# Draco vario DisplayPort 1.2

# KVM Extender
# Series 490

### Introduction

This manual contains important safety instructions as well as instructions for setting up the product and operating it. Please read the general safety instructions (see chapter 2, page 11) and additional notice in the respective chapters. Read carefully through the User Manual before you switch on the product.

The model and serial number of your products are indicated on the bottom of our products. Always refer to this information when you need to contact your distributor or the support of IHSE GmbH (see chapter 13, page 121).

### Trademarks and Trade Names

All trademark and trade names mentioned in this document are acknowledged to be the property of their respective owners.

### Validity of this Manual

This manual applies to all products of the series named on the cover page. Differences between the various models are clearly described. Please note the change log for this manual in chapter 17, page 128.

The manufacturer reserves the right to change specifications, functions or circuitry of the series described here without notice. Information in this manual can be changed, expanded, or deleted without notice. You can find the current version of the manual in the download area of our website.

### Copyright



### Available Documentation

| Name | Format | Description | Provision |
|---|---|---|---|
| User Manual | PDF | Provides an overview of the product together with technical data and safety instructions.<br>Contains all instructions required to operate the product to a basic level. | Download from website |
| Quick Setup | Print | Provides a quick installation guide and safety instructions | Contained in the scope of delivery |

### Contact

IHSE GmbH

Benzstraße 1

88094 Oberteuringen

Germany

phone: +49 7546-9248-0

fax: +49 7546-9248-48

e-mail: info@ihse.com

website: https://www.ihse.com

# Table of Contents

# 1 Important Information

## 1.1 Firmware and Software

The information in this manual refers to the latest extender firmware available at the date of manual release. Please refer to the change log (see chapter 17, page 128) for user manual updates.

## 1.2 Symbols for Warnings and Helpful Information

The meaning of the symbols used for warnings and helpful information in this manual is described below:

| ⚠ WARNING |
| --- |
| WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. |

| ⚠ CAUTION |
| --- |
| CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. |

| NOTICE |
| --- |
| NOTICE identifies information, if not observed, endangers the functionality of your device or the security of your data. |

This symbol indicates information about special features on the device or when using device and function variants.

This symbol indicates instructions for procedures recommended by the manufacturer for an effective utilization of the device potential.

## 1.3 Terms and Spellings

Uniform terms and spellings are used in this manual for better readability or easier assignment.

The following spellings are used for products and system descriptions:

| Term | Description |
| --- | --- |
| Tera Tool | Management software |
| Source | Computer, graphic card |
| Sink | Console (monitor, keyboard, mouse) |

The following spellings are used for keyboard commands:

| Keyboard command | Description |
| --- | --- |
| key | Key on the keyboard |
| key + key | Press keys simultaneously |
| key, key | Press keys successively |
| 2x key | Press key quickly, twice in a row (like a mouse double-click) |

The following spelling is used for, e.g., descriptions of editing files or updating firmware:

| Keyboard command | Description |
|---|---|
| `Config.txt` | E.g., file name |
| `#CFG` | E.g., file content |

The following spellings are used for software descriptions:

| Spelling | Description |
|---|---|
| **Bold print** | Description of terms that are used in the management software, e.g., menus and buttons |
| **Bold print > Bold print** | Management software: selection of a menu item in the menu bar or the toolbar, e.g., **Extras > Options** |

| Mouse button | Description |
|---|---|
| Left mouse button | Primary mouse button* (default in most operating systems) |
| Right mouse button | Secondary mouse button* |
| * Unless you have customized your mouse settings in the used operating system. | |
| Descriptions containing "click...", "mouse click" or "double-click" each means a click with the primary (left) mouse button. If the right mouse button has to be used, this is explicitly declared in the description. | |

## 1.4 EU Declaration of Conformity

Please find the EU Declaration of Conformity for the device under:
www.ihse.com/eu-declaration-of-conformity

A copy of the original, product-specific EU Declaration of Conformity can be provided upon request. For contact details, see page 2 of this manual.

# 2 Safety instructions

To ensure reliable and safe long-term operation of your device, please note the following guidelines:

- ➡ Read this user manual carefully.
- ➡ Only use the device according to this user manual. Failure to follow the instructions described can damage the device or endanger the security of your data.
- ➡ Take any required ESD precautions.

**⚠ WARNING**

**Risk of electric shock due to freely accessible power connections when the chassis is open**

**Risk of bruising, abrasion or shearing of fingertips due to rotating fan when the chassis is open**

If the chassis is opened while power is supplied to the device, electric shock may occur if the internal wiring is touched. If a running fan is touched while the case is open, bruises, abrasions or shearing of fingertips may occur.

There are no necessary maintenance procedures that require opening the chassis.

- ➡ Do NOT remove the cover of the chassis.
- ➡ Do NOT install the device in environments where children are likely to be present.

**⚠ CAUTION**

**Risk of burns due to tremendously heated chassis surface after a long period of operation**

When the chassis is fully equipped, the surface of the chassis can become very warm after a long period of operation. If the chassis surface is touched after a long period of operation, this can cause skin burns.

- ➡ Protective gloves must be worn to transport a fully equipped chassis after a long period of operation.
- ➡ Ensure that there is sufficient distance from the operator, e.g., for mounting under a table.
- ➡ Do NOT install the device in environments where children are likely to be present.

### Installation Location

While operating the device and the power supply units can get warm. Damage to the device can occur in a damp environment.

- ➡ Use the device only in dry, indoor environments.
- ➡ Use the device only in a room with adequate ventilation.
- ➡ For rack-mount installations, at least 0.5 RU (rack unit) is required above the device for ventilation.
- ➡ Do not place the power supply units directly on top of the device.
- ➡ Existing ventilation openings on the device must always be free.
- ➡ If installing the device under the table, place the device at a sufficient distance from the operator.
- ➡ Place all power sockets including the sockets for the supplied external power supply units easily accessible and directly next to each other.

**Connection**

- ➡ Check the device and the power supply units for visible damage before connecting it.
- ➡ Only connect the device if the device and the ports are not damaged.
- ➡ Only use power supply units originally supplied with the product or manufacturer-approved replacements.
- ➡ Only use power supply units without any visible damage at the chassis or the cable.
- ➡ Connect all power supply units to grounded outlets.
- ➡ Ensure that the ground connection is maintained from the outlet socket through to the power supply unit's AC power input.
- ➡ Only connect the device to KVM devices using the interconnecting cable - not to other devices, particularly not to telecommunications or network devices.

**Disconnect the Device from the Circuit**

| NOTICE |
| --- |
| The cable plugs on the device side can contain a lock. In the event of a necessary quick and complete disconnection from external electric circuits:<br>➡ Remove all corresponding cable plugs from the socket,<br>➡ Or set the power switch of the power outlets (if available) to the “Off” position. |

# 3 Consignes de Sécurité

Pour garantir un fonctionnement fiable et sûr de votre périphérique à long terme, veuillez respecter les directives suivantes :

- Lisez attentivement ce manuel d'utilisation.
- N'utilisez le périphérique que conformément à ce manuel d'utilisation. Le non-respect des instructions décrites peut endommager le périphérique ou mettre en danger la sécurité de vos données
- Prenez toutes les précautions nécessaires contre les décharges électrostatiques.

**⚠ AVERTISSEMENT**

**Risque de choc électrique dues de l'accès libre aux connexions électriques lorsque le châssis est ouvert**
**Risque de contusion, d'abrasion ou de cisaillement des bouts des doigts dues de la rotation du ventilateur lorsque le châssis est ouvert**

Si le châssis est ouvert alors que le périphérique est sous tension, un choc électrique peut se produire si le câblage interne est touché.

Si vous touchez un ventilateur en marche alors que le châssis est ouvert, vous risquez de vous blesser, de vous abraser ou de vous cisailler le bout des doigts.

Aucune procédure d'entretien nécessaire ne requiert l'ouverture du châssis.

- Ne retirez PAS le couvercle du châssis.
- N'installez PAS le périphérique dans des environnements où des enfants sont susceptibles d'être présents.

**⚠ ATTENTION**

**Risque de brûlures dues à la surface du châssis très chaude après une longue période d'utilisation**

Lorsque le châssis est entièrement équipé, la surface du châssis peut devenir très chaude après une longue période de fonctionnement.

Si la surface du châssis est touchée après une longue période d'utilisation, cela peut provoquer des brûlures de la peau.

- Des gants de protection doivent être portés pour transporter un châssis entièrement équipé après une longue période d'opération.
- Veillez à ce que la distance avec l'opérateur soit suffisante, par exemple pour un montage sous une table.
- N'installez PAS le périphérique dans des environnements où des enfants sont susceptibles d'être présents.

### Emplacement de l'installation

Pendant le fonctionnement, le périphérique et les unités d'alimentation peuvent chauffer. Le périphérique peut être endommagé dans un environnement humide.

- N'utilisez le périphérique que dans un environnement sec et intérieur.
- N'utilisez le périphérique dans un lieu correctement ventilée.
- Pour les installations en rack, au moins 0,5 RU (unité de rack) est nécessaire au-dessus du périphérique pour la ventilation.
- Ne placez jamais les unités d'alimentation sur le dessus du périphérique.
- Les ouvertures de ventilation existantes sur le périphérique doivent toujours être libres.
- Si vous installez le périphérique sous la table, placez le périphérique à une distance suffisante de l'opérateur.

- Placez toutes les prises de courant, y compris les prises de courant pour les unités d'alimentation externes fournis, de manière facilement accessible et directement les unes à côté des autres.

**Connexion**

- Avant de connecter le périphérique et les unités d'alimentation, vérifiez qu'ils ne présentent pas de dommages visibles.
- Seulement connectez le périphérique et les unités d'alimentation que si le périphérique et les ports ne sont pas endommagés.
- Utilisez uniquement les unités d'alimentation fournis à l'origine avec le produit ou des pièces de rechange approuvées par le fabricant.
- N'utilisez que des unités d'alimentation sans dommages visibles au niveau du châssis ou du câble.
- Connectez tous les unités d'alimentation à des prises de terre.
- Raccordez tous les unités d'alimentation à des prises de courant mises à la terre.
- Veillez à ce que la connexion à la terre soit maintenue depuis la prise de courant jusqu'à l'entrée d'alimentation CA du les unités d'alimentation.
- Ne connectez le périphérique qu'à des périphériques KVM à l'aide du câble d'interconnexion - pas à d'autres périphériques, en particulier pas à des périphériques de télécommunications ou de réseau.

**Déconnecter le périphérique du circuit**

| AVIS |
| --- |
| Les fiches de câble du côté du périphérique peuvent contenir un verrou. En cas de nécessité d'une déconnexion rapide et complète des circuits électriques externes :<br>- Retirez toutes les fiches de câble correspondantes de la prise,<br>- ou mettez l'interrupteur des prises de courant (si elles existent) sur la position « Off ». |

# 4 Description

## 4.1 Intended Use

Extender modules are used to increase the distance between sources and associated consoles. The signals can be extended using Cat X cables or fiber optic cables.

**Extender modules with Cat X Interface:**
Extender modules with Cat X connections are unsuitable for connection between buildings. Use a fiber optic-based extender module instead.

**Extender modules with Fiber Interface:**
Extender modules with fiber connections can also be used with applications in environments which are subject to electromagnetic interference.

**NOTICE**

**Interferences when the immunity limit values are exceeded**

If the limit values listed in EN55024 are exceeded, reliable and fault-free functioning of the devices cannot be guaranteed.

**NOTICE**

**Possible radio interference in a domestic environment**

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

- ➡ Follow the safety and installation instructions given in this manual.
- ➡ Use connection cables according to the specifications for the length and type given in this manual.

## 4.2 System Overview

### 4.2.1 KVM Extender - Structure

A pair of KVM extenders consists of 2 KVM extender modules, each with at least one CPU extender module and at least one CON extender module. The various extender modules are installed respectively in a Draco vario chassis (2-slot, 4-slot, or 6-slot) on the CPU side (CPU Unit) and console side (CON Unit). With 2-slot, 4-slot and 6-slot chassis add-on modules are placed above an extender, with 21-slot chassis, add-on modules are placed to the right of an extender module.

The assignment of the extenders or add-on modules can be recognized by the article number:

- Extender module or add-on module for the CPU Unit: **L**4XX (L = Local)
- Extender module or add-on module for the CON Unit: **R**4XX (R = Remote)

An add-on module can contain up to 2 independent function parts (part A and B), one on the left and one on the right, see Fig. 1.

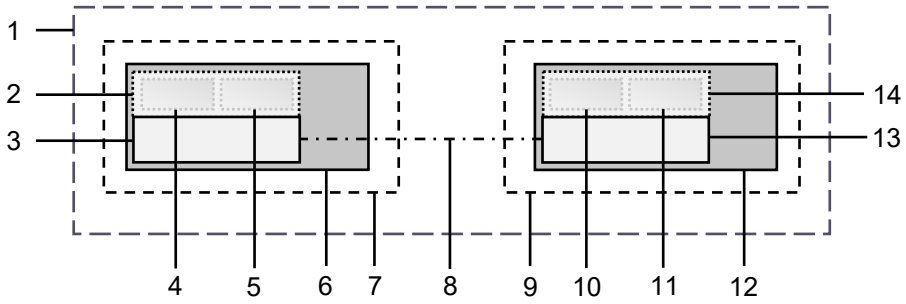



*Fig. 1 KVM Extender pair with CPU Unit and CON Unit*

1 KVM Extender pair
2 Extender module or add-on module (optional)
3 Extender module
4 Part A of the CPU add-on module (optional)
5 Part B of the CPU add-on module (optional)
6 Chassis
7 CPU Unit
8 Interconnect cable
9 CON Unit
10 Part A of the CON add-on module (optional)
11 Part B of the CON add-on module (optional)
12 Chassis
13 Extender module
14 Extender module or add-on module (optional)

### 4.2.2 KVM Extender - Numbering of the Chassis Slots

The numbering of the slots in the chassis runs from bottom left to top right (2-/4-/6-slot chassis) and from left to right (21-slot chassis). The slot numbering is relevant for the placement of an SNMP module in a backplane chassis (see example) or a USB 2.0 stand-alone module in chassis without backplane (slot 2).

| | | |
|---|---|---|
| 2 | 4 | 6 |
| 1 | 3 | 5 |

*Fig. 2 Example 1 - Numbering of the 6-slot chassis with placement (gray) of an SNMP module*

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

*Fig. 3 Example 2 - Numbering of the 21-slot chassis with placement (gray) of an SNMP module*

### 4.2.3 KVM Extender - Embedded Audio Signals

The extender modules offer the option of transmitting video signals with embedded audio signals, which can be played back directly from connected monitors with integrated loudspeakers.

If optional add-on modules are used, signals such as e.g., audio (analog, serial, digital or symmetrical) or USB 2.0 are transferred to the underlying extender module and embedded as well as transmitted via the link connection to the CON Unit. The embedded signals are extracted in the CON Unit, transferred to the add-on module above and output there separately.

**Example with optional Add-on Module L- /R474-BAE**

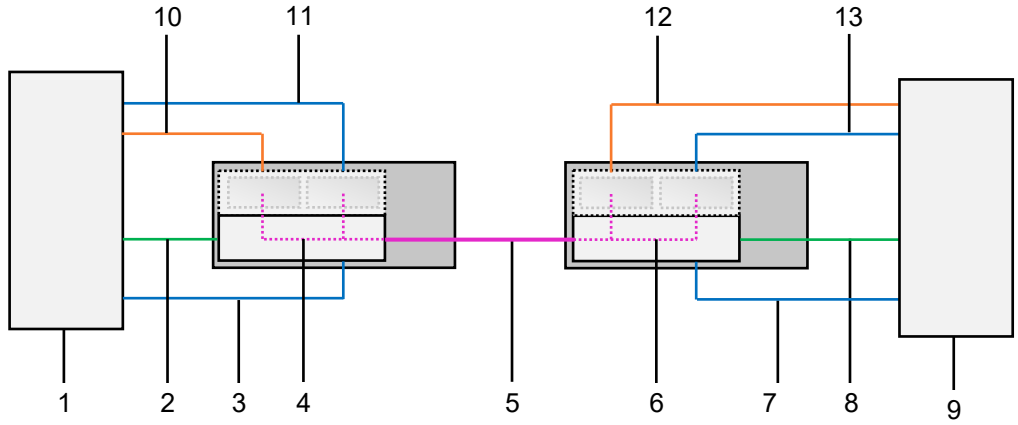



*Fig. 4 Embedding/de-embedding of signals in a KVM extender pair (example L- /R474-BAE)*

1 Source
2 Video signal with embedded audio signal
3 USB-HID signal
4 Embedding the audio and USB 2.0 signal
5 Interconnect cable
6 De-embedding the audio and USB 2.0 signal
7 USB-HID signal
8 Video signal with embedded audio signal
9 Sink (console with monitor, keyboard, and mouse)
10 Audio signal
11 USB 2.0 signal
12 Audio signal, de-embedded
13 USB 2.0 signal, de-embedded

Add-on modules can only be placed above an inserted extender module. An add-on module will not work if it is mounted above an empty slot.

**Example with optional Add-on Module R474-BDX**

To output an audio signal with separate speakers, there is only the optional audio add-on module for the CON Unit required.

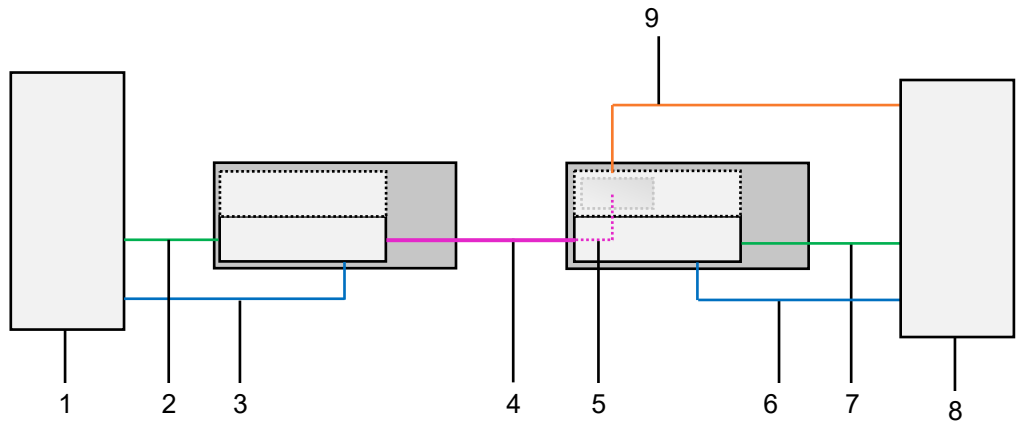



*Fig. 5 De-embedding of audio signals in a KVM extender pair (example R474-BDX)*

1 Source
2 Video signal with embedded audio
3 USB-HID signal
4 Interconnect cable
5 De-embedding digital audio signal
6 USB-HID signal
7 Video signal with embedded audio
8 Sink (console with monitor, keyboard, mouse, and speakers)
9 De-embedded digital audio signal

## 4.3 System Compatibility

### 4.3.1 Video Compatibility

Extender modules are operated with a different firmware and technology and are not completely compatible with each other. The following table lists video compatibility (X) and non-video compatibility (-) (see footnotes).

| | | R474 | R477 | R481 | R482 | | R483 | | R486 | R488 | R490 | R492 | R493 | | R495 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SH | SH | SH | SH | DH | SH | DH | DH | SH | SH | SH | SH | DH | SH |
| L474 | SH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| L477 | SH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| L481 | SH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| L482 | SH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| | DH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| L483 | SH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| | DH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| L484 | SH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| L486 | DH | X | X | X | X | X | X | X | X | X | - | - | - | X | - |
| L490 | SH | - | - | - | - | - | - | - | - | - | X | X | X | X | X |
| L491 | SH | - | - | - | - | - | - | - | - | - | X | X | X | X | X |
| L492 | SH | - | - | - | - | - | - | - | - | - | X | X | X | X | X |
| L493 | SH | - | - | - | - | - | - | - | - | - | X | X | X | X | X |
| | DH | - | - | - | - | - | - | - | - | - | X | X | X | X | X |
| L494 | SH | | | | | | | | | | X | X | X | X | X |
| L495* | SH | - | - | - | - | - | - | - | - | - | X | X | X | X | X |

1) Compatibility is based on video/USB-HID signal only, not on the embedded signals like audio or USB 2.0.
2) Compatible up to the maximum specified resolution of the console.
No image is displayed when a Single Link CON Unit (e.g., R482-B2HC with 1080p monitor) is switched to a Dual Link CPU Unit (e.g., L482-BDHC with a 4k30 video signal) unless the configuration is set up accordingly.
3) Compatible up to the maximum transmission speed and interface compatibility (see chapter 4.3.2, page 20).

### 4.3.2 Audio Compatibility

The audio compatibility depends on the combination of extender modules and add-on modules, see following figure.

HDMI 1.3: 5.1-Channel LPCM digital audio, embedded/HDMI 2.0: 2-Channel LPCM digital audio, embedded
DP 1.1: 5.1-Channel LPCM digital audio, embedded/DP 1.2: 2-Channel LPCM digital audio, embedded

5.1-Channel PCM digital audio

Balanced audio

2-Channel analog audio + RS232 (19200 baud)

2-Channel analog audio + RS422 (115200 baud)

2-Channel analog audio + RS232 (115200 baud)

2-Channel PCM digital audio, embedded

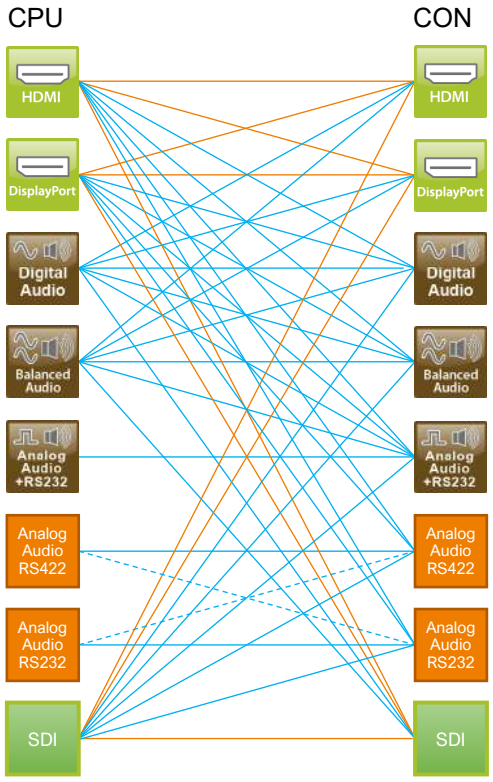



*Fig. 6 Audio compatibility of extender modules and add-on modules*

* Extender modules of HDMI 1.3 series 481/491 and DP 1.1 series 483/493 support 5.1 channel digital audio whereas extender modules of HDMI 2.0 series 495 and DP 1.2 series 490 only support 2-channels

Requires an audio add-on module on the CPU Unit or the CON Unit

True embedded audio

Connection is representing audio content only

Analog audio add-on modules are not necessarily audio compatible to each other since they use difference protocols. The following table lists the audio compatibility (X) and non-audio compatibility (-) for the add-on modules analog audio:

| | **R474-BAX RS232 @ 19.2 kBaud** | **R474-BRX RS232 @ 115 kBaud** | **R474-BSX RS422 @ 115 kBaud** |
|---|---|---|---|
| **L474-BAX RS232 @ 19.2 kBaud** | X | - | - |
| **L474-BRX RS232 @ 115 kBaud** | - | X | X |
| **L474-BSX RS422 @ 115 kBaud** | - | X | X |

### 4.3.3 Connection Compatibility

Extender modules are available in the following connection versions. The type of connection of the extenders can be recognized by the article number:

- Connection via Cat X cable ("C")
- Connection (1.25 Gbit/s = "1G") via single-mode fiber cable ("S")
- High speed connection (3.125 Gbit/s = 3G) via single-mode fiber cable ("X")

Fiber devices can be used with Multi-mode and Single-mode cables (see chapter 12.2.2, page 111).

**Point-to-point Connection between Extender Modules**

| | Cat X 1G | Fiber 1G | Fiber 3G |
|---|---|---|---|
| Cat X 1G | Compatible | Not compatible | Not compatible |
| Fiber 1G | Not compatible | Compatible | Not compatible |
| Fiber 3G | Not compatible | Not compatible | Compatible |

**Connection of Extender Modules via Matrix or Cross-Repeater 485-BX/485-BXX**

| | Cat X 1G | Fiber 1G | Fiber 3G |
|---|---|---|---|
| Cat X 1G | Compatible | Compatible | Not compatible |
| Fiber 1G | Compatible | Compatible | Not compatible |
| Fiber 3G | Not compatible | Not compatible | Compatible |

**Connection of Extender Modules via Matrix Draco tera enterprise with Bridge Card**

| | Cat X 1G CON Unit | Fiber 1G CON Unit | Fiber 3G CON Unit |
|---|---|---|---|
| Cat X 1G CPU Unit | Compatible | Compatible | Compatible |
| Fiber 1G CPU Unit | Compatible | Compatible | Compatible |
| Fiber 3G CPU Unit | Not compatible | Not compatible | Compatible |

A special card (bridge card) is available to be used with the matrix Draco tera enterprise to connect up to 8 CPU Units with 1G transmission speed (Cat X or fiber version). The transmission speed will be increased within the bridge card from 1G to 3G. The signals are transmitted to the backplane of the matrix and can be output to up to 8 CON Units, connected to the matrix.

This function is only available in one direction.

1G CPU Unit - Draco tera enterprise with bridge card - 3G CON Unit

## 4.4 Installation Examples

This section illustrates typical installations of KVM extender pairs.

The CPU Unit is connected directly to the source using the supplied cables. The CON Unit is connected to the console (monitor, keyboard, and mouse).

The CPU Unit and the CON Unit communicate with each other through the interconnect cables.

### 4.4.1 Single-Head Installation

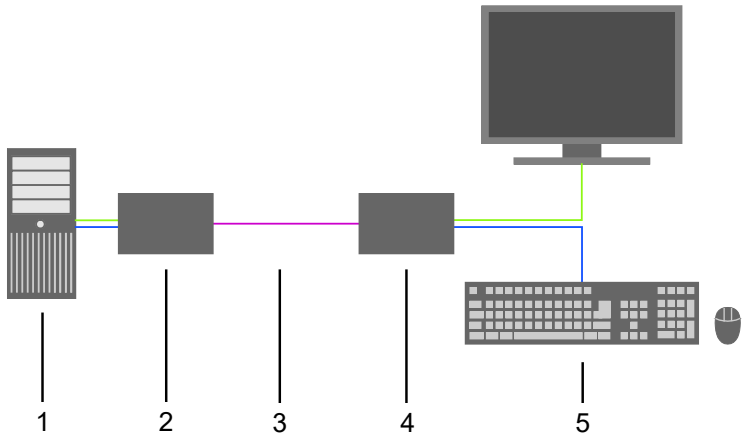



*Fig. 7 Installation example Single-Head*

1 Source
2 CPU Unit
3 Interconnect cable
4 CON Unit
5 Console (monitor, keyboard, mouse)

### 4.4.2 Single-Head Installation with Add-on Module Audio

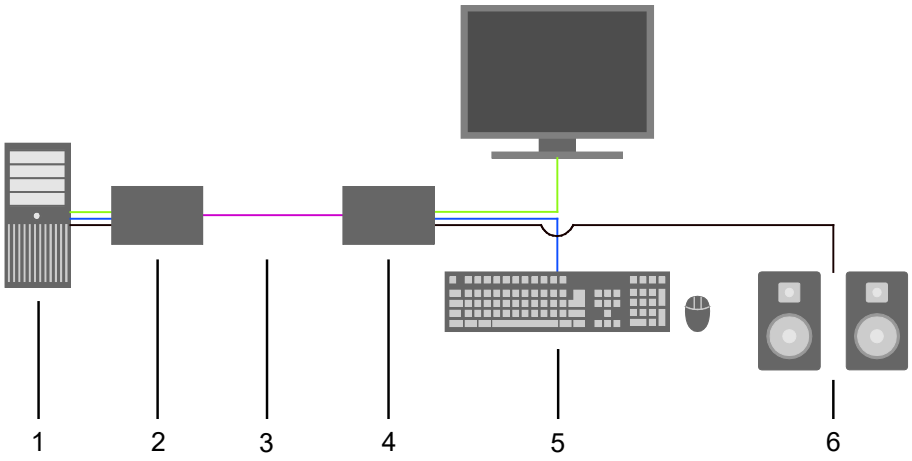



*Fig. 8 Installation example (Single-Head with add-on module audio)*

1 Source
2 KVM Extender CPU Unit
3 Interconnect cable
4 KVM Extender CON Unit
5 Console (monitor, keyboard, mouse)
6 Audio sink (optional, only with devices with add-on module analog audio/Serial option, digital audio, or balanced analog audio

### 4.4.3 Dual-Head Installation with Add-on Module USB 2.0

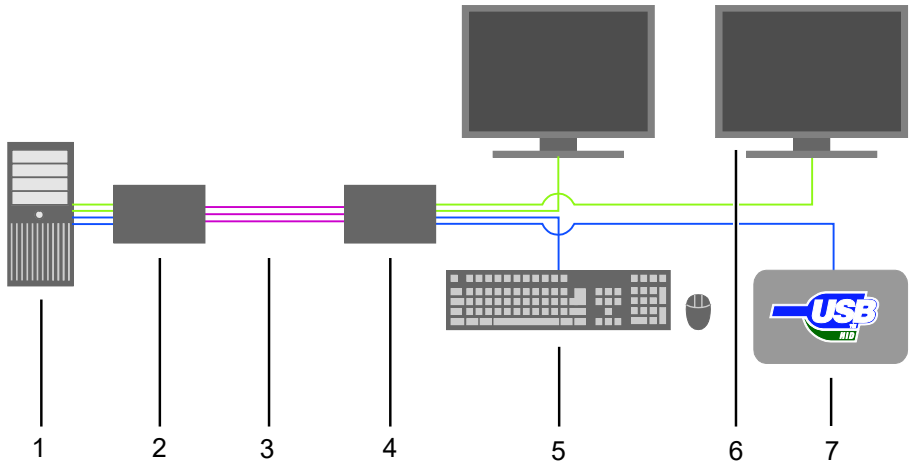



*Fig. 9 Installation example (Dual-Head with add-on module USB 2.0)*

1 Source
2 KVM Extender CPU Unit
3 Interconnect cable
4 KVM Extender CON Unit
5 Console (monitor, keyboard, mouse)
6 Second monitor (optional, only with Dual-Head extenders)
7 USB 2.0 devices (optional, only with add-on modules USB 2.0)

## 4.5 Overview Add-on Modules

This section illustrates an overview of the available types of add-on modules for KVM extender modules.

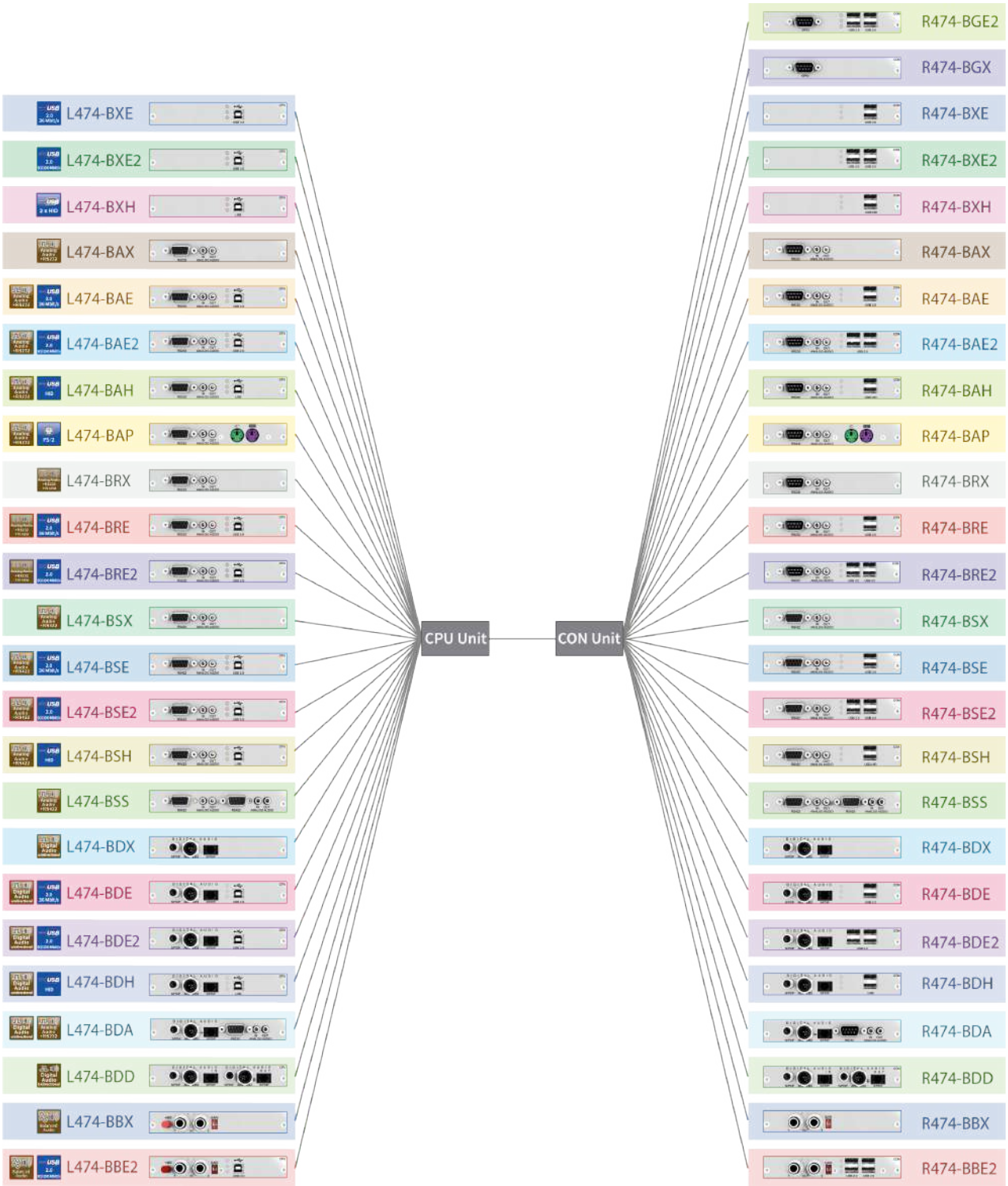



*Fig. 10 Overview add-on modules*

# 4.6 Product Types

## 4.6.1 Chassis

### Mounting Chassis

| | Chassis | | | Power supply unit | | |
|---|---|---|---|---|---|---|
| Type | Slots | Active backplane | Current input | Internal | External | Setup for redundant power supply voltage |
| 474-BODY2 | 2 | No | Interface side | - | 1x | - |
| 474-BODY2R | 2 | No | Interface side | - | 1x | 1x (external) |
| 474-BODY2N | 2 | No | Interface side | 1x | - | 1x (external) |
| 474-BODY4 | 4 | No | Interface side | - | 1x | - |
| 474-BODY4R | 4 | No | Interface side | - | 1x | 1x (external) |
| 474-BODY6R-R1 | 6 | No | Interface side | 1x | - | 1x (external) |

### Slide-in Chassis

| | Chassis | | | Power supply unit | | |
|---|---|---|---|---|---|---|
| Type | Slots | Active backplane | Current input | Internal | External | Setup for redundant power supply voltage |
| 474-BODY2BPF | 2 | Yes | Interface side | 1x | - | 1x (external) |
| 474-BODY6BP | 6 | Yes | Rear view | 2x | - | - |
| 474-BODY6BPF | 6 | Yes | Interface side | 2x | - | - |
| 474-BODY21/4U | 21 | Yes | Rear view | 1x | - | 1x (internal) |
| 474-BODY21/4UR | 21 | Yes | Rear view | 2x | - | - |

All external power supply units are separately certified to the relevant major international safety standards.

## 4.6.2 Extender Modules without Local Input/Output

| Product type | Connection | Redundancy | DisplayPort | USB-HID |
|---|---|---|---|---|
| L490-BPHX | Single-mode fiber 1G | Not redundant | 1x | 2x |
| R490-BPHX | | | | |
| L490-BPHXR | | Redundant | | |
| R490-BPHXR | | | | |

### 4.6.3 Extender Modules with Local Input/Output

| Product type | Connection | Redundancy | DisplayPort | USB-HID | Local Mini DisplayPort |
|---|---|---|---|---|---|
| L490-BPHCXL | Cat X 3G | Not redundant | 1x | 2x | Output |
| R490-BPHCXL | | | | | Input |
| L490-BPHCXLR | | Redundant | | | Output |
| R490-BPHCXLR | | | | | Input |
| L490-BPHXL | Single-mode fiber 1G | Not redundant | 1x | 2x | Output |
| R490-BPHXL | | | | | Input |
| L490-BPHXLR | | Redundant | | | Output |
| R490-BPHXLR | | | | | Input |

### 4.6.4 Supplementary with Extended Function for Extender Modules

To monitor all function- and safety-critical components of extender modules and add-on modules of a chassis, SNMP modules installed in the same chassis can be used.

SNMP modules can be used to query the status of the extender modules, configure extender module settings, and query and update the firmware of the extender modules and add-on modules. For more information, please refer to the SNMP manual.

| Part number | Description |
|---|---|
| 474-SNMP | SNMP module for sliding-in into the chassis 474-BODY6BP (slot 5), 474-BODY6BPF (slot 5) and 474-BODY21/4U (slot 21).<br>The transmission of the traps is unencrypted (SNMP v1). |
| 474-SNMPV3 | SNMP module for sliding-in into the chassis 474-BODY6BP (slot 5), 474-BODY6BPF (slot 5) and 474-BODY21/4U (slot 21).<br>The transmission of the traps is unencrypted (SNMP v3). |

Extender modules can be combined with a U-Switch module that can seamlessly control multiple sources as one source using just a single set of keyboard and mouse, while the video outputs of the sources are directly connected to the monitors. For more information, please refer to the Draco U-Switch manual.

| Part number | Description |
|---|---|
| B476-4U4T | Draco vario U-Switch Module 4-Port USB-HID + USB 2.0 |

### 4.6.5 Add-on Modules

**Add-on Modules USB 2.0 and USB-HID**

| Part. No. | Description |
|---|---|
| L474-BXE | Add-on module with 2x USB 2.0 embedded (up to 36 Mbit/s) |
| R474-BXE | |
| L474-BXE2 | Add-on module with 4x USB 2.0 embedded (up to 50/100 Mbit/s) |
| R474-BXE2 | |
| L474-BXH | Add-on module with 2x USB-HID |
| R474-BXH | |

### Add-on Modules Analog Audio (bidirectional), RS232 (serial)

| Part. No. | Description |
|---|---|
| L474-BAX | Add-on module with analog audio (bidirectional) and RS232 (serial) |
| R474-BAX | |
| L474-BAE | Add-on module with analog audio (bidirectional), RS232 (serial) and 2x USB 2.0 embedded (up to 36 Mbit/s) |
| R474-BAE | |
| L474-BAE2 | Add-on module with analog audio (bidirectional), RS232 (serial) and 4x USB 2.0 embedded (up to 50/100 Mbit/s) |
| R474-BAE2 | |
| L474-BAH | Add-on module with analog audio (bidirectional), RS232 (serial) and 2x USB-HID |
| R474-BAH | |
| L474-BAP | Add-on module with analog audio (bidirectional), RS232 (serial) and PS/2 |
| R474-BAP | |
| L474-BRX | Add-on module with analog audio (bidirectional) and RS232 up to 115 k (serial) |
| R474-BRX | |
| L474-BRE | Add-on module with analog audio (bidirectional), RS232 up to 115 k (serial) and 2x USB 2.0 embedded (up to 36 Mbit/s) |
| R474-BRE | |
| L474-BRE2 | Add-on module with analog audio (bidirectional), RS232 up to 115 k (serial) and 4x USB 2.0 embedded (up to 50/100 Mbit/s) |
| R474-BRE2 | |

### Add-on Modules Analog Audio (bidirectional), RS422 (serial)

| Part. No. | Description |
|---|---|
| L474-BSX | Add-on module with analog audio (bidirectional) and RS422 (serial) |
| R474-BSX | |
| L474-BSE | Add-on module with analog audio (bidirectional), RS422 (serial) and 2x USB 2.0 embedded (up to 36 Mbit/s) |
| R474-BSE | |
| L474-BSE2 | Add-on module with analog audio (bidirectional), RS422 (serial) and 4x USB 2.0 embedded (up to 50/100 Mbit/s) |
| R474-BSE2 | |
| L474-BSH | Add-on module with analog audio (bidirectional), RS422 (serial) and 2x USB-HID |
| R474-BSH | |
| L474-BSS | Add-on module with 2x analog audio (bidirectional) and 2x RS422 (serial) |
| R474-BSS | |

**Add-on Modules Digital Audio (unidirectional)**

| Part. No. | Description |
|---|---|
| L474-BDX | Add-on module with digital audio (unidirectional) |
| R474-BDX | |
| L474-BDE | Add-on module with digital audio (unidirectional) and 2x USB 2.0 embedded (up to 36 Mbit/s) |
| R474-BDE | |
| L474-BDE2 | Add-on module with digital audio (unidirectional) and 4x USB 2.0 embedded (up to 50/100 Mbit/s) |
| R474-BDE2 | |
| L474-BDH | Add-on module with digital audio (unidirectional) and 2x USB-HID |
| R474-BDH | |
| L474-BDA | Add-on module with digital audio (unidirectional), analog audio (bidirectional) and RS232 |
| R474-BDA | |
| L474-BDD | Add-on module with 2x digital audio (unidirectional) |
| R474-BDD | |

**Add-on Modules Balanced Analog Audio**

| Part. No. | Description |
|---|---|
| L474-BBX | Add-on module with balanced analog audio (unidirectional) |
| R474-BBX | |
| L474-BBE2 | Add-on module with balanced analog audio (unidirectional) and 4x USB 2.0 embedded (up to 50/100 Mbit/s) |
| R474-BBE2 | |

**Add-on Modules GPIO**

| Part. No. | Description |
|---|---|
| R474-BGX | Add-on module for CON Units with up to 8 configurable GPIO in-/outputs |
| R474-BGE2 | Add-on module for CON Units with up to 8 configurable GPIO in-/outputs and 4x USB 2.0 embedded (up to 50/100 Mbit/s) |

### 4.6.6 Fan Cartridge Module

| Part. No. | Description |
|---|---|
| 474-MODFAN | Fan cartridge module, retrofittable for all Draco vario chassis |

### 4.6.7 Add-on Modules/Extender Modules USB 2.0 (Stand-alone)

| Part. No. | Description |
|---|---|
| L474-BXUC | Add-on module with 4x USB 2.0 (up to 480 Mbit/s), Cat X (Base: ICRON 2300 Core) |
| R474-BXUC | |
| L474-BXUS | Add-on module with 4x USB 2.0 (up to 480 Mbit/s), Single-Mode Fiber (Base: ICRON 2300 Core) |
| R474-BXUS | |

## 4.7 Accessories for Chassis

| Part. No. | Description |
|---|---|
| 474-2RMK | 19"-Rackmount Ears for Draco vario 2-Slot chassis |
| 474-2NRMK | 19"-Rackmount Ears for Draco vario 2-slot chassis w/ built-in PSU |
| 474-4RMK | 19"-Rackmount Ears for Draco vario 4-Slot chassis |
| 474-6RMK | 19"-Rackmount Ears for Draco vario 6-slot chassis |
| 474-VPLATE | Mounting plate for 2-/4-/6-slot chassis |
| 474-VSNAP | Mounting plate w/ DIN Rail Snap On for 2-slot chassis |
| 474-BRACKET | Wall-/Tablemount L-Brackets for all 2-/4-/6-Slot chassis |
| 474-PSU2 | Spare ext. PSU for 2-slot chassis |
| 474-PSU2BPF | Spare ext. PSU for 474-BODY2-BPF, lockable connector |
| 474-PSU4 | Spare ext. PSU for 474-BODY2N and 474-BODY4/4R |
| 474-PSU6 | Spare ext. PSU for 474-BODY6R-R1 |
| 474-PSU21 | Spare PSU for 474-BODY21/4U, slide-in, hot-swap |
| 474-BLND1 | Blanking plate with IHSE Logo, 1-slot for Draco vario chassis |
| 474-6FAN | Optional fan for Draco vario 2-slot and 6-slot chassis with backplane |
| 260-5G | International power supply unit 100...240VAC/5VDC/3A |
| 260-5M | International power supply unit 100...240VAC/5VDC/5A |
| PC-TYP-E/C13-020 | Power cord IEC Schuko 90° Type-E/C13 2.0 m lockable |
| PC-TYP-B/C13-020 | Power cord IEC US Type-B/C13 2.0 m lockable |

All external power supplies are separately certified according to all relevant safety standards.

## 4.8 Accessories for Extender Modules

| Part. No. | Description | Interface |
|---|---|---|
| VC-DP2DP-020-MM | DisplayPort cable male/male, 2.0 m | Video |
| VC-DP2MDP | DisplayPort cable to MiniDP male/male, 2.0 m | Video |
| 436-DPDV | DisplayPort cable to DVI male/male, 2.0 m (VGA/DVI-I) | Video |
| 247-U1 | USB cable Type A-B, 1.8 m | USB/USB-HID |
| 247-U2 | USB cable Type A-B, 3.0 m | USB/USB-HID |
| 436-USB20 | USB extension cable Type A-A, 3.0 m | USB/USB-HID |

## 4.9 Accessories for Add-on Modules

| Part. No. | Description | Interface |
|---|---|---|
| 455-CK | Duplex audio cable 2 m (3.5 mm) | Audio |
| 455-CR | Cinch cable 2.5 m | Audio |
| 455-CT | TOSLINK cable 2.0 m | Audio |
| 247-U1 | USB cable Type A-B, 1.8 m | USB/USB-HID |
| 247-U2 | USB cable Type A-B, 3.0 m | USB/USB-HID |
| 436-USB20 | USB extension cable Type A-A, 3.0 m | USB/USB-HID |
| 024-3A | PS/2 cable 1.8 m | USB/USB-HID |
| DC-DB9-MF-018 | RS-232/422 data cable DB9 male/female, 1.8 m | Serial |
| 476-CTRL4-GPIO | Remote Control for Draco vario GPIO module with 4 push buttons/LEDs (cable length approx. 3.0 m) | GPIO |

# 4.10 Scope of Delivery

## 4.10.1 Scope of Delivery Extenders

Depending on the order, the scope of delivery contains the following items and may vary depending on country of delivery and customer specification:

| Product type | Scope of delivery | |
|---|---|---|
| KVM Extender pair | • 1x CPU Unit in Draco vario chassis<br>• 1x CON Unit in Draco vario chassis<br>• 1x DisplayPort cable male/male, 2.0 m<br>• 1x USB cable 1.8 m (type A-B)<br>• Quick Setup | |
| CPU Unit | • 1x CPU Unit in Draco vario chassis<br>• 1x DisplayPort cable male/male, 2.0 m<br>• 1x USB cable 1.8 m (type A-B)<br>• Quick Setup | |
| CON Unit | • 1x CON Unit in Draco vario chassis<br>• Quick Setup | |
| Per each Draco vario chassis | 474-BODY2,<br>474-BODY2R | • 1x 5 V DC / 3 A international power supply unit<br>• 1x country-specific power cord |
| | 474-BODY4,<br>474-BODY4R | • 1x 5 V DC / 5 A international power supply unit<br>• 1x country-specific power cord |
| | 474-BODY2N,<br>474-BODY2BPF<br>474-BODY6R-R1 | • 1x IEC country-specific power cord C13, 2.0 m |
| | 474-BODY6BP,<br>474-BODY6BPF<br>474-BODY21/4UR | • 2x IEC country-specific power cord C13, 2.0 m lockable |
| | 474-BODY21/4U | • 1x IEC country-specific power cord C13, 2.0 m lockable |

## 4.10.2 Scope of Delivery Add-on Modules

Some add-on modules consist of 2 function parts (left and right). In the case of add-on modules with 2 function parts, more cables are supplied accordingly (e.g., 2 audio parts or 1 audio part and 1 PS/2 part).

| Product type | Delivery scope per function part |
|---|---|
| Add-on module USB 2.0/USB 2.0 embedded | • USB cable Type A-B, 1.8 m |
| Add-on module USB-HID | • USB cable Type A-B, 1.8 m |
| Add-on module analog audio/Serial | • 1x Serial cable 1.8 m (RS232)<br>• 1x Duplex audio cable 2 m (3.5 mm) |
| Add-on module digital audio | • 1x Cinch cable 2.5 m<br>• 1x TOSLINK cable 2.0 m |
| Add-on module PS/2 | • 2x PS/2 cable 1.8 m |

## 4.11 Device Views Draco vario Chassis

**NOTICE**

**Exceeding the maximum permissible power consumption**

In addition to the power consumption of the used modules, the power consumption of the connected peripherals must be added.

➡ Note the maximum current draw of the chassis (see chapter 12.4, page 117 and chapter 12.4.2, page 117).

The device status of a module is displayed via LED on the front side of following chassis: 474-BODY2, 474-BODY2R, 474-BODY2N, 474-BODY4, 474-BODY4R and 474-BODY6R-R1.

### 4.11.1 2-Slot-Chassis Draco vario 474-BODY2

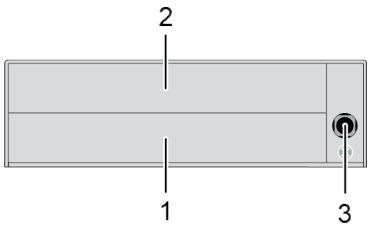



*Fig. 11 Interface side chassis 474-BODY2*

1 Slot 1
2 Slot 2
3 Power supply voltage, DC

### 4.11.2 2-Slot-Chassis Draco vario 474-BODY2R

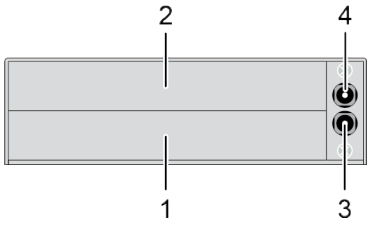



*Fig. 12 Interface side chassis 474-BODY2R*

1 Slot 1
2 Slot 2
3 Power supply voltage 1, DC
4 Power supply voltage 2, DC

### 4.11.3 2-Slot Chassis Draco vario 474-BODY2N

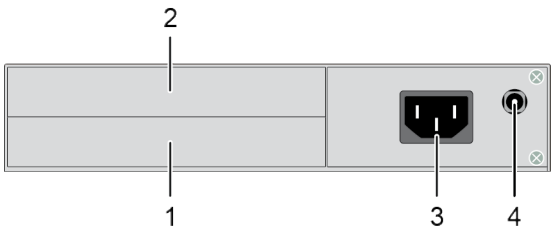



*Fig. 13 Interface side chassis 474-BODY2N*

1 Slot 1
2 Slot 2
3 Power supply voltage 1, AC
4 Power supply voltage 2, DC

**NOTICE**

**Excessive current draw**

The 2-slot Draco vario chassis with an internal power supply unit is not equipped with a fuse on its primary side.

➡ The protection against excessive current draw has to be provided by the electrical installation of the building.

### 4.11.4 2-Slot Chassis Draco vario 474-BODY2BPF

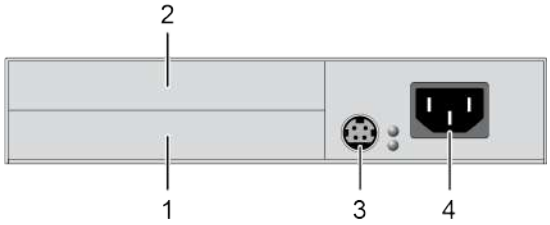



*Fig. 14 Interface side chassis 474-BODY2BPF*

1 Slot 1
2 Slot 2
3 Power supply voltage 2, DC
4 Power supply voltage 1, AC

### 4.11.5 4-Slot-Chassis Draco vario 474-BODY4

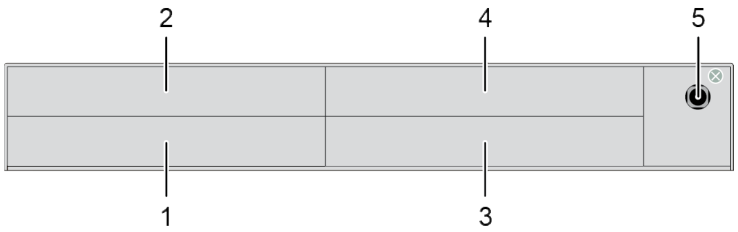



*Fig. 15 Interface side chassis 474-BODY4*

1 Slot 1
2 Slot 2
3 Slot 3
4 Slot 4
5 Power supply voltage, DC

### 4.11.6 4-Slot Chassis Draco vario 474-BODY4R

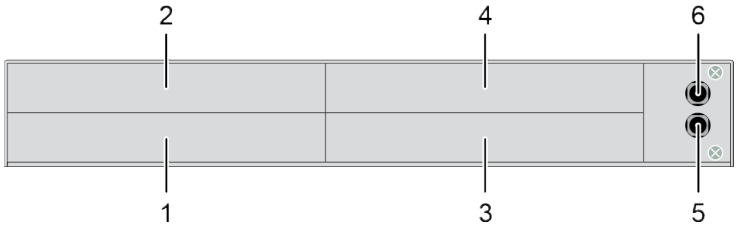



*Fig. 16 Interface side chassis 474-BODY4R*

1 Slot 1
2 Slot 2
3 Slot 3
4 Slot 4
5 Power supply voltage 2, DC
6 Power supply voltage 1, DC

### 4.11.7 6-Slot Chassis Draco vario 474-BODY6R-R1

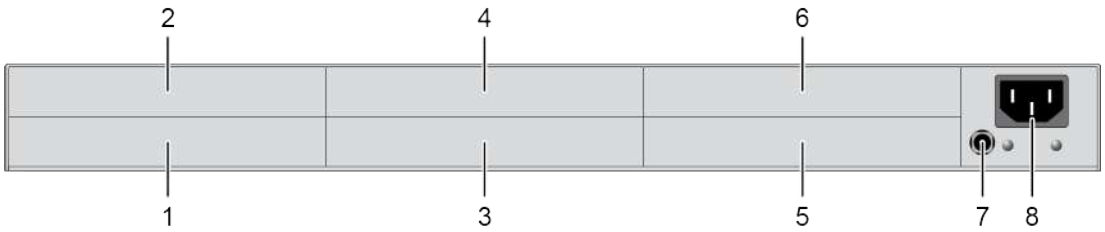



*Fig. 17 Interface side chassis 474-BODY6R-R1*

1 Slot 1
2 Slot 2
3 Slot 3
4 Slot 4
5 Slot 5
6 Slot 6
7 Power supply voltage 2, DC
8 Power supply voltage 1, AC

**NOTICE**

**Too low power supply voltage**

With Draco vario chassis 474-BODY6R-R1 a redundant power supply voltage is possible up to a current of maximum 5 A (modules inclusive connected periphery). If the power supply voltage of the internal power supply unit fails, the device's power supply voltage is secured via the 5 V external power supply unit.

If there is no redundant power supply voltage and the current is above 5 A, the device is not supplied with sufficient power supply voltage and fails.

➡ Note the maximum current draw of the chassis (see from chapter 12.4, page 117).

➡ With a current of more than 5 A, use an external power supply unit. In this case, redundancy is inapplicable.

**NOTICE**

**Excessive current draw**

The 6-slot Draco vario chassis with an internal power supply unit is not equipped with a fuse on its primary side.

➡ The protection against excessive current draw has to be provided by the electrical installation of the building.

### 4.11.8 6-Slot Chassis Draco vario 474-BODY6BP

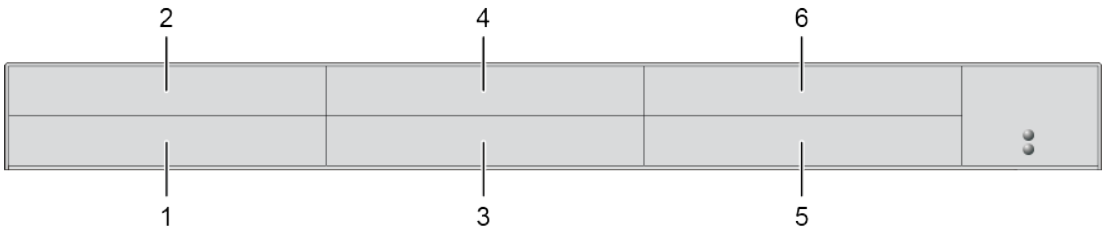



*Fig. 18 Interface side chassis 474-BODY6BP*

1 Slot 1
2 Slot 2
3 Slot 3
4 Slot 4
5 Slot 5
6 Slot 6


*Fig. 19 Rear view chassis 474-BODY6BP*

1 Power supply voltage 1, AC
2 Power supply voltage 2, AC
3 Grounding

### 4.11.9 6-Slot Chassis Draco vario 474-BODY6BPF

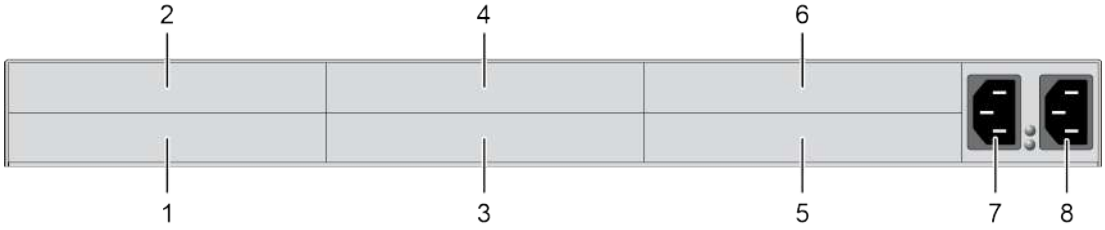



*Fig. 20 Interface side chassis 474-BODY6BPF*

1 Slot 1
2 Slot 2
3 Slot 3
4 Slot 4
5 Slot 5
6 Slot 6
7 Power supply voltage 1, AC
8 Power supply voltage 2, AC

### 4.11.10 21-Slot Chassis Draco vario 474-BODY21/4U and 474-BODY21/4UR

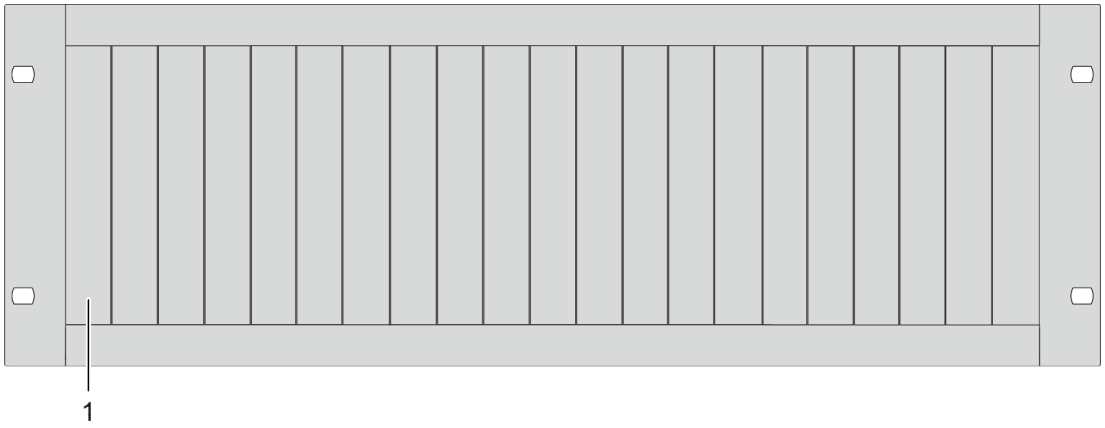



*Fig. 21 Interface side chassis 474-BODY21/4U and 474-BODY21/4UR*

1 Slots 1 to 21 (from left to right)

The chassis 474-BODY21/4U is supplied with one power supply unit (Pos. 3). A second power supply unit can be optionally installed.
The chassis 474-BODY21/4UR is supplied with two power supply units (Pos. 2 and 3).

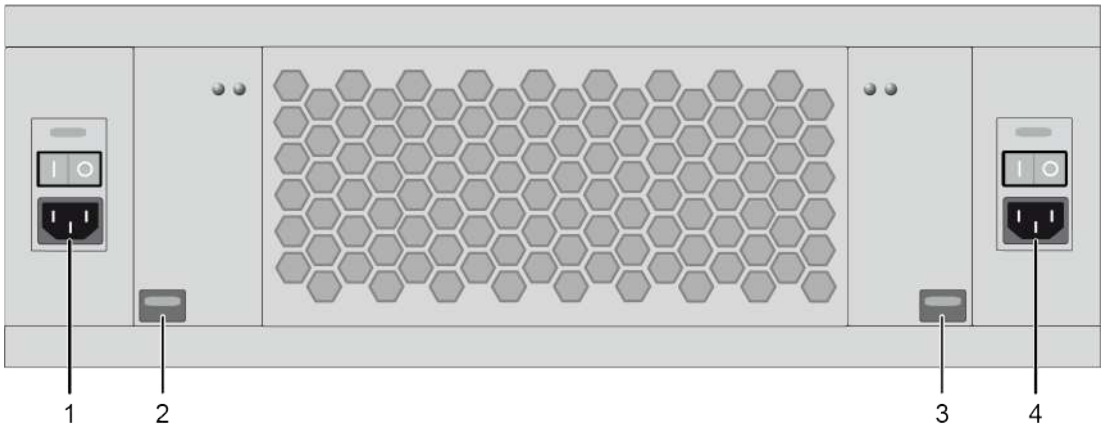



*Fig. 22 Rear view chassis 474-BODY21/4U and 474-BODY21/4UR*

1 Power supply voltage 2, AC (redundancy)
2 Power supply unit 2 (redundancy)
3 Power supply unit 1
4 Power supply voltage 1, AC

# 4.12 Device Views Extender Modules without Local Input/Output

## 4.12.1 Extender Module L-/R490-BPHX

**Source side (CPU module)**

**Sink side (CON module)**


*Fig. 23 Interface side L-/R490-BPHX*

1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type B, USB-HID
4 DisplayPort 1.2, input source

1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type A, USB-HID device 1
4 USB Type A, USB-HID device 2
5 DisplayPort 1.2, output to monitor

## 4.12.2 Extender Module L-/R490-BPHXR

**Source side (CPU module)**

**Sink side (CON module)**


*Fig. 24 Interface side L-/R490-BPHXR*

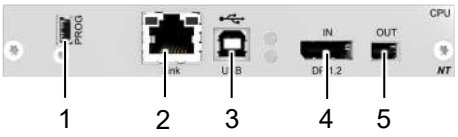
1 Mini-USB, service interface
2 Fiber, interconnection 1
3 Fiber, interconnection 2
4 USB Type B, USB-HID
5 DisplayPort 1.2, input source

1 Mini-USB, service interface
2 Fiber, interconnection 1
3 Fiber, interconnection 2
4 USB Type A, USB-HID device 1
5 USB Type A, USB-HID device 2
6 DisplayPort 1.2, output to monitor

# 4.13 Device Views Extender Modules with Local Input/Output

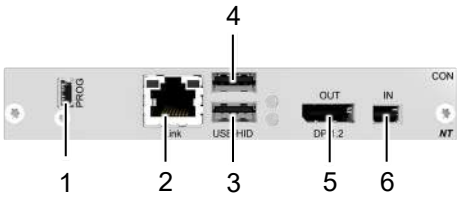
## 4.13.1 Extender Module L-/R490-BPHCXL

**Source side (CPU module)**




1 Mini-USB, service interface
2 Cat X, interconnection
3 USB Type B, USB-HID
4 DisplayPort 1.2, input source
5 Mini-DisplayPort 1.2, local output

**Sink side (CON module)**

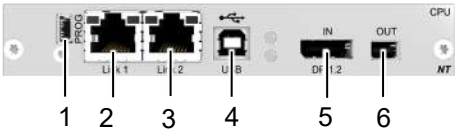



1 Mini-USB, service interface
2 Cat X, interconnection
3 USB Type A, USB-HID device 1
4 USB Type A, USB-HID device 2
5 DisplayPort 1.2, output to monitor
6 Mini-DisplayPort 1.2, local input

*Fig. 25 Interface side L-/R490-BPHCXL*

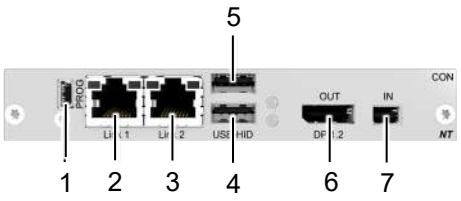
## 4.13.2 Extender Module L-/R490-BPHCXLR

**Source side (CPU module)**




1 Mini-USB, service interface
2 Cat X, interconnection 1
3 Cat X, interconnection 2
4 Input/Output Cat X (interconnection 2)
5 USB Type B, USB-HID
6 DisplayPort 1.2, input source
7 Mini-DisplayPort 1.2, local output

**Sink side (CON module)**

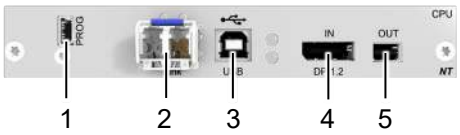



1 Mini-USB, service interface
2 Cat X, interconnection 1
3 Cat X, interconnection 2
4 USB Type A, USB-HID device 1
5 USB Type A, USB-HID device 2
6 DisplayPort 1.2, output to monitor
7 Mini-DisplayPort 1.2, local input

*Fig. 26 Interface side L-/R490-BPHCXLR*

### 4.13.3 Extender Module L-/R490-BPHXL

**Source side (CPU module)**




**Sink side (CON module)**

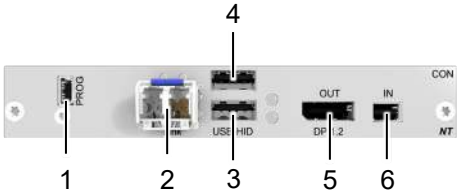


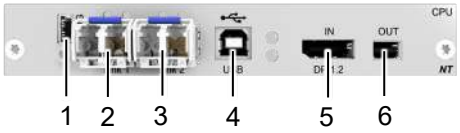

*Fig. 27 Interface side L-/R490-BPHXL*

1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type B, USB-HID
4 DisplayPort 1.2, input source
5 Mini-DisplayPort 1.2, local output

1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type A, USB-HID device 1
4 USB Type A, USB-HID device 2
5 DisplayPort 1.2, output to monitor
6 Mini-DisplayPort 1.2, local input

### 4.13.4 Extender Module L-/R490-BPHXLR

**Source side (CPU module)**




**Sink side (CON module)**

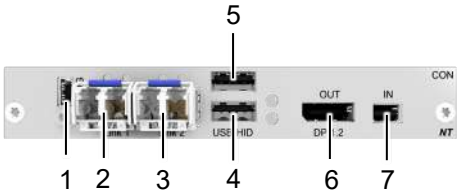



*Fig. 28 Interface side L-/R490-BPHXLR*

1 Mini-USB, service interface
2 Fiber, interconnection 1
3 Fiber, interconnection 2
4 USB Type B, USB-HID
5 DisplayPort 1.2, input source
6 Mini-DisplayPort 1.2, local output

1 Mini-USB, service interface
2 Fiber, interconnection 1
3 Fiber, interconnection 2
4 USB Type A, USB-HID device 1
5 USB Type A, USB-HID device 2
6 DisplayPort 1.2, output to monitor
7 Mini-DisplayPort 1.2, local input

# 4.14 Device Views Add-on Modules

## 4.14.1 Add-on Module USB 2.0 embedded L-/R474-BXE

**Source side (CPU module)**


**Sink side (CON module)**


*Fig. 29 Interface side L-/R474-BXE*

1 USB Type B, USB 2.0 (up to 36 Mbit/s)

1 USB Type A, USB 2.0 (up to 36 Mbit/s)
2 USB Type A, USB 2.0 (up to 36 Mbit/s)

## 4.14.2 Add-on Module USB 2.0 embedded L-/R474-BXE2

**Source side (CPU module)**


**Sink side (CON module)**

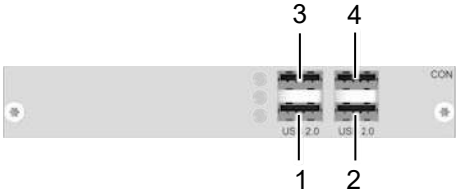



*Fig. 30 Interface side L-/R474-BXE2*

1 USB Type B, USB 2.0 (up to 50/100 Mbit/s)

1 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
2 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
3 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
4 USB Type A, USB 2.0 (up to 50/100 Mbit/s)

## 4.14.3 Add-on Module USB-HID L-/R474-BXH

**Source side (CPU module)**


**Sink side (CON module)**

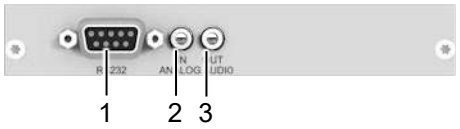

*Fig. 31 Interface side L-/R474-BXH*

1 USB Type B, USB-HID

1 USB Type A, USB-HID device 1
2 USB Type A, USB-HID device 2

### 4.14.4 Add-on Module Analog Audio (bidirectional) L-/R474-BAX/-BRX/-BSX

**Source side (CPU module)**




**Sink side (CON module)**

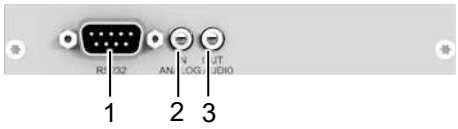
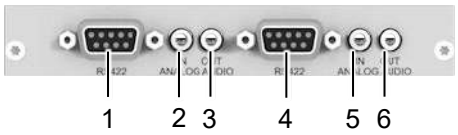



*Fig. 32 Interface side L-/R474-BAX/-BSX*

| | |
|---|---|
| 1 D-Sub 9, female socket, RS232 serial | 1 D-Sub 9, male socket, RS232 serial |
| 2 3.5 mm jack socket, analog audio, input | 2 Input analog audio (3.5 mm jack socket) |
| 3 3.5 mm jack socket, analog audio, output | 3 3.5 mm jack socket, analog audio, output |

### 4.14.5 Add-on Module Analog Audio (bidirectional) L-/R474-BSS

**Source side (CPU module)**




**Sink side (CON module)**

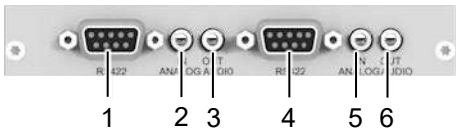
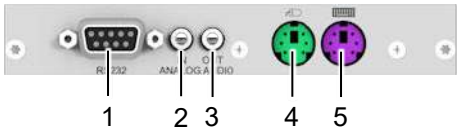



*Fig. 33 Interface side L-/R474-BSS*

| | |
|---|---|
| 1 D-Sub 9, female socket, RS422 serial | 1 D-Sub 9, female socket, RS422 serial |
| 2 3.5 mm jack socket, analog audio, input | 2 3.5 mm jack socket, analog audio, input |
| 3 3.5 mm jack socket, analog audio, output | 3 3.5 mm jack socket, analog audio, output |
| 4 D-Sub 9, female socket, RS422 serial | 4 D-Sub 9, female socket, RS422 serial |
| 5 3.5 mm jack socket, analog audio, input | 5 3.5 mm jack socket, analog audio, input |
| 6 3.5 mm jack socket, analog audio, output | 6 3.5 mm jack socket, analog audio, output |

### 4.14.6 Add-on Module Analog Audio (bidirectional) L-/R474-BAP

**Source side (CPU module)**




**Sink side (CON module)**

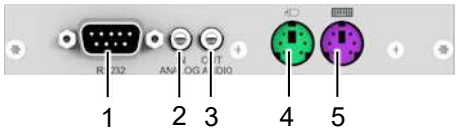



*Fig. 34 Interface side L-/R474-BAP*

| | |
|---|---|
| 1 D-Sub 9, female socket, RS232 serial | 1 D-Sub 9, male socket, RS232 serial |
| 2 3.5 mm jack socket, analog audio, input | 2 3.5 mm jack socket, analog audio, input |
| 3 3.5 mm jack socket, analog audio, output | 3 3.5 mm jack socket, analog audio, output |
| 4 PS/2, output mouse | 4 PS/2, input mouse |
| 5 PS/2, output keyboard | 5 PS/2, input keyboard |

## 4.14.7 Add-on Module Analog Audio (bidirectional) L-/R474-BAE/-BRE/-BSE

**Source side (CPU module)**

**Sink side (CON module)**


*Fig. 35 Interface side L-/R474-BAE*

1 D-Sub 9, female socket, RS232 serial
2 3.5 mm jack socket, analog audio, input
3 3.5 mm jack socket, analog audio, output
4 USB Type B, USB 2.0 (up to 36 Mbit/s)

1 D-Sub 9, male socket, RS232 serial
2 3.5 mm jack socket, analog audio, input
3 3.5 mm jack socket, analog audio, output
4 USB Type A, USB 2.0 (up to 36 Mbit/s)
5 USB Type A, USB 2.0 (up to 36 Mbit/s)

## 4.14.8 Add-on Module Analog Audio (bidirectional) L-/R474-BAE2/-BRE2/-BSE2

**Source side (CPU module)**

**Sink side (CON module)**


*Fig. 36 Interface side L-/R474-BAE2*

1 D-Sub 9, female socket, RS232 serial
2 3.5 mm jack socket, analog audio, input
3 3.5 mm jack socket, analog audio, output
4 USB Type B, USB 2.0 (up to 50/100 Mbit/s)

1 D-Sub 9, male socket, RS232 serial
2 3.5 mm jack socket, analog audio, input
3 3.5 mm jack socket, analog audio, output
4 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
5 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
6 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
7 USB Type A, USB 2.0 (up to 50/100 Mbit/s)

## 4.14.9 Add-on Module Analog Audio (bidirectional) L-/R474-BAH/-BSH

**Source side (CPU module)**

**Sink side (CON module)**


*Fig. 37 Interface side L-/R474-BAH*

1 D-Sub 9, female socket, RS232 serial
2 3.5 mm jack socket, analog audio, input
3 3.5 mm jack socket, analog audio, output
4 USB Type B, USB-HID

1 D-Sub 9, male socket, RS232 serial
2 3.5 mm jack socket, analog audio, input
3 3.5 mm jack socket, analog audio, output
4 USB Type A, USB-HID device 1
5 USB Type A, USB-HID device 2

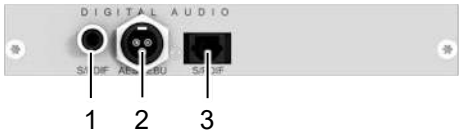
## 4.14.10 Add-on Module Digital Audio (unidirectional) L-/R474-BDX

**Source side (CPU module)**


*Fig. 38 Interface side L-/R474-BDX*

1 RCA, S/PDIF, input
2 Mini-XLR, AES/EBU, input
3 TOSLINK, S/PDIF, input

**Sink side (CON module)**




1 RCA, S/PDIF, output
2 Mini-XLR, AES/EBU, output
3 TOSLINK, S/PDIF, output

## 4.14.11 Add-on Module Digital Audio (unidirectional) L-/R474-BDD

**Source side (CPU module)**

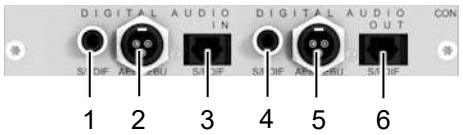
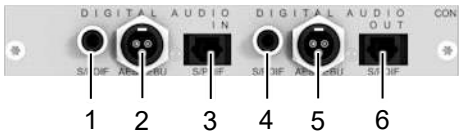



*Fig. 39 Interface side L-/R474-BDD*

1 RCA, S/PDIF, input
2 Mini-XLR, AES/EBU, input
3 TOSLINK, S/PDIF, input
4 RCA, S/PDIF, input
5 Mini-XLR, AES/EBU, input
6 TOSLINK, S/PDIF, input

**Sink side (CON module)**




1 RCA, S/PDIF, output
2 Mini-XLR, AES/EBU, output
3 TOSLINK, S/PDIF, output
4 RCA, S/PDIF, output
5 Mini-XLR, AES/EBU, output
6 TOSLINK, S/PDIF, output

## 4.14.12 Add-on Module Digital Audio (unidirectional) L-/R474-BDA

**Source side (CPU module)**

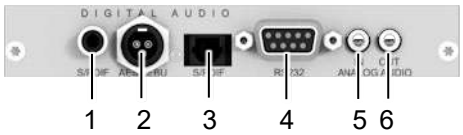
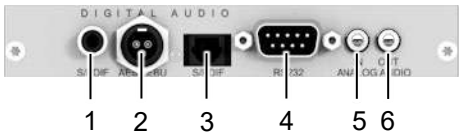



*Fig. 40 Interface side L-/R474-BDA*

1 RCA, S/PDIF, input
2 Mini-XLR, AES/EBU, input
3 TOSLINK, S/PDIF, input
4 D-Sub 9, female socket, RS232 serial
5 3.5 mm jack socket, analog audio, input
6 3.5 mm jack socket, analog audio, output

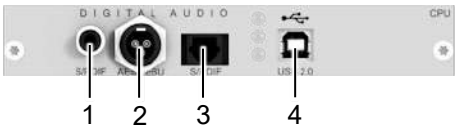
**Sink side (CON module)**




1 RCA, S/PDIF, output
2 Mini-XLR, AES/EBU, output
3 TOSLINK, S/PDIF, output
4 D-Sub 9, male socket, RS232 serial
5 3.5 mm jack socket, analog audio, input
6 3.5 mm jack socket, analog audio, output

## 4.14.13 Add-on Module Digital Audio (unidirectional) L-/R474-BDE

**Source side (CPU module)**




**Sink side (CON module)**

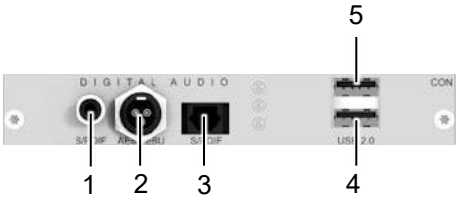


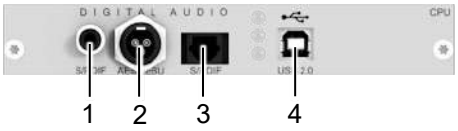

*Fig. 41 Interface side L-/R474-BDE*

1 RCA, S/PDIF, input
2 Mini-XLR, AES/EBU, input
3 TOSLINK, S/PDIF, input
4 USB Type B, USB 2.0 (up to 36 Mbit/s)

1 RCA, S/PDIF, output
2 Mini-XLR, AES/EBU, output
3 TOSLINK, S/PDIF, output
4 USB Type A, USB 2.0 (up to 36 Mbit/s)
5 USB Type A, USB 2.0 (up to 36 Mbit/s)

## 4.14.14 Add-on Module Digital Audio (unidirectional) L-/R474-BDE2

**Source side (CPU module)**




**Sink side (CON module)**

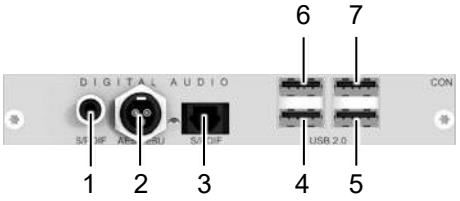



*Fig. 42 Interface side L-/R474-BDE2*

1 RCA, S/PDIF, input
2 Mini-XLR, AES/EBU, input
3 TOSLINK, S/PDIF
4 USB Type B, USB 2.0 (up to 50/100 Mbit/s)

1 RCA, S/PDIF, output
2 Mini-XLR, AES/EBU, output
3 TOSLINK, S/PDIF, output
4 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
5 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
6 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
7 USB Type A, USB 2.0 (up to 50/100 Mbit/s)

## 4.14.15 Add-on Module Digital Audio (unidirectional) L-/R474-BDH

**Source side (CPU module)**


**Sink side (CON module)**

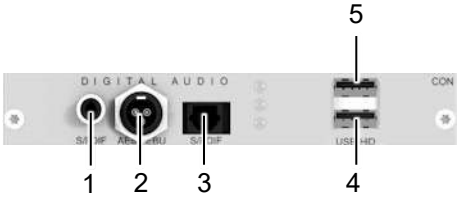


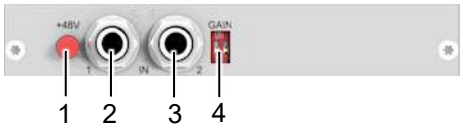

*Fig. 43 Interface side L-/R474-BDH*

1 RCA, S/PDIF, input
2 Mini-XLR, AES/EBU, input
3 TOSLINK, S/PDIF
4 USB Type B, USB-HID

1 RCA, S/PDIF, output
2 Mini-XLR, AES/EBU, output
3 TOSLINK, S/PDIF, output
4 USB Type A, USB-HID device 1
5 USB Type A, USB-HID device 2

## 4.14.16 Add-on Module Symmetrical Analog Audio L-/R474-BBX

**Source side (CPU module)**




**Sink side (CON module)**

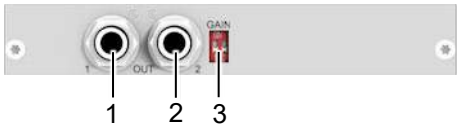



*Fig. 44 Interface side L-/R474-BBX*

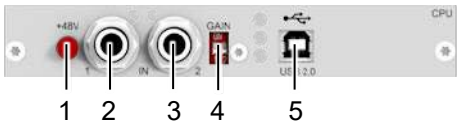
1 Switch for phantom power
2 6.35 mm jack socket, analog audio, input 1
3 6.35 mm jack socket, analog audio, input 2
4 Dip switch for pre-amplification

1 6.35 mm jack socket, analog audio, output 2
2 6.35 mm jack socket, analog audio, output 2
3 Not in use

The CPU module with balanced audio can also be used on a CON Unit, depending on the purpose.

## 4.14.17 Add-on Module Symmetrical Analog Audio L-/R474-BBE2

**Source side (CPU module)**




**Sink side (CON module)**

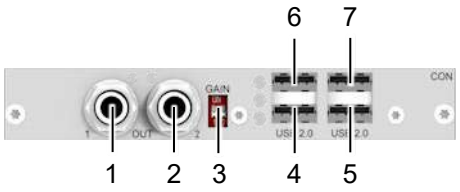



*Fig. 45 Interface side L-/R474-BBE2*

1 Switch for phantom power
2 6.35 mm jack socket, analog audio, input 1
3 6.35 mm jack socket, analog audio, input 2
4 Dip switch for pre-amplification
5 USB Type B, USB 2.0 (up to 50/100 Mbit/s)

1 6.35 mm jack socket, analog audio, output 1
2 6.35 mm jack socket, analog audio, output 2
3 Not in use
4 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
5 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
6 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
7 USB Type A, USB 2.0 (up to 50/100 Mbit/s)

## 4.14.18 Add-on Module GPIO R474-BGX

**Source side (CPU module)**


*Fig. 46 Interface side R474-BGX*

1 D-Sub 9, male socket, input GPIO (for an external switching solution via dry-contact)

## 4.14.19 Add-on Module GPIO R474-BGE2

**Source side (CPU module)**

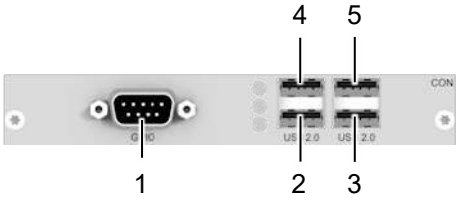



*Fig. 47 Interface side R474-BGE2*

1 D-Sub 9, male socket, input GPIO (for an external switching solution via dry-contact)
2 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
3 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
4 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
5 USB Type A, USB 2.0 (up to 50/100 Mbit/s)

## 4.14.20 Fan Cartridge Module 474-MODFAN

The fan cartridge module 474-MODFAN can be installed in all slots of the chassis.

For optimal ventilation we recommend installation of the fan cartridge module in the upper slots of the chassis.

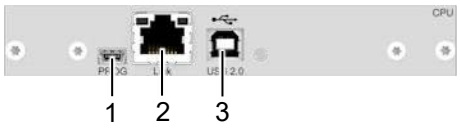

*Fig. 48 Interface side 474-MODFAN*

1 Mini-USB, service interface

## 4.15 Device Views Add-on Modules/Extender Modules USB 2.0 (Stand-alone)

### 4.15.1 Add-on Module/Extender Module USB 2.0 (Stand-alone) L-/R474-BXUC

**Source side (CPU module)**




**Sink side (CON module)**

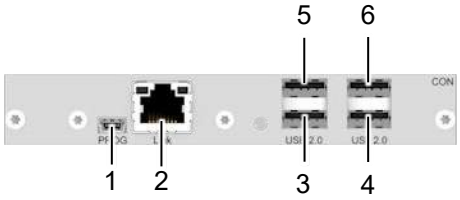


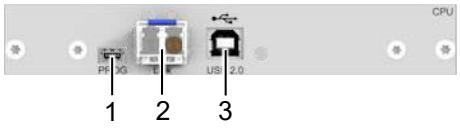

*Fig. 49 Interface side L-/R474-BXHC*

1 Mini-USB, service interface
2 Cat X, interconnection
3 USB Type B, USB 2.0 (up to 50/100 Mbit/s)

1 Mini-USB, service interface
2 Cat X, interconnection
3 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
4 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
5 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
6 USB Type A, USB 2.0 (up to 50/100 Mbit/s)

### 4.15.2 Add-on Module/Extender Module USB 2.0 (Stand-alone) L-/R474-BXUS

**Source side (CPU module)**




**Sink side (CON module)**

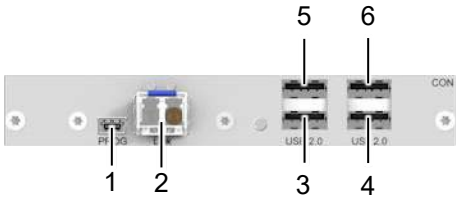



*Fig. 50 Interface side L-/R474-BXUS*

1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type B, USB 2.0 (up to 50/100 Mbit/s)

1 Mini-USB, service interface
2 Fiber, interconnection
3 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
4 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
5 USB Type A, USB 2.0 (up to 50/100 Mbit/s)
6 USB Type A, USB 2.0 (up to 50/100 Mbit/s)

## 4.16 Status Indication of Chassis

### 4.16.1 2-Slot-Chassis Draco vario 474-BODY2

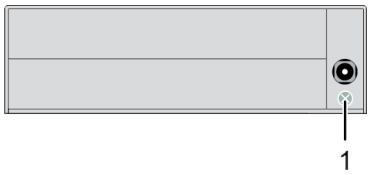



*Fig. 51 Interface side chassis 474-BODY2 - Status LED*

1 LED for power supply voltage 1

#### Status LED for Power Supply Voltage

The following table shows the LED states/colors for the power supply voltage (see chapter 4.11.1, page 32) for the respective situation.

| Pos. 1 | Description |
|---|---|
| Green | Redundant power supply voltage available. |
| Off | No power supply voltage available. |

### 4.16.2 2-Slot-Chassis Draco vario 474-BODY2R

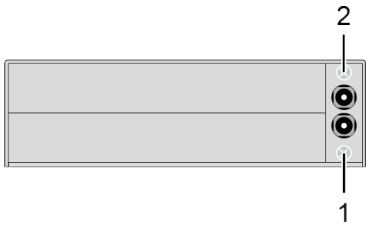



*Fig. 52 Interface side chassis 474-BODY2R - Status LEDs*

1 LED for power supply voltage 1 2 LED for power supply voltage 2

#### Status LEDs for Power Supply Voltage

The following tables show the LED states/colors for the power supply voltage (see chapter 4.11.2, page 32) for the respective situation.

| Pos. 1 | Pos. 2 | Description |
|---|---|---|
| Green | Green | Redundant power supply voltage available. |
| Green | Red | No redundant power supply voltage available. |
| Red | Green | No redundant power supply voltage available. |
| Off | Off | No power supply voltage available. |

### 4.16.3 2-Slot-Chassis Draco vario 474-BODY2N

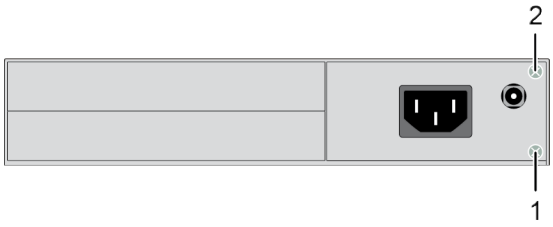



*Fig. 53 Interface side chassis 474-BODY2N - Status LEDs*

1 LED for power supply voltage 1 2 LED for power supply voltage 2

**Status LEDs for Power Supply Voltage**

The following tables show the LED states/colors for the power supply voltage (see chapter 4.11.3, page 33) for the respective situation.

| Pos. 1 | Pos. 2 | Description |
|---|---|---|
| Green | Green | Redundant power supply voltage available. |
| Green | Red | No redundant power supply voltage available. |
| Red | Green | No redundant power supply voltage available. |
| Off | Off | No power supply voltage available. |

### 4.16.4 2-Slot-Chassis Draco vario 474-BODY2BPF

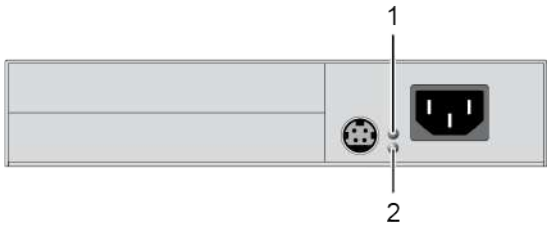



*Fig. 54 Interface side chassis 474-BODY2BPF - Status LEDs*

1 LED for power supply voltage 1 2 LED for power supply voltage 2

**Status LEDs for Power Supply Voltage**

The following tables show the LED states/colors for the power supply voltage (see chapter 4.11.4 page 33) for the respective situation.

| Pos. 1 | Pos. 2 | Description |
|---|---|---|
| Green | Green | Redundant power supply voltage available. |
| Green | Red | No redundant power supply voltage available. |
| Red | Green | No redundant power supply voltage available. |
| Off | Off | No power supply voltage available. |

### 4.16.5 4-Slot-Chassis Draco vario 474-BODY4

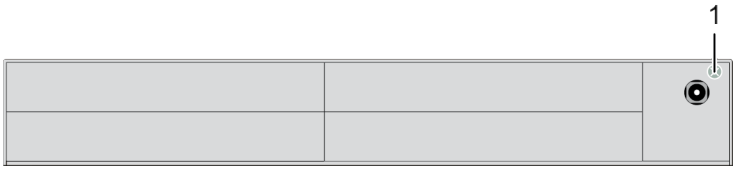



*Fig. 55 Interface side chassis 474-BODY4 - Status LEDs*

1 LED for power supply voltage 1

#### Status LED for Power Supply Voltage

The following table shows the LED states/colors for the power supply voltage (see chapter 4.11.5, page 34) for the respective situation.

| Pos. 1 | Description |
|---|---|
| Green | Redundant power supply voltage available. |
| Off | No power supply voltage available. |

### 4.16.6 4-Slot-Chassis Draco vario 474-BODY4R

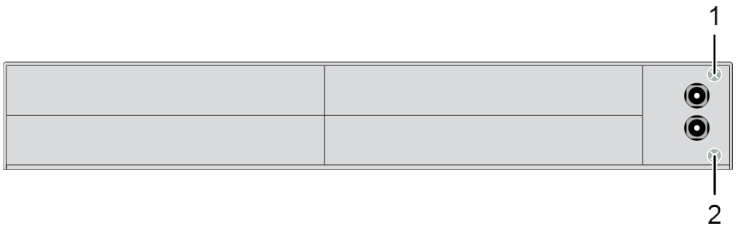



*Fig. 56 Interface side chassis 474-BODY4R - Status LEDs*

1 LED for power supply voltage 1 2 LED for power supply voltage 2

#### Status LEDs for Power Supply Voltage

The following tables show the LED states/colors for the power supply voltage (see chapter 4.11.6 page 34) for the respective situation.

| Pos. 1 | Pos. 2 | Description |
|---|---|---|
| Green | Green | Redundant power supply voltage available. |
| Green | Red | No redundant power supply voltage available. |
| Red | Green | No redundant power supply voltage available. |
| Off | Off | No power supply voltage available. |

### 4.16.7 6-Slot-Chassis Draco vario 474-BODY6R-R1

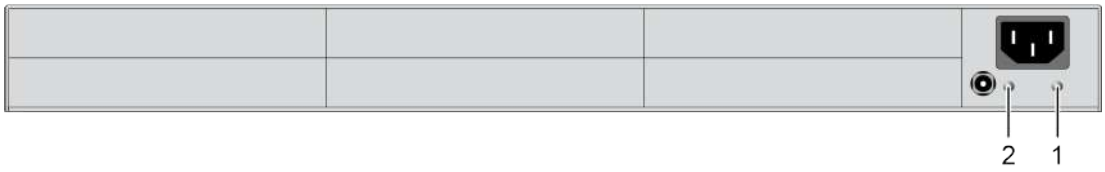



*Fig. 57 Interface side chassis 474-BODY6R-R1 - Status LEDs*

1 LED for power supply voltage 1 2 LED for power supply voltage 2

**Status LEDs for Power Supply Voltage**

The following tables show the LED states/colors for the power supply voltage (see chapter 4.11.7 page 35) for the respective situation.

| Pos. 1 | Pos. 2 | Description |
|---|---|---|
| Green | Green | Redundant power supply voltage available. |
| Green | Red | No redundant power supply voltage available. |
| Red | Green | No redundant power supply voltage available. |
| Off | Off | No power supply voltage available. |

### 4.16.8 6-Slot Chassis Draco vario 474-BODY6BP

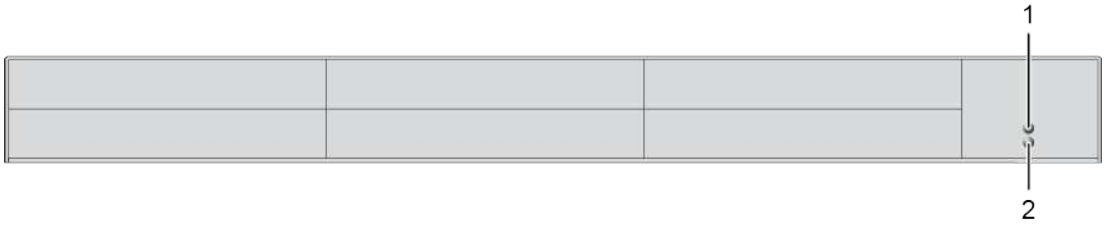



*Fig. 58 Interface side chassis 474-BODY6BP - Status LEDs*

1 LED for power supply voltage 1 2 LED for power supply voltage 2

**Status LEDs for Power Supply Voltage**

The following tables show the LED states/colors for the power supply voltage (see chapter 4.11.8 page 36) for the respective situation.

| Pos. 1 | Pos. 2 | Description |
|---|---|---|
| Green | Green | Redundant power supply voltage available. |
| Green | Red | No redundant power supply voltage available. |
| Red | Green | No redundant power supply voltage available. |
| Off | Off | No power supply voltage available. |

### 4.16.9 6-Slot-Chassis Draco vario 474-BODY6BPF

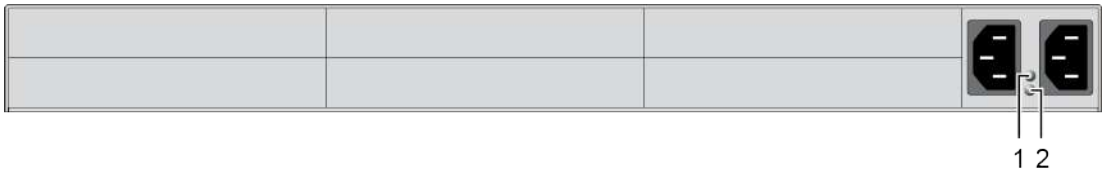



*Fig. 59 Interface side chassis 474-BODY6BPF - Status LEDs*

1 LED for power supply voltage 1 2 LED for power supply voltage 2


*Fig. 60 Rear view chassis 474-BODY6BPF - Status LEDs*

1 LED for power supply voltage 1 2 LED for power supply voltage 2

**Status LEDs for Power Supply Voltage**

The following tables show the LED states/colors for the power supply voltage (see chapter 4.11.9 page 36) for the respective situation.

| Pos. 1 | Pos. 2 | Description |
|---|---|---|
| Green | Green | Redundant power supply voltage available. |
| Green | Red | No redundant power supply voltage available. |
| Red | Green | No redundant power supply voltage available. |
| Off | Off | No power supply voltage available. |

## 4.16.10 21-Slot Chassis Draco vario 474-BODY21/4U and 474-BODY21/4UR

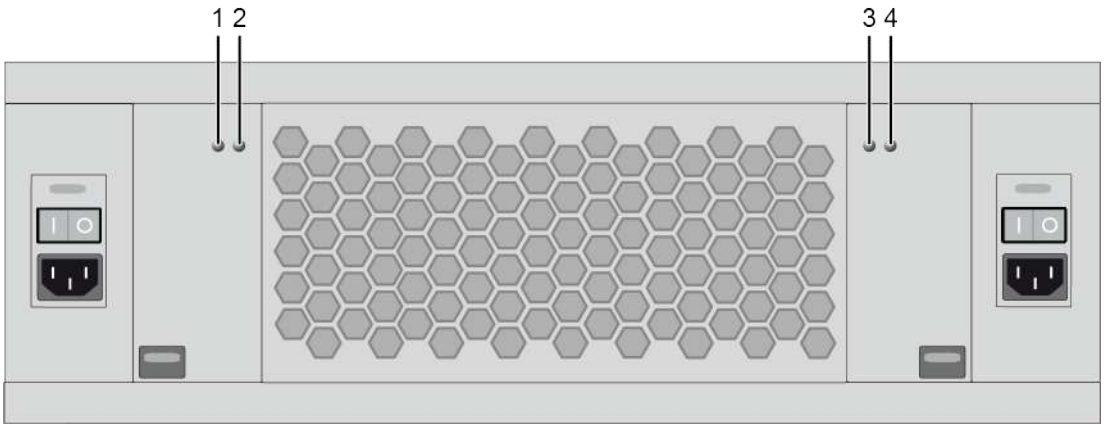



*Fig. 61 Rear side chassis 474-BODY21/4U und 474-BODY21/4UR - Status and fault LEDs*

1 Status LED power supply voltage 2 (redundancy)
2 Fault LED power supply voltage 2 (redundancy)
3 Status LED power supply voltage 1
4 Fault LED power supply voltage 1

### Status LEDs for Power Supply Voltage of the Standard Power Supply Unit

The following tables show the LED states/colors for the power supply voltage (see chapter 4.11.10 page 37) for the respective situation.

| Pos. 3 | Pos. 4 | Description |
|---|---|---|
| Green | Off | Power supply voltage available. |
| Green | Red | • The input voltage of the power supply unit is too low.<br>• The output voltage of the power supply unit too high.<br>• Permissible power supply temperature exceeded. |
| Off | Off | No power supply voltage available. |

### Status LEDs for Power Supply Voltage of the Redundant Power Supply Unit

| Pos. 1 | Pos. 2 | Description |
|---|---|---|
| Green | Off | Power supply voltage available. |
| Green | Red | • The input voltage of the power supply unit is too low.<br>• The output voltage of the power supply unit too high.<br>• Permissible power supply temperature exceeded. |
| Off | Off | • No power supply voltage available.<br>• No redundant power supply unit installed. |

# 4.17 Status Indication of Extender Modules

## 4.17.1 Link Connection

The LED status of the link connection is described using the redundant extender modules as an example.

**Source side (CPU module)**

**Sink side (CON module)**

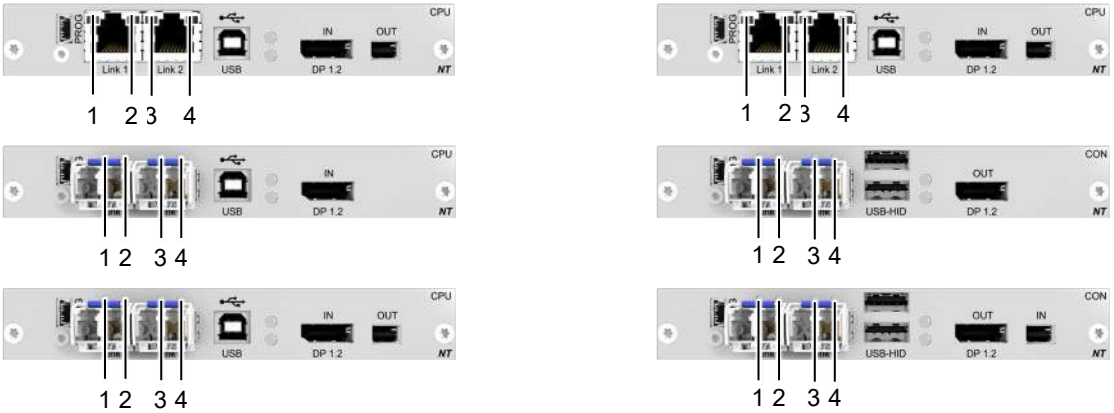



*Fig. 62 Interface side extender modules - Status LEDs (example)*

1 Failure LED link 1
2 Status LED link 1
3 Failure LED link 2
4 Status LED link 2

1 Failure LED link 1
2 Status LED link 1
3 Failure LED link 2
4 Status LED link 2

### Link Connection Cat X

The following table shows the respective Link LED states/colors (left LED 1, 3 and right LED 2, 4) of the CPU Unit and the CON Unit for the respective situation.

| Pos. 1/3 | Pos. 2/4 | Description |
|---|---|---|
| Off | Green | Link connection available. |
| Off | Flashing green | No link connection available. |
| Flashing green | Green | Link connection failure (flashes for approx. 20 s following each occurring connection failure). |

### Link Connection Fiber 1G and 3G

The following table shows the respective Link LED states/colors (left LED 1/3 and right LED 2/4) of the CPU Unit and the CON Unit for the respective situation.

| Pos. 1/3 | Pos. 2/4 | Description |
|---|---|---|
| Off | Green | Link connection available. |
| Off | Flashing red | No link connection available. |
| Flashing red | Green | Link connection failure (flashes for approx. 20 s following each occurring connection failure). |

## 4.17.2 USB-HID and Video Connection

The LED status of the link connection is described using the redundant extender modules as an example.

**Source side (CPU module)** **Sink side (CON module)**

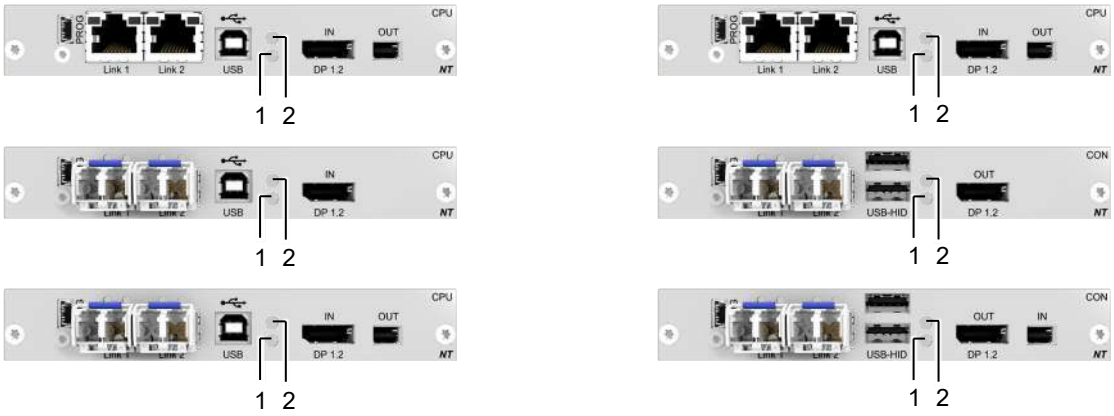



*Fig. 63 Interface side extender modules - Status LEDs (example)*

1 Status LED 1 USB-HID and video
2 Status LED 2 USB-HID and video

1 Status LED 1 USB-HID and video
2 Status LED 2USB-HID and video

When extender modules are connected directly, the LEDs behave differently depending on whether there is a link connection between the CON Unit and the CPU Unit, whether a video signal is present, at which resolution a video signal is transmitted, or whether a USB connection exists.

The following tables show the respective LED states/colors (upper LED (2) and the lower LED (1) of the CPU Unit (column 2) and the CON Unit (column 3) for the respective situation.

**Without Link Connection, without Video Signal**

| Pos. | LED CPU Unit | LED CON Unit |
|---|---|---|
| 2 | Red | Flashing red/violet |
| 1 | Red | Flashing red/violet |

**With Link Connection, without Video Signal**

| Pos. | LED CPU Unit | LED CON Unit |
|---|---|---|
| 2 | Violet | Violet |
| 1 | Violet | Violet |

**Without Link Connection, with Video Signal**

| Pos. | LED CPU Unit | LED CON Unit | Effective data rate |
|---|---|---|---|
| 2 | Red | Flashing red/violet | Max. 4.14 Gbit/s |
| 1 | Green | Flashing red/violet | |
| 2 | Green | Flashing red/violet | Between 4.14 and 17.28 Gbit/s |
| 1 | Red | Flashing red/violet | |

### With Link Connection, with Video Signal, without USB Connection

The USB connection is missing, when the command mode is started, or when the CON Unit currently has no USB-HID control with shared operation of a redundant CPU Unit.

| Pos. | LED CPU Unit | LEDCON Unit | Effective data rate |
|---|---|---|---|
| 2 | Violet | Flashing red/violet | Max. 4.14 Gbit/s |
| 1 | Light blue | Flashing green/light blue | |
| 2 | Light blue | Flashing green/light blue | Between 4.14 and 17.28 Gbit/s |
| 1 | Light blue | Flashing green/light blue | |

### With Link Connection, Video Signal and USB Connection

| Pos. | LED CPU Unit | LEDCON Unit | Effective data rate |
|---|---|---|---|
| 2 | Violet | Violet | Max. 4.14 Gbit/s |
| 1 | Light blue | Light blue | |
| 2 | Light blue | Light blue | Between 4.14 and 17.28 Gbit/s |
| 1 | Light blue | Light blue | |

## 4.18 Status Indication of Add-on Modules

The LEDs are described here once per function part of the add-on modules. Up to two function parts can be installed per add-on module, one function part on the left and one on the right.

### 4.18.1 Add-on Module Digital Audio

**Source side (CPU module)**


**Sink side (CON module)**


*Fig. 64 Interface side add-on module digital audio - Status LEDs*

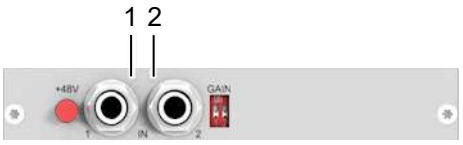
1 Status LED digital audio

1 Status LED digital audio

| Pos. | LED | Status | Description |
|---|---|---|---|
| 1 | Red | Static | **CPU Unit and CON Unit:** no signal |
| | Light blue | Static | **CPU Unit:** S/PDIF signal (RCA) available |
| | | Flashing | **CPU Unit:** digital noise |
| | Violet | Static | **CPU Unit:** AES/EBU signal (Mini-XLR) available |
| | | Flashing | **CPU Unit:** digital noise |
| | Blue | Static | **CPU Unit:** S/ PDIF signal (TOSLINK) available |
| | | Flashing | **CPU Unit:** digital noise |
| | Green | Static | **CON Unit:** signal available, digital noise |

## 4.18.2 Add-on Module Balanced Audio

**Source side (CPU module)**




**Sink side (CON module)**


*Fig. 65 Interface side add-on module balanced audio - Status LEDs*

1 Status LED for input 1
2 Status LED for input 2

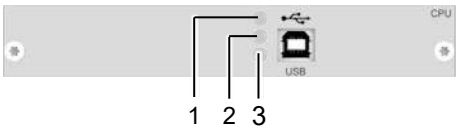
1 Status LED for output 1
2 Status LED for output 22

The following table shows the respective Link LED states/colors of the CPU Unit and the CON Unit for the respective situation.

| Pos. | LED | Description |
|---|---|---|
| 1, 2 | Off | No signal |
| | Green | Signal available |
| | Orange | Signal level too high |

## 4.18.3 Add-on Module USB-HID

**Source side (CPU module)**




**Sink side (CON module)**

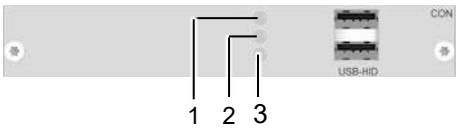



*Fig. 66 Interface side add-on module USB-HID - Status LEDs*

1 USB-HID device 1 status LED
2 USB-HID device 2 status LED
3 Link status LED

1 USB-HID device 1 status LED
2 USB-HID device 2 status LED
3 Link status LED

The following tables show the respective LED states/colors of the CPU add-on module (column 2) and the CON add-on module (column 3) for the respective situation.

| Pos. | LED CPU Add-on | LED CON Add-on | Description |
|---|---|---|---|
| 1 | Off | Off | • Link connection between add-on module and extender module available.<br>• No link connection between CPU Unit and source available.<br>• No USB-HID device connected or not supported USB device connected. |
| 2 | Off | Off | |
| 3 | Red, slowly flashing | Red, slowly flashing | |

| | | | |
|---|---|---|---|
| 1 | Off | Off | • Link connection between add-on module and extender module, and between CPU Unit and source available.<br>• No USB-HID device or unsupported USB device connected. |
| 2 | Off | Off | |
| 3 | Red, fast flashing | Red, fast flashing | |

| | | | |
|---|---|---|---|
| 1 | Off | Off | • Link connection between add-on module and extender module, and between CPU Unit and source available.<br>• Keyboard connected to USB-HID port 1 or 2. |
| 2 | Red | Red | |
| 3 | Red, fast flashing | Red, fast flashing | |

| | | | |
|---|---|---|---|
| 1 | Red | Red | • Link connection between add-on module and extender module, and between CPU Unit and source available.<br>• Mouse connected to USB-HID port 1 or 2. |
| 2 | Off | Off | |
| 3 | Red, fast flashing | Red, fast flashing | |

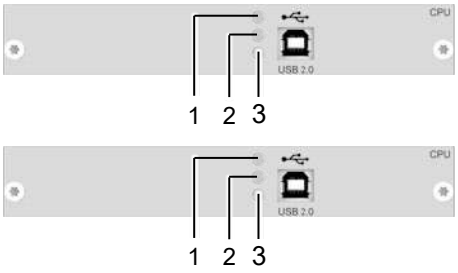
| | | | |
|---|---|---|---|
| 1 | Off | Off | • Link connection between add-on module and extender module, and between CPU Unit and source available.<br>• Keyboard connected to USB-HID port 1 or 2.<br>• Keyboard input active |
| 2 | Red | Red, fast flashing | |
| 3 | Red, fast flashing | Red, fast flashing | |

| | | | |
|---|---|---|---|
| 1 | Red | Red, fast flashing | • Link connection between add-on module and extender module, and between CPU Unit and source available.<br>• Mouse connected to USB-HID port 1 or 2.<br>• Mouse active |
| 2 | Off | Off | |
| 3 | Red, fast flashing | Red, fast flashing | |

If the link connection between CPU Unit and CON Unit is missing (e.g., extender module in command mode), LED 3 flashes slowly, the LEDs for the connected USB-HID devices (1 and/or 2) maintain their status.

### 4.18.4 Add-on Module USB 2.0 embedded

**Source side (CPU module)**




**Sink side (CON module)**

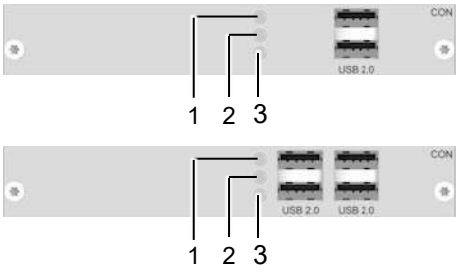



*Fig. 67 Interface side add-on modules USB 2.0 - Status LEDs*

1 USB 2.0 status LED
2 Connect status LED
3 Link status LED

1 USB 2.0 status LED
2 Connect status LED
3 Link status LED

The following tables show the respective LED states/colors of the CPU add-on module (column 2) and the CON add-on module (column 3) for the respective situation.

| Pos. | LED CPU Add-on | LED CON Add-on | Description |
|---|---|---|---|
| 1 | Off | Off | • Link connection between CPU Unit and CON Unit available.<br>• No USB connection between CPU Unit and source available. |
| 2 | Off | Off | |
| 3 | Green | Green | |

| | | | |
|---|---|---|---|
| 1 | Green, flashing | Green, flashing | • Link connection between CPU Unit and CON Unit available.<br>• USB connection between CPU Unit and source available. |
| 2 | Green | Green | |
| 3 | Green | Green | |

| | | | |
|---|---|---|---|
| 1 | Off | Off | When connected to a matrix:<br>• Link connection between CPU Unit and CON Unit available.<br>• USB connection between CPU Unit and source available.<br>• OSD opened. |
| 2 | Off | Off | |
| 3 | Off | Off | |

### 4.18.5 Fan Cartridge Module


*Fig. 68 Interface side fan cartridge module - Status LEDs*

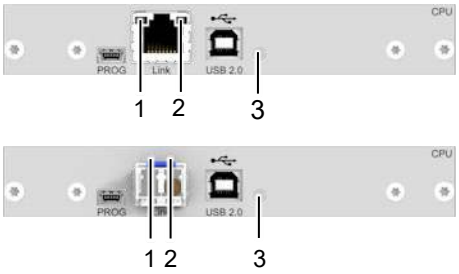
1 Status LED

| Pos. | LED | Color | Description |
|---|---|---|---|
| 1 | Red | Static | Failure, fan is not operable |
| | Green | Static | Fan runs with reduced speed until 40 °C (with parameter set, see chapter 7.5.4, page 78) |
| | Light blue | Static | Operating condition |

The light blue LED is very bright and might also appear as white.

## 4.19 Status Indication of the Add-on Modules/Extender Modules USB 2.0 (Stand-alone)

**Source side (CPU module)**




**Sink side (CON module)**

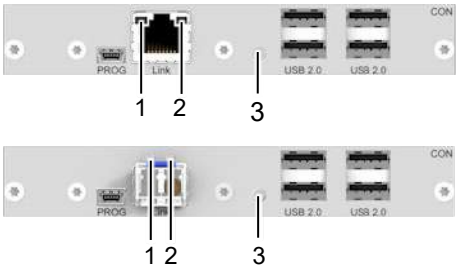



*Fig. 69 Interface side add-on modules/extender modules USB 2.0 (stand-alone) - Status LEDs*

1 Failure LED link connection
2 Status LED link connection
3 Status LED USB 2.0

1 Failure LED link connection
2 Status LED link connection
3 Status LED USB 2.0

The following tables show the respective Link LED states/colors (left LED 1, 3 and right LED 2, 4) of the CPU Unit and the CON Unit for the respective situation.

**Status LEDs for Link Connection Cat X**

| Pos. 1, Pos. 3 | Pos. 2, Pos. 4 | Description |
|---|---|---|
| Off | Green | Link connection available. |
| Off | Flashing green | No link connection available. |
| Flashing green | Green | Link connection failure (flashes for approx. 20 s following each occurring connection failure). |

**Status LEDs for Link Connection Fiber**

| Pos. 1, Pos. 3 | Pos. 2, Pos. 4 | Description |
|---|---|---|
| Off | Green | Link connection available. |
| Off | Flashing red | No link connection available. |
| Flashing red | Green | Link connection failure (flashes for approx. 20 s following each occurring connection failure). |

**USB 2.0 Status LEDs**

| Pos. | LED | Color | Description |
|---|---|---|---|
| 3 | Red | On | No link connection available, no USB-2.0 signal available |
| | Green | On | **CPU Unit:** Link connection available, no USB-2.0 signal available |
| | Light blue | On | Link connection and USB 2.0 signal available (operating condition) |

# 5 Access Option

You have following options to configure and/or operate the extender module and add-on module:

| Access option | Description |
|---|---|
| Command mode | The CON extender modules include a command mode that enables access to several functions of connected KVM devices, e.g., Draco U-Switch or Draco tera matrix switch when using additional keyboard commands.<br>In addition, individual extender module functions for USB-HID Ghosting and the EDID, as well as switching via command mode and additional keyboard commands can be executed. |
| Management software | Firmware updates for extender modules can be performed via the management software.<br>The management software is available in the form of a single executable program file. The management software can be downloaded from the link https://www.ihse.com/software.<br>For extender modules connected to a matrix, additional functions are available in the management software. For more information, please refer to the manual of the respective IHSE Draco tera matrix. |

## 5.1 Command Mode

To start the command mode, use a keyboard sequence (Hot Key) at the keyboard of a CON Unit plugged in a KVM device. The command mode can also be called up using a keyboard with USB-HID interface connected to an add-on module.

To exit the command mode, press Esc.

| NOTICE |
| --- |
| While in command mode,<br>➡ the **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing,<br>➡ the USB-HID devices are not operable, mouse and keyboard functions are deactivated,<br>➡ only selected keyboard commands are available. |

If there is no keyboard command entered within 10 seconds after activating the command mode, it will be deactivated automatically.

The following keyboard commands are used to enter, and to exit the command mode, and to change the Hot Key.

| Function | Keyboard command |
| --- | --- |
| Start the command mode | 2x Left Shift (Hot Key, factory setting) |
| Exit the command mode | Esc and also Left Shift + Esc, if necessary |
| Change the Hot Key | current Hot Key, c, new Hot Key Code, Enter |

| NOTICE |
| --- |
| In a combined KVM matrix/U-switch configuration, select different Hot Keys for the connected extender modules, e.g., 2x Left Shift for access to the matrix and e.g., 2x Right Shift for access to the U-Switch. |

Hot Keys currently can only be changed at the console and only for that console.

**Hot Key Code**

The Hot Key to start the command mode can be changed. The following table lists the Hot Key codes for the available Hot Keys.

| Hot Key Code | Hot Key |
| --- | --- |
| 0 | Freely selectable, except Esc, Del and Enter |
| 2 | 2x Scroll |
| 3 | 2x Left Shift (default) |
| 4 | 2x Left Ctrl |
| 5 | 2x Left Alt |
| 6 | 2x Right Shift |
| 7 | 2x Right Ctrl |
| 8 | 2x Right Alt |

**Change the current Hot Key via Hot Key Code (exemplary)**

To change the current Hot Key to, e.g., 2x Left Alt, enter Hot Key, c, 5, Enter.

**Set a freely selectable Hot Key (exemplary)**

To set a freely selectable Hot Key (e.g., 2x Space), enter Hot Key, c, 0, Space, Enter.

Keyboard commands are fixed to the position of the keys on the keyboard. Keyboard mapping tables may vary for country-specific layouts.

➔ Note the key position of a freely defined Hot Key when changing the keyboard layout, e.g., from QWERTZ to AZERTY. E.g., if defining 2x a as Hot Key on a German or US keyboard layout, the French keyboard layout (AZERTY) requires then 2x q as Hot Key to be pressed instead.

**Reset the Hot Key**

To set a Hot Key back to default settings, press Right Shift + Del within 5 s after switching on the CON Unit or plugging in a keyboard.

The Hot Key is set back to Left Shift.

## 5.2 Management Software

The menu structure of the management software is subdivided into various sections.

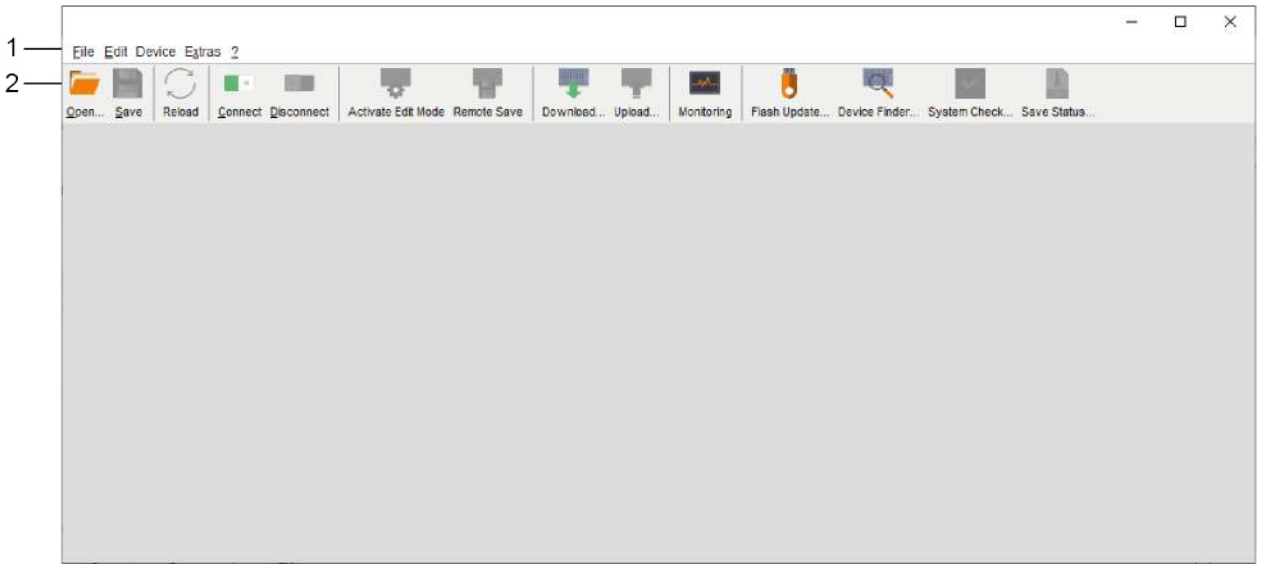



*Fig. 70 Management software **Menu structure***

1 Menu bar (top line) 2 Toolbar (second line)

The following mouse buttons are selectable for menu functions:

| Mouse command | Function |
|---|---|
| Left mouse button | Select function, open drop-down menus, enter input field, activate/deactivate option checkboxes, etc. |
| Right mouse button | Open context specific selection menus |

# 6 Installation

| NOTICE |
| --- |
| Please verify that interconnect cables, interfaces, and handling of the devices comply with the requirements (see chapter 10, page 84). |

First-time users are recommended to set up the system in a test environment that is limited to a single room. This makes it easier to identify and solve any cabling problems, and experiment with your system more conveniently.

## 6.1 Setting up the System

### 6.1.1 Setting up the Extender Module

➡ Switch off all devices.

**Installing the CON Unit**

1. Connect the monitor(s), keyboard, and mouse to the CON Unit.
2. Connect the CON Unit to the power supply unit(s)/power socket(s).

**Installing the CPU Unit**

1. Connect the source to the CPU Unit with the supplied cables. Please ensure the cables are not strained.
2. Connect the CPU Unit to the power supply unit(s)/power socket(s).

**Establishing a Point-to-Point Connection of CON Unit and CPU Unit and Powering on the system**

1. Connect the CON Unit to the CPU Unit by using an interconnect cable.
2. Power up the system, following the recommended sequence:
   Monitor - CON Unit - CPU Unit - source
3. Boot the source and check that everything works correctly.

Establishing a matrix connection of CON Unit and CPU Unit is described in the respective Draco tera matrix manual.

### 6.1.2 Setting up an Add-on Module

The add-on modules can be hot plugged.

**Add-on Module Analog Audio/Serial RS232**

1. Connect the audio source to the CPU Unit (e.g., computer audio OUT with CPU Unit audio IN, computer audio IN with CPU Unit audio OUT).
2. Connect the audio OUT on the CON Unit to headphones or suitable speakers.
3. Connect the audio IN on the CON Unit to a suitable microphone.

**Add-on Module Serial RS422**

1. Connect the CPU to the CPU Unit by using the serial cable.
2. Connect the CON Unit to the serial connector of the input device.

**Add-on Module Digital Audio**

1. Connect the digital audio source to the audio input of the CPU Unit.
2. Connect the audio output of the CON Unit to suitable speakers or audio amplifiers.

If several active sources are connected, Mini-XLR input takes priority.
The audio signal is available at all outputs.

**Add-on Module Balanced Audio**

1. Connect the balanced audio source to the appropriate audio input of the CPU Unit.
2. Connect the audio output of the CON Unit to suitable speakers or audio amplifiers.

**Add-on Module USB-HID**

1. Connect the source to the CPU Unit (USB-HID port).
2. Connect the USB-HID devices to the CON Unit (USB-HID ports).

**Add-on Module PS/2**

1. Connect the source to a CPU Unit (PS/2 ports).
2. Connect the PS/2 devices to the CON Unit (PS/2 ports).

**Add-on Module USB 2.0 embedded**

1. Connect the source to the CPU Unit (USB 2.0 port).
2. Connect the USB 2.0 devices to the CON Unit (USB 2.0 ports).

**Add-on Module USB 2.0**

1. Connect the CPU to the CPU Unit (USB 2.0).
2. Connect the USB 2.0 devices to the CON Unit (Connect to USB 2.0 devices).

### Add-on Module GPIO

The GPIO add-on modules R474-BGX or R474-BGE2 are configured via DIP switches. In the delivery states, all DIP switches are set to the bottom = input. The DIP switches belong to the pins listed below:

| | Pin 1 | Pin2 | Pin 3 | Pin 4 | Pin 5 | Pin 6 | Pin 7 | Pin 8 | Pin 9 |
|---|---|---|---|---|---|---|---|---|---|
| DIP Switch | 1 | 2 | - | 3 | 4 | 5 | 6 | 7 | 8 |

To set up the GPIO add-on module for an external keypad with up to four buttons and one associated LED each, proceed as follows:

➡ Move the DIP switches of the pins up (ON = output) to which you want to connect LEDs.

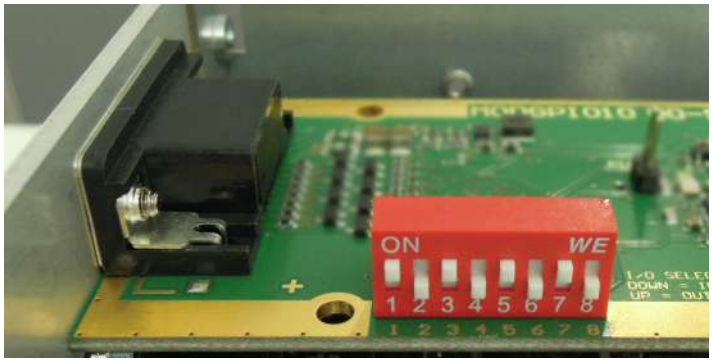



*Fig. 71 Example of DIP switch settings*

## 6.2 Connecting to the Extender Module via Management Software

The management software can be used to configure the extender modules and to update the firmware of extender modules and add-on modules.

The management software is available as a single executable program file (desktop) that does not require installation.

➡ Save the management software in a locally available directory.

**Requirements**

If you want to use the management software with integrated Java Runtime on Windows operating systems, the following requirements must be fulfilled:

| Computer/Software/Network | | Requirements/Recommendations |
|---|---|---|
| Free memory | RAM | Recommended: 512 MB |
| Operating system | Microsoft | Windows 8, Windows 8.1, Windows 10 |
| Management software with integrated Java Runtime | Tera Tool | Downloaded from https://www.ihse.com/software |

If you want to use the management software without integrated Java Runtime, the following requirements must be fulfilled:

| Computer/Software/Network | | Requirements/Recommendations |
|---|---|---|
| Free memory | RAM | Recommended: 512 MB |
| Operating system | Microsoft | Windows 8, Windows 8.1, Windows 10 |
| | macOS | macOS 10.14 (Mojave) or higher, Intel platform |
| Specification | Java | Installed: Oracle Java Runtime Environment (JRE) 1.8.x or higher<br>Strongly recommended: Oracle Java 1.8 update 152, or higher. (https://adoptopenjdk.net, https://github.com/ojdkbuild/ojdkbuild |
| Management software | Tera Tool | Downloaded from https://www.ihse.com/software |

Contact your system administrator concerning JRE and network connection.

### 6.2.1 Connecting the Extender Module to the Computer

➡ Connect the Mini-USB cable to the Mini-USB port of the extender module and the USB-A port of the computer.

### 6.2.2 Starting the Management Software

➡ Open the management software by a double-click on the program icon on the desktop or the file in the directory.

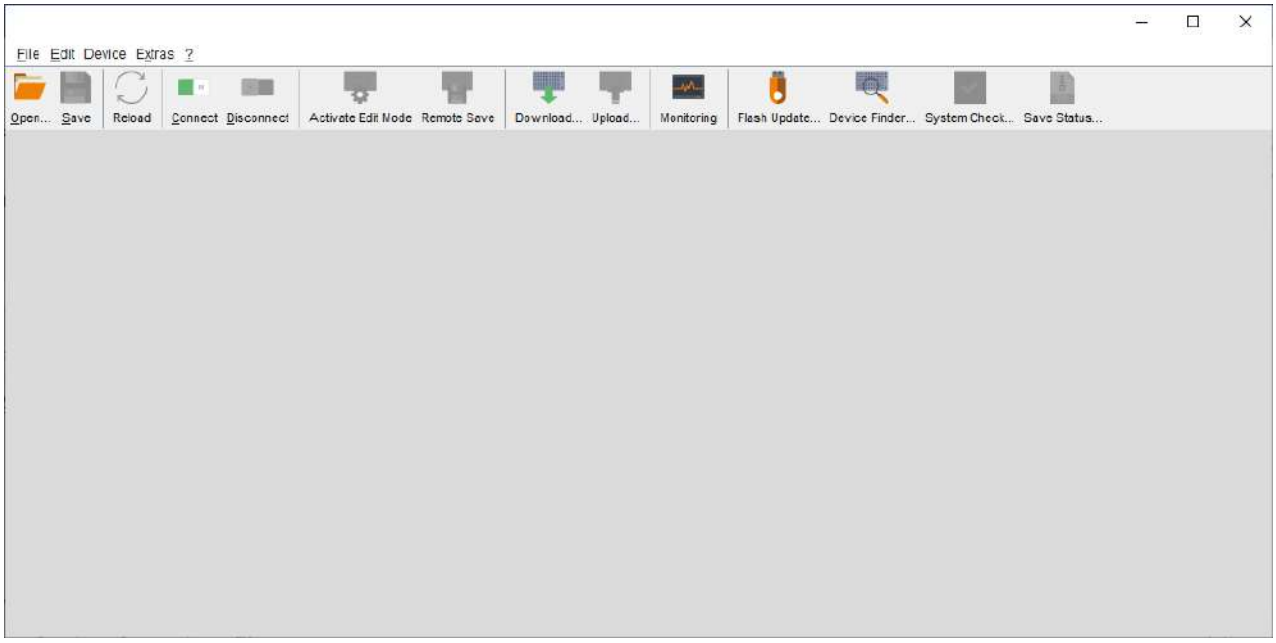



*Fig. 72 Management software*

# 7 Configuration

## 7.1 Configuration Options via Mini-USB Service Port

Both the CPU Unit and the CON Unit can be configured and updated via the Mini-USB service port. When a CPU Unit/CON Unit is connected to a computer using a mini-USB cable, the CPU Unit/CON Unit is displayed in the computer's file manager as an external drive "401xxxxx" or "101xxxxx" (Serial No.).

This directory contains the configuration file `Config.txt`, the EDID and firmware files.

The `Config.txt` file shows the Serial No., the manufacturing p/n, and the video signal details. If present, additional configuration parameters are displayed in the line directly below `#CFG`.

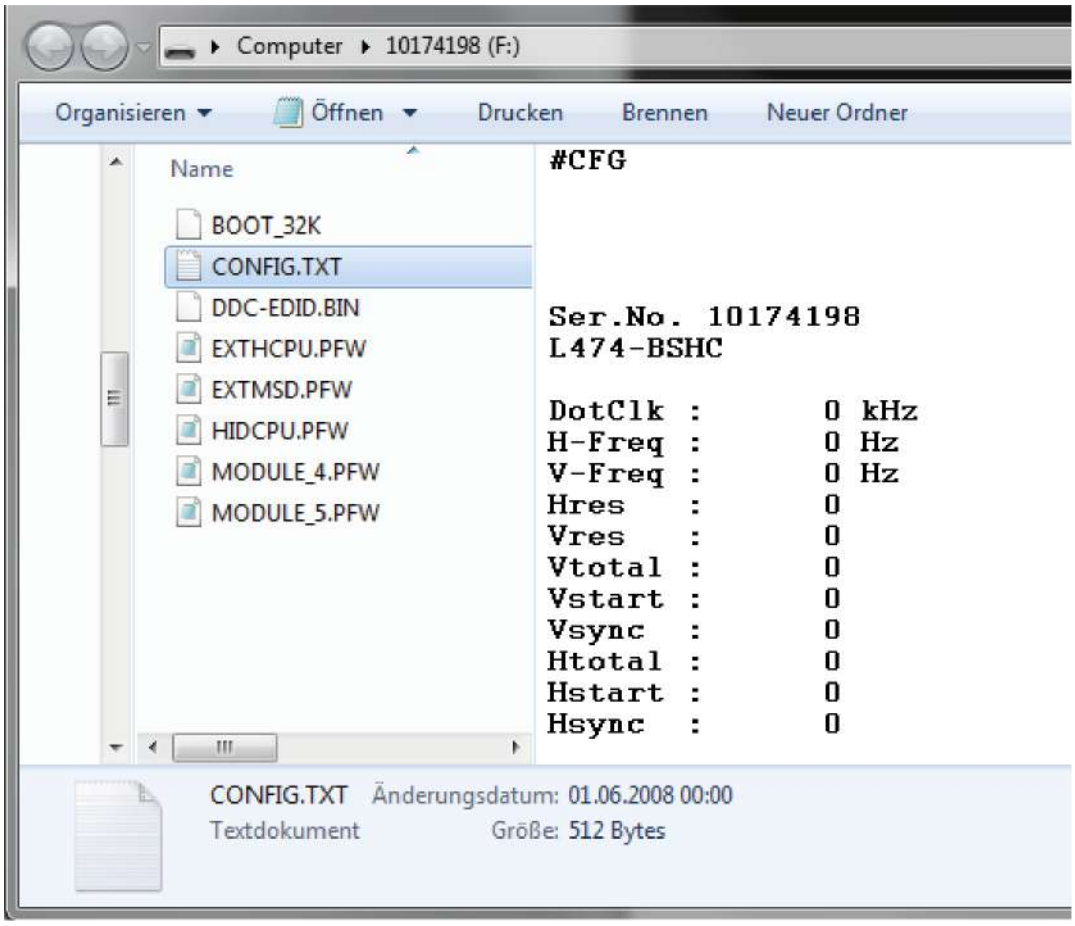



*Fig. 73 Example **Opened Flash drive of a CPU Unit***

## 7.2 Transmission Parameters

The device operates with a manufacturer optimized compression method, the so-called Video-Codec Lici® (Lightweight Image Coding) of the Fraunhofer Institute for Integrated Circuits IIS. The transmission is handled visibly and up to mathematically lossless, at the same time without the loss of frames (no frame drops) and at low latency.

In default configuration, the device adapts dynamically to monitor resolution and image content. This configuration is suitable for almost all conditions and should only be modified if image quality is not fully satisfactory.

## 7.3 EDID Settings

By default, the CPU Unit provides the EDID for the sources by default. This information is suitable in most cases. Loading the EDID from the console monitor can be performed during normal operation (see chapter 8.1, page 80).

For special requirements, the EDID can be retrieved and uploaded as a binary file to both the CPU Unit and the CON Unit.

➡ Connect your computer with a Mini-USB cable to the service port of the CPU Unit or CON Unit.

The data area of the CPU Unit or CON Unit is now accessible as a flash drive "Extender".

**Uploading the EDID**

➡ Copy the binary file containing your specific EDID to the flash drive of the CPU Unit or CON Unit.

The current EDID is replaced.

**Retrieving the EDID**

➡ Copy the file `DDC-EDID.bin` on the flash drive of the CPU Unit to your computer.

To open the binary file, install a suitable software, e.g., WinDDCwrite, on your computer. Please, contact your distributor for this purpose.

**Reset the EDID to Factory Settings**

1. Delete the file called `DDC-EDID.bin` on the flash drive of the CPU Unit.
2. Manually power off the extender module.
3. Power on the extender module to restart the extender module.

   The extender module starts automatically, and the factory EDID is restored.

## 7.4 USB-HID Ghosting

This function allows specific keyboard and mouse descriptors (device descriptions) to be permanently stored in the CPU Unit. This permanent storage eliminates the need to register and deregister the keyboard and mouse on an operating system each time there is a shared use of a source by two or more consoles within a KVM matrix.

The following table lists the keyboard commands for the configuration of USB-HID ghosting:

| Keyboard command | Function |
|---|---|
| Hot Key, h, w, Enter | Write the device descriptions of the input devices connected to the CON Unit into the CPU Unit. Activates the emulation of these device descriptions in the CPU Unit. |
| Hot Key, h, e, Enter | Activate the emulation of already stored device descriptions in the CPU Unit. |
| Hot Key, h, d, Enter | Deactivate the emulation of active device descriptions in the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source. |
| Hot Key, h, r, Enter | Deactivate the emulation of active device descriptions in the CPU Unit. Deletes the descriptions out of the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source. |

**NOTICE**

When using a USB combo device as a USB-HID input device, switching to a CPU Unit with activated USB-HID ghosting may cause limited functionality.

Keyboard commands are fixed to the position of the keys on the keyboard. Keyboard mapping tables may vary for country-specific layouts.

➥ E.g., press Hot Key, h, z, Enter on a French keyboard layout (AZERTY) instead of Hot Key, h, w, Enter to write the device descriptions of the input devices connected to the CON Unit into the CPU Unit and to activate the emulation of these device descriptions in the CPU Unit.

## 7.5 Configuration File

The extender module contains a configuration file (`Config.txt`) to set specific parameters and to read out device and video information. The configuration file is located on the flash drive of the extender module. The flash drive can be opened by a Mini-USB connection to a computer. The configuration file can be edited with all common text editors.

| NOTICE |
| --- |
| If the start command `#CFG` is missing or is written to the wrong place, or if parameters are not separated in extra lines, the parameterization will fail. For a successful parameterization, the following sequence must be strictly observed. |

To enter or change a parameter of an extender module, proceed as follows:

1. Connect the extender module to any source using a Mini-USB cable.
   The extender module opens a flash drive containing the `Config.txt` file.
2. Open the `Config.txt` file in a text editor.
3. Ensure that `#CFG` is written in the first line of the file.
4. Add a line break directly behind `#CFG`.
5. Add the parameter/s in capitals in the line below `#CFG` (one line per parameter).
6. Add a line break directly behind each parameter.
7. Delete everything that follows the entered parameter/s, including blanks and blank lines.
8. Save the `Config.txt` file.
9. Manually power off the extender module.
10. Power on the extender module to restart the extender module.
    The extender module starts automatically, and the extender module parameters will be rewritten in the `Config.txt` file.

**Example**

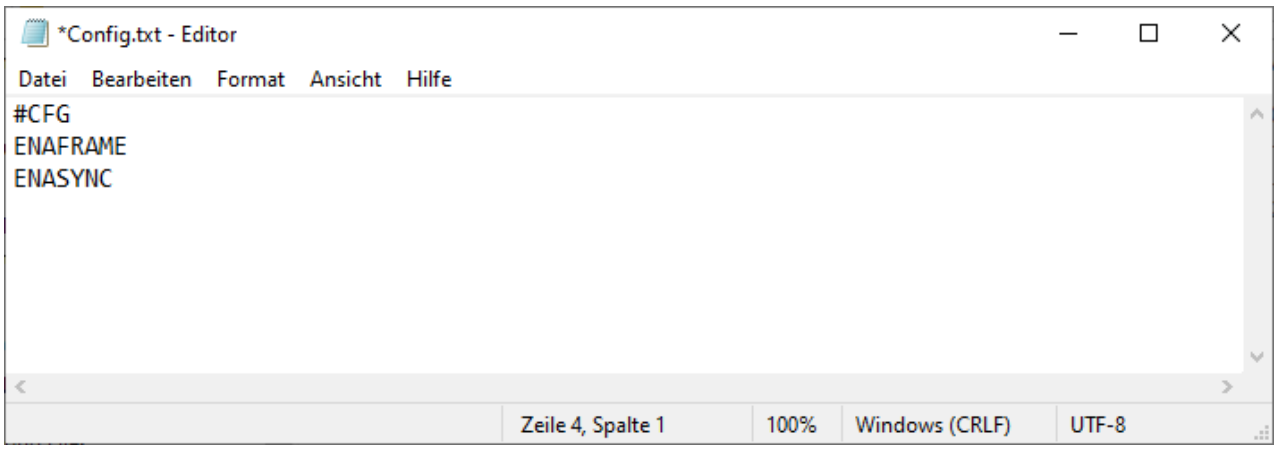



*Fig. 74 Example **Config.txt with parameters***

### 7.5.1 Parameters for CPU Units

The following parameters can be written into the configuration file of a CPU Unit. In the **Series** column is listed if there is a restriction to certain devices (e.g., L483-B2xx) or if the mentioned parameters are available for the complete series (e.g., L483/L493).

**EDID Management**

| Parameter | Function | Series |
|---|---|---|
| LOCKEDID | Activate EDID write protection | L490 |

**Digital-Audio**

Parameters available only in conjunction with additional modules for digital audio.

| Parameter | Function | Series |
|---|---|---|
| SRC32000 | Activate sample rate conversion, sample rate 32 kHz (only with digital audio add-on module) | L490 |
| SRC44100 | Activate sample rate conversion, sample rate 44.1 kHz (only with digital audio add-on module) | L490 |
| SRC48000 | Activate sample rate conversion, sample rate 48 kHz (only with digital audio add-on module) | L490 |
| SRC88200 | Activate sample rate conversion, sample rate 88.2 kHz (only with digital audio add-on module) | L490 |
| SRC96000 | Activate sample rate conversion, sample rate 96 kHz (only with digital audio add-on module) | L490 |
| SRC176400 | Activate sample rate conversion, sample rate 176.4 kHz (only with digital audio add-on module) | L490 |
| SRC192000 | Activate sample rate conversion, sample rate 192 kHz (only with digital audio add-on module) | L490 |
| SRC_NONE | Deactivate sample rate conversion (only with digital audio add-on module) | L490 |
| SRCXXXXX;X | Set a delay, enter the appropriate value X in milliseconds, both parameters separated by a semicolon, e.g., SRC32000;8<br>If this information exceeds the FIFO size, the highest possible value is set. | L490 |

**Balanced Audio**

Parameters available only in conjunction with additional modules for balanced audio.

| Parameter | Function | Series |
|---|---|---|
| SRC32000 | Activate sample rate conversion, sample rate 32 kHz (only with digital audio add-on module) | L490 |
| SRC44100 | Activate sample rate conversion, sample rate 44.1 kHz (only with digital audio add-on module) | L490 |
| SRC96000 | Activate sample rate conversion, sample rate 96 kHz (only with digital audio add-on module) | L490 |
| When using another parameter for balanced audio than the three mentioned above there will be a sample frequency of 48 kHz. | | |

**Shared Operation**

| Parameter | Function | Serie |
|---|---|---|
| KBDCON | Activate keyboard connect (only with redundant CPU Units) | L490-BPHXR/ -BPHXLR/ -BPHCXLR |
| MOUCON | Activate mouse connect (only with redundant CPU Units) | L490-BPHXR/ -BPHXLR/ -BPHCXLR |
| RELEASETIME=n* | Activate the release timer n = 0...9 seconds for mouse and keyboard connect<br>RELEASETIME=X deactivates the shared operation. | L490-BPHXR/ -BPHXLR/ -BPHCXLR |

* If no parameter for the release time has been entered for a redundant extender, the release time is 2 seconds.

## 7.5.2 Parameters for CON Units

The following parameters can be written into the configuration file of a CON Unit. In the **Series** column you can see if there is a restriction to certain devices (e.g., R483-BPxx) or if the mentioned parameters are available for the complete series (e.g., v).

**Output Settings**

| Parameter | Function | Series |
|---|---|---|
| DISEXTOSD | Deactivate extender module OSD | R490 |
| ENAFRAME | Show orange colored frame when losing extender module connection | R490 |
| ENAHOLDPIC | Show last transmitted picture highlighted by an orange-colored frame when losing connection | R490 |
| ENALOSTMR | Activate LOS timer | R490 |
| ENADDCTX | Activate EDID transmission by unplugging and connecting the monitor back to the CON Unit | R490 |
| ENAAUDIO | Enable RS232 or RS422 and analog audio during Video-only connections | R490 |
| ENATEMPOSD | Display chip temperature by OSD | R490 |
| DISPLAY2 | Show second screen of Dual-Head source by default when connected to a Single-Head CON. | R490 |

**Redundancy**

| Parameter | Function | Serie |
|---|---|---|
| DISRED | Disable Redundancy on the extender module where the parameter is set. | R490 |
| ENAREDFRAME | Enable colored (default: blue) frame in case of using the redundant extender module link | R490 |

### 7.5.3 Parameters for CPU and CON Units

The following parameters have to be written into the configuration file of both CON Unit and CPU Unit. In the **Series** column you can see if there is a restriction to certain devices (e.g., R483-BPxx) or if the mentioned parameters are available for the complete series (e.g., L483/R483).

**USB 2.0 embedded**

| Parameter | Function | Series |
|---|---|---|
| ENAUSB11 | Activate USB 1.1 mode for USB 2.0 embedded add-on modules (only with add-on module L474-/R474-BXE, not for L474-/R474-BXE2)<br>Needs to be set on CPU Unit and CON Unit, mixed configurations not supported. | L490/R490 |

**Transmission**

| Parameter | Function | Series |
|---|---|---|
| ENASYNC | Activate a synchronization impulse to adjust the pixel clock between the CPU Unit and CON Unit | L490/R490 |

### 7.5.4 Parameters for the Add-on Module 474-MODFAN

| Parameter | Function |
|---|---|
| LOWSPEED | Reduce the fan speed. Up to 40 °C, the fan LED lights up green.<br>If the temperature exceeds 40 °C, the fan runs at full speed and the fan LED lights up light blue |

The parameter must be written in lower case if the firmware version (`MODFAN.pfw`) is older than 2019-04-16.

## 7.6 Parameters for parallel Operation of redundant CPU Units

CPU Units with a redundant port for interconnect cables offer the possibility for a competing control by two connected CON Units.

Taking over control is performed using a keyboard and/or mouse. The release timer function determines the release time of the input devices at one of the CON Units after that control can be taken over from the second CON Unit.

To configure a redundant CPU Unit for the operation with two parallelly controlling CON Units, proceed as follows:

1. Connect a redundant CPU Unit to any source by using a Mini-USB connection.

   The extender module opens a flash drive containing the `Config.txt` file.
2. Open the `Config.txt` file in a text editor.
3. Ensure that #CFG is in the first line of the file.
4. Activate the release timer by writing the parameter `RELEASETIME=n` into the second line. The variable `n` defines the time in seconds and has to be replaced by the numbers 0 to 9 (e.g., `RELEASETIME=5`).

   If this parameter is not activated at all, the release time is set to 2 seconds by default. The parameter `RELEASETIME=X` deactivates the shared operation.
5. Delete everything that follows the entered parameter/s.
6. Save the `Config.txt` file.
7. Manually power off the extender module.
8. Power on the extender module to restart the extender module.

   The extender module starts automatically, and the extender module parameters will be rewritten in the `Config.txt` file.

**Example**


*Fig. 75 Example **Config.txt with parameter for sharing operation***

**NOTICE**

When using the redundant CPU Unit in combination with a KVM matrix, the function of competing control will be automatically deactivated in the extender module and will have to be configured by the KVM matrix.

# 8 Operation

## 8.1 Downloading the EDID

In the delivery state, the factory-set EDID in the CPU Unit is reported to the source. If these are not the optimal settings for the console monitor, the EDID can be loaded from the console monitor and stored in the internal memory of the CPU Unit.

On extender modules with USB-HID ports, you can load the EDID of the console monitor via keyboard command under operating conditions.

1. Enter the Hot Key to start the command mode (see chapter 5.1, page 65).

   The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing.

2. Press a to load the EDID of the console monitor into the CPU Unit.

   The screen will go black for a short time and the LEDs of the CPU Unit and CON Unit flash briefly. At the same time the command mode is closed, and the keyboard LEDs return to previous status.

3. Restart the corresponding source.

   The video mode has been readjusted. Screen quality should be optimal. The source should now show the console monitor as the current screen, together with the available video resolutions.

   If the EDID was loaded once, the EDID can be reloaded by repeating the process.

Keyboard commands are fixed to the position of the keys on the keyboard. Keyboard mapping tables may vary for country-specific layouts.

➥ E.g., press Hot Key + q on a French keyboard layout (AZERTY) instead of Hot Key + a to download the EDID of the monitor connected to the CON Unit into the CPU Unit.

## 8.2 Switching between KVM and local Input

CON Units with local input have the possibility to connect a local source.

These extender modules allow an active manual switching between the extender module connection and the local source.

When using the local KVM switch function, the add-on module L474-BXH is necessary to get USB-HID access to the local source.

The following keyboard commands are available for switching at the following devices:

| Keyboard command | Function |
|---|---|
| Hot Key, k, 1, Enter | Switch to the extender module connection 1 |
| Hot Key, l, Enter | Switch to the local source |

* For switching of redundant CON Units, see chapter 8.4, page 81.

## 8.3 Switching of Video Channels in Dual-Head Mode

CPU Units offer the possibility for a specific switching of single video channels in Dual-Head mode regarding the device compatibility and the following requirements:

- The Dual-Head CPU Unit is connected to a Dual-Head source.
- An active connection exists between the Dual-Head CPU Unit and the Single-Head CON Unit, either point-to-point or through a matrix*
- Identical connection speed (1G/3G).*

* In compliance with the compatibility requirements, see chapter 4.3.1, page 19 and chapter 4.3.2, page 20.

Switching of single video channels is executed by using the following keyboard commands at the CON Unit:

| Keyboard command | Function |
|---|---|
| Hot Key, d, 1, Enter | Switch to video channel 1 of the Dual-Head CPU Unit |
| Hot Key, d, 2, Enter | Switch to video channel 2 of the Dual-Head CPU Unit |

## 8.4 Switching of two different CPU Units via redundant CON Unit

CON Units with a redundant port for interconnect cables offer the possibility to connect two different CPU Units with different sources.

To switch a redundant CON Unit with two different CPU Units, proceed as follows:

| Keyboard command | Function |
|---|---|
| Hot Key, k, 1, Enter | Switch to the extender module connection 1 |
| Hot Key, k, 2, Enter | Switch to the extender module connection 2 |

**Point-to-point connection**

With extender modules connected directly, the switching of redundant CON Units to extender module connection 2 is not available for keyboards connected to add-on modules with USB-HID interface.

**Matrix connection**

With extender modules connected via a matrix, the switching of redundant CON Units to extender module connection 2 is also available for keyboards connected to add-on modules with USB-HID interface.

# 9 Summary of Keyboard Commands

In the following you find a summary of keyboard commands that can be used in conjunction with 483/493 extender modules and add-on modules.

Keyboard commands are fixed to the position of the keys on the keyboard. Keyboard mapping tables may vary for country-specific layouts.
Note the key position of keys when changing the keyboard layout, e.g., from QWERTZ to AZERTY with the French keyboard layout.

## 9.1 Command Mode

### 9.1.1 Starting and Exiting the Command Mode

| Keyboard command | Function |
|---|---|
| 2x Left Shift | Start the command mode (Hot Key, factory setting) |
| Esc | Exit the command mode |

### 9.1.2 Changing and Resetting the Hot Key

**Hot Key**

| Keyboard command | Function |
|---|---|
| Hot Key, c, new Hot Key code, Enter | Change the Hot Key according to the predefined Hot Key Code table. |
| Hot Key, c, 0, new Hot Key, Enter | Define a freely selectable Hot Key. |
| Right Shift + Del within 5 s after plugging in a keyboard | Reset the Hot Key back to default settings |

**Hot Key Code**

| Hot Key Code | Hot Key |
|---|---|
| 0 | Freely selectable, Esc, Del, and Enter |
| 2 | 2x Scroll |
| 3 | 2x Left Shift (default) |
| 4 | 2x Left Ctrl |
| 5 | 2x Left Alt |
| 6 | 2x Right Shift |
| 7 | 2x Right Ctrl |
| 8 | 2x Right Alt |

## 9.2 Managing of the EDID and USB-HID Ghosting

### 9.2.1 EDID

| Keyboard command | Function |
|---|---|
| Hot Key, a | Download the EDID of a monitor connected to the CON Unit into the CPU Unit. |

### 9.2.2 USB-HID Ghosting

| Keyboard command | Function |
|---|---|
| Hot Key, h, w, Enter | Write the device descriptions of the input devices connected to the CON Unit into the CPU Unit. Activate the emulation of these device descriptions in the CPU Unit. |
| Hot Key, h, e, Enter | Activate the emulation of already stored device descriptions in the CPU Unit. |
| Hot Key, h, d, Enter | Deactivate the emulation of active device descriptions in the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source. |
| Hot Key, h, r, Enter | Deactivate the emulation of active device descriptions in the CPU Unit. Deletes the descriptions out of the CPU Unit. The input devices connected to the CON Unit will be now passed transparently to the source. |

## 9.3 Switching

### 9.3.1 Switching of Sources for CON Units with local Input

| Keyboard command | Function |
|---|---|
| Hot Key, k, 1, Enter | Switch to the extender module connection 1 |
| Hot Key, l, Enter | Switch to the local source |

* For switching of redundant CON Units, see chapter 8.4, page 81.

### 9.3.2 Switching of Video Channels in Dual-Head Systems

| Keyboard command | Function |
|---|---|
| Hot Key, d, 1, Enter | Switch to video channel 1 of the Dual-Head CPU Unit (only L483-/L493-B2Hx) |
| Hot Key, d, 2, Enter | Switch to video channel 2 of the Dual-Head CPU Unit (only L483-/L493-B2Hx) |

### 9.3.3 Switching of two different CPU Units via redundant CON Unit

| Keyboard command | Function |
|---|---|
| Hot Key, k, 1, Enter | Switch to the extender module connection 1 |
| Hot Key, k, 2, Enter | Switch to the extender module connection 2 |

* Switching of redundant CON Units via a keyboard on an add-on module with USB-HID interface is only available for an extender module connection via matrix, not for a point-to-point connection, see chapter 8.4, page 81.

# 10 Maintenance

## 10.1 Maintening the Hardware

**NOTICE**

**Possible damage to the mechanical and electronic components**

The chassis contains no serviceable parts inside. If the chassis is nevertheless opened and damaged in the process, the manufacturer's warranty is voided.

The chassis, the extender modules and add-on modules as well as the accessories can be damaged by cleaning with damp or aggressive cleaning agents. If the chassis is nevertheless cleaned with damp or aggressive cleaning agents and damaged in the process, the manufacturer's warranty will be voided.

➡ DO NOT open the chassis.

➡ DO NOT open the supplied power supply unit.

➡ In case of failure, contact the supplier or manufacturer.

➡ Remove dust deposits from the device with a dry, antistatic cloth.

## 10.2 Updating the Firmware via Mini-USB Service Port

There are two possibilities to update the extender firmware via Mini-USB service port:

- Via management software (see following chapter),
- Via copy & paste (see chapter 10.2.2, page 90).

**NOTICE**

To process successful firmware updates and avoid failures:

➡ For firmware update of the extender module, use only stand-alone computers that are not integrated into the extender module setup.

➡ Ensure that the computer used for the firmware update is not set into standby mode or sleep mode during the update.

➡ Always update the firmware with firmware of the same name. The firmware of 483 and 493 series are not compatible with each other. The firmware of 1G extender modules of one series is not compatible with the firmware of 3G extender modules.

If required, the update files can be requested from the manufacturer’s technical support.

We recommend using the efficient flash update via management software. The parameters set in the `Config.txt` file are retained and the extender module is automatically updated with firmware of the same name.

**Preparation**

We recommend using a central location for firmware files, e.g., by using the management software’s option menu under **Extras > Options > Default Settings > Firmware Directory**.

### 10.2.1 Updating the Extender Firmware via Management Software

For a parallel flash update of several extender modules, proceed as follows:

- ➡ Using mini-USB cables, connect as many extender modules to USB ports on your computer running the management software as USB ports are available.
- ➡ Run the management software as often as extender modules are connected.
- ➡ Proceed as described below and select a different extender module to be updated in each running management software.

To perform a firmware update of extender modules using the management software, proceed as follows.

1. Run the management software.
2. Click **Flash Update** in the toolbar.
3. Click **Extender Update via Mini-USB flash drive**.

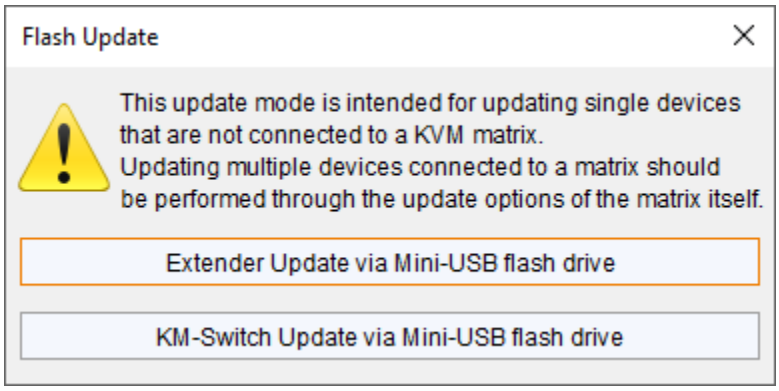



*Fig. 76 Management software **Flash Update***

The update dialog appears.

4. Connect the extender module to your computer running the management software using a Mini-USB cable.
5. Power up the extender module.
6. Click **Search Extender**.

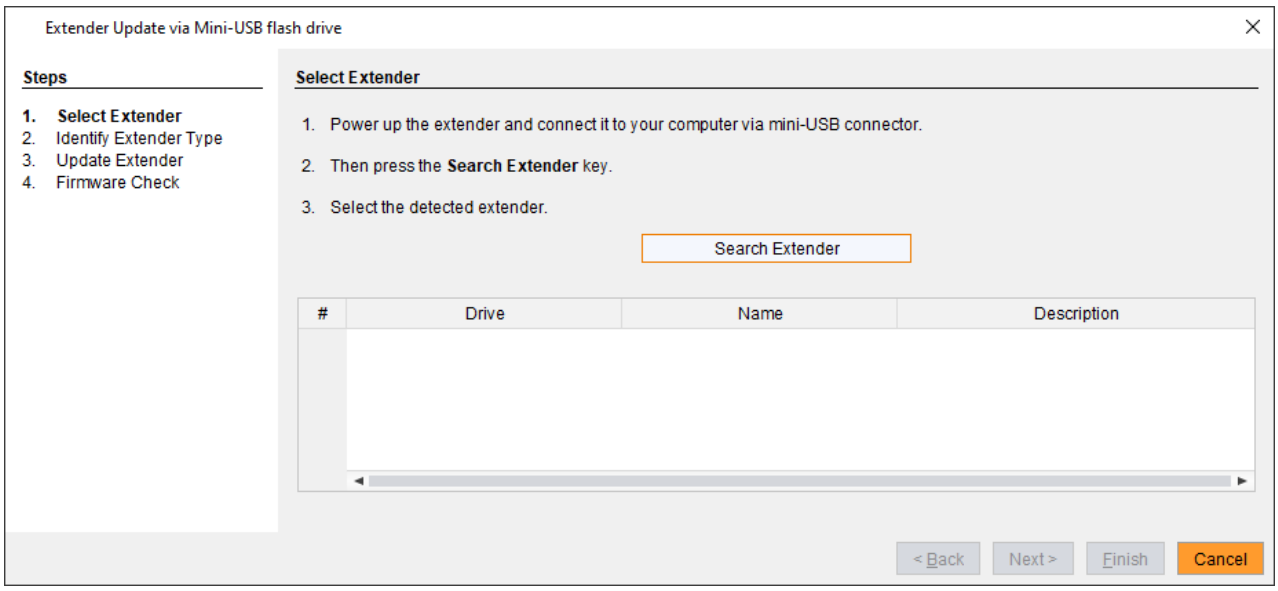



*Fig. 77 Management software **Flash Update - Search Extender***

The flash drive of the connected extender module is displayed in the drive overview.

7. Select the flash drive of the extender module to be updated.
8. Click **Next >**.

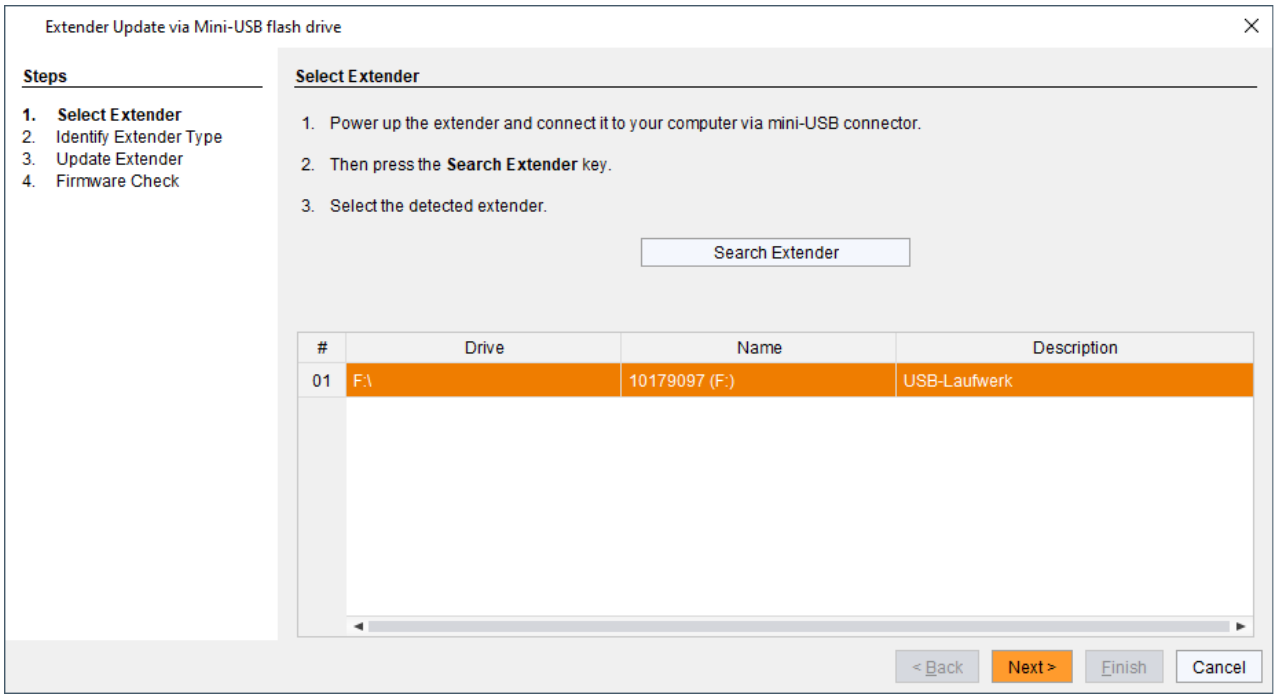



*Fig. 78 Management software **Flash Update - Select Extender***

The identification of the extender module type automatically starts.

After successful identification, the extender module specific firmware is displayed in the **Status Log** area.

9. Click **Next >** after successful identification.

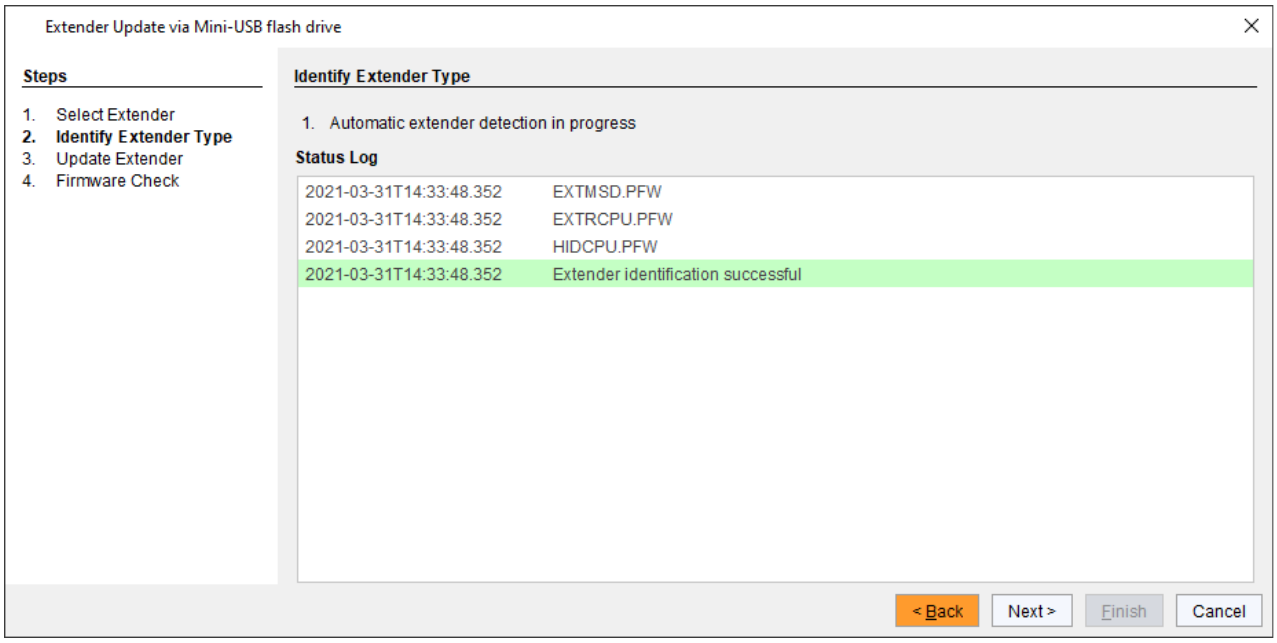



*Fig. 79 Management software **Flash Update - Identify Extender Type***

10. Click **Browse…** to go to the location the update files are saved.

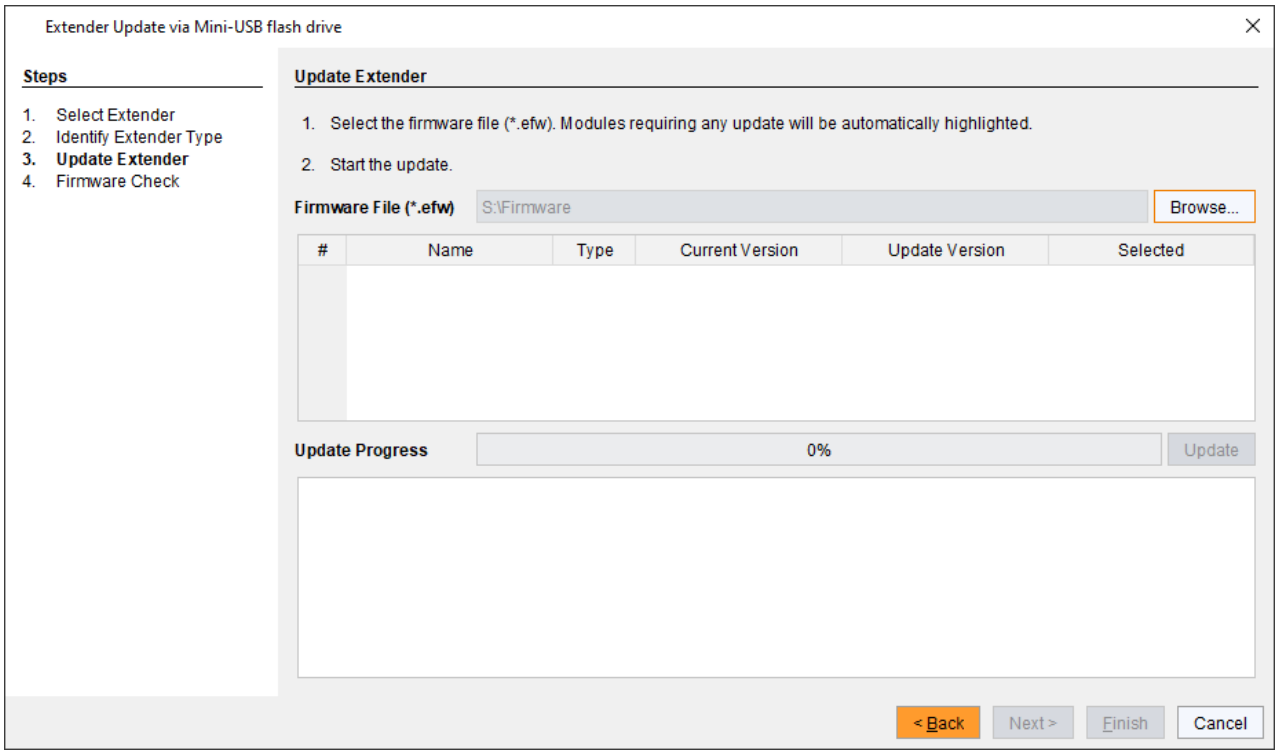



*Fig. 80 Management software **Flash Update - Update Extender - Select files***

11. Select the update files and click **Select** in the selection dialog.
    The firmware available for the extender module is displayed.
    Firmware requiring any update will be automatically highlighted.
12. Click **Update** to start the update process.

After the update of an MSD firmware, the extender module will automatically be restarted.

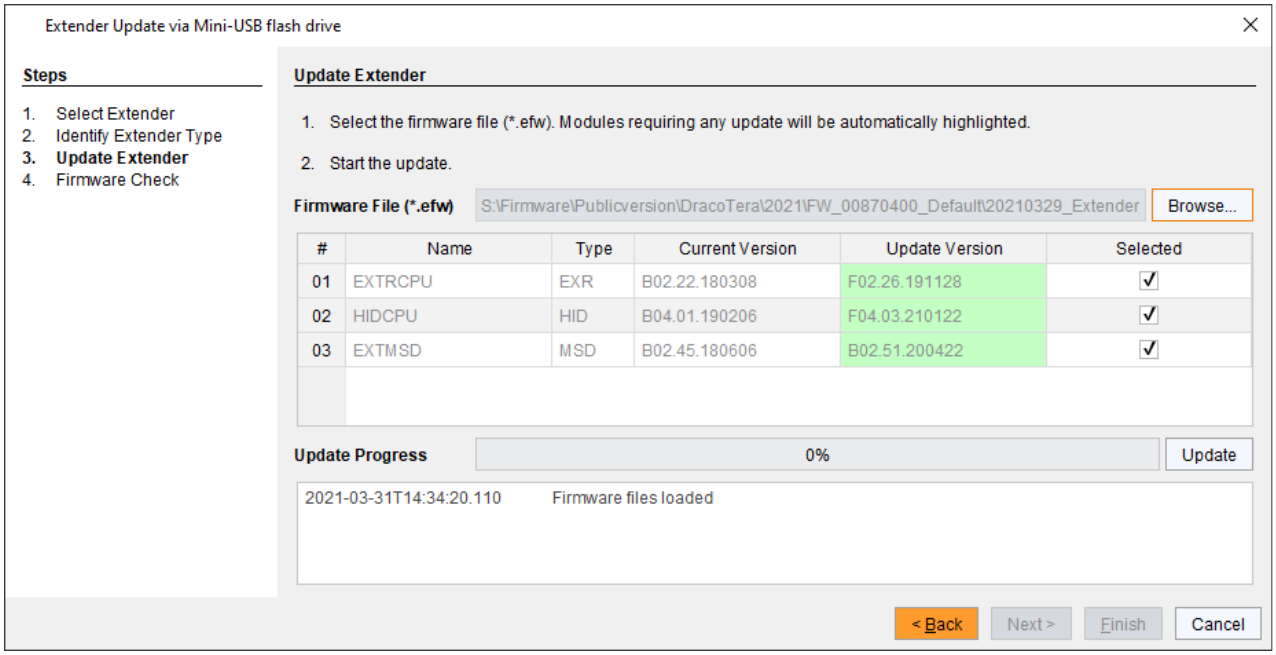



*Fig. 81 Management software **Flash Update - Update Extender - Load files***

A green highlighted message appears when the firmware update has been completed.

13. Click **Next >** to verify the update.

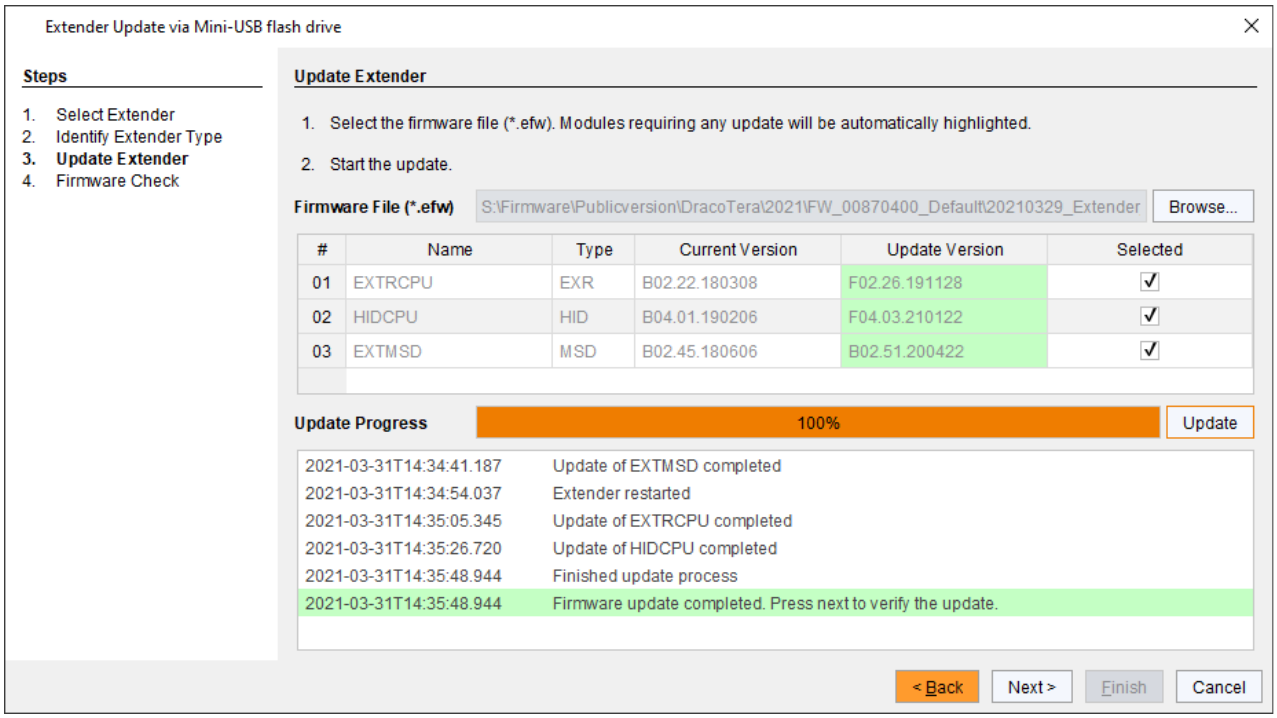



*Fig. 82 Management software **Flash Update - Update Extender - Firmware update completed***

14. Click **Next >**.
15. Manually power off the extender module.
16. Power on the extender module.

    The extender module restarts, and validation begins automatically. The completion of the validation is displayed in the **Status Log** area.

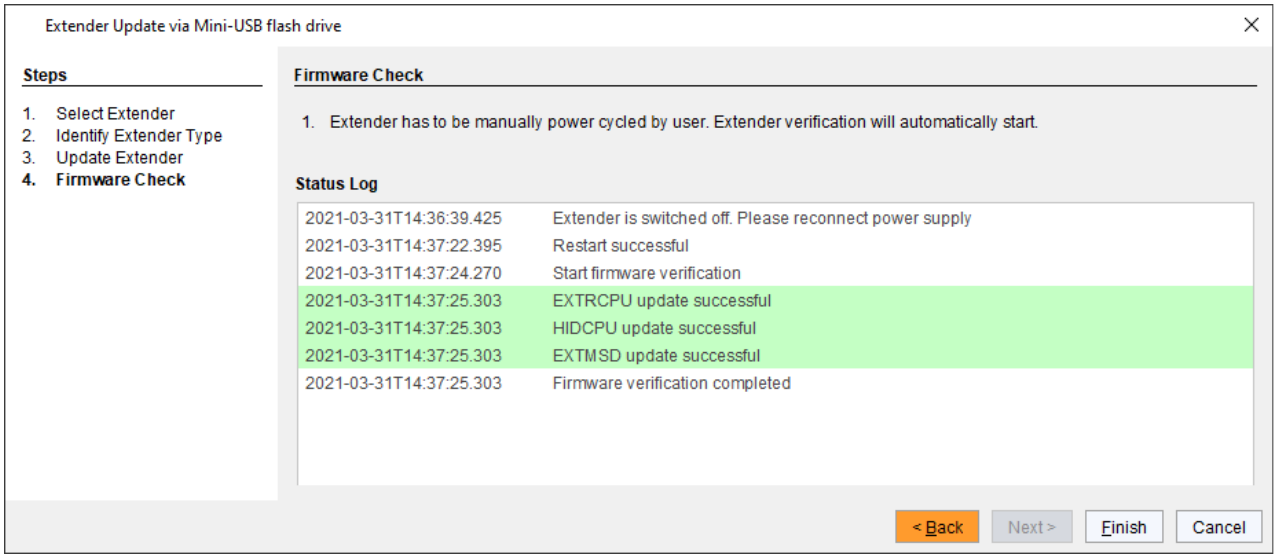



*Fig. 83 Management software **Flash Update - Firmware Check - Firmware verification completed***

17. Click **Finish**.

The firmware update of the extender module is completed.

A dialog appears offering to update another extender module.

18. Click **Yes** to update another extender module or click **No** and **Finish** to quit the Update dialog.

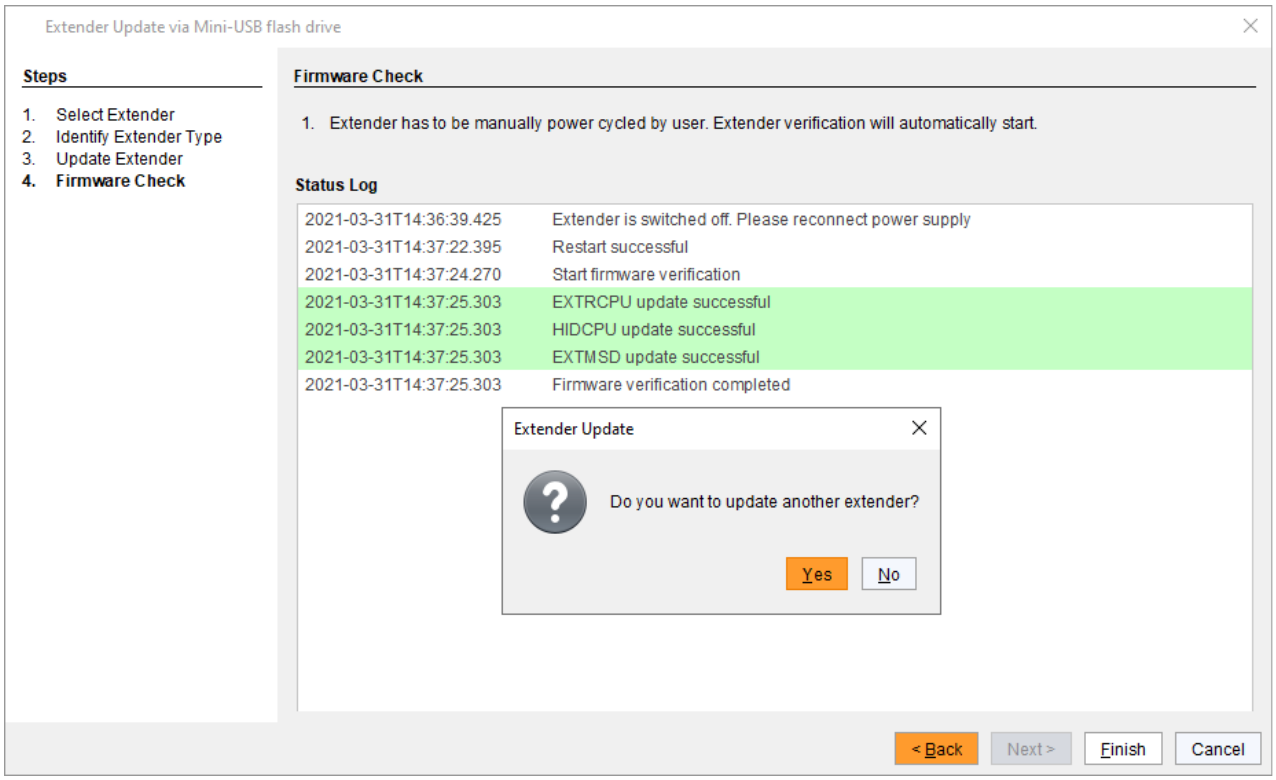



*Fig. 84 Management software **Flash Update - Firmware Check - Complete firmware update***

### 10.2.2 Updating the Firmware of Extender Modules via Copy & Paste

The extender modules can be updated via copy & paste using the Mini-USB service port of the extender modules. The firmware type is part of the file name, e.g. for the MSD firmware `EXTDZMSD.pfw` with the file extension .pfw

Updating the firmware manually via copy & paste is usually not necessary. We recommend using the efficient flash update via management software and to manually copy & paste only if a single firmware file should be updated.

In rare cases, e.g., for the xxxMSD firmware, an update may be necessary to expand the functionality of certain extender modules for specific requirements. In this case, please contact the technical support of the manufacturer in advance.

**NOTICE**

**Possible failures when updating the extender firmware**

In case the xxxMSD firmware part of an extender module requires an update, there may be dependencies between the new contents of xxxMSD firmware files and other extender firmware files. In this case, installing other firmware files before updating xxxMSD firmware files could lead to failed updates.

To proceed successful firmware updates:

- ➡ Please check the release notes of the firmware package for dependencies between the extender firmware files.
- ➡ If you got information from the manufacturer's technical support that an update of xxxMSD firmware files of a certain extender module is required, please follow the instructions in this chapter.

**NOTICE**

**Possible update failure with extender modules of the Draco vario ultra Series 493**

The extender modules of the Draco vario ultra Series 493 with firmware listed below require special handling of manual firmware updates. These firmware files cannot be overwritten: FZTDPCPU, FZTDPCON, FZVDPCPU, FZVDPCON.

- ➡ When updating an extender module of the Series 493 with one of these named firmware files, the old existing firmware has to be deleted before copying the new firmware to the extender. Even if there is the latest xxxMSD file running on the extender.

By updating an xxxMSD firmware via copy & paste, the `Config.txt` file will be overwritten. If there are parameters set in the `Config.txt` file, they are lost and have to be set again. To avoid resetting the parameters:

- ➡ Store the `Config.txt` file before updating an xxxMSD firmware and copy the stored `Config.txt` file after updating MSD firmware back to the flash drive of the extender module.

To achieve a successful firmware update, proceed as follows:

- ➡ Always update the firmware with firmware of the same name.
- ➡ Update all firmware files sequentially.
- ➡ First update the required xxxMSD firmware part. If several xxxMSD firmware parts need to be updated, update them one by one, file by file.
- ➡ If necessary, then update all other firmware files one by one, file by file.
- ➡ Wait between each copy process until the respective copy process has been completed.
- ➡ Restart the extender module after all copy processes of other firmware files have been completed.

However, if you are manually updating a single firmware part via Mini-USB service port on an extender module, we recommend updating all firmware on this extender module.

### Preserving the Parameters of the Config.txt File

To store the `Config.txt` file before updating MSD firmware, if parameters have been set, proceed as follows:

1. Connect the extender module to any source using a Mini-USB cable.
   The extender module opens a flash drive containing the `Config.txt` file.
2. Copy the `Config.txt` file from the flash drive and paste it to a local directory of the connected computer.

### Performing Firmware Updates via Copy & Paste

**NOTICE**

**Possible update failure with extender modules of the Draco vario ultra Series 493**

The extender modules of the Draco vario ultra Series 493 with firmware listed below require special handling of manual firmware updates. These firmware files cannot be overwritten: FZTDPCPU, FZTDPCON, FZVDPCPU, FZVDPCON.

➡ When updating an extender module of the Series 493 with one of these named firmware files, the old existing firmware has to be deleted before copying the new firmware to the extender. Even if there is the latest MSD file running on the extender.

To perform a manually firmware update of an extender module via copy & paste using the Mini-USB service port, proceed as follows.

1. Connect the extender module to your computer via Mini-USB cable.
   The flash drive of the extender module opens.
2. If you want to update an extender module of the 493 Series with any of the firmware mentioned above, delete all firmware contained in the flash drive of the respective extender module.
3. Navigate on your computer to the directory with the firmware update files.
4. If you got instructions from the manufacturer's technical support to update xxxMSD firmware part:
   4.1. Copy the first `xxxMSD.pfw` firmware file and paste it to the flash drive of the extender module.
   4.2. Wait until the copying process is complete.
   4.3. The extender module will be restarted after the copy process of the `xxxMSD.pfw` firmware file is completed.
   4.4. If several xxxMSD firmware parts have to be updated, copy and paste them individually. In each case, wait until the copying process has been completed and the extender module has been restarted.
5. Afterwards update the other firmware files changed if required, regarding the following steps:
   5.1. Copy additional firmware files one by one and paste it to the extender module flash drive.
   5.2. After copying each firmware file, wait until the copying process is complete.

6. Optionally: copy the stored `Config.txt` file from the local directory and paste it to the flash drive of the extender module.
7. Manually power off the extender module after copying all required firmware files.
8. Remove the Mini-USB cable from the extender module.
9. Power on the extender module.
   The extender module starts automatically with the new firmware.

### 10.2.3 Updating the Firmware of Add-on Modules

The most add-on modules can be updated via the Mini-USB service port by copy & paste.

**Add-on Modules USB 2.0**

Both CON Units and CPU Units for embedded as well as 480 Mbit/s can be updated via their own Mini-USB interface.

To update a CON USB 2.0 module (add-on or stand-alone module), proceed as follows:

1. Connect the USB 2.0 module to any source using a Mini-USB cable.
   The USB 2.0 module opens a flash drive containing the `Config.txt` file.
2. Delete the USB firmware on the flash drive.
3. Manually power off the USB 2.0 module.
4. Power on the USB 2.0 module.
   The USB 2.0 module starts automatically.
5. Copy the `REX_xx.pfw` file to the USB 2.0 module.
6. Manually power off the USB 2.0 module.
7. Power on the USB 2.0 module.
   The USB 2.0 module starts automatically with the new firmware.

To update a CPU USB 2.0 module (add-on or stand-alone module), exactly repeated this process for the CPU USB 2.0 unit with the `TEX_xx.pfw` file.

**Analog Add-on Modules**

Analog audio add-on modules cannot be field-updated via Mini-USB interface or matrix. They need to be factory programmed. However, a firmware update is usually not necessary. If you have any questions about updating add-on modules, please contact the manufacturer's technical support.

## 10.3 Resetting an Extender Module to the Factory Settings

| NOTICE |
| --- |
| If a firmware update has been carried out since the delivery, the latest installed firmware version is retained. |

To reset extender modules back to default, there are the following possibilities:

**Parameter**

1. Connect the extender module to any source using a Mini-USB cable.
   The extender module opens a flash drive containing the `Config.txt` file.
2. Delete the `Config.txt` file.
3. Manually power off the extender module.
4. Power on the extender module.
   The extender module restarts and the extender module's parameters, such as Serial No., the manufacturing p/n, and the video signal details, are written in the `Config.txt` file.

**USB-HID Ghosting**

1. Reset the USB-HID Ghosting by entering this keyboard command:
   Hot Key, h, r, Enter

**EDID**

1. Connect the extender module to any source using a Mini-USB cable.
   The extender module opens a flash drive containing the `*.bin` file.
2. Delete the `*.bin` file.
3. Manually power off the extender module.
4. Power on the extender module.
   The extender module starts automatically, and the factory EDID is restored.

# 11 Troubleshooting

## 11.1 General Failures

| Diagnosis | Possible reason | Measure |
|---|---|---|
| `Config.txt` parameter without function | Parameter not set or saved | ➡ Write the parameter into `Config.txt` file and save changes. |
| | Start command `#CFG` not set | ➡ Write the start command #CFG into first line of the `Config.txt` file. |
| | Parameter written incorrectly | ➡ Check correct spelling and capitalization. |
| | Extender module not restarted | ➡ Restart the extender module. |

## 11.2 Extender Module

### 11.2.1 Blank Screen

The LED status of the link connection is described using the redundant extender modules as an example.

**Source side (CPU module)** **Sink side (CON module)**

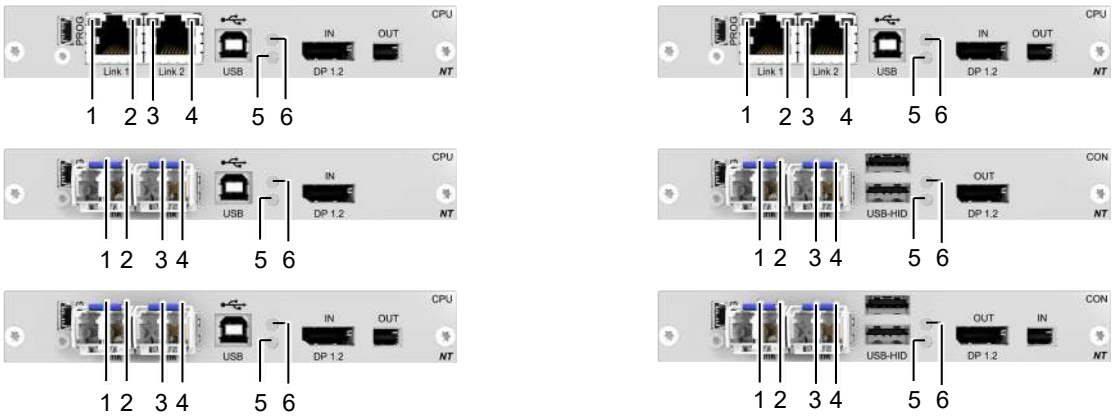



*Fig. 85 Interface side extender failure indication - Failure indication*

See also status display of the extender modules in chapter 4.17, from page 55.

| Diagnosis | Possible reason | Measure |
|---|---|---|
| All LEDs are off. | Power supply voltage not available. | ➡ Check the power supply units.<br>➡ Check the connection to the power network. |
| LED **1/3** or **2/4** are flashing. | No link connection between CON Unit and CPU Unit available. | ➡ Check the interconnect cables.<br>➡ Check the connectors. |
| **CON Unit:**<br>LED **5 and 6** flashing red/violet. | No link connection between CON Unit and CPU Unit available. | ➡ Check the interconnect cables.<br>➡ Check the connectors. |
| **CPU Unit:**<br>LED **5 and 6** light up red. | No link connection between CON Unit and CPU Unit available. | ➡ Check the interconnect cables.<br>➡ Check the connectors. |
| | No video signal detected. | ➡ Check the video cable to the source.<br>➡ Download the EDID from console monitors (see chapter 8.1, page 80).<br>Reboot source if necessary. |

| Diagnosis | Possible reason | Measure |
|---|---|---|
| **CPU Unit and CON Unit:** LED **5 and 6** light up violet. | No video signal detected. | ➡ Check the video cable to the source.<br>➡ Download the EDID from console monitors (see chapter 8.1, page 80). Reboot the source if necessary. |
| **CPU Unit:** LED **5 and 6** light up 1x red and green each. | No link connection between CON Unit and CPU Unit available. | ➡ Check the interconnect cables.<br>➡ Check the connectors. |

## 11.2.2 No USB-HID Connection

**Source side (CPU module)** **Sink side (CON module)**

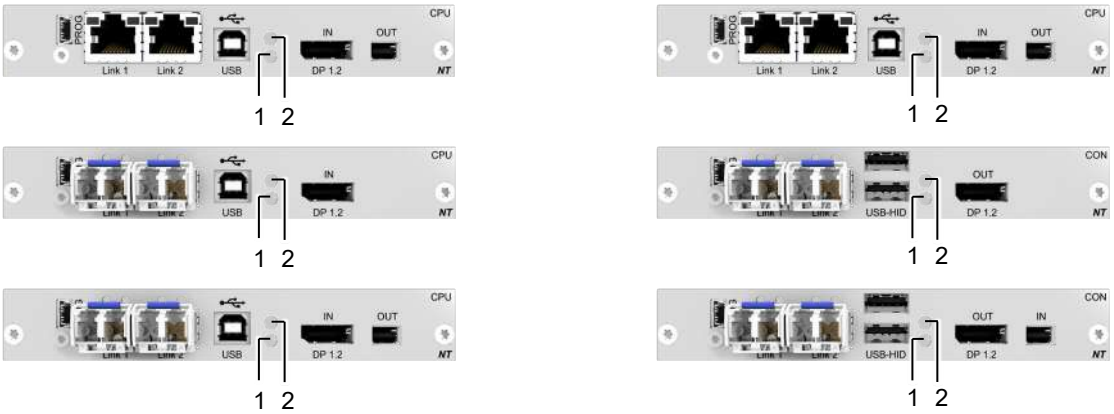



*Fig. 86 Interface side extender module USB-HID - Failure indication*

In the following, diagnoses, causes and measures are described for the case that a video signal is present.

See also status indication of the extender modules in chapter 4.17, from page 55.

In the case of shared operation of a redundant CPU Unit, control of the USB-HID devices on the non-active CON Unit can be taken over by keyboard input or mouse movement.

| Diagnosis | Possible reason | Measure |
|---|---|---|
| The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing. | The keyboard is in command mode. | ➡ Press Esc to leave the command mode.<br>➡ Or press Left Shift + Esc to leave the command mode. |

| Diagnosis | Possible reason | Measure |
|---|---|---|
| USB device without function. | No USB-HID device detected. | ➡ Check the connection of the USB-HID cable to the USB-HID device.<br>➡ Connect a USB-HID device.<br>➡ Contact your distributor if necessary. |
| | The USB-HID device is not supported. | ➡ Check the compatibility.<br>➡ New connection of the USB-HID device.<br>➡ Contact your distributor if necessary. |
| | No USB-HID connection to the source available. | ➡ Check the connection of the USB cable to the source, select another USB-HID port if necessary.<br>➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit. |
| | Problems with the USB-HID connection at the CON Unit. | ➡ Check the connection of the USB-HID cable to the USB-HID device.<br>➡ Remove the USB-HID and power cables, connect the power cable, then connect the USB cable, and restart the CON Unit. |
| **CON Unit:** LED **1** is flashing green/light blue and LED **2** is flashing red/violet (resolution > 1920 px * 1200 px). | The keyboard is in command mode. | ➡ Press Esc to leave the command mode.<br>➡ Or press Left Shift + Esc to leave the command mode. |
| | Shared operation of a redundant CPU Unit. | ➡ Move the mouse or press a key to get back USB-HID control.<br>➡ Or press Left Shift + Esc to leave the command mode. |
| **CON Unit:** LED **1** is flashing green/light blue and LED **2** is light blue (resolution ≤ 1920 px * 1200 px). | The keyboard is in command mode. | ➡ Press Esc to leave the command mode.<br>➡ Or press Left Shift + Esc to leave the command mode. |
| | Shared operation of a redundant CPU Unit. | ➡ Move the mouse or press a key to get back USB-HID control.<br>➡ Or press Left Shift + Esc to leave the command mode. |

## 11.3 Add-on Modules

### 11.3.1 Serial Interface

| Diagnosis | Possible reason | Measure |
|---|---|---|
| Serial device is not operational | Settings of the serial interface are wrong. | ➡ Check baud rate and general settings. |
| | No serial connection to the source available. | ➡ Check connection via serial cable. |
| | No serial connection to the end device (e.g., touch screen, keyboard) available. | ➡ Connect serial end device and switch it on.<br>➡ Check connection via serial cable. |
| Touchscreen is not operational | Hardware handshake | ➡ Adjust serial interface to X-ON/X-OFF software handshake. |

### 11.3.2 Add-on Module, Analog Audio

| Diagnosis | Possible reason | Measure |
|---|---|---|
| **CON Unit:**<br>No signal at audio output | No audio connection to the audio source available. | ➡ Connect an analog audio source.<br>➡ Check the connection of the audio cable between the CPU Unit and the audio source. |
| | No signal available. | ➡ Switch the analog audio source on.<br>➡ Activate the analog output at the audio source. |
| | No audio connection to the audio sink (e.g., speakers) available. | ➡ Connect an analog audio sink and switch it on.<br>➡ Check the connection of the audio cable between the CON Unit and the audio sink. |
| **CPU Unit:**<br>No signal at audio output (microphone) | No audio connection to the audio source (microphone) available. | ➡ Connect the analog audio source (microphone).<br>➡ Check the connection of the audio cable between the CON Unit and the analog audio source (microphone). |
| | No signal available. | ➡ Switch the analog audio source on.<br>➡ Activate the analog output at the audio source. |
| | No audio connection to the audio sink (e.g., computer) available. | ➡ Check the connection of the audio cable between the CPU Unit and the audio sink.<br>➡ Check the audio configuration. |

### 11.3.3 Add-on Module, Digital Audio

**CPU side (CPU module)**


**Console side (CON module)**

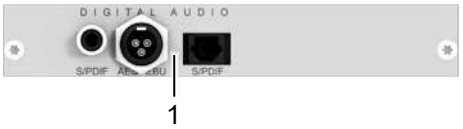
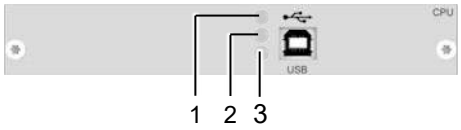



*Fig. 1 Interface side add-on module digital audio - Failure indication*

| Diagnosis | Possible reason | Measure |
|---|---|---|
| **CPU Unit:**<br>LED **1** lights up red | No audio connection to the audio source available. | ➡ Connect a digital audio source.<br>➡ Check the connection of the audio cable between the CPU Unit and the audio source. |
| | No signal available. | ➡ Switch the digital audio source on.<br>➡ Activate the digital output at CPU/audio source. |
| **CON Unit:**<br>LED **1** lights up red | No audio connection to the audio sink (e.g., speakers) available. | ➡ Connect the digital audio sink.<br>➡ Check the connection of the audio cable between the CPU Unit and the audio source. |
| | No signal available. | ➡ Check signal at CPU Unit. |
| No signal:<br>**CON Unit:**<br>LED **1** lights up green<br>**CPU Unit**:<br>LED **1** is flashing | Digital noise at the active audio source. | ➡ Check the audio format (see LED color at the CPU Unit, see chapter 4.18.1, page 58).<br>➡ Check the mute setting.<br>➡ Change the audio input. |

### 11.3.4 Add-on Module, USB-HID

**CPU side (CPU module)**




**Console side (CON module)**

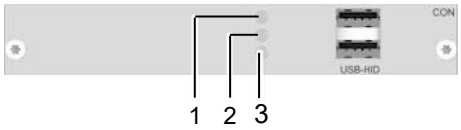
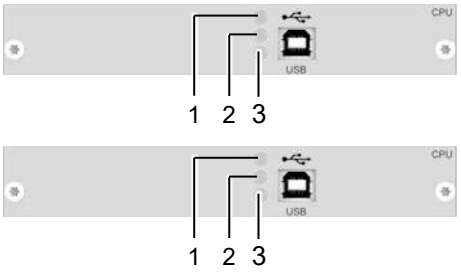



*Fig. 2 Interface side add-on module USB-HID - Failure indication*

| Diagnosis | Possible reason | Measure |
|---|---|---|
| All LEDs are off. | Power supply voltage not available. | ➡ Check the power supply units.<br>➡ Check the connection to the power network. |
| The **Caps Lock** and **Scroll Lock** LEDs on the keyboard are flashing | The keyboard is in command mode | ➡ Press Esc to leave the command mode.<br>➡ Or press Left Shift + Esc to leave the command mode. |
| USB device without function<br>**CON Unit und CPU Unit:**<br>LED **1/2** are off | No USB-HID device detected. | ➡ Check the connection of the USB-HID cable to the USB-HID device.<br>➡ Connect a USB-HID device.<br>➡ Contact your distributor if necessary. |
| | The USB-HID device is not supported. | ➡ Check the compatibility.<br>➡ New connection of the USB-HID device.<br>➡ Contact your distributor if necessary. |
| | No USB-HID connection to the source available. | ➡ Check the connection of the USB cable to the source, select another USB-HID port if necessary.<br>➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit. |
| | Problems with the USB-HID connection at the CON Unit. | ➡ Check the connection of the USB-HID cable to the USB-HID device.<br>➡ Remove the USB-HID and power cables, connect the power cable, then connect the USB cable, and restart the CON Unit. |
| **CON Unit:**<br>LED **3** is flashing slowly | No connection between CON Unit and CPU Unit | ➡ Check the interconnect cable.<br>➡ Check the connectors. |

### 11.3.5 Add-on Module, USB 2.0 embedded

**CPU side (CPU module)**




**Console side (CON module)**

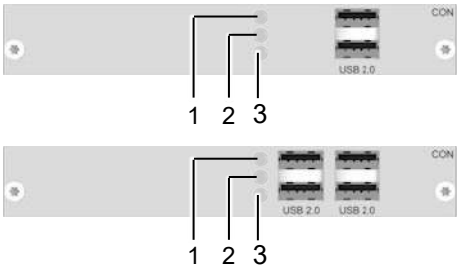



*Fig. 3 Interface side add-on module USB 2.0 embedded - Failure indication*

| Diagnosis | Possible reason | Measure |
|---|---|---|
| All LEDs are off | Power supply voltage not available. | ➡ Check the power supply units.<br>➡ Check the connection to the power network. |
| | When connecting to a matrix: no USB-HID connection available. | ➡ Exit the OSD. |
| USB 2.0 device without function. | No USB 2.0 device connected. | ➡ Check the cable to the USB 2.0 device.<br>➡ Connect a USB 2.0 device.<br>➡ Contact your distributor if necessary. |
| | The USB 2.0 device is not supported. | ➡ Check the installation of the USB 2.0 device and the necessary drivers at the CPU.<br>➡ New connection of the USB 2.0 device.<br>➡ Contact your distributor if necessary. |
| USB 2.0 device without function<br>**CPU Unit und CON Unit:**<br>LED **1 and 2** are off | No connection between CPU Unit and source available. | ➡ Check the connection of the USB cable to the source, select another USB-HID port if necessary.<br>➡ Check the connectors. |

### 11.3.6 Add-on Module/Extender Module USB 2.0 (Stand-alone)

**CPU side (CPU module)** **Console side (CON module)**


*Fig. 4 Interface side add-on module/extender module USB 2.0 (stand-alone) - Failure indication*

| Diagnosis | Possible reason | Measure |
|---|---|---|
| USB 2.0 device without function. | No USB 2.0 device connected | ➡ Check the cable to the USB 2.0 device.<br>➡ Connect a USB 2.0 device.<br>➡ Contact your distributor if necessary. |
| | The USB 2.0 device is not supported | ➡ Check the installation of the USB 2.0 device and the necessary drivers at the CPU.<br>➡ New connection of the USB 2.0 device.<br>➡ Contact your distributor if necessary. |
| | No connection between CPU Unit and source available. | ➡ Check the connection of the USB cable to the source, select another USB port if necessary.<br>➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit. |
| LED **1** flashes | Link connection failure between CON Unit and CPU Unit | ➡ Check the interconnect cable.<br>➡ Check the connectors. |
| LED **2** flashes | No connection between CON Unit and CPU Unit available | ➡ Check the interconnect cable.<br>➡ Check the connectors. |
| **CPU Unit:**<br>LED **3** lights up green | No connection between CPU Unit and source available. | ➡ Check the connection of the USB cable to the source, select another USB port if necessary.<br>➡ Remove the USB and power cables, first connect the power cable, then connect the USB cable, and restart the CPU Unit. |
| | The source is off. | ➡ Switch-on the source. |
| **CON Unit:**<br>LED **3** lights up red | No link connection between CON Unit and CPU Unit available | ➡ Check the interconnect cable.<br>➡ Check the connectors. |

## 11.4 Fan Cartridge Module


*Fig. 5 Interface side fan cartridge module - Failure indication*

| Diagnosis | Possible reason | Measure |
|---|---|---|
| LED **1** red | Fan is not operable | ➡ Check the firmware version.<br>➡ The fan is defect.<br>➡ Contact your distributor if necessary. |

# 12 Technical Data

## 12.1 Interfaces

### 12.1.1 DisplayPort 1.2

#### Upstream/Downstream

The pins of the DisplayPort sockets are assigned differently.

Upstream: data is sent (e.g., source, graphics card, video output of a device)

Downstream: data is received (e.g., sink, monitor, video input of a device

#### Video

The video interface supports the DisplayPort 1.2 standard. All signals that comply with this standard can be transmitted. This includes monitor resolutions up to 409 6x 2160 @ 60Hz. Data rate is limited to the effective bandwidth of 17.28 Gbit/s in High Bit Rate 2 (HBR2) mode. The bit depth is 30 bit (4:4:4).

#### Audio

Various audio formats can be transmitted through the interface.

| Parameter | Value |
|---|---|
| Standards | Stereo Linear Pulse Code Modulation (LPCM) |
| Bit depth | 16 to 24 bit |
| Sample rate | 32 to 192 kHz |

### 12.1.2 Mini DisplayPort 1.2

#### Upstream/Downstream

The pins of the Mini DisplayPort sockets are assigned differently.

Upstream: data is sent (e.g., source, graphics card, video output of a device)

Downstream: data is received (e.g., sink, monitor, video input of a device

#### Video

The video interface supports the DisplayPort 1.2 standard. All signals that comply with this standard can be transmitted. This includes monitor resolutions up to 4096 x 2160 @ 60Hz. Data rate is limited to the effective bandwidth of 17.28 Gbit/s in High Bit Rate 2 (HBR2) mode. The bit depth is 30 bit (4:4:4).

#### Audio

Various audio formats can be transmitted through the interface.

| Parameter | Value |
|---|---|
| Standards | Stereo Linear Pulse Code Modulation (LPCM) |
| Bit depth | 16 to 24 bit |
| Sample rate | 32 to 192 kHz |

### 12.1.3 USB-HID

Our devices with USB-HID interface support a maximum of two devices with USB-HID protocol. Each USB-HID port provides a maximum current of 100 mA.

**Keyboard**

Compatible with most USB keyboards. Certain keyboards with additional functions may require custom firmware to operate. Keyboards with an integral USB Hub (Mac keyboards e.g.) are also supported, however, a maximum of two devices are supported.

**Mouse**

Compatible with most 2-button, 3-button and scroll mice.

**Other USB-HID Devices**

The proprietary USB emulation supports certain other USB-HID devices, such as specific touch screens, graphic tablets, barcode scanners or special keyboards. However, support cannot be guaranteed for every USB-HID device. In bestimmten Fällen können solche Geräte mit spezieller Firmware betrieben werden.

**Extension**

If it is required to extend the USB-HID signals on CPU or console side (e.g., mounting requirement), the signals can be extended either via a 3.0 m A-B cable (247-U2) or a 3.0 m USB A-A extension cable (436-USB20). The compatibility to other extension cables cannot be guaranteed.

Only two USB-HID devices are supported concurrently, such as keyboard and mouse or keyboard and touch screen. A hub is allowed, but it does not increase the number of devices allowed.
To support other USB 'non-HID' devices, such as scanners, web cams or memory devices, use the USB 2.0 interfaces.

### 12.1.4 PS/2

Our devices with PS/2 interface support the use of a PS/2 keyboard and mouse.

**Keyboard**

Compatible with most PS/2 keyboards, even with various special keyboards. Certain keyboards with additional functions can be run with special firmware.

**Mouse**

Compatible with most 2-button, 3-button and scroll mice.

### 12.1.5 USB 2.0 (transparent)

The extender module with transparent USB 2.0 interface supports almost all types of USB 2.0 devices. USB 2.0 data transfer is supported with USB high speed (max. 480 Mbit/s) or USB-embedded (up to 36/50/100 Mbit/s), depending on the add-on module.

Each USB embedded port provides a maximum current of 500 mA (high power). When using a USB high speed interface with 4 USB ports, respectively 2 connectors provide a maximum of 500 mA (high power) and 2 connectors a maximum of 100 mA.

### 12.1.6 Mini-USB

The Mini-USB interface enables a customer specified communication with the extender module. The firmware could also be updated using this interface.

### 12.1.7 GPIO

An external switching solution (dry contact) with up to four buttons, each of which one associated LED can be connected to this interface. After pressing a button, the corresponding source is switched. The switching carried out is indicated on the associated LED. E.g., button 1 is assigned to the USB-B port for source 1. Max. 50 mA is supplied at the port for the power supply.

### 12.1.8 RJ45 (Interconnect)

Cat X devices offer a 2.5GBASE-T interface to establish an interconnection between Cat X devices. All four wire pairs are used in both directions. The cabling is suitable for a full duplex operation.

### 12.1.9 Fiber SFP Type LC (Interconnect)

The communication of fiber devices is performed via Gigabit SFPs that are connected to suitable fibers fitted with connectors type LC (see chapter 12.2.2, page 111).

| NOTICE |
| --- |
| The correct function of the device can only be guaranteed with SFPs provided by the manufacturer. |

| NOTICE |
| --- |
| SFP modules can be damaged by electrostatic discharge (ESD).<br>➡ Please consider ESD handling specifications. |

### 12.1.10 RS232 Serial

Extender modules with serial interface option support a full-duplex transmission with a real hardware handshake up to a baud rate of 115,200 Baud.

The CON Unit is cabled as DTE (Data Terminal Equipment, like CPU output) and can be connected directly to DCE devices (Data Communication Equipment).

- A touch screen can be connected directly to the CON Unit.
- To connect to a serial printer (or any other DTE instead of DCE device), you need a null modem cable (crossed cable) between CON Unit and the device.

**Operation of several Devices:**

The serial interface transmits 6 signals (3 for each direction). Normally, 4 of the 6 signals are handshake signals (in addition to RxD and TxD).

The following configurations can be realized using special adapter splitting cables:

- Three single 2-wire transmissions
- Two transmissions with a handshake signal
- A serial mouse and a single 2-wire transmission.

In this case, choose X-ON/X-OFF software handshake for traffic control at printer and PC.

| Parameter | Value |
|---|---|
| Connection Format | DTE (Data Terminal Equipment) |
| Speed | • Up to 19,200 Baud (L- /R474-BAx)<br>• Up to 115,200 Baud (L-/R474-BRx) |
| Data Format | Format independent |
| Data Transmission | • RxD (Receive Data)<br>• TxD (Transmit Data) |
| Traffic Control | The following signals are transmitted (hardware handshake):<br>• RTS (Request To Send)<br>• CTS (Clear To Send)<br>• DTR (Data Terminal Ready)<br>• DSR (Data Set Ready) |

### 12.1.11 RS422 Serial

Extender modules with a serial interface RS422 (D-Sub 9) support a differential full duplex transmission up to a baud rate of 115,200 Baud.

The CPU Unit is designed as controlling device and can, for example, be connected directly to video or media servers.

The CON Unit is designed as a controlled device and can be connected directly to remote controllers.

| Parameter | Value |
|---|---|
| Connection Format | Sony Standard |
| Speed | Up to 115,200 Baud |
| Data Format | Format independent |
| Data Transmission | • Rx + (Receive Data)<br>• Rx – (Receive Data)<br>• Tx + (Transmit Data)<br>• Tx – (Transmit Data) |

| NOTICE |
|---|
| The serial interface only supports one connected device per add-on module. |

## 12.1.12 Analog Audio

Extender modules with the analog audio option support a bidirectional stereo audio transmission, in near-CD quality.

The audio interface is a 'line level' interface, and it is designed to transmit the signals of a sound card (or another 'line level' device) as well as to allow the connection of active speakers to the CON Unit.

Stereo audio can be transmitted bidirectionally at the same time.

**Connection of a Microphone**

Connect the microphone to the 'audio' input of the CON Unit. There are two ways to establish this connection:

- Connect the output of the CPU Unit to the microphone input of the sound card (red).
  Adjust the sound card to provide an additional amplification (20 dB).
- Connect the output of the CPU Unit is connected to the audio input of the sound card (blue).
  Choose this connection if the microphone has its own pre-amplifier.

The CON Unit can also provide pre-amplification of a microphone. To activate the pre-amplification:

➡ Open the CON Unit.

➡ Locate the pins marked with 'MICJP' on the audio board and close the pins with a jumper.

**Specification Analog Audio**

| Parameter | Value |
|---|---|
| Transmission format | Digitized virtually CD quality audio (16 bit, 38.4 kHz) |
| Signal level | Line-Level (5 Volt Pk-Pk Maximum) |
| Input impedance | 47 kOhm |
| Output impedance | 270 kOhm |
| Connections CPU Unit | 2x 3.5 mm stereo jack plug (audio IN & audio OUT) |
| Connections CON Unit | 2x 3.5 mm stereo jack plug (audio IN & audio OUT) |

**Specification Analog Audio USB 2.0**

| Parameter | Value |
|---|---|
| Transmission Format | Digitized virtually CD quality audio, 16 bit (8/11,025/16/22,05/32/44,1/48 kHz) |
| Signal Level | Line-Level (0.43 Volt Pk-Pk maximum) |
| Input Impedance | 20 kOhm |
| Connections CPU Unit | 1x USB-B |
| Connections CON Unit | 2x 3.5 mm stereo jack plug (audio IN & audio OUT) |

### 12.1.13 Digital Audio

Extender modules with the digital audio option support the unidirectional transmission of digital audio data.

Up to three sources can be connected to the CPU Unit. The active source is transmitted. If several sources are active, the XLR signal takes priority, otherwise the first active signal.

The three connectors on the CON Unit provide concurrent digital audio.

Extender modules with the digital audio option include an inbuilt sample rate converter that provides predefined sample frequencies at the output of the CON Unit.

The user can directly set the following parameters by using a configuration file:

- Activate or deactivate the sample rate converter in the `Config.txt` file on the flash drive of the extender module. If the sample rate converter is activated, the following characteristics are valid:
  - 140 dB dynamic range,
  - 120 dB total harmonic distortion + noise.
- Set the selected sample frequency of the sample rate converter for the output by writing the parameter in a new line. The following sample frequencies are available:
  - 32,0 kHz (write **SRC32000** in the `Config.txt` file of the CPU Unit)
  - 44,1 kHz (write **SCR44100** in the `Config.txt`)
  - 48,0 kHz (write**SCR48000** in the `Config.txt` file of the CPU Unit)
  - 96,0 kHz (write**SCR96000** in the `Config.txt` file of the CPU Unit)
- You can set a delay for converting the sample rate. The time is set in milliseconds and separated from the parameter for the sample rate by a semicolon (e.g., **SRC44100;12**). You can set the following delays for the sample rates:
  - 32,0 kHz: 3 to 60 ms
  - 44,1 kHz: 2 to 44 ms
  - 48,0 kHz: 2 to 40 ms
  - 96,0 kHz: 1 to 20 ms
- To deactivate the sample rate converter, write **SRC_NONE** in the `Config.txt` file of the CPU Unit.

**Specification Digital Audio**

| Parameter | Value |
|---|---|
| Compatibility | AES/EBU, S/PDIF, EIAJ CP1201, IEC 60958 |
| Standards | Stereo Linear Pulse Code Modulation (LPCM), DTS, DTS-HD (5.1), Dolby Digital, Dolby Digital Plus (5.1) |
| Bit depth | 24 bit |
| Sample Rate | 32 to 192 kHz |
| CPU Unit (Inputs) | • Mini-XLR (AES/EBU; symmetrical, lockable)<br>• Coaxial (S/PDIF; RCA, Cinch)<br>• Optical (S/PDIF; TOSLINK) |
| CON Unit (Outputs) | • Mini-XLR (AES/EBU; symmetrical, lockable)<br>• Coaxial (S/PDIF; RCA, Cinch)<br>• Optical (S/PDIF; TOSLINK) |

### 12.1.14 Balanced Audio Interface

Extender modules with a balanced audio interface support a unidirectional 2-channel mono or 1-channel stereo transmission in studio quality.

The audio interface is at the same time a 'Line-Level' and 'Mic-Level' interface and is designed to transmit signals of a microphone or mixing desk for example with a high tolerance for interferences, even at larger distances. In addition to that you can connect active speakers at the CON Unit.

Each audio input port contains a 6.35 mm jack socket and can be used symmetrically or asymmetrically.

**NOTICE**

**Microphone connection and/or speaker connection**

To connect a microphone to the console, the CPU module with audio input must be installed in the CON Unit. If a loudspeaker is to be connected to the console, additionally a CON module with audio output is required.

#### Phantom Power of a Microphone

Phantom power is used for condenser microphones to operate the internal electronic components. The provided voltage is 48 V DC. Phantom power can only be activated on the audio input side (CPU module).

The microphone has to be connected to the audio input of the CPU module.

To activate phantom power, the switch on the CPU module has to be pressed and clicked into the pressed position.

**NOTICE**

**Damage to audio output devices from phantom power**

If audio output devices (e.g., loudspeakers) are operated with phantom power, unexpected damage can occur to the devices.

➡ Use phantom power only for microphones.

#### Pre-amplification of a Microphone

The balanced audio interface offers the possibility of a pre-amplification of a microphone at the audio input of the CPU module.

- The pre-amplification can be activated for each audio channel separately.
- To activate the pre-amplification, the dip switch (1 for the left and 2 for the right channel) of the respective audio channel has to be set to the ON position at the CPU module.
- The default pre-amplification is 10 dB.
- The pre-amplification can be configured in the `Config.txt` file of the extender module with the balanced audio CPU module. Therefore, the respective parameter **GAIN** has to be entered into a new line. The setting can be configured in single steps between 10 and 65 dB, for example:
  - 36 dB (enter **GAIN=36** in `Config.txt` file)
  - 48 dB (enter **GAIN=48** in `Config.txt` file)

### Configuration of the Sample Rate

The sample rate of the balanced audio interface can be configured individually.

- The default sample rate is 48.0 kHz.
- The sample rate can be configured in the `Config.txt` file of the extender module with the balanced audio CPU module. Therefore, the respective parameter **SRC** has to be entered into a new line. If there is not entered any parameter, the sample rate 48.0 kHz will be used. The following additional sample rates can be configured:
  - 32.0 kHz (enter **SRC32000** in `Config.txt` file)
  - 44.1 kHz (enter **SRC44100** in `Config.txt` file)
  - 88.2 kHz (enter **SRC88200** in `Config.txt` file)
  - 96.0 kHz (enter **SRC96000** in `Config.txt` file)
  - 176.4 kHz (enter **SRC176400** in `Config.txt` file)
  - 192.0 kHz (enter **SRC192000** in `Config.txt` file)

### Compatibility

Extender modules with balanced audio interface are compatible to extender modules with digital audio interface regarding the transmission of the audio standard 2-channel PCM.

- The compatibility shall be applied to the add-on module digital audio and the extender modules of the 481/491 and 483/493 series.
- The compatibility is regardless of the input or output side, this means that a digital audio input is compatible to a balanced audio output and vice versa.

### Specification Balanced Audio

| Parameter | Value |
|---|---|
| Bit depth | 24 bit |
| Sample rate | 32 to 192 kHz |
| Input signal level | Max. 6.4 dBu balanced (Gain: 0 dB)<br>Max. 0.4 dBu unbalanced (Gain: 0 dB) |
| Output signal level | 8.1 dBu (balanced)<br>2.1 dBu (unbalanced) |
| Phantom power | 48 V DC |
| Pre-amplification | 10 to 65 dB |
| CPU Unit (Inputs) | 2x 6.35 mm stereo jack plug |
| CON Unit (Outputs) | 2x 6.35 mm stereo jack plug |

## 12.2 Interconnect Cables

### 12.2.1 Cat X

**NOTICE**

**Transmission problems**

Routing over an active network component, such as an ethernet hub, switch, or router is not allowed. Operation with several patch fields is possible.

➡ Establish a point-to-point connection.

➡ Avoid routing Cat X cables along power cables.

**NOTICE**

**Exceeding the limit of the device class**

The use of unshielded Cat X cables with higher electromagnetic emissions/radiation can exceed the limit values for the specified device class.

➡ Correctly install shielded Cat X cable throughout interconnection, to maintain regulatory EMC compliance.

**NOTICE**

**Exceeding limit values for electromagnetic radiation**

The limit values for the electromagnetic radiation of the device are complied with if ferrites are mounted on both sides of all Cat X cables near the device. With installed ferrites, the devices meet the EU guidelines for electromagnetic compatibility. The operation of the devices without mounted ferrites leads to a loss of conformity with the EU directives.

➡ Mount ferrites on both sides of all Cat X cables near the device to maintain regulatory EMC compliance.

**Type of Interconnect Cable**

The extender modules require interconnect cabling specified for Gigabit Ethernet (1000BASE-T). The use of solid core (AWG24), shielded, Cat 5e (or better) is recommended.

| Type of cable | Specification |
|---|---|
| Cat X installation cable AWG24 | S/UTP (Cat 5e) cable according to EIA/TIA-568, standard 568-A or 568-B. Four pairs of wires AWG24.<br>We recommend using standard 568-A, but standard 568-B is also supported. |
| Cat X patch cable AWG26/8 | S/UTP (Cat 5e) cable according to EIA/TIA-568, standard 568-A or 568-B. Four pairs of wires AWG26/8.<br>We recommend using standard 568-A, but standard 568-B is also supported. |

The use of flexible cables (patch cables) type AWG26/8 is possible. However, the maximum possible extension distance is halved.

**Maximum Transmission Range for Video and USB-HID Signals (End-to-End Connection)**

| Type of cable | Maximum transmission range |
|---|---|
| Cat X installation cable AWG24 | 140 m (460 ft) |
| Cat X patch cable AWG26/8 | 70 m (230 ft) |

### 12.2.2 Fiber

**NOTICE**

**Transmission problems**

Routing over an active network component, such as an ethernet hub, switch, or router is not allowed. Operation with several patch fields is possible.

➡ Establish a point-to-point connection.

➡ Avoid routing Cat X cables along power cables.

**Type of Interconnect Cable***

| Type of cable | Specification |
|---|---|
| Single-mode 9 µm | • Two fibers 9 µm<br>• I-V(ZN)H 2E9 (in-house patch cable)<br>• I-V(ZN)HH 2E9 (in-house breakout cable)<br>• I/AD(ZN)H 4E9 (in-house or outdoor breakout cable, resistant)<br>• A/DQ(ZN)B2Y 4G9 (outdoor cable, with protection against rodents) |
| Multi-mode 50 µm | • Two fibers 50 µm<br>• I-V(ZN)H 2G50 (in-house patch cable)<br>• I/AD(ZN)H 4G50 (in-house or outdoor breakout cable, resistant) |

* Cable notations according to VDE

**Maximum Transmission Range for Video and USB-HID Signals (End-to-End Connection)**

**NOTICE**

**Transmission ranges when using add-on modules with transparent USB**

When using L474/R474 add-on modules with transparent USB, the binding specifications stated in the data sheets of the add-on modules apply.

| Type of cable | Bandwidth | Maximum transmission range |
|---|---|---|
| Single-Mode 9 µm | 1G | 10,000 m (32,808 ft) |
| Single-Mode 9 µm | 3G | 5,000 m (16,404 ft) |
| Multi-Mode 50 µm (OM3) | 1G/3G | 1,000 m (3,280 ft) |
| Multi-Mode 50 µm | 1G/3G | 400 m (1,312 ft) |

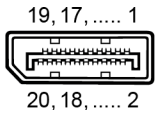
When using single-mode SFPs with multi-mode fiber optic cables, the maximum transmission range can usually be doubled.

**Type of Connector**

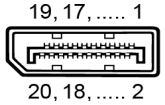
| Connector | Type |
|---|---|
| Plug-in connector | LC-Connector |

## 12.3 Connector Pinouts

### 12.3.1 DisplayPort - Upstream

| Connector | Pin | Signal | Pin | Signal |
|---|---|---|---|---|
|  | 1 | ML_Lane 0 (p) | 11 | GND |
| | 2 | GND | 12 | ML_Lane 3 (n) |
| | 3 | ML_Lane 0 (n) | 13 | CONFIG1 |
| | 4 | ML_Lane 1 (p) | 14 | CONFIG 2 |
| | 5 | GND | 15 | AUX CH (p) |
| | 6 | ML_Lane 1 (n) | 16 | GND |
| | 7 | ML_Lane 2 (p) | 17 | AUX CH (n) |
| | 8 | GND | 18 | Hot Plug Detect |
| | 9 | ML_Lane 2 (n) | 19 | Power Out Return |
| | 10 | ML_Lane 3 (p) | 20 | Power out (+3.3 V/0.5 A) |

### 12.3.2 DisplayPort - Downstream

| Connector | Pin | Signal | Pin | Signal |
|---|---|---|---|---|
|  | 1 | ML_Lane 3 (n) | 11 | GND |
| | 2 | GND | 12 | ML-LANE 0 (p) |
| | 3 | ML_Lane 3 (p) | 13 | Config1/GND |
| | 4 | ML_Lane 2 (n) | 14 | Config2/GND |
| | 5 | GND | 15 | AUX CH (p) |
| | 6 | ML_Lane 2 (p) | 16 | GND |
| | 7 | ML_Lane 1 (n) | 17 | AUX CH (n) |
| | 8 | GND | 18 | Hot Plug Detect |
| | 9 | ML_Lane 1 (p) | 19 | Power Out Return |
| | 10 | ML_Lane 0 (n) | 20 | Not connected |

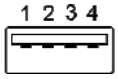
### 12.3.3 Mini-DisplayPort - Upstream

| Connector | Pin | Signal | Pin | Signal |
|---|---|---|---|---|
|  | 1 | GND | 11 | ML_Lane 1 (n) |
| | 2 | Hot Plug Detect | 12 | ML_Lane 3 (n) |
| | 3 | ML_Lane 0 (p) | 13 | GND |
| | 4 | CONFIG1 | 14 | GND |
| | 5 | ML_Lane 0 (n) | 15 | ML_Lane 2 (p) |
| | 6 | CONFIG2 | 16 | AUX_CH (p) |
| | 7 | GND | 17 | ML_Lane 2 (n) |
| | 8 | GND | 18 | AUX_CH (n) |
| | 9 | ML_Lane 1 (p) | 19 | Power Out Return |
| | 10 | ML_Lane 3 (p) | 20 | Not connected |

### 12.3.4 Mini-DisplayPort - Downstream

| Connector | Pin | Signal | Pin | Signal |
|---|---|---|---|---|
|  | 1 | GND | 11 | ML_Lane 1 (n) |
| | 2 | Hot Plug Detect | 12 | ML_Lane 0 (p) |
| | 3 | ML_Lane 3 (n) | 13 | GND |
| | 4 | CONFIG1 | 14 | GND |
| | 5 | ML_Lane 3 (p) | 15 | ML_Lane 2 (p) |
| | 6 | CONFIG2 | 16 | AUX_CH (p) |
| | 7 | GND | 17 | ML_Lane 2 (n) |
| | 8 | GND | 18 | AUX_CH (n) |
| | 9 | ML_Lane 1 (p) | 19 | Power Out Return |
| | 10 | ML_Lane 0 (n) | 20 | Power out (+3.3 V/0.5 A) |

### 12.3.5 USB, Type A

| Connector | Pin | Signal | Color |
|---|---|---|---|
|  | 1 | +5 V (DC) | Red |
| | 2 | D - | White |
| | 3 | D + | Green |
| | 4 | GND | Black |

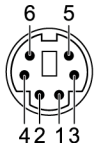
### 12.3.6 USB, Type B

| Connector | Pin | Signal | Color |
|---|---|---|---|
|  | 1 | +5 V (DC) | Red |
| | 2 | D - | White |
| | 3 | D + | Green |
| | 4 | GND | Black |

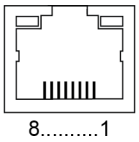
### 12.3.7 Mini-USB, Type B

| Connector | Pin | Signal | Color |
|---|---|---|---|
|  | 1 | +5 V (DC) | Red |
| | 2 | Data – | White |
| | 3 | Data + | Green |
| | 4 | Not connected | - |
| | 5 | GND | Black |

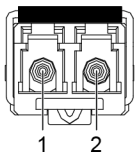
### 12.3.8 PS/2

| Connector | Pin | Signal | Pin | Signal |
|---|---|---|---|---|
|  | 1 | DATA | 5 | CLK |
| | 2 | GND | 6 | Not connected |
| | 3 | +5 V (DC) | 7 | Not connected |

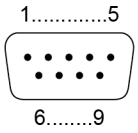
### 12.3.9 RJ45 (Interconnect)

| Connector | Pin | Signal | Pin | Signal |
|---|---|---|---|---|
|  | 1 | D1+ | 5 | D3- |
| | 2 | D1- | 6 | D2- |
| | 3 | D2+ | 7 | D4+ |
| | 4 | D3+ | 8 | D4- |

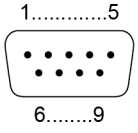
### 12.3.10 Fiber SFP Type LC

| Connector | Diode | Signal |
|---|---|---|
|  | 1 | Data OUT |
| | 2 | Data IN |

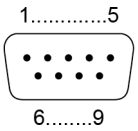
### 12.3.11 D-Sub 9 (Serial) RS232

| Connector | Pin | Signal | Color | |
|---|---|---|---|---|
|  | 1 | Not connected | 6 | DSR |
| | 2 | RxD | 7 | RTS |
| | 3 | TxD | 8 | CTS |
| | 4 | DTR | 9 | Not connected |
| | 5 | GND | - | - |

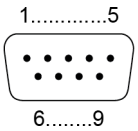
### 12.3.12 D-Sub 9 (Serial) RS422 Controlling Device

| Connector | Pin | Signal | Color | |
|---|---|---|---|---|
|  | 1 | GND | 6 | Tx-GND |
| | 2 | TxA | 7 | TxB |
| | 3 | RxB | 8 | RxA |
| | 4 | Rx-GND | 9 | Not connected |
| | 5 | Not connected | - | - |

### 12.3.13 D-Sub 9 (Serial) RS422 Controlled Device

| Connector | Pin | Signal | Color | |
|---|---|---|---|---|
|  | 1 | GND | 6 | Rx-GND |
| | 2 | RxA | 7 | RxB |
| | 3 | TxB | 8 | TxA |
| | 4 | Tx-GND | 9 | Not connected |
| | 5 | Not connected | - | - |

### 12.3.14 D-Sub 9 (GPIO)

| Connector | Pin | Channel | Control |
|---|---|---|---|
|  | 1 | 1 | OUT for LED 1, ground |
| | 2 | 1 | IN from push button 1 |
| | 3 | - | +5 V (DC) |
| | 4 | 2 | OUT for LED 2, ground |
| | 5 | 2 | IN from push button 2 |
| | 6 | 3 | OUT for LED 3, ground |
| | 7 | 3 | IN from push button 3 |
| | 8 | 4 | OUT for LED 4, ground |
| | 9 | 4 | IN from push button 4 |

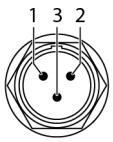
### 12.3.15 3.5/6.35 mm Stereo Jack Plug

| Connector | Pin | Signal |
|---|---|---|
|  | 1 | GND |
| | 2 | Audio IN/OUT L |
| | 3 | Audio IN/OUT R |

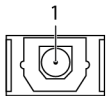
### 12.3.16 RCA (Cinch)

| Connector | Pin | Signal |
|---|---|---|
|  | 1 | GND |
| | 2 | Data IN/OUT |

### 12.3.17 Mini-XLR

| Connector | Pin | Signal |
|---|---|---|
|  | 1 | GND |
| | 2 | Data + |
| | 3 | Data - |

### 12.3.18 Toslink

| Connector | Diode | Signal |
|---|---|---|
|   | 1 | Data IN/OUT |

### 12.3.19 Power Supply Voltage

| Connector | Pin | Signal |
|---|---|---|
|   | Inside | +5 V DC |
| | Out-side | GND |

## 12.4 Power Supply Voltage, Current Draw and Power Consumption

**NOTICE**

**Overheating of the power supply units**

In case of having redundant power supply units, the maximum current must not exceed the value of one of the two power supply units due to the heat dissipation.

### 12.4.1 Power Supply Voltage of the Chassis (AC)

| Product type | Maximum current draw | Maximum voltage AC | Frequency |
|---|---|---|---|
| 474-BODY2N | 700 mA | 100 V to 240 V | 50/60 Hz |
| 474-BODY2BPF | 700 mA | 100 V to 240 V | 50/60 Hz |
| 474-BODY6R-R1 | 1,500 mA | 90 V to 264 V | 47-63 Hz |
| 474-BODY6BP* | 1,300 mA | 100 V to 240 V | 50/60 Hz |
| 474-BODY6BPF* | 1,300 mA | 100 V to 240 V | 50/60 Hz |
| 474-BODY21/4U | 4,000 mA | 1x 100 V to 240 V | 50/60 Hz |
| 474-BODY21/4UR | 4,000 mA | 2x 100 V to 240 V | 50/60 Hz |

* The 474-BODY6BP and 474-BODY6BPF chassis require a fan should the extender modules exceed a current draw of 6,000 mA. We recommend mounting the chassis fan 474-6FAN. Please refer to the mounting instructions.

### 12.4.2 Power Supply Voltage of the Chassis (DC)

| Product type | Maximum current draw | Maximum voltage DC |
|---|---|---|
| 474-BODY2 | 3,000 mA | 5 V |
| 474-BODY2R | 3,000 mA | 5 V |
| 474-BODY2N | 5,000 mA | 5 V |
| 474-BODY2BPF* | 5,000 mA | 5 V |
| 474-BODY4 | 5,000 mA | 5 V |
| 474-BODY4R | 5,000 mA | 5 V |
| 474-BODY6R-R1 | 12,000 mA | 5 V |

* The 474-BODY2BPF chassis require a fan should the extender modules exceed a current draw of 2,500 mA. We recommend mounting the chassis fan 474-6FAN. Please refer to the mounting instructions.

### 12.4.3 Current Draw of the KVM Extenders Modules, Series 490

| Product type | L490- | R490- |
|---|---|---|
| BPHX | 1,250 mA | 1,500 mA |
| BPHXR | 1,400 mA | 1,650 mA |
| BPHCXL | 1,900 mA | 2,600 mA |
| BPHCXLR | 2,100 mA | 2,800 mA |
| BPHXL | 1,400 mA | 1,650 mA |
| BPHXLR | 1,550 mA | 1,800 mA |

### 12.4.4 Current Draw and Power Consumption of the Add-on Modules (per function part)

**NOTICE**

**Exceeding the maximum permissible current draw**

In addition to the current draw of the extender modules and add-on modules, there is also the current draw of the connected peripherals.

➡ Note the maximum current draw of the chassis (see chapter 12.4, page 117 and chapter 12.4.2, page 117).

The current draw is specified here per function part of the add-on modules. Up to two function parts can be combined per add-on module, one on the left and one on the right. The current draw of the add-on modules behaves accordingly with combined function parts. E.g., the maximum current draw for CPU module L-474-BAH (analog audio with USB-HID) is 160 mA.

| | CPU module | | CON module | |
|---|---|---|---|---|
| Interface | Maximum current draw | Maximum power consumption | Maximum current draw | Maximum power consumption |
| Analog audio (RS232) | 70 mA | 0.3 W | 70 mA | 0.3 W |
| Analog audio (RS422) | 70 mA | 0.3 W | 70 mA | 0.3 W |
| Digital audio | 100 mA | 0.5 W | 100 mA | 0.5 W |
| Symmetrical audio | 500 mA | 2.3 W | 370 mA | 1.7 W |
| USB 2.0 embedded (up to 36 Mbit/s) | 90 mA | 0.4 W | 170 mA | 0.8 W |
| USB 2.0 embedded (up to 50/100 Mbit/s) | 110 mA | 0.5 W | 290 mA | 1.3 W |
| USB-HID | 90 mA | 0.4 W | 280 mA | 1.3 W |
| PS/2 | 0 mA | 0 W | 200 mA | 0.9 W |
| GPIO | - | | 10 mA | 0 W |

| Product type | Maximum current draw | Maximum power consumption |
|---|---|---|
| 474-MODFAN | 220 mA | 1.0 W |

## 12.5 Environmental Conditions and Emissions

| Parameter | Value |
|---|---|
| Operating temperature | 5 to 45 °C (41 to 113 °F) |
| Storage temperature | -25 to 60 °C (-13 to 140 °F) |
| Relative humidity | Max. 80% non-condensing |
| Operating altitude | Max. 2.500 m (7,500 ft) |
| Sound pressure level (SPL) | Max. 43 dBA per fan (474-6FAN) |
| Heat dissipation | Corresponds to power consumption in Watt (W) |

## 12.6 Dimensions

### 12.6.1 Dimensions Chassis

| Unit | Product | Dimension | Dimension of the shipping box |
|---|---|---|---|
| CPU Unit | 474-BODY2/<br>474-BODY2R | 145 x 147 x 43 mm<br>(5.7" x 5.8" x 1.7") | 253 x 194 x 113 mm<br>(10“ x 7.6“ x 4.4“) |
| | 474-BODY2N | 221 x 147 x 43 mm<br>(8.7" x 5.8" x 1.7") | |
| | 474-BODY2BPF | | |
| CON Unit | 474-BODY2/<br>474-BODY2R | 145 x 147 x 43 mm<br>(5.7" x 5.8" x 1.7") | 267 x 216 x64 mm<br>(10.5" x 8.5" x 2.5") |
| | 474-BODY2N | 221 x 147 x 43 mm<br>(8.7" x 5.8" x 1.7") | |
| | 474-BODY2BPF | | |
| CPU Unit/CON Unit | 474-BODY4/<br>474-BODY4R | 296 x 147 x 43 mm<br>(11.6" x 5.8" x 1.7") | 445 x 240 x 110 mm<br>(17.5“ x 9.4“ x 4.3“) |
| | 474-BODY6R-R1 | 444 x 147 x 43 mm<br>(17.5" x 5.8" x 1.7") | |
| | 474-BODY6BP/<br>474-BODY6BPF | 444 x 270 x 43 mm<br>(17.5" x 10.6" x 1.7") | 545 x 368 x 143 mm<br>(21.5" x 14.8" x 5.6") |
| | 474-BODY21/4U<br>474-BODY21/4UR | 482 x 462 x 176 mm<br>(19.0" x 18.2" x 6.9") | 630 x 560 x 340 mm<br>(24.8" x 22.0" x 13.4") |

### 12.6.2 Dimensions Extender Modules and Add-on Modules

| Device | Dimension |
|---|---|
| Extender Modules | 128.6 x 20 x 145 mm (5.1" x 0.8" x 5.7") |
| Add-on Modules | 128.6 x 20 x 145 mm (5.1" x 0.8" x 5.7") |

## 12.7 Weight of the Chassis

The following table contains the weight when the respective chassis is fully equipped, for both the CPU Unit and the CON Unit.

| Chassis | Weight | Weight inclusive shipping box**** |
|---|---|---|
| 474-BODY2/<br>474-BODY2R'* | 0.7 kg (1.5 lb) | 2.5 kg (5.5 lb) |
| 474-BODY2N | 1.1 kg (2.4 lb) | 2.9 kg (6.4 lb) |
| 474-BODY2BPF** | 1.3 kg (2,9 lb) | 3.1 kg (6.8 lb) |
| 474-BODY4/<br>474-BODY4R* | 0.9 kg (2.0 lb) | 3.4 kg (7.5 lb) |
| 474-BODY6R-R1* | 1.9 kg (4.2 lb) | 5.1 kg (11.2 lb) |
| 474-BODY6BP/<br>474-BODY6BPF | 2.5 kg (5.5 lb) | 3.5 kg (7.7 lb) |
| 474-BODY21/4U<br>474-BODY21/4UR*** | 10.0 kg (22.1 lb) | 14.5 kg (32.0 lb) |

* Plus 0.2 kg (0.4 lb) with redundant AC power supply unit.

** Plus 0.27 kg (0.6 lb) with redundant AC power supply unit.

*** Plus 1.34 kg (3 lb) with redundant DC power supply unit.

**** Plus, up to 0.2 kg (0.4 lb) for each cable included in the shipping boxes for CON Units depending on the order.

## 12.8 MTBF

Specific MTBF values (mean time between failure) can be requested from the manufacturer’s technical support if required.

# 13 Technical Support

Prior to contacting support, please ensure you have read this manual, and then installed and set-up your KVM extender as recommended.

## 13.1 Support Checklist

To efficiently handle your request, it is necessary that you complete a support request checklist (Download). Please ensure that you have the following information available before you call:

- Company, name, phone number and email,
- Type and serial number of the device (see bottom of the device),
- Date and number of sales receipt and name of your distributor if necessary,
- Issue date of the existing manual,
- Nature, circumstances, and duration of the problem,
- Components included in the system (such as graphic source/CPU, OS, graphic card, monitor, USB-HID/USB 2.0 devices, interconnect cable) including manufacturer and model number,
- Results from any testing you have done.

## 13.2 Shipping Checklist

1. To return your device, you need an RMA number (Return-Material-Authorization). Therefore, please contact your distributor.
2. Package your devices carefully. Add all pieces which you received originally. Preferably use the original box.
3. Note your RMA number visibly on your shipment.

Devices that are sent in without an RMA number will not be accepted. The shipment will be sent back without being opened; postage unpaid.

# 14 Certificates/Directives

## 14.1 North American Regulatory Compliance

This equipment has been found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Shielded cables must be used with this equipment to maintain compliance with radio frequency energy emission regulations and ensure a suitably high level of immunity to electromagnetic disturbances.

All power supplies are certified to the relevant major international safety standards.

## 14.2 Product Safety

The product safety of the following devices is proven by the compliance to the listed standards.

| Type | Standards |
|---|---|
| 474-BODY2BPF<br>474-BODY6BP<br>474-BODY6BPF | • IEC 62368-1:2014<br>• EN 62368-1:2014/A11:207<br>• UL 62368-1:2014<br>• CAN/CSA-C22.2 No. 62368-1:2014 |
| 474-BODY2N<br>474-BODY6R<br>474-BODY21/4U | • EN 60950-1/A12:2011<br>• IEC 60950-1/A1:2010<br>• UL 60950-1-2007<br>• CAN/CSA-C22.2 No. 60950-1:2007 |

The compliance to the standards is verified and confirmed by TÜV Süd, Germany.

## 14.3 WEEE

The manufacturer complies with the EU Directive 2012/19/EU on the prevention of waste electrical and electronic equipment (WEEE).

The device labels carry a respective marking.

# 15 Glossary

The following terms are commonly used in this manual or in video and KVM technology.

| Term | Description |
|---|---|
| AES/EBU | Interface specification for the transmission of digital stereo, two-channel or mono audio signals between different devices according to the AES3 standard |
| Cat X | Any Cat 5e (Cat 6, Cat 7) cable |
| CON Unit | Component of a KVM extender module or Media Extender to connect to the console (monitor(s), keyboard, and mouse; optionally also with USB 2.0 devices) |
| Console | Keyboard, mouse, and monitor |
| CPU Unit | Component of a KVM extender module or Media Extender to connect to a source |
| DDC | Display Data Channel (DDC) is a serial communication interface between monitor and source. DDC enables data exchange via monitor cable and an automatic installation and configuration of a monitor driver by the operating system. |
| DisplayPort | A VESA standardized interface for an all-digital transmission of audio and video data. The signals have LVDS level. |
| Dual-Head | A system with two video connections |
| EDID | Extended Display Identification Data (EDID) is a metadata format (128 Byte) for display devices to describe their capabilities to a video source (e.g., graphics card). |
| Fiber | Single-mode or multi-mode fiber cables |
| KVM | Keyboard, video and mouse |
| LPCM | LPCM (Linear Pulse Code Modulation) is a pulse modulation method, also known as an uncompressed data format. The LPCM method is used for converting analog audio into digital audio with evenly large value ranges. |
| Mini-DisplayPort | A VESA standardized interface for an all-digital transmission of audio and video data. The signals have LVDS level. |
| Mini-XLR | Industrial standard for electrical plug connections (3 pole) for the transmission of digital audio and control signals |
| MTBF | Mean Time Between Failure (MTBF) is measured in power-on hours and describes the system reliability. |
| Multi-Mode | 50 µm multi-mode fiber cable or 62.5 µm multi-mode fiber cable |
| RCA (Cinch) | A non-standard plug connection for transmission of electrical audio and video signals, especially with coaxial cables |
| S/PDIF | Interface for electrical or optical transmission of digital stereo audio signals between different devices used in consumer electronics. |

| Term | Description |
|---|---|
| SFP | SFPs (Small Form Factor Pluggable) are pluggable interface modules for Gigabit connections. SFP modules are available for Cat X and fiber cables. |
| Single-Head | A system with one video connection |
| Single-Mode | 9 µm single-mode fiber cable |
| TOSLINK | Standardized fiber connection system for digital transmission of audio signals (F05 plug connection) |
| USB-HID | USB-HID devices (Human Interface Device) allow users to interact with computers. There is no need for a special driver during installation. When connecting, the message “New USB-HID device found” is reported.<br>Typical USB-HID devices include keyboards, mice, graphics tablets and touch screens. Storage, video, and audio devices are not USB-HID devices. |

# 16 Table of Figures

# 17 Change Log

This table offers an overview about the most important changes available, such as new functions, changed configuration or operation.

| Edition | Date | Firmware version | Software version | Chapter | New functions/changes |
|---|---|---|---|---|---|
| REV01.00 | 2022-01-07 | Latest version | V4.0.2.0, 2021-04-19 | - | Initial user manual in new format, generally actualized content |