

Audio Player for AGV HG G-31500-A

CAN | USB | serial | MP3/WAV

English, Revision 06

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Basic characteristics of the audio player HG G-31500-A:

- ♦ Audio player for automated guided vehicles (AGV)
- ♦ Control via CAN / digital inputs (PLC) / serial (RS 232) / buttons (function test)
- ♦ Voltage supply range: 10 – 30 VDC
- ♦ Supported formats: MP3/WAV
- ♦ Slot for an USB stick with audio files, up to 255 files usable in the memory medium's root directory
- ♦ Operating mode of the digital inputs (PLC) configurable: alternatively single evaluation (one of the first 5 tracks selectable) or binary evaluation (one of the first 31 tracks selectable)
- ♦ Nominal output: 2 x 10 watt @ 4 Ohm (peak output max. 2 x 25 watt, to be taken into consideration when selecting loudspeakers)
- ♦ Potentiometer for limiting the maximum volume
- ♦ Configuration of interface parameters
- ♦ Installation via mounting lugs / optionally top-hat rail mounting (s. Variants, section 3.1 on page 8)

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a certified quality management system
according to ISO 9001.



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About this Document

For you to be able to use your product simply and safely this device description uses consistent warning notices, symbols, terms and abbreviations. Those are described in the following sections.

For you to be able to use your product simply and safely this device description uses consistent warning notices, symbols, terms and abbreviations. Those are described in the following sections.

1.1 Warning Notices

In this device description warning notices appear before sequences of actions that may lead to damage to persons or property. The listed actions for the danger prevention have to be observed.




Warning notices have the following structure:

 SIGNAL WORD
Kind or source of the danger Consequences ► Danger prevention

- The **warning symbol** (warning triangle) indicates danger to life or risk of injury.
- The **signal word** indicates the severity of the danger.
- The paragraph **kind or source of the danger** names the kind or source of the danger.
- The paragraph **consequences** describes the consequences of not observing the warning notice.
- The paragraphs for **danger prevention** explain, how to avoid the danger.

The signal words have the following meanings:

Table 1 Hazard classification according to ANSI Z535.6-2006

Warning Symbol, Signal Word	Meaning
 DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	NOTICE indicates property damage: The product or the environment could be damaged.

1.2 Symbols

In this device description the following symbols and formatting are used:



If this information is ignored the product may not be operated in an optimal way.



Indicates one or more links to the Internet.

- www.goetting.de/xxx
- www.goetting.de/yyy



Indicates tips for easier operation of the product.

- ✓ The check mark lists a requirement.
- ▶ The arrow shows an action step.
The indentation shows the result of an action or an action sequence.
- ♦ Program texts and variables are indicated through the use of a `fixed width font`.
- ♦ Menu items and parameters are shown in *cursive characters*.
- ♦ Whenever the pressing of letter keys is required for program entries, the required **L**etter **K**eys are indicated as such (for any programs of Götting KG small and capital letters are equally working).

2

Introduction

During the operation of automated guided vehicles (AGV) there often is a demand to let the vehicles play notification sounds at certain positions throughout the track. For this purpose the audio player HG G- 31500 was developed. Various interfaces make system integration easy. An audio amplifier for direct connection of loudspeakers is already integrated.



The audio player does not have internal speakers. External speakers and USB storage medium are not included in the scope of delivery.

NOTICE

Damage to USB storage media and/or loudspeakers

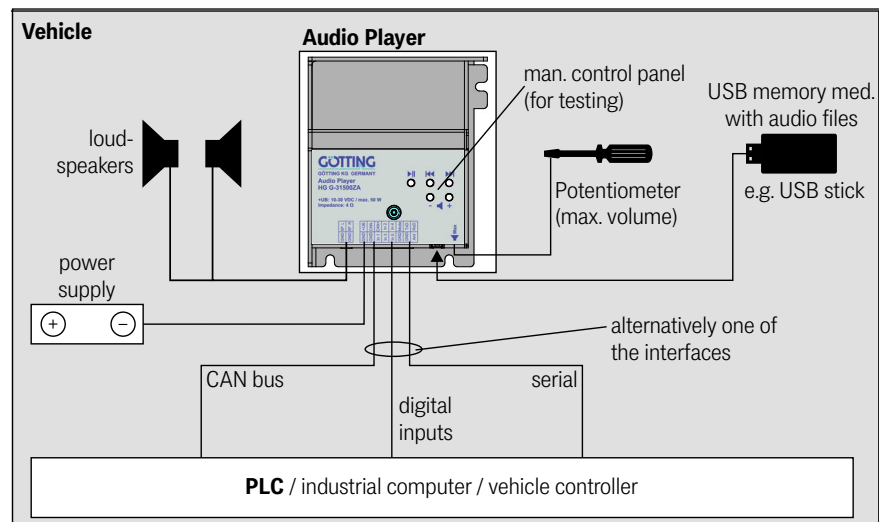
USB storage media and loudspeakers are available in versions for different operating temperature ranges. The audio player can cover a wide operating temperature range. If it is operated in a temperature range for which the USB storage medium and speakers are not specified, they may be damaged.

- The USB storage medium and speakers must be selected so that they match the temperature range in which the audio player is operated.

2.1 Connection Overview

The following picture shows the usual connection options for the audio player.

Figure 1 Connection options



2.2 Interfaces

The audio player is characterized in particular by its large number of inputs, which can be used to control the selection and playback of audio files. The supply voltage range of 10 – 30 V was also designed so that the player can be easily integrated into a vehicle.

- ♦ CAN interface for integration into the vehicle's own CAN bus, selection of one of up to 255 audio files. Control of playback and volume.
- ♦ Serial interface (RS232) for selection of one of up to 255 audio files. Control of playback and volume.
- ♦ Five digital inputs, which can be used, for example, by a PLC to select audio files on the stick.

3

Hardware

3.1 Variants

The audio player is available in two variants, which differ in the mounting options:

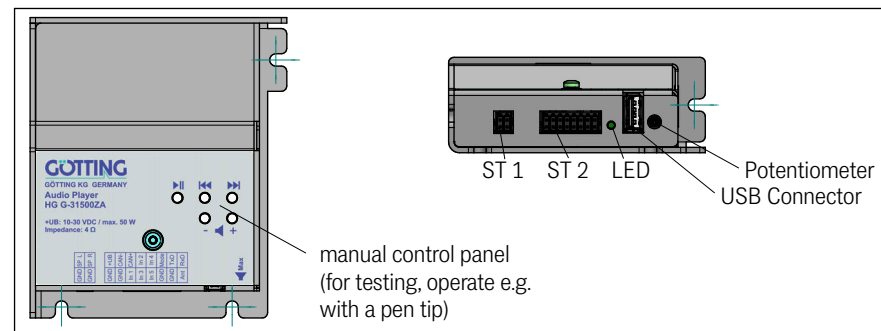
- ♦ Order no.: HG G-31500ZA
Mounting lugs (s. Figure 3 on page 10)
- ♦ Order no.: HG G-31500YA
Mounting lugs and an adapter for top-hat rail mounting (s. Figure 3 on page 10)

3.2 Factory Settings

- ♦ Mode: Stereo (s. section 3.8 on page 10)
- ♦ Potentiometer: Maximum position (s. section 3.9 on page 10)
- ♦ Interface parameters s. Table 11 on page 19 / adjusting s. section 5.2 on page 17

3.3 Operating Elements / Connectors

Figure 2 Operating elements



The audio player has the following operating elements:

- ♦ A control panel on the front panel for manual operation for function tests, s. section 4.6 on page 16.
- ♦ Two connectors ST 1 and ST 2 (pin assignment s. section 3.5 on page 9).
- ♦ One LED for function control, s. section 3.4 on page 9.
- ♦ A USB Typ B slot for connecting a USB storage medium with the audio files, s. sections 3.11 on page 11 and 4.1 on page 12.
- ♦ A potentiometer for limiting the maximum volume, see section 3.9 on page 10.

3.4 LED

The green LED indicates operating states:

Table 2 LED: Operating states

LED	Meaning
Off	no voltage supply
Flashes quickly (T = 0,2 s)	Initialization phase
Lit up continuously	idle mode
Dims slowly (T = 1,5 s)	Playback active
Flashes slowly (T = 1,5 s)	Standby active
Flashes very quickly (T < 0,1 s)	Firmware is programmed, see section 5.3 on page 18

3.5 Pin Assignments ST 1 & ST 2

The pin assignments are shown on the identification plate on the front panel. The available pins have the following functions.

3.5.1 ST 1 Loudspeaker

Table 3 Pin assignment ST 1

Pin		Loudspeaker
1	SP L	⊕ Loudspeaker left
2	GND	⊖ Loudspeaker left
3	SP R	⊕ Loudspeaker right
4	GND	⊖ Loudspeaker right

3.5.2 ST 2 Supply & Interfaces

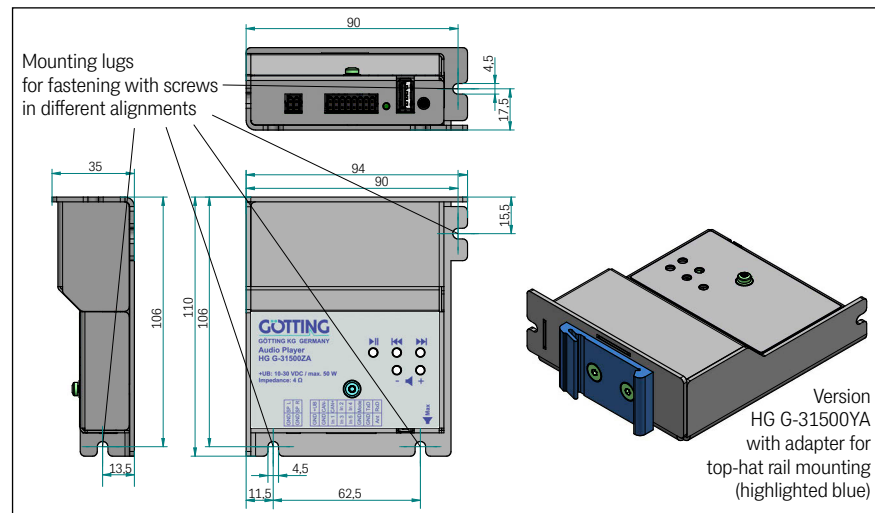
Table 4 Pin assignment ST 2 (part 1 of 2)

Pin		Function
1	+UB	Supply
2	GND	Ground
3	CAN-	CAN bus (telegram structure s. section 4.4 on page 15)
4	GND	
5	CAN+	
6	In 1	Digital inputs (PLC)
7	In 2	
8	In 3	
9	In 4	
10	In 5	
11	Mode	Mono / Stereo (s. section 3.8 on page 10)
12	GND	

Table 4 Pin assignment ST 2 (part 2 of 2)

Pin	Function
13	TxD
14	GND
15	RxD
16	Ant

3.6 Mounting

Figure 3 Mounting: Lugs / top-hat rail mounting (variant) / casing dimensions

3.7 Audio Amplifier

The integrated audio amplifier has a nominal power of 2 x 10 watts into 4 ohms. The peak power is up to 2 x 25 watts, which should be taken into account when selecting the speakers.

The maximum achievable power values depend on the level of the supply voltage as well as the level of the audio files. The mentioned power values are reached from the nominal voltage of 24 volts and a file level of 95 dB.

3.8 Selection Mono/Stereo

The audio player supports the playback of stereo files. If only one speaker is to be connected to the device, it is recommended to select the Mono mode. For this purpose, either mono audio files can simply be used, or mono operation is forced by applying ground potential to input Mode of connector ST 2 (connector ST 2: connect pin 11 with pin 12, s. section 3.5.2 on page 9).

3.9 Potentiometer

The potentiometer is used to set the maximum volume. This value then corresponds to 100 %. The adjustable volume is thus in the range from 0 % (silence) to 100 % (potentiometer value).

For the adjustment, an audio file with a volume of 100 % must be played back. This can be achieved as follows:

- ♦ The transfer value for the volume in the telegram is set to 100.
- ♦ Playback is started via the control inputs (always 100 %).
- ♦ Playback is started via the manual button field. The volume must be set to the maximum value with the + key.

3.10 Standby Mode

The standby bit can be used to activate or deactivate the power saving mode. In activated standby mode, the current consumption of the audio player is 0.02A at 24V. The wake-up time from standby mode is approx. 1 second. Any audio playback already in progress is terminated when the standby mode is activated. The standby bit can be set serially and via CAN bus in the control byte, see section 4.5 on page 15.

3.11 USB Storage Medium

Only USB storage media with the FAT32 file system are supported. If the USB storage medium has a different file system, e.g. exFAT or NTFS, the file system must be changed to FAT32.

USB storage media up to a size of 256 GB were tested.

3.12 Commissioning

Commissioning includes the following steps:

- ♦ Mount the device at the desired location (s. section 3.6 on page 10).
- ♦ Connect one or two loudspeakers to ST 1 (see section 3.5.1 on page 9).
- ♦ Connect the desired interface to the corresponding pins of ST 2 (see section 3.5.2 on page 9).
- ♦ Insert a USB storage device with the audio files on it into the USB port. For format and location of the audio files see section 4.1 on page 12.
- ♦ Connect supply voltage and ground to the corresponding pins of ST 2 (see section 3.5.2 on page 9).
- ♦ Use the desired interface to control play/pause/stop playback of the audio files (see chapter 4 on page 12).



When the device is switched on for the first time or when a USB storage medium is connected which has not been used with the audio player before, some files/directories are created on the USB storage medium, see chapter 5 on page 17.

4

Audio Control: Interfaces, Telegrams & Buttons

4.1 Audio Files on the USB Storage Medium

The audio files are read from a USB storage medium (s. section 3.11 on page 11) and must be in MP3 or WAV format. A maximum of 255 files can be managed, which must be located in the root directory of the USB storage medium. Subdirectories are not supported. The files are sorted in ascending alphabetical order.



For a more convenient overview, the file name can be preceded by an index:

Figure 4 Example: File names with index for easier assignment

```
001_FileName1.mp3
002_FileName2.mp3
003_FileName3.mp3
...
```

Thus, the index would also correspond to the audio file number used when controlling the audio player.

To unify the volume of all audio files, it is recommended to normalize the files with a program such as *mp3gain*[®].



mp3gain home page: <https://sourceforge.net/projects/mp3gain/>

Furthermore, pauses at the beginning of the audio files should be removed to avoid unnecessary delays during playback. A suitable program for this purpose would be e.g. *Audacity*[®].



Audacity home page: <https://www.audacityteam.org/>

4.2 Digital Inputs



With active digital inputs, control via telegrams (serial/CAN) is not possible.

Five digital inputs are available. The digital inputs are active when a voltage in the range of +5 volts to +30 volts is applied. For deactivation, the voltage must be in the range of 0 volts to +1 volts. The debounce time when reading in the digital inputs is 20 ms. The operating mode of the digital inputs can be set to single evaluation (default) or binary coded. The playback takes place with maximum volume (100%), whereby the limitation is carried out by the potentiometer.

4.2.1 Single Evaluation

This is the default operating mode of the digital inputs. One of the first five audio files is selected directly via the respective digital inputs and played back as long as the digital input is active. If several digital inputs are activated, the first recognized digital input remains valid until it is released again. Only then are the other digital inputs processed.

4.2.2 Binary Coded

This operating mode is activated with the entry *InputExtended = yes* in the CONFIG.INI file (see section 5.2 on page 17). In this operating mode, one of the first 31 audio files is selected according to the binary code applied to the control inputs and played back as long as the corresponding control inputs are active. If the binary code is changed, the current playback is terminated and the audio file corresponding to the new binary code is played back.

Table 5 Codes for the binary coding of the digital inputs (part 1 of 2)

In 1	In 2	In 3	In 4	In 5	Action
0	0	0	0	0	Stop, no playback
1	0	0	0	0	File 1
0	1	0	0	0	File 2
1	1	0	0	0	File 3
0	0	1	0	0	File 4
1	0	1	0	0	File 5
0	1	1	0	0	File 6
1	1	1	0	0	File 7
0	0	0	1	0	File 8
1	0	0	1	0	File 9
0	1	0	1	0	File 10
1	1	0	1	0	File 11
0	0	1	1	0	File 12
1	0	1	1	0	File 13
0	1	1	1	0	File 14
1	1	1	1	0	File 15
0	0	0	0	1	File 16
1	0	0	0	1	File 17
0	1	0	0	1	File 18
1	1	0	0	1	File 19
0	0	1	0	1	File 20
1	0	1	0	1	File 21
0	1	1	0	1	File 22
1	1	1	0	1	File 23
0	0	0	1	1	File 24
1	0	0	1	1	File 25
0	1	0	1	1	File 26
1	1	0	1	1	File 27

Table 5 Codes for the binary coding of the digital inputs (part 2 of 2)

In 1	In 2	In 3	In 4	In 5	Action
0	0	1	1	1	File 28
1	0	1	1	1	File 29
0	1	1	1	1	File 30
1	1	1	1	1	File 31

4.3 Serial Interface RS 232

Factory settings of the interface parameters see Table 11 on page 19. Adjustment via CONFIG.INI (s. section 5.2 on page 17).

The serial RS-232 interface can be used to control the audio player. For this purpose, a data block with the following content is transmitted:

Table 6 Structure of the serial telegram

Function	Value / value range	Description
Start character	2	STX, ASCII 2
Number of the audio file	000..255	0 = random selection
Playback duration [s]	000..255	0 = complete file
Volume [%]	000..100	
Control byte	000..255	Bit coded, see section 4.5 on page 15
End character	3	ETX, ASCII 3
Check sum	000..255	Sum of the individual bytes incl. STX and ETX modulo 256

The decimal values are transmitted ASCII coded with leading zeros.

Example: Play file 2 for 5 seconds with 80 % volume

ASCII: [STX] 0 0 2 0 0 5 0 8 0 0 0 1 [ETX] 0 8 5

HEX: 02 30 30 32 30 30 35 30 38 30 30 30 31 03 30 38 35

4.4 CAN Bus

Factory settings of the interface parameters see Table 11 on page 19. Adjustment via CONFIG.INI (s. section 5.2 on page 17). A terminating resistor is not implemented.

The audio player can also be controlled via the CAN bus interface. The data field comprises 8 bytes with the following content:

Table 7 Structure of the CAN bus telegram

Index [Byte]	Function	Value range	Description
0	Number of the audio file	0..255	0 = random selection
1	Playback duration [s]	0..255	0 = complete file
2	Volume [%]	0..100	
3	Control byte	0..255	Bit coded, see section 4.5 on page 15
4	–		
5	–		
6	–		
7	–		

4.5 Bit Coded Control Byte (Serial & CAN Bus)

The control byte is used to influence states during the playback of audio files:

Table 8 Control byte (bit coded, serial & CAN-Bus)

Bit	Function
7	Toggle bit: The telegram is only accepted when the bit toggles
6	Standby: 0 = off, 1 = on
5	–
4	–
3	–
2	Repeat: 0 = off, 1 = on
1	Pause: 0 = no, 1 = yes
0	Playback: 0 = Stop, 1 = Play

4.6 Button Panel

For test purposes, the audio player can be controlled via buttons on the top. The last selected volume setting for playback via the button panel is permanently stored in the device.

Table 9 *Buttons of the button panel and their function*

Taster	Symbol	Function
1	>	Start/Stop
2	<<	One file backwards
3	>>	One file forward
4	–	Decrease volume
5	+	Increase volume
6	Reset	Reset (only internally)

5

Configuration / Firmware Update

When the device is switched on, the directory SYSTEM is created on a connected USB storage medium. This directory is used exclusively for system maintenance and configuration and can contain the following files:

5.1 Release Notes

The file *INFO.TXT* contains information about the installed software.

5.2 Configuration via CONFIG.INI

The factory interface settings can be changed by the user. For this purpose, a text file CONFIG.INI must be created with the desired settings. Comment lines start with the # character. Numbers are interpreted decimally or hexadecimally (by prefixing them with 0x). In case of missing or invalid entries, the respective factory default values (see Table 11 on page 19) are taken for setting.

The following settings are possible:

Table 10 Interface parameters that can be adjusted via CONFIG.INI

Interface	Parameter	Possible values	Unit
CAN Bus	CanExtended	no, yes	
	CanId	All valid identifiers except 0	
	CanBitRate	1000000, 500000, 250000, 125000, 50000, 20000	[bit/s]
Serial (RS 232)	UartBitRate	115200, 57600, 38400, 19200, 9600	[bit/s]
	UartDataBits	7, 8	[bit]
	UartParity	none, even, odd	
	UartStopBits	1, 2	[bit]
Digital inputs	InputExtended	no, yes	

You can also download and customize the default *CONFIG.INI* file shown in Figure 5 below from our website at the following link:



<https://goetting-agv.com/components/31500>

If you create your own *CONFIG.INI*, please make sure that it is not generated by the operating system as CONFIG.INI.TXT. This can happen e.g. under Microsoft® Windows®, where the Windows Explorer then displays the file as CONFIG.INI by default anyway. A CONFIG.INI.TXT on the USB stick is not recognized and not evaluated by the audio player. By using our template from the website you can work around this problem.

Figure 5 Example: Structure of a CONFIG.INI file

```
#Config file for audio player HG G-31500A
#CAN
CanExtended = no
CanId = 0x64
CanBitRate = 500000
#UART
UartBitRate = 115200
UartDataBits = 8
UartParity = none
UartStopBits = 1
#MISC
InputExtended = yes
```

5.3 Firmware Update/Downgrade

The firmware 31500AA of the audio player can be updated by the user. New firmware files are made available for download on the product page of the audio player:



<https://goetting-agv.com/components/31500>

To update the firmware, the downloaded firmware file *31500AAx.x.bin* must be saved in the system directory of the USB storage medium.



There may only be at most one firmware file in the system directory of the USB storage medium.



It is recommended to use a separate USB storage medium for firmware files. This way, the storage media with the audio files are not changed and in installations with several audio players, the update/downgrade can be performed everywhere with one storage medium.

The file is checked the next time the device is switched on. If the version identifier is different to the installed firmware, the firmware is programmed from the USB storage medium. Thus, both updates and downgrades are possible. The programming process is indicated by the very fast flashing of the LED.

Afterwards, the audio player restarts and is ready for operation again.

6

Technical Data

Table 11 *Technical Data*

Technical Data	
Dimensions	94 mm x 110 mm x 35 mm (W x H x D without top-hat rail adapter)
Casing	Aluminum plate
Weight	approx. 185g (without top-hat rail adapter)
Protection class	IP 20
Relative humidity	95% @ 25° C (without condensation)
Temperature ranges	<ul style="list-style-type: none"> – Operation: +0° C to +70° C / on request: -25° C to +70° C – Storage: -40° to +85° C
Voltage supply	10 - 30 VDC, nominal voltage 24 VDC
Output power	<ul style="list-style-type: none"> – Nominal output 2 x 10 W @ 4 Ohm – Peak output 2 x 25 W @ 4 Ohm (potentiometer set to max, nominal voltage or higher, volume set to 100%, audio file modulation >= 95 db)
Current consumption	Operation 0.07 A to 2 A / standby 0.02 A (see section 3.10 on page 11)
Connectors	1x 4 pin loudspeakers, 1x 16 pin interfaces, nominal wire cross section connection cable 0.5 mm ² , pin assignment s. section 3.5 on page 9
Interfaces factory settings can be changed via the configuration file CONFIG.INI on the stick (s. section 5.2 on page 17)	<ul style="list-style-type: none"> – CAN-Bus: CAN <u>Basic</u>/Extended, without terminator, Node ID <u>100</u>_{dez} (all valid IDs except 0), Bit rate 1000, <u>500</u>, 250, 125, 50, 20 kbit/s – serial RS232: Baud rate <u>115200</u>, 57600, 38400, 19200, 9600 Baud, – Data bits: 7/8, Parity: <u>None</u>/Even/Odd, Stop Bits: <u>1</u>/<u>2</u>, no handshake – USB 2.0 for memory medium – Digital inputs (see below)
Digital inputs	5x – as long as a digital input is active no telegrams are processed <ul style="list-style-type: none"> – Low level: 0 to +1 VDC – High level: +5 to +30 VDC Operating modes: <u>Single evaluation</u> / binary coded (optional, s. section 4.2 on page 12)
File formats	WAV, MP3 up to 320 kbit/s
Operating elements	5 buttons, 1 LED, potentiometer for limiting the maximum volume
Operation modes	<u>Stereo</u> / Mono (optional, s. section 3.8 on page 10)

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Revision History

The following table lists the revisions of this device description that have been published so far with the most important changes in each case.

Table 12 Document revision history

Revision	Edited by	Description of changes
01 Date: 07.06.2021	RAD	<ul style="list-style-type: none"> – Firmware version 1.2.0 – First revision of this device description
02 Date: 08.06.2021	RAD / TN	Define the temperature range of the USB flash drive
03 Date: 10.06.2021	RAD / TN	Temperature ranges are defined
04 Date: 27.08.2021	RAD / TC	Offer standard CONFIG.INI on the website
05 Date: 21.06.2022	RAD / TC	<ul style="list-style-type: none"> – Firmware version 1.2.1 – Extension to include optional binary evaluation of the 5 control inputs – Layout updates
06 Date: 13.08.2024	RAD / TC	<ul style="list-style-type: none"> – Firmware version 1.2.2 – Information on size and file system of supported USB sticks – Layout updates, this chapter revision history added to the device description

11

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Any information given is to be understood as system description only, but is not to be taken as guaranteed features. Any values are reference values. The product characteristics are only valid if the systems are used according to the description.

This instruction manual has been drawn up to the best of our knowledge. Installation, setup and operation of the device will be on the customer's own risk. Liability for consequential defects is excluded. We reserve the right for changes encouraging technical improvements. We also reserve the right to change the contents of this manual without having to give notice to any third party.

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