ω
  - Fixed voltage range: 10 V_P
  - High signal quality
  - Direct connection of the shaker amplifiers

APPLICATIONS

Data acquisition for modal analysis in the following sectors, for example

- Automotive, aviation and aerospace, shipbuilding
- Research and development
- Electrical appliances

DETAILS

COMBINED INPUT AND OUTPUT MODULE

*lab*V12-O4 II is a module that can be used to excite structures with shakers while measuring the resulting responses at the same time.

The shaker amplifiers are directly connected to the BNC sockets of *lab*V12-O4 II. The excitation signals for the shakers are configured using the Recorder of ArtemiS SUITE. The responses are measured using accelerometers, for example, and can be used in modal analysis after the transfer function has been calculated in ArtemiS SUITE.

HEAD*lab* SYSTEM

*lab*V12-O4 II is connected to a HEAD*lab* controller, for example, that is used for data concentration and synchronization within the HEAD*lab* system and is connected to the computer via USB or LAN. The entire system is controlled using the Recorder. A maximum of two *lab*V12-O4 II (a maximum of eight uncorrelated output channels) are supported per system.

*lab*V12-O4 II is supplied with power by the controller, which, in turn, is powered by the power adapter that comes with the device or by the rechargeable battery of a supply module.

SELF-SUFFICIENT

HEAD acoustics provides three supply modules with different power levels that can be used to operate HEAD*lab* systems (controller plus the connected modules) as self-sufficient systems, for example, to be protected against power failures. Depending on the configuration, the battery of a supply module can power a system for several hours.

RUGGED

*lab*V12-O4 II is characterized by a rugged design and can be connected to other HEAD*lab* modules using the proven mechanical connection technology. Like all modules, *lab*V12-O4 II operates noiselessly (no fan).

OUTPUT CHANNELS

SHAKERS

The shaker amplifiers can be directly connected using the four BNC sockets of the output channels.

QUALITY

The output channels are characterized by low output impedance over the entire frequency range and high signal quality. They are electrically isolated from both the input channels and the HEAD*link* interfaces.

SAFETY

The integrated Out Control switch is used for manual interruption (soft mute) or continuation (soft unmute) of the interrupted shaker excitation or for switching off the shaker outputs (Off), thus providing additional safety.

INPUT CHANNELS

MAXIMUM SAMPLING RATE OF 204.8 KHZ

With *lab*V12-O4 II, data is transmitted to the controller via HEAD*link* 2.0. This enables the input channels to achieve a maximum sampling rate of 204.8 kHz. The overload detection provides protection for all input channels and automatically switches off affected channels.

DUAL LINK

In Dual Link mode, *lab*V12-O4 II is connected to the *lab*CTRL II.1 controller using two HEAD*link* cables. Compared to Single Link mode (connecting *lab*V12-O4 II to a controller using one HEAD*link* cable), Dual Link enables measurements with twice the number of channels at sampling rates ≥ system sampling rate.

AT A GLANCE

EXCITATION/ DATA ACQUISITION

EXCITATION OF SHAKERS

Via shaker amplifiers

- Shakers

Out Control: Soft Mute / Soft Unmute / Off

CONNECTION OF SENSORS

Via breakout cables / adapters

- Voltage or IEPE/ICP sensors (TEDS)
- Triax sensors (Microtech)
- BHM III.3 Mobile HEAD microphone for binaural recordings
- HSU III.2 Artificial Head Microphone
- BHS II Binaural Headset
- Voltage sources

...

CONTROL / POWER SUPPLY

CONNECTION TO ...

Via HEAD*link* 2.0

- Dual Link (HEAD*link* 1 + HEAD*link* 2) or Single Link (HEAD*link* 1)
  - *lab*CTRL II.1
- Single Link (HEAD*link* 1)
  - *lab*COMPACT12 II, *lab*COMPACT24 II
  - *lab*HSU (as of firmware 2.1)
  - HMS V Digital HEAD Measurement System (as of firmware 2.1)

Via HEAD*link* 1.0

- Single Link (HEAD*link* 1)
  - VMA V HEAD VISOR microphone array

POWER SUPPLY

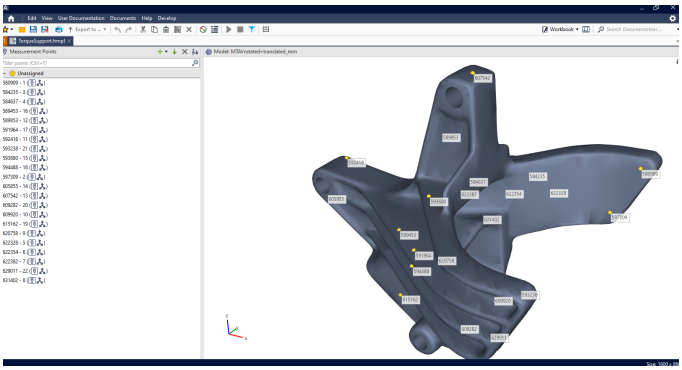
Via HEAD*link* 1

CONTROL / FURTHER PROCESSING / STRUCTURAL ANALYSIS PACKAGE

CONTROL

MEASUREMENT POINT LIBRARY (INCLUDED IN APR 000)

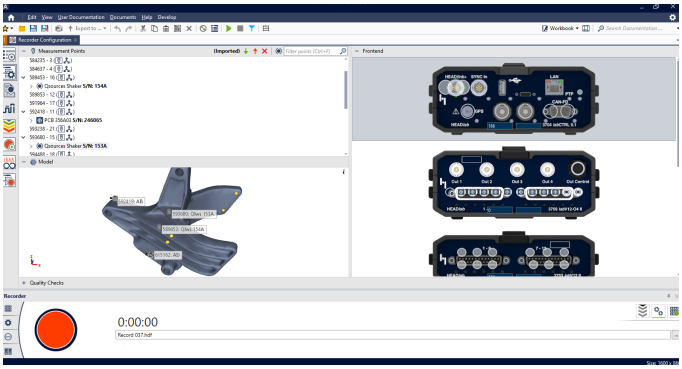
When measuring with *lab*V12-O4 II, the use of a 3D grid model offers many advantages. Thanks to the Measurement Point Library, creating a 3D grid model or importing a corresponding CAD model is very easy.



Measurement Point Library with 3D grid model.

RECORDER (APR 040)

The Recorder of ArtemiS SUITE is used to configure the outputs and inputs of *lab*V12-O4 II. There are various triggers available for starting and stopping the shaker excitation and for synchronizing the measurement of the responses, for example.

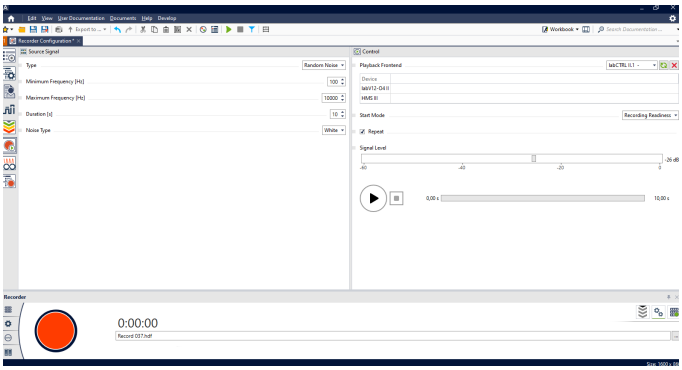


Configuration in the Recorder.

FURTHER PROCESSING

SYSTEM ANALYSIS (ASP 201)

Based on the measurements of the responses (in HDF format), the transfer functions of the examined structure are calculated in ArtemiS SUITE using a System Analysis license (ASP 201 is required) in a Pool Project (APR 010 is required) or an Automation Project (APR 050 is required). The results can be animated, analyzed, and further processed with the Structural Analysis Package.



Excitation using triggers.

STRUCTURAL ANALYSIS PACKAGE

The powerful and perfectly coordinated Structural Analysis Package of ArtemiS SUITE (APR 420, APR 400, and APR 420) is very easy to use and enables easy and intuitive determination and extraction of dynamic structural properties using artificial intelligence (AI).

MODAL ANALYSIS PROJECT (APR 420)

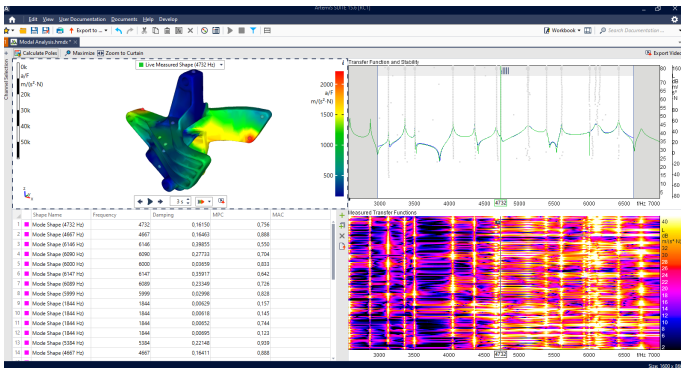
The calculated transfer functions form the basis for modal analysis in the Modal Analysis Project. The AI-supported one-click solution minimizes possible errors and delivers optimized results: at the push of a button, the Modal Analysis Project determines the characteristic poles, displays the result in the stability diagram, and calculates the synthesized transfer functions using curve fitting (p-LSCF). In the background, artificial intelligence determines the parameters for the pLSCF algorithm and transfers them automatically. In addition, 3D animations and the handy user interface which presents all the necessary aspects at a glance make the Modal Analysis Project an extremely user-friendly tool.

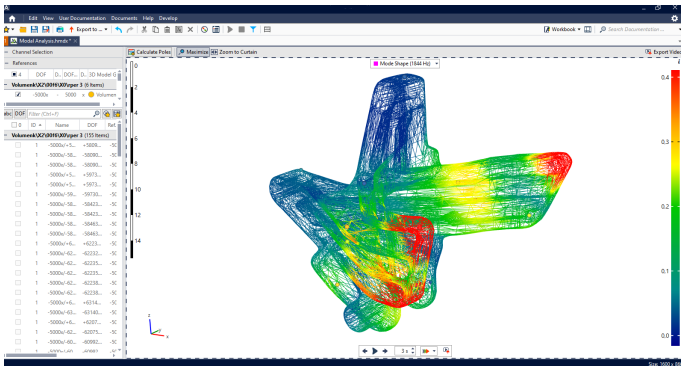
OPERATING DEFLECTION SHAPE PROJECT (APR 400)

The Operating Deflection Shape Project (ODS) can be used to animate and analyze structures in a defined stationary operating condition as well as to examine time-varying movements in more detail.

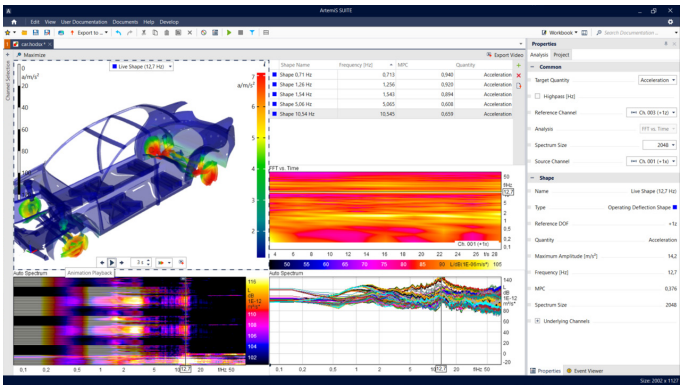
SHAPE COMPARISON PROJECT (APR 410)

The Shape Comparison Project is the optimal tool for analyzing and comparing deflection shapes. This project enables users to observe individual shapes, compare simulations, and evaluate component modifications.

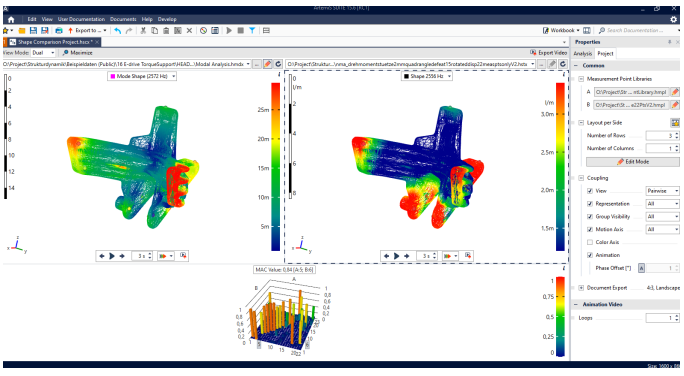




Modal Analysis Project



Operating Deflection Shape Project



Shape Comparison Project

SCOPE OF DELIVERY AND ACCESSORIES

SCOPE OF DELIVERY

*lab*V12-O4 II (Code 3759)
HEAD*lab* module with HEAD*link* 2.0,
4 analog outputs, and 12 analog/ICP inputs

HARDWARE ACCESSORIES

REQUIRED

(with HEAD*link* 2.0)

Controller

*lab*CTRL II.1 (Code 3704)
› Controller

or

*lab*COMPACT12 II (Code 31020)
› 12-channel compact system (controller)

or

*lab*COMPACT24 II (Code 31021)
› 24-channel compact system (controller)

or

2-channel frontend

*lab*HSU (Code 3710)
› 2-channel frontend with stand-alone mode (as of firmware 2.1)
(up to firmware 2.1, only with HEAD*link* 1.0)

or

Artificial head

HMS V (Code 1502)
› Digital HEAD Measurement System (as of firmware 2.1)
(up to firmware 2.1, only with HEAD*link* 1.0)

or

(with HEAD*link* 1.0)

HEAD VISOR

VMA V (Code 7528)
› HEAD VISOR microphone array

or

Controller, ... (no longer available)

*lab*CTRL I.1 (Code 3701)
*lab*CTRL I.2 (Code 3702)
*lab*COMPACT12 (Code 3708)
*lab*COMPACT12-V1 (Code 3708-V1)
*lab*COMPACT24 (Code 3709)
*lab*COMPACT24-V1 (Code 3709-V1)
VMA II.1 (Code 7522)

CABLES (REQUIRED)

CLL X.xx (Code 3780-xx)
› HEAD*link* cable
› LEMO 8-pin → LEMO 8-pin
› Available cable lengths: 0.17 m, 0.26 m, 0.36 m, 0.5 m, 1 m, 1.5 m, 2.5 m, 5 m, 10 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m

CABLES (RECOMMENDED)

CDB X-V1.xx (Code 3792-V1-xx)
› Breakout cable
› D-Sub 25-pin → 6 x BNC, female, 1 m
› (channels 1 to 6)
› Available cable lengths: 0.3 m, 1 m

CDB X-V2.xx (Code 3792-V2-xx)
› Breakout cable
› D-Sub 25-pin → 6 x BNC, female, 1 m
› (channels 7 to 12)
› Available cable lengths: 0.3 m, 1 m

CDB II-V1-1 (Code 3579-V1-1)
› Breakout cable
› D-Sub 25-pin → 6 x BNC, male, 1 m (channels 1 to 6)

CDB II-V2-1 (Code 3579-V2-1)
› Breakout cable
› D-Sub 25-pin → 6 x BNC, male, 1 m (channels 7 to 12)

CDM X.03 (Code 3793-03)
› Breakout cable
› D-Sub 25-pin → 6 x Microdot, 0.3 m

CDM I.1 (Code 3570-1)
› Breakout cable
› D-Sub 25-pin → 2 x Microtech, 1 m

CLB I.2 (Code 9847)
› Adapter for connecting BHS II

HARDWARE ACCESSORIES

SUPPLY MODULES (RECOMMENDED)

*lab*PWR I.1 (Code 3711)
› Supply module for HEAD*lab* systems up to a maximum of 40 W

*lab*PWR I.2 (Code 3712)
› Supply module for HEAD*lab* systems up to a maximum of 100 W

*lab*PWR I.3 (Code 3713)
› Supply module for HEAD*lab* systems up to a maximum of 35 W

POWER ADAPTERS FOR SUPPLY MODULES (RECOMMENDED)

PS 24-60-L2
24 V, 60 W, LEMO 2-pin
(Code 0623B)
› For *lab*PWR I.1, *lab*PWR I.3

PS 24-150-L2
24 V, 150 W, LEMO 2-pin
(Code 0621B)
› For *lab*PWR I.1, *lab*PWR I.2, *lab*PWR I.3

SOFTWARE ACCESSORIES

REQUIRED

APR 000 (Code 50000)
APR Framework
› Basis of ArtemiS SUITE
› The Measurement Point Library is included in APR 000

APR 040 (Code 50040)
Recorder
› Universal Recorder of ArtemiS SUITE

RECOMMENDED

APR 010 (Code 50010)
Pool Project
› Interactive processing and analyzing

APR 050 (Code 50050)
Automation Project
› Automated processing and analyzing

ASP 201 (Code 51201)
System Analysis
› Calculating the transfer functions in a Pool Project or in an Automation Project

APR 420 (Code 50420)
Modal Analysis Project
› AI-based and intuitively performable modal analysis

APR 400 (Code 50400)
ODS Project
› Animation and analysis of deflection shapes

APR 410 (Code 50410)
Shape Comparison Project
› Analysis and comparison of deflection shapes

TECHNICAL DATA

General	
Connectors data acquisition / data generation	12 x voltage-in/ICP-In, 4 x voltage-out
Communication interfaces	2 x HEAD*link*
Supply connection	HEAD*link* 1 (input)
Supply voltage	10 V_{DC} to 28 V_{DC}
Reverse polarity protection	No
Max. power consumption stand-alone operation	7.5 W
Max. power consumption	12.5 W
System sampling rate	32.768 (2^n) kHz, 44.1 kHz, 48 kHz, 51.2 kHz
Min. to max. sampling rate @32.768 (2^n) kHz	2.048 kHz to 131.072 kHz
Min. to max. sampling rate @44.1 kHz	2.75625 kHz to 176.4 kHz
Min. to max. sampling rate @48 kHz	3 kHz to 192 kHz
Min. to max. sampling rate @51.2 kHz	3.2 kHz to 204.8 kHz
Synchronization	HEAD*link*
Max. sampling rate	204.8 kHz
Cooling	Convection (without fan)
Operating temperature	-10 °C to +60 °C, +14 °F to +140 °F
Storage temperature	-20 °C to +70 °C, -4 °F to +158 °F
Dimensions	148 x 62 x 181 mm (WxHxD)
Weight	908 g

HEAD*link*	
Plug connector	2 x LEMO 8-pin
Number of interfaces	2
Supply voltage	10 V_{DC} to 28 V_{DC}
HEAD*link* version	HEAD*link* 1.0, HEAD*link* 2.0
Electrical isolation	Yes
Synchronization	32.768 (2^n) kHz, 44.1 kHz, 48 kHz, 51.2 kHz
Maximum cable length	60 m

Voltage/ICP (analog inputs)	
Plug connector	2 x D-Sub 25-pin
Number of channels	12
Measured quantity	Voltage
Measurement ranges	0.01 V_P, 0.1 V_P, 1 V_P, 10 V_P, 30 V_P
Input impedance	1000 kΩ

Voltage/ICP (analog inputs)

Frequency range	0 Hz to 86.4 kHz
Coupling	DC, AC, ICP, ICP-DC
Analog highpass filter	0.14 Hz, 1st order, ±5% 22 Hz, 2nd order, switchable, ±5%
Digital highpass filter @f_S = 48 kHz, proportional to f_S	0.1 Hz
Digital lowpass filter @f_S = 48 kHz, proportional to f_S	21.6 kHz
Resolution	32 bits
Electrical isolation input/output	Yes
Electrical isolation, channel by channel	No
Electric strength	±60 V
TEDS (IEEE 1451.4) read	TEDS class 1, shared signal wire (version 0.9 and 1.0)
ICP voltage	22.8 V
ICP current	4 mA (-7.5% / +25%)
Common mode rejection	90 dB

Voltage/ICP – measurement ranges (analog inputs)[1]

Measurement range	0.01 V_P	0.1 V_P	1 V_P	10 V_P	30 V_P
S/N	79 dB(A)	99 dB(A)	109 dB(A)	109 dB(A)	108 dB(A)
Crosstalk at 1 kHz	-101 dB	-113 dB	-126 dB	-120 dB	-98 dB
THD+N	-77 dB	-87 dB	-101 dB	-103 dB	-78 dB
Dynamics 5 Hz analysis bandwidth	115 dB	135 dB	145 dB	145 dB	144 dB
Input-related noise (24 kHz bandwidth)	1.59 µV	1.59 µV	5 µV	50.1 µV	168.7 µV
DC accuracy	1.5%	0.25%	0.1%	0.1%	0.1%
AC accuracy at 1 kHz	2.5%	0.4%	0.4%	0.4%	0.4%
Frequency response 20 Hz to 20 kHz @fs = 48 kHz re 1 kHz	+0.05 dB, -0.02 dB	+0.07 dB, -0.02 dB	+0.09 dB, -0.02 dB	+0.08 dB, -0.02 dB	+0.02 dB, -1.2 dB
Frequency response 20 Hz to 40 kHz @fs = 96 kHz re 1 kHz	+0.05 dB, -0.21 dB	+0.07 dB, -0.02 dB	+0.11 dB, -0.02 dB	+0.08 dB, -0.02 dB	+0.04 dB, -3.5 dB
Frequency response 20 Hz to 80 kHz @fs = 192 kHz re 1 kHz	+0.05 dB, -0.88 dB	+0.05 dB, -0.1 dB	+0.15 dB, -0.02 dB	+0.08 dB, -0.02 dB	+0.05 dB, -7.8 dB
Linearity 0 to 80 dB below full scale	0.34 dB	0.05 dB	0.03 dB	0.03 dB	0.03 dB
Linearity 0 to 100 dB below full scale	2.7 dB	0.35 dB	0.15 dB	0.08 dB	0.11 dB

[1] Valid for: ambient temperature 23 °C, 73.4 °F (±3 °C, ±5.4 °F), operating duration ≥1 h. Vibration excitation of the device may cause deviations.

All measurement ranges are calibrated at the factory. In addition, the measurement ranges 100 mV_P to 30 V_P can be calibrated in the accredited calibration laboratory of HEAD acoustics GmbH in accordance with DIN EN ISO 17025.

Voltage (analog outputs)	
Plug connector	4 x BNC
Number of channels	4
Voltage ranges	10 V_P
Output impedance	6 Ω
DC capable	Yes
Frequency range	0 Hz to 23.6 kHz
Electrical isolation input/output	Yes
Electrical isolation, channel by channel	No
Resolution	32 bits
Equalization	No
Maximum voltage	10 V_P
Maximum output power for all outputs together	0.8 W

Voltage ranges (analog outputs)	
Voltage range	10 V_P
S/N	115 dB
Crosstalk output to input at 1 kHz	-117 dB
THD+N	-109 dB
DC accuracy	0.1 %
DC offset	1 mV
AC accuracy at 1 kHz	0.6 %
Frequency response 20 Hz to 20 kHz @fs = 48 kHz re 1 kHz	+0.02 dB, -0.15 dB
Linearity 0 to 80 dB below full scale	0.015 dB
Linearity 0 to 100 dB below full scale	0.05 dB

Dynamics

There is no standardized calculation method for the term "dynamics".

Therefore, the Signal-to-Noise Ratio (SNR or S/N) is specified for *lab*V12-O4 II. It is calculated based on the level of a sinusoidal tone with maximum modulation in relation to the full bandwidth noise floor level of the *lab*V12-O4 II module, measured over the entire relevant frequency range.

In the literature, the term "dynamics" is sometimes used by analogy with the S/N, but this is often based on a narrow-band calculation of the inherent noise. Depending on the analysis bandwidth, *labV12-O4 II* will then have a much higher "dynamic" value.

HEAD acoustics

Contact

Ebertstrasse 30a
52134 Herzogenrath, Germany
Phone: +49 2407 577-0
E-Mail: sales@head-acoustics.com
Website: www.head-acoustics.com