DirectOut TECHNOLOGIES

MADI.MONI

User's Manual

Version 1.1

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About This Manual

How to Use This Manual

This manual guides you through the installation and operation of the device. Use the Table of Contents at the beginning of the manual or Index Directory at the end of the document to locate help on a particular topic. You can access more information and latest news by visiting on the DirectOut website at www.directout.eu.

Conventions

The following symbols are used to draw your attention to:

TIPS!

indicate useful hints and shortcuts.

NOTES!

are used for important points of clarification or cross references.

WARNINGS!

alert you when an action should always be observed.

CHAPTER 1: Overview

Introduction

Welcome to MADI.MONI, DirectOut's battery powered, mobile monitor and tester for MADI signals. MADI.MONI provides a coaxial MADI I/O for standard BNC cabling and a flexible SFP I/O to meet various connection standards by using SFP modules. Input signals are analysed (e.g. signal level, jitter, sample rate,...) and can be monitored via a headphone output.

Feature Summary

MADI Ports	1 x SFP (empty cage without module) 1 x coaxial BNC connectors
MADI Formats	56/64 channel, 48k/96k Frame
Sample Rates	44.1, 48, 88.2, 96, 176.4, 192 kHz +/-12.5%
USB Port	USB 2.0 (B) plug for charging and firmware updates.
Analysing Features	Sample Rate, MADI Format, Signal Amplitude, Jitter
Display	Segment display to indicate channel / volume / signal level and 12 LEDs to confirm the integrity of the physical link, the format and settings of the MADI transmission at a glance.

How it works

The signal of the selected input is analysed. Analysis results are displayed on the device itself by individual LEDs for each parameter. Amplitude and Jitter are monitored via simple 'traffic light' LEDs.
The selected input can be monitored via headphones. Channel selection (mono or stereo pairs) and volume level are adjusted via two push buttons.
The brightness of the display and the leds may be varied to match different lighting conditions.

Applications

MADI.MONI can be used in numerous applications where MADI connections are used. Both quick integrity check of the physical link and monitoring the audio signal serve the aim of solid operating conditions in MADI environments.

Typical applications include:

- ensuring stable signal connections
- detection of cabling issues (poor signal condition)
- line check of pre-installed cabling
- portable audio signal monitoring
- ...

CHAPTER 2: Legal issues & facts

Before Installing This Device

WARNING!

Please read and observe all of the following NOTE!s before installing this product:

- Check the hardware device for transport damage.
- Any devices showing signs of mechanical damage or damage from the spillage of liquids must not be operated.
- Do not use the device at extreme temperatures. Proper operation can only be guaranteed between temperatures of 5° C and 45° C and a maximum relative humidity of 80 %, non-condensing.
- The cabinet of the device will heat up. Do not place the device close to heating sources (e.g. heaters). Observe the environmental conditions.
- Do not dispose the device into fire, water or other liquids.

Battery - Safety Instructions

WARNING

This device contains a rechargeable lithium-ion polymer battery. Observe the following safety instructions.

- Use only approved chargers and procedures. Improperly charging a cell or battery may cause the cell or battery to flame or damage.
- The battery may be exchanged only by service staff that has been authorized by DirectOut GmbH.
- The battery must be recycled or disposed of separately from general trash.
- Contact your DirectOut representative for exchanging the battery.
- Do not expose the battery to temperatures below 0°C or higher than 45° C.
- The battery is excluded from warranty claims.

Defective Parts/Modules

WARNING!

This device contains no user-serviceable parts. Therefore do not open the device. In the event of a hardware defect, please send the device to your DirectOut representative together with a detailed description of the fault.
We would like to remind you to please check carefully whether the failure is caused by erroneous configuration, operation or connection before sending parts for repair.

First Aid (in case of electric shock)

WARNING!

- Do not touch the person or his/her clothing before power is turned off, otherwise you risk sustaining an electric shock yourself.
- Separate the person as quickly as possible from the electric power source as follows:
  - Switch off the equipment.
  - Unplug or disconnect the mains cable.
- Move the person away from the power source by using dry insulating material (such as wood or plastic).
- If the person is unconscious:
  - Check their pulse and reanimate if their respiration is poor.
  - Lay the body down and turn it to one side. Call for a doctor immediately.
- Having sustained an electric shock, Always consult a doctor.

Updates

DirectOut products are continually in development, and therefore the information in this manual may be superseded by new releases. To access the latest documentation, please visit the DirectOut website:
www.directout.eu.
This guide refers to firmware version 1.3.

Intended Operation

MADI.MONI is designed for analysis and monitoring of MADI signals (AES10).

WARNING!

No compensation can be claimed for damages caused by operation of this unit other than for the intended use described above. Consecutive damages are also excluded explicitly. The general terms and conditions of business of DirectOut GmbH are applied.

Conditions of Warranty

This unit has been designed and examined carefully by the manufacturer and complies with actual norms and directives.
Warranty is granted by DirectOut GmbH over the period of two years for all components that are essential for proper and intended operation of the device. The date of purchase is applied for this period.
Consumable parts (e.g. battery) are excluded from warranty claims.

WARNING!

All claims of warranty will expire once the device has been opened or modified, or if instructions and warnings were ignored.
For warranty claims please contact the dealer where your device was acquired.

Conformity & Certificates

CE

This device complies with the basic requests of applicable EU guidelines. The appropriate procedure for approval has been carried out.

RoHS

(Restriction of the use of certain Hazardous Substances)
This device was constructed fulfilling the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2002/95/EC.

WEEE

(Directive on Waste Electrical and Electronic Equipment)
Due to the directive 2002/96/EC for waste disposal this device must be recycled.
For correct recycling please dispatch the device to:
DirectOut GmbH,
Leipziger Str. 32
09648 Mittweida
Germany
Only stamped parcels will be accepted!
WEEE-Reg.-No. DE 123456789

Contact

Sales:
DirectOut GmbH, Leipziger Str. 32, 09648 Mittweida, Germany
Phone: +49 (0)3727 5665-100 // Fax: +49 (0)3727 5665-101
www.directout.eu

Manufacturer:
Leine-Weser-Labor GmbH, Brabeckstr. 121, 30539 Hannover, Germany

Contents

The contents of your MADI.MONI package should include:

- 1 x MADI.MONI
- 1 x USB cable
- 1 x product information

To complete the delivery please download from the DirectOut website: www.directout.eu

- User Manual
- USB Serial driver
- Update Tool

Accessory

Two different optical SFP modules are available from DirectOut GmbH:

- Multimode SFP transceiver with LC connectors (No: DOICT0129)
- Singlemode SFP transceiver with LC connectors (No: DOICT0130)

Specification of the optical SFP modules:

SFP	Multimode	Singlemode
Wavelength TX	1310 nm	1310 nm
Wavelenght RX	1310 nm	1310 nm
Distance	2 km	10 km
Powerbudget (dB)	11 dB	12 dB
Protocols	Fast Ethernet OC3/STM1	Gigabit Ethernet, Gigabit Fibre Channel
Bandwidth from	100 Mbit/s	1.050 Gbit/s
Bandwidth	155 Mbit/s	1.250 Gbit/s
Laser	FP	FP
Receiver Type	PIN	PIN
Connector	LC	LC
Wavelength TX min	1260 nm	1260 nm
Wavelength TX max	1360 nm	1360 nm
Wavelength RX min	1260 nm	1260 nm
Wavelength RX max	1620 nm	1600 nm
Transmit min	- 19.00 dBm	- 9.00 dBm
Transmit max	- 14.00 dBm	- 3.00 dBm
Receive min	- 30 dBm	- 21.00 dBm
Receive max (Receiver overload)	- 5.00 dBm	- 3.00 dBm
Temperature (min)	0° Celsius	0° Celsius
Temperature (max)	70° Celsius	70° Celsius
Type of DDM/DOM	internal	internal
Extinction Ratio	8.20 dB	9 dB

The modules support all analysing features of MADI.MONI.

CHAPTER 3: Installation

Installing the Device

1. Open the packaging and check that the contents have been delivered complete and undamaged.

WARNING!

Avoid damage from condensation by waiting for the device to adapt to the environmental temperature. Proper operation can only be guaranteed between temperatures of 5° C and 45° C and a maximum relative humidity of 80%, non-condensing.
Ensure that the unit has sufficient air circulation for cooling.

2. Connect signal cable(s) for the MADI signals.

3. Connect the headphones for monitoring.

4. Turn on the power switch and check the battery condition.

While the device is booting the currently installed firmware is indicated in the display - e.g. firmware version1.2.

TIP

Use the DirectOut Release Map to match your DirectOut device with the latest firmware or software release.
Link: http://www.directout.eu/upload/dokumente/dotec_release_map.pdf

5. Connect an USB cable to the USB port for charging the battery or firmware updates.

NOTE!!

To update the firmware an installed USB Serial driver (Windows®) and the Update Tool are necessary. The software and the installation instructions are available at www.directout.eu.

6. Installation of USB Serial driver

- download the USB Serial driver
- download the 'Installation Guide for USB Control'
  - Link: http://www.directout.eu/en/support/downloads/madi-moni.html
- follow the installation instructions in the 'Installation Guide for USB Control'

TIP!

Keep any packaging in order to protect the device should it need to be dispatched for service.

7. Calibration of BNC I/O
To assure accuracy of the measuring of a coaxial MADI signal, the BNC I/O shall be calibrated first- see „Calibration BNC I/O“ on page 33.

Charging the battery

The battery 'LEVEL' led should be green. A yellow or red led indicates low level and requires charging the battery.
To charge the battery switch off the device and and connect it to an external USB power supply or USB computer port.

NOTE!

If the battery is empty the device can be operated with an external USB power supply. The battery will only be charged when the device is switched off.

CHAPTER 4: Operation

Introduction

This chapter describes the basic operation of the device.
Note that throughout this manual, the abbreviation FS refers to sample rate or sample frequency. So, when dealing with scaling factors, the following sample rates can be written as:

- 44.1 kHz or 48 kHz = 1 FS
- 88.2 kHz or 96 kHz = 2 FS
- 176.4 kHz or 192 kHz = 4 FS

Global Control

The power switch is on the side panel. LEDs on the top panel inform about battery level or charge state.

Power	**1 Switch** Move slider to switch device ON or OFF.
USB	**USB 2.0 socket (Type B)** Connect here for charging the battery or firmware updates.

Signal Connections

MADI.MONI provides two MADI I/Os:

- coaxial BNC port
- SFP cage to connect other media carrying MADI signals, e.g. fibre (single mode/multi mode), different wavelengths etc.

1 BNC OUT / IN	**2 x BNC socket (coaxial)** OUT: MADI output (64 ch), connect for MADI output signal here. IN: MADI input (64 ch), connect MADI input signal here.
2 SFP	**1 x SFP cage*** Insert SFP module here and connect MADI input/ output

* empty cage, module not included in delivery - see „Accessory“ on page 13.

Battery

The device can operate continously up to two hours with a fully charged battery. The battery level is indicated by the 'LEVEL' led.

Battery - Charge	**LED (green) - indicating charge status** ON = charging battery OFF = no charge flashing (1,5 Hz) = NTC fault (temperature alarm) flashing (6 Hz) = battery defective
Battery - Level	**LED (green / yellow / red) - indicating battery level while operation** green = charged (> 3.5 V) yellow = needs charging soon (> 3,3 V) red = immediate charging required (< 3.3 V)

NOTE!

The operating time of the battery depends on the environmental conditions (temperature, type of installed SFP module).

NOTE!

See „Charging the battery“ on page 17.

Operating Principles

The device is operated via four push buttons, 'VOL/CH' and 'MENU' navigate the parameters. The two 'SET' buttons (▲▼) are used for adjusting parameter values.

'Signal Format' and 'Signal Quality' inform about the signal state of the selected input. The values of 'Signal Quality' are expressed by using different colors and combinations of the three LEDs ('traffic light').

The alphanumeric display monitors the signal level of the selected channel(s) for monitoring. Using the navigation buttons it can be toggled to temporary display of volume level or the selected channel for monitoring or the individual parameters of the device settings.

On the following pages each parameter and its corresponding values are described. The „Menu Structure" on page 27 provides a basic overview of the device settings.

VOL/CH	**Push button** Push for toggling between volume control and channel selection.
MENU	**Push button** Push to enter and navigate the menu.
VOL	**LED (green) - indicates selection of volume control to adust level for headphones** ON = Volume control enabled OFF = Volume control not enabled
CH	**LED (green) - indicates selection of channel selection to adjust channel for headphones** ON = Channel selection enabled OFF = Channel selection not enabled
MENU	**LED (green) - indicates selection of menu to adjust device settings** ON = Menu settings enabled OFF = Menu settings not enabled
SET ▼	**Push button** Push to decrease level / channel selection / parameter value. Hold for continous change.
SET ▲	**Push button** Push to increase level / channel selection / parameter value. Hold for continous change.
Display	**2 x segment display** Display content is explained on the following pages.

The content of the alphanumeric display follows the navigation control. The device resumes to idle mode (= level meter) after about 10 seconds.

NOTE!

Volume Control and Channel Selection do not affect the MADI output signal.

Display- Volume control

Display		**The adjusted volume level is indicated.** The signal can be varied within a range of -74 dBFS to 0 dBFS in steps of 2 dB. An additional boost up to 6 dB can be applied.
Volume		Headphone output muted.
		Lowest volume level for headphone output.
		Highest volume level for headphone output.

WARNING

The use of headphones at high volume may harm your hearing.

Display- Channel selection

Display		**The selected channel (pair) is indicated.** In stereo mode* odd numbers are indicated only. In mono mode* all channels are indicated. Values: 01 to 64 (example below)
		stereo mode = monitoring channels 05 (left) and 06 (right) mono mode = monitoring channel 05 (both sides)

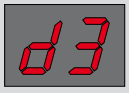
* the monitoring mode for the headphones output is adjusted in the device settings- see „Display- Menu settings“ on page 24.

Display- Menu settings

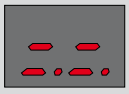
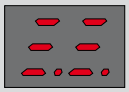
Display		**The individual parameter of a device setting is indicated.**
Input Source		BNC input is selected for analysis and monitoring.
		SFP input is selected for analysis and monitoring.
Monitor Mode		Mono mode, monitoring of a single channel, left and right are identical.
		Stereo mode, monitoring of a channel pair, odd number = left, even number = right
*Scaling Factor**		Scaling factor for monitoring 1 (44.1 / 48 kHz)
		Scaling factor for monitoring 2 (88.2 / 96 kHz)
		Scaling factor for monitoring 4 (176.4 / 192 kHz)
Output Source SFP		SFP MADI output follows the input selection (parameter <S>)
		SFP MADI output fed by SFP input
		SFP MADI output fed by BNC input

* A 96k Frame input signal forces the scaling factor temporarily to 2 FS, overriding this setting until a 48k Frame input signal is resumed.

Legend: c = cage = SFP, C = Channel = monitor channel mode

Display		**The individual parameter of a device setting is indicated.**
Output Source BNC		BNC MADI output follows the input selection (parameter <S>)
		BNC MADI output fed by SFP input
		BNC MADI output fed by BNC input
Display Brightness		Display and led dim level 1 (dark)
		Display and led dim level 2 (moderate)
		Display and led dim level 3 (light)
		Display and led dim level 4 (strong)

Display- Level meter (during idle mode)

Display		**The signal level of the selected channels is indicated (left and right individually).**
Level Meter		LSB is used = audio is present
		- 30 dBFS
		- 18 dBFS
		- 6 dBFS

Input Selection

Select between SFP I/O or coaxial BNC I/O by using the menu.

SFP	**LED (green) - indicating selection state of SFP input** OFF = SFP I/O not selected ON = SFP I/O selected
BNC	**LED (green) - indicating selection state of BNC input** OFF = BNC I/O not selected ON = BNC I/O selected

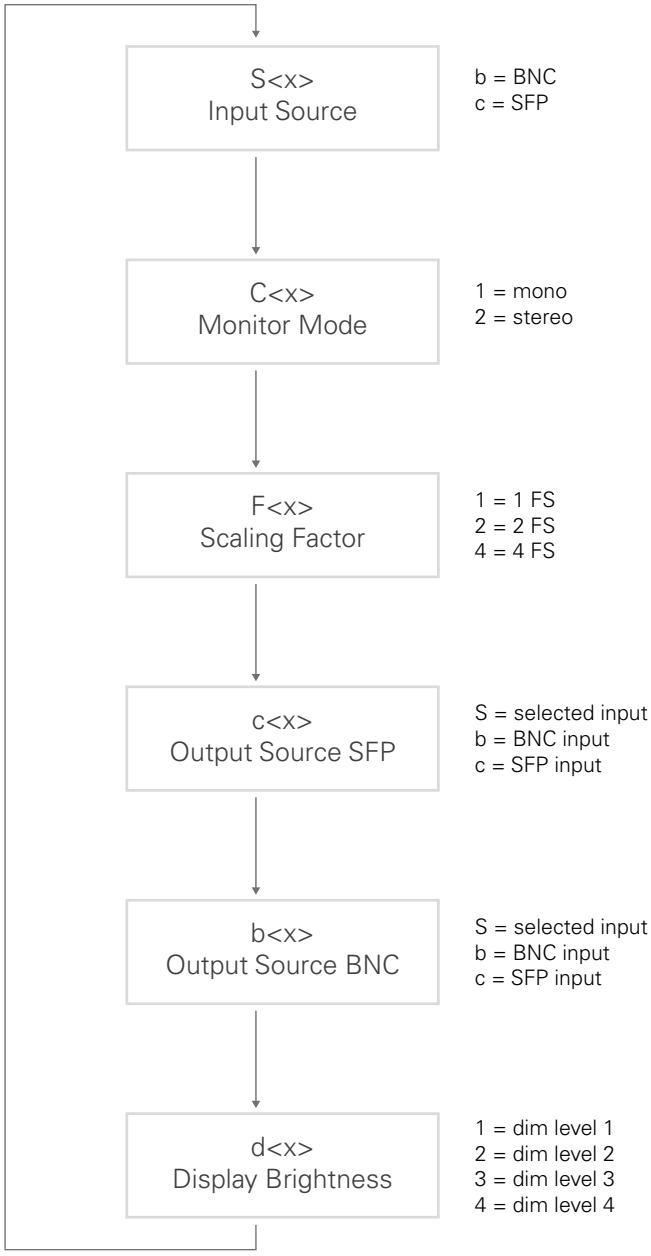
Sync

The device is clocked by the selected input signal.

LOCK	**LED (green) - indicating input lock/sync state** OFF = no signal detected at selected input ON = selected input is in sync FLASHING = selected input is locked but clock rate is out of range (< 28 kHz or > 54 kHz)

Menu Structure

Press ‚MENU' to enter the menu and to navigate the parameters.
Use the ‚SET' keys to alter the setting of the parameter.



Legend: c = cage = SFP, C = Channel = monitor channel mode

Sample Rate

The sample rate (FS) of the selected input is measured and indicated by two green leds. Base rates that deviate more than 0.1 % from the standard rates 44100 Hz or 48000 Hz are indicated by individual flashing codes of both leds.

Code	Meaning	LED Code
○ ○	unlock	both leds OFF
☀ ○	FS < 44056 Hz	44.1 FLASHING green 48 OFF
● ○	FS = 44100 Hz ± 0.1 %	44.1 ON 48 OFF
☀ ☀	44145 Hz < FS < 47952 Hz	both leds FLASHING green
○ ●	FS = 48000 Hz ± 0.1 %	44.1 OFF 48 ON
○ ☀	FS > 48049 Hz	44.1 OFF 48 FLASHING green

Frame Format

The frame format of the selected input is indicated by two leds. 96k Frame is available at 2 FS only while 48k Frame may be used at 1 FS, 2 FS and 4 FS. Thus a 48k Frame MADI signal needs the scaling factor to be adjusted manually for proper monitoring- see „Display- Menu settings“ on page 24.

Code	Meaning	LED Code
● ○	48k Frame	48k ON, green 96k OFF
○ ●	96k Frame	48k OFF 96k ON, yellow

NOTE!

A 96k Frame signal forces the scaling factor temporarily to 2 FS. Once a 48k Frame signal is detected the set scaling factor is resumed.

Channel Mode

The channel mode of the selected input is indicated by two green leds. Deviations from the standard's channel counts of 56 or 64 channels (N) are indicated by individual flashing codes of both leds.

Code	Meaning	LED Code
	channel count not constant	both leds FLASHING alternately, green
	N < 56 channels	56ch FLASHING, green 64ch OFF
	N = 56 channels	56ch ON, green 64ch OFF
	56 channels < N < 64 channels	both leds FLASHING concurrently, green
	N = 64 channels	56ch OFF 64ch ON, green
	N > 64 channels	56ch OFF 64ch FLASHING, green

Amplitude

If the BNC input is selected, the voltage of the MADI carrier is measured. Using the SFP input the module's DDM* signalling is utilized. The analysis results are indicated by 'traffic light' leds.

Code	BNC	SFP	LED Code
○ ○ ○	--	no SFP with DDM	
● ○ ○	< 150 mV	low power alarm	LEFT FLASHING, red MID OFF RIGHT OFF
● ○ ○	< 300 mV	low power warning	LEFT ON, yellow MID OFF RIGHT OFF
○ ● ○	< 600 mV	ok (if SFP with DDM)	LEFT OFF MID ON, green RIGHT OFF
○ ○ ●	< 800 mV	high power warning	LEFT OFF MID OFF RIGHT ON, yellow
○ ○ ●	> 800 mV	high power alarm	LEFT OFF MID OFF RIGHT FLASHING, red

* appropriate SFP Modules: see „Accessory" on page 13.

NOTE!

The AES10 spec requires the voltage of the carrier to be between 300..600 mV.

NOTE

It is advised to perform the calibration of the BNC I/O at periodic intervals- see page 33.

Jitter

The jitter of the MADI carrier of the selected input is analysed. The analysis results are indicated by 'traffic light' leds.

Code	Measured Jitter	LED Code
	very poor	LEFT FLASHING, red MID OFF RIGHT OFF
	poor	LEFT ON, yellow MID OFF RIGHT OFF
	average	LEFT OFF MID ON, yellow RIGHT OFF
	good	LEFT OFF MID ON, green RIGHT ON, green
	excellent	LEFT OFF MID OFF RIGHT ON, green

better

Calibration BNC I/O

The input of the coaxial BNC port shall be calibrated at periodic intervals to assure accuracy of the measuring.

Procedure:

- Connect a loop from BNC input to BNC output
- Press and hold VOL/CH and MENU buttons for 5 seconds until ‘C1’ is displayed.

During the calibration process ‘C2’, ‘C3’ and ‘C4’ will be displayed. When the calibration is done the device returns to normal operation mode.

Display	Progress of calibration
	calibration process is initiated
	calibration phase 2
	calibration phase 3
	calibration done

NOTE

If the display stays at ‘C1’ check the cabling.

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CHAPTER 5: Troubleshooting and Maintenance

Troubleshooting

To identify a possible defect with the device please consult the following table.
If the fault cannot be resolved using these instructions, please contact your local DirectOut representative or visit support.directout.eu.

Issue	Possible reason	Solution
Device doesn't work.	Battery discharged.	Check that the power supply switch is off and plug the device to a matching charging device using the USB connection. Check led 'BATTERY-CHARGE'.
Rare flashing led codes after switch on.	Low power- battery discharged.	Check that the power supply switch is off and plug the device to a matching charging device using the USB connection. Check led 'BATTERY-CHARGE'.
Optional SFP Module: Optical port does not work.	Optic is dirty.	Use an air supply to carefully remove any dust. Never use objects for cleaning.
Optional SFP Module: Analysis of Amplitude does not work	SFP Module does not support this feature.	Use appropriate SFP module. See „Accessory" on page 13.
No signal at the output port.	Signal cable defective.	Exchange the signal cable.
No signal at the output port.	Connections (input / output) are mixed up.	Check the connections and change the cables if necessary.

Maintenance

To clean the device, use a soft, dry cloth. To protect the surface, avoid using cleaning agents.
The device should be switched off during the cleaning process.

CHAPTER 6: Technical Data

Dimensions

- Width: 120 mm
- Height: 90 mm
- Depth: 28 mm
- Weight:about 200 g

Battery

- Nominal Capacity: 1100 mAh (typical)
- Nominal Voltage: 3.7 V
- Charging via USB connection (max. 5 V)
- Charging Current max. 500 mA

Environmental Conditions

- Operating temperature +5°C up to +45°C
- Relative humidity: 10% - 80%, non condensing

MADI Port BNC coaxial

- 2 x BNC socket (input / output)
- Impedance: 75 Ω
- 0.3 V up to 0.6 V (peak to peak)

MADI Port SFP

- 1 x SFP (empty cage without module)
- optional SFP Modules: see „Accessory“ on page 13

Headphones Output

- 3.5 mm TRS jack, mono/stereo

Sample Rate

- 32, 44.1, 48, 88.2, 96, 176.4, 192 kHz (+/- 12.5 %)

MADI Format (I/O)

- 48k Frame, 96k Frame
- 56 channel, 64 channel

USB

- 1 x USB 2.0 socket (Type B)
- for charging and firmware updates

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