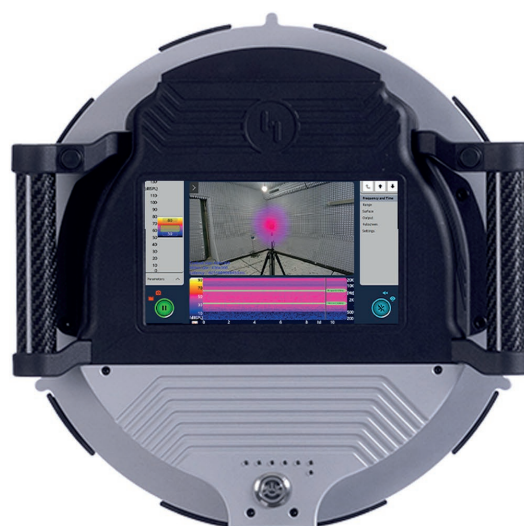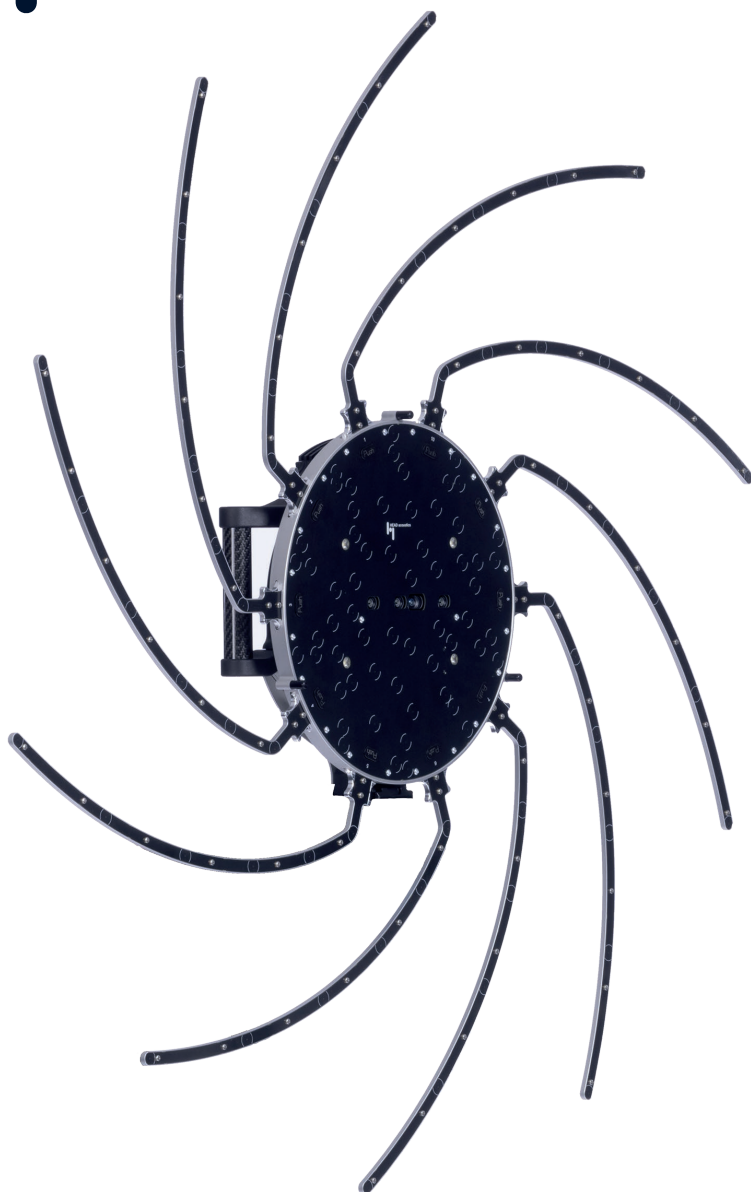# DATA SHEET

Code 7528

VMA V

Hand-held Acoustic Camera with up to 120 Microphones

OVERVIEW

VMA V

Code 7528

Hand-held acoustic camera system with up to 120 high-resolution MEMS microphones for fast, intuitive, and professional real-time sound source localization

Our hand-held acoustic camera system VMA V makes professional sound source localization fast and intuitive with unprecedented ease of use and unparalleled handling. VMA V is compact, light-weight, and integrates all relevant inputs and outputs in a single device.

With its integrated cameras, the internal battery, and the high-resolution touchscreen, VMA V redefines mobility and flexibility. Buttons for your thumbs on both carbon handles operate essential software features, such as navigating the menu and starting or stopping recordings. All features of the sophisticated and advanced software are accessible via an intuitive user interface on the high-quality 7" touchscreen.

The lightweight base array with a 30 cm diameter contains everything: the touchscreen, the battery, the cameras, LED lights, 60 high-resolution MEMS microphones, two handles with buttons, and all connectors and switches. The handle buttons enable you to start and stop measurements silently and operate essential user interface features on the touchscreen without taking your hand off a handle.

For enhanced resolution, especially in the low-frequency range, array arms are available that increase the diameter to 100 cm. These arms are manufactured from lightweight aluminum and can easily be connected to the body via robust connectors. Even with the extended diameter, VMA V remains highly mobile and easy-to-use.

As part of the HEAD VISOR product family, VMA V combined with the powerful HEAD VISOR software and the low-frequency measuring tool HEAD VISOR Probe constitutes the world's most versatile and advanced hand-held acoustic camera system.

KEY FEATURES

Customizable and scalable system for a variety of applications with two configurations:
› 30 cm diameter / 60 microphones
› 100 cm diameter / 120 microphones with the array arms installed

Light-weight, robust, mobile, and versatile
› Less than 4 kg with the array arms installed
› Battery-powered operation of up to two hours
› 7" multi-touch display and high-resolution cameras
› Integrated distance measurement
› LED lights to illuminate the workspace

Real-time analysis and result review on the display

Multiple connectivity options: HEAD*lab* integration, LAN, CAN, analog inputs, Pulse In, Headphones output

Seamless integration with our HEAD VISOR 6 software (mandatory) and HEAD VISOR Probe

APPLICATIONS

Troubleshooting / Leak detection / Testing

Sound optimization and analysis

Test benches
› Detecting sound-radiating components
› Visualizing acoustic weak spots

Room and structural acoustics

Wind tunnels
› Eliminating interior wind noise by identifying rough edges

Wind turbines
› Auralizing high sound energy locations
› Localizing typical wind turbine noise sources
› Analyzing the acoustic impact of the rotor design

DETAILS

Every Connectivity You Need

VMA V offers multiple connectivity options for additional hardware to extend its recording capabilities or to integrate VMA V into a larger system.

Two analog inputs with ICP supply and the USB host connector enable you to connect and power HEAD VISOR Probe. If HEAD VISOR Probe is not required in your application, these connectors can be used for microphones, for example, as an additional source for audio signals.

Furthermore, you can connect a pulse source to VMA V via an SMB connector, for example, to record RPM data. Additionally, VMA V offers a dedicated CAN FD bus connector to record vehicle bus data in a dedicated channel.

The headphones connector is used for playback or real-time monitoring, for example, of a virtual microphone that has been defined via the software running on VMA V or the HEAD VISOR software.

When VMA V is connected to the power supply, a HEAD*lab* module an be supplied via the HEAD*link* connector. This connection is then be used to transfer sensor data from the HEAD*lab* module to the computer. Furthermore, HMS series artificial heads can be connected to incorporate their binaural recording capabilities into your measurement. The SYNC In connector enables you to synchronize to a HEAD*lab* controller.

The locked LAN connector provides a 1 Gbit network connection to the computer running the HEAD VISOR software.

HEAD VISOR Probe (Code 7523) is used for acquiring low-frequency sound components with VMA V. HEAD VISOR Probe has two microphones in its tip which detect sound emitted by a surface of the measured object along with the exact sound location. The position of HEAD VISOR Probe itself is tracked and recorded by the VMA V cameras.

labVF6 II (Code 3752) is one of our second-generation HEADlab modules and offers six analog channels for recording with voltage/ICP microphones. Many of our HEADlab modules are compatible to VMA V and can very easily be connected via the HEADlink connector.

The VMA V base array has a robust tripod mount and can easily be mounted on a tripod, for example, VMT II.1 (Code 7584). VMT II.1 offers a multitude of adjustment options to find the optimal measuring position for your application.

Key Features at Your Fingertip

VMA V is developed to work with HEAD VISOR 6, our modular software solution for real-time sound source localization. HEAD VISOR 6 offers an extensive amount of features for modifying, filtering, and experiencing measurements acquired with our acoustic camera.

Compared to its predecessor, VMA V is an even more precise, lightweight, and highly mobile acoustic camera. HEAD VISOR 6 key features are mirrored to the display and can be navigated, configured, and operated via the buttons on the handles or your fingertips on the touchscreen. Among these key features are changing measuring parameters, taking snapshots, using the Freeze Buffer feature, and placing virtual microphones.

The main camera view is presented in the center of the touchscreen showing the recorded real-time image and the visualized sound sources. Being able to perform measurements completely on the device with all necessary operating options, makes VMA V incredibly mobile, flexible, and versatile.
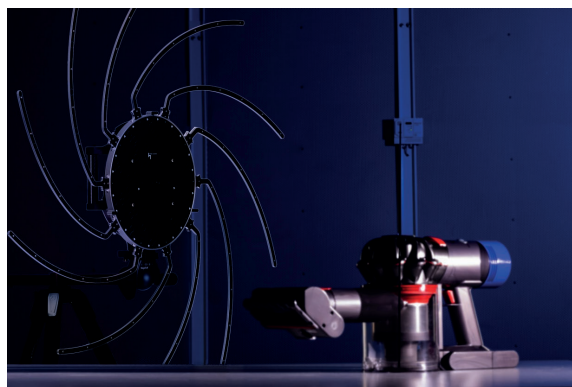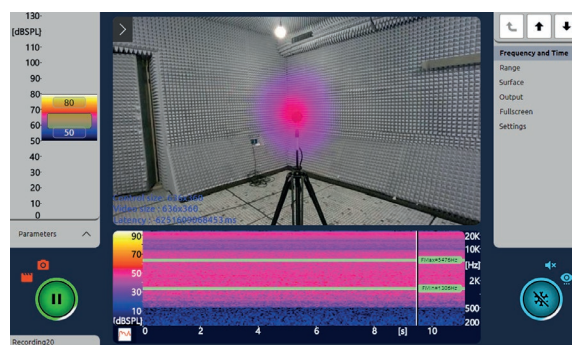

Back in Time with the Freeze Buffer

The Freeze Buffer continuously saves raw audio and video data from an adjustable period of time in a circular buffer. It enables retroactive sound event observation as with a saved recoding. Using the Freeze Buffer button on the touchscreen or on top of the right handle loops the buffered data on the display. The Play Cursor can be moved to any position, you can toggle between an FFT vs. Time or Time Signal display, and set the frequency range and the displayed dynamic range.

Listen Closely with Virtual Microphones and Depth Map Autofocus

Virtual microphones enable you to auralize interesting point sources separately from the combined sound sources captured by VMA V and display the respective sound levels. With an active virtual microphone, sound source auralization and level display represent the sound captured by the virtual microphone. By adding multiple virtual microphones, you can concentrate on different aural aspects of the sound source by simply activating a different virtual microphone. Once a virtual microphone is added, you can move it to any position within the Camera View with your fingertip. Just tap on the respective icon and move your finger.

The Depth Map Autofocus feature automatically focuses the center of the display or – even better – a virtual microphone that you positioned anywhere on the camera display. The distance to the focus point is continuously and accurately measured and used for beamforming. You can even move VMA V to a different position. Simply continue pointing the array towards your measurement object while you move and let VMA V do the work.

INTERFACES

CAN FD BUS
Connect VMA V to the CAN FD bus system and use vehicle specific data, for example, RPM for order detection.

PULSE INPUT
Connect a pulse source and record, for example, RPM.

USB HOST
USB type A host connector to supply voltage to HEAD VISOR Probe, the near-field probe for low-frequency sound source mapping.

LINE IN
BNC connectors to connect HEAD VISOR Probe or additional sensors, such as analog microphones or acceleration sensors.

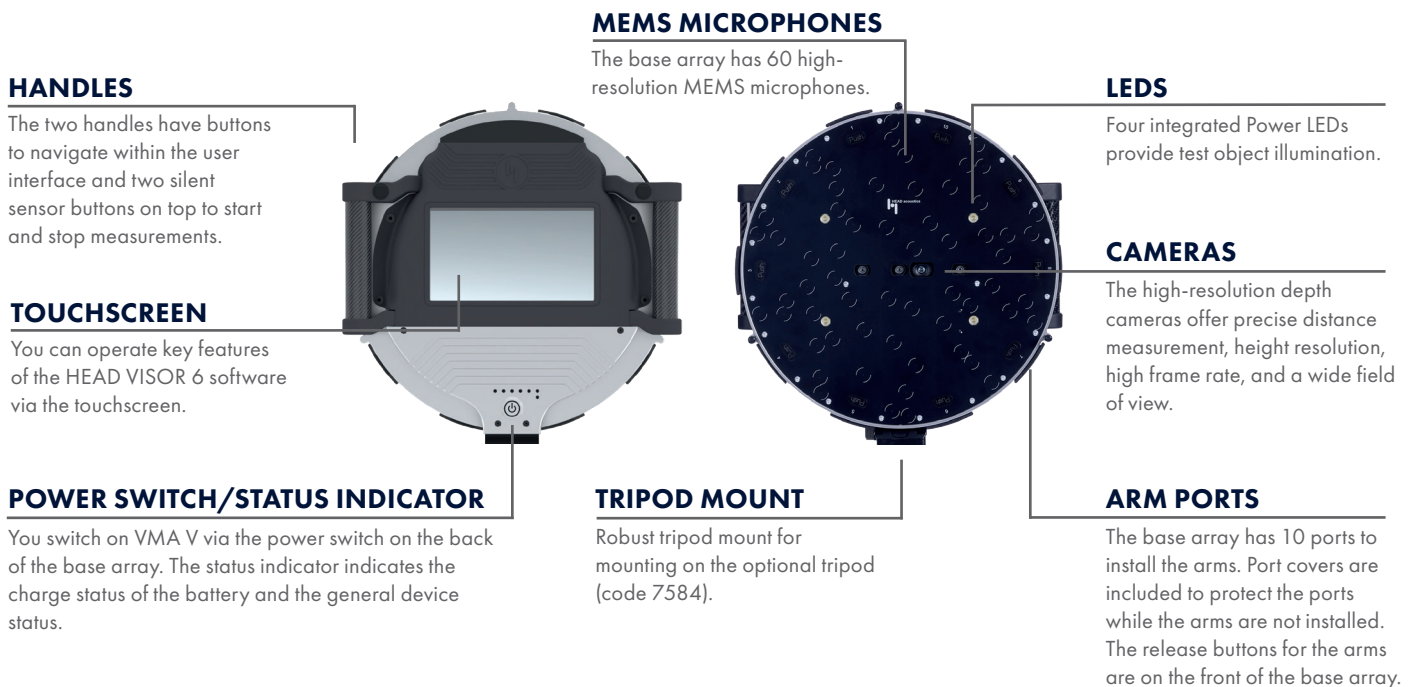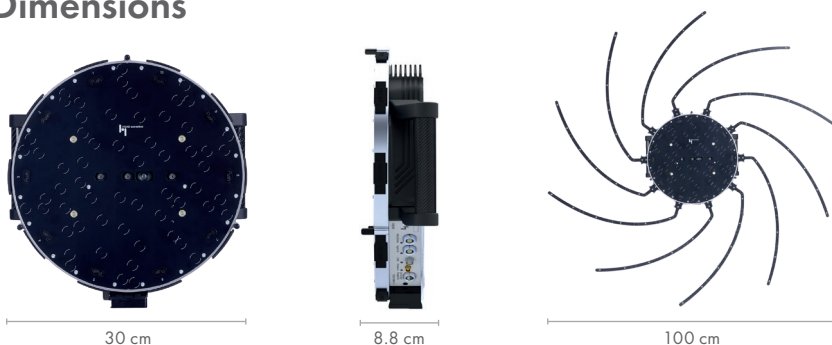**SYNCHRONIZATION**
HEADlink and Sync In to synchronize a HEADlab module or to integrate VMA V into a larger system controlled by a HEADlab controller.

HEADPHONES
Connect headphones to VMA V for playback or real-time monitoring.

POWER SUPPLY
Connect the power supply to the mechanically locked Power In connector to power and charge VMA V.

NETWORK CONNECTIVITY
Mechanically locked LAN connector to prevent interrupting the connection to the computer running the HEAD VISOR 6 software. The connection supports 1 Gbit speed and the Precision Time Protocol (PTP).

DEVICE FEATURES

HANDLES
The two handles have buttons to navigate within the user interface and two silent sensor buttons on top to start and stop measurements.

MEMS MICROPHONES
The base array has 60 high-resolution MEMS microphones.

LEDS
Four integrated Power LEDs provide test object illumination.

TOUCHSCREEN
You can operate key features of the HEAD VISOR 6 software via the touchscreen.

CAMERAS
The high-resolution depth cameras offer precise distance measurement, height resolution, high frame rate, and a wide field of view.

POWER SWITCH/STATUS INDICATOR
You switch on VMA V via the power switch on the back of the base array. The status indicator indicates the charge status of the battery and the general device status.

TRIPOD MOUNT
Robust tripod mount for mounting on the optional tripod (code 7584).

ARM PORTS
The base array has 10 ports to install the arms. Port covers are included to protect the ports while the arms are not installed. The release buttons for the arms are on the front of the base array.

Dimensions

30 cm

8.8 cm

100 cm

LICENSING

To use VMA V, one of the HEAD VISOR 6 software licenses listed below is necessary. Each of these licenses already includes algorithms, the Frequency Overview, and Virtual Microphones and additionally adds the features listed.

Tool Pack licenses extend the VMA V feature set even further. We have designed the following freely combinable Tool Packs, each of which activates a particular set of features.

HEAD VISOR 6 Licenses

- › **HEAD VISOR complete** (Code 7500)
  - » Project View
  - » Recording
  - » Online and Offline Analysis
  - » Freeze Buffer
  - » Export
- › **HEAD VISOR record** (Code 7511)
  - » Recording
  - » Online Analysis
- › **HEAD VISOR snap** (Code 7512)
  - » Online Analysis
  - » Freeze Buffer
  - » Export

Tool Pack Licenses

- › **TP01** (Code 7501)
  - » Multiple Eye
  - » Depth Map Autofocus

- › **TP02** (Code 7502)
  - » Order Detection
  - » Pulse Gate
  - » Derotation

- › **TP03** (Code 7503)
  - » Coherence
  - » Stepping
  - » Deconvolution
  - » PCA
  - » Neural Deconvolution

- › **TP04** (Code 7504)
  - » Software option for HEAD VISOR Probe

SCOPE OF DELIVERY

VMA V

- › VMA V Base array (Code 7528)
  Base array with 30 cm diameter and 60 MEMS microphones
- › VMA V microphone caps (Code 7529.1)
  Caps for covering the arm ports if the arms are not installed
- › HSC VII.6 (Code 7592)
  Carrying case for VMA V
- › CLAN I.10 (Code 7563-10)
  CAT7 network cable Yamaichi push-pull connector ↔ RJ45, 10 m

- › CDB I.0.3 (Code 7562-0.3)
  Cable adapter Binder ↔ D-Sub, 0.3 m
- › CSB VII (Code 3350)
  Pulse cable SMB ↔ SMB with adapter SMB ↔ BNC
- › Power supply (Code 0617)
  24 V, 60 W, LEMO 4 pin
- › Manual

Optional Accessories

- › VMA V microphone arm (Code 7529)
  - » Microphone arm with 6 MEMS microphones
- › HWS III (Code 7576)
  Wind shield for the base array
- › HWS II.10 (Code 7577)
  Ten wind shields for the array arms
- › HEAD VISOR Probe (Code 7523)
  Near-field probe for low-frequency sound component acquisition with VMA V and HEAD VISOR 6

- › VMT II.1 (Code 7584)
  3-Section Tripod with horizontal column including Novoflex Magic Ball, Handle for Magic Ball, Manfrotto 323 quick-release adapter, MBAG 75PN padded tripod bag, Quick-release adapter/tripod head for VMA V
- › VMT III.1 (Code 7585)
  Monopod

TECHNICAL DATA

General

Connectors for data acquisition/data generation	60 x Mic, 1 x CAN (CAN/CAN FD/OBD-2), 1x Pulse In, 2 x ICP; Additional 60 microphones with the arms installed
Communication interfaces	1 x HEAD*link*, 1 x SYNC In, 1 x USB host (type A), 1 x LAN
Connections via adapters/adapter cables	CAN/CAN FD/OBD-2
Supply connector	LEMO 4 pin
Supply voltage	18 – 24 V DC
System sampling rate	48 kHz
Synchronization	Via HEAD*link*/PTP
Max. sampling rate	48 kHz
Cooling	Convection (fan-less)
Operating temperature	0 °C – +40 °C

Overall dimensions (W x H x D)
    Base array
    Base array incl. 10 array arms
	
	320 x 328 x 88 mm
	1021 x 1021 x 88 mm

Weight
    Base array
    Base array incl. 10 array arms
	
	2900 g
	3800 g

Battery

Type	Li-Ion
Capacity	4 Ah
Energy	59.2 Wh
Operating time with battery supply	2 h (under typical usage and load)
Discharge time through self discharge	200 days
Charge cycles	500
Charge status display	Via LEDs

Display

Type	Capacitive TFT LCD panel, multi-touch capable
Resolution	1024 x 600 px (WSVGA)
Dimensions	7"/17.8 cm (155 x 92 mm)
Color depth	16.7m
Back light	Individually adjustable, automatically dimmable

LEDs

Luminous flux	Max. 172 lm per LED
Color temperature	6000 k
Light color	Cold white
Beam angle	125°

Camera

Resolution	Up to 1280 x 800 px
Frame rate	Up to 30 fps
Sensor technology	Global Shutter
Sensor field of view (FOV)	90° x 65° (H x V)
Ideal range	0.6 m – 6 m
Depth	
Technology	Stereoscopic
Field of view (FOV)	87° x 58°
Min. distance (min-z) at max. resolution	~52 cm
Accuracy	<2% at 4 m
Output resolution	Up to 1280 x 720 px
Frame rate	Up to 90 fps

Beamforming Parameters

Beamforming Parameters	Without arms	With arms
Microphones	60	120
Aperture/Microphone grid diameter	30 cm	100 cm
Sampling rate	48 kHz	48 kHz
Bandwidth	20 kHz	20 kHz
The following source mapping parameters are theoretical specifications. They may differ according to your real-life application.		
Dynamic range (standard beamforming)	Typically 14 dB	Typically 15 dB
Dynamic range (with advanced algorithms)	Up to 40 dB	Up to 40 dB
Frequency range (standard beamforming)	Typically 980 Hz – 20 kHz	Typically 250 Hz – 20 kHz
Near-field frequency range	Typically 20 Hz – 2 kHz	Typically 20 Hz – 2 kHz

Communication Interfaces

USB host

Connector	1 x USB type A
Specification	USB 2.0
Data rate	480 Mbit/s
Output voltage	5 V DC
Output power	0.5 A

LAN

Connector	1 x lockable push-pull connector
Standard	IEEE 802.3ab
Data rate	1000 Mbit/s
Electrical isolation	Yes, with unshielded cable only
Power over Ethernet	No

HEAD*link*	
Connector	1 x LEMO 8 pin
HEAD*link* version	1.0
Electrical isolation	No
Synchronization	48 kHz
Max. cable length	60 m

Analog Inputs

Voltage/ICP	
Connectors	2 x BNC
Number of channels	2
Measured value	Voltage
Measurement ranges	0.01 V_p, 0.1 V_p, 1 V_p, 10 V_p
Input impedance	1000 kΩ
Frequency range	0 Hz – 20 kHz
Coupling	AC, DC, ICP
Analog high-pass filter	0.14 Hz, 1st order, ±5%; 22 Hz, 2nd order, switchable, ±5%
Resolution	24 bit (Delta-sigma ADC)
Dielectric strength	±60 V
ICP voltage	22 V
ICP current	4 mA (±25%)

Microphones	
Number of microphones	60 (extendable to 120 using the optional array arms)
Type	MEMS (digital)
Intrinsic noise	29 dB_{SPL}(A)
Frequency range	50 Hz – 20 kHz
Max. sound pressure level	117 dB_{SPL}

Analog Outputs

Headphones	
Connector	1 x headphones jack, 3.5 mm
Electrical isolation input/output	No
Equalization	None

Digital Inputs

Pulse

Connector	1 x SMB
Number of channels	1
Switchable power source (pull-up substitute)	5.6 mA (-0.6 mA/+0.9 mA) / 5V
Maximum pulse frequency	1000 kHz
Digitally adjustable threshold	Yes
Digitally adjustable hysteresis	Yes
Resolution threshold/hysteresis	40 mV
Input impedance	36 kΩ
Input voltage	0 V – 10 V
Electrical isolation	Yes
Electrical isolation per channel	No

CAN/CAN FD/OBD-2

Connector	1 x Binder
Data rate	5 Mbit/s
Electrical isolation	Yes
Electrical isolation per channel	No
Identifier	11 bit (CAN 2.0A) and 29 bit (CAN 2.0B)
Standards	ISO 11898-2:2015 ISO 15765-4
Termination	120 Ω, switchable
Dielectric strength	±8 V

HEAD acoustics

Contact information

Ebertstraße 30a
52134 Herzogenrath, Germany
Phone: +49 (0) 2407 577-0
Email: sales@head-acoustics.com
Website: www.head-acoustics.com