Draco vario IP CPU

488 Series

KVM Extender

User Manual

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Contents

1 About This Manual

1.1 Scope

This manual describes how to install your KVM Extender, how to operate it and how to perform trouble shooting.

1.2 Validity

This manual is valid for all devices listed on the front page. The product code is printed on the base of the devices.

1.3 Cautions and Notes

The following symbols are used in this manual:

This symbol indicates an important operating instruction that should be followed to avoid any potential damage to hardware or property, loss of data, or personal injury.

This symbol indicates important information to help you make the best use of this product.

This symbol indicates best practice information to show recommended and optimal ways to use this product in an efficient way.

2 Safety Instructions

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

Installation

- ➔ Only use in dry, indoor environments.
- ➔ Only use the device according to this User Manual. Failure to follow these procedures could result in damage to the equipment or injury to the user or installer.
- ➔ The KVM Extender and the power supply units can get warm. Do not install components in an enclosed space without any airflow.
- ➔ Do not place the power supply directly on top of the device.
- ➔ Do not obscure ventilation holes.
- ➔ Only use power supplies originally supplied with the product or manufacturer-approved replacements. Do not use a power supply if it appears to be defective or has a damaged chassis.
- ➔ Connect all power supplies to grounded outlets. In each case, ensure that the ground connection is maintained from the outlet socket through to the power supply's AC power input.
- ➔ Do not connect the link interface to any other equipment, particularly network or telecommunications equipment.
- ➔ Take any required ESD precautions.

In order to disconnect the device completely from the electric circuit, all power cables have to be removed.

Repair

- ➔ Do not attempt to open or repair a power supply unit.
- ➔ Do not attempt to open or repair the KVM Extender. There are no user serviceable parts inside.
- ➔ Please contact your dealer or manufacturer if there is a fault.

3 Description

3.1 Application

The KVM Extender is used to increase the distance between a source (computer, CPU) and its console (keyboard, mouse, and other peripheral devices).

The KVM Extender is designed for use with Cat X (Twisted Pair) interconnect cables or fiber interconnect cables.

The KVM Extender with Cat X interconnect cables is unsuitable for connection between buildings where a fiber optic based product should be used instead.

The KVM Extender with fiber interconnect cables can also be used with applications in environments which are subject to electromagnetic interference. Electromagnetic interference can limit the maximum distance and reliability of operation.

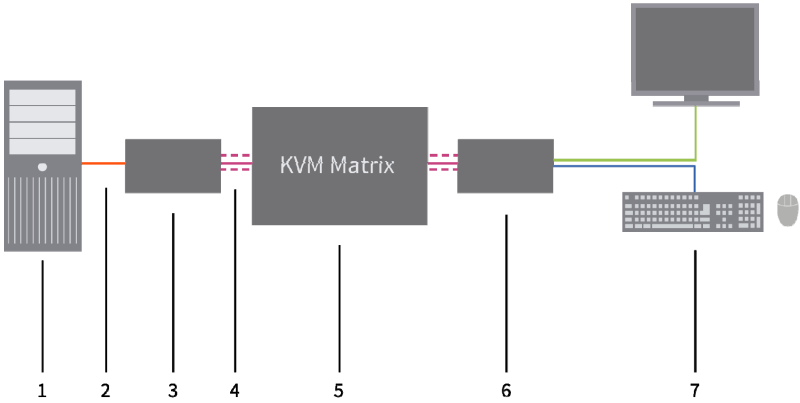
3.2 System Overview

The KVM Extender consists of at least one IP CPU module and one CON module. The various modules are summarized respectively in a vario chassis (2-fold, 4-fold or 6-fold) at CPU site and CON site (CPU and CON Unit).

The IP CPU module is connected the source (computer, CPU) via TCP/IP network cable.

The CON module is connected to the console (monitor, keyboard and mouse).

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



System Overview

1 Source (computer, CPU)
2 TCP/IP network cable
3 KVM Extender IP CPU Unit
4 Interconnect cable
5 KVM Matrix
6 KVM Extender CON Unit
7 Console (monitor, keyboard, mouse)

See Chapter 4.3, Page 27 for installation examples.

3.3 Product Range

3.3.1 Part Numbers

Part numbers for Connections via Cat X or Fiber Cable

All devices are available in the following versions:

- Connection via Cat X cable (x = "C")
- Connection via Single-mode fiber cable (x = "S")

Fiber devices can be used with Multi-mode and Single-mode cables (see Chapter 7.2.2, Page 45).

Part numbers for CPU Unit and CON Unit

The part numbers for the CPU Unit and the CON Unit can be derived from the part number of the complete device.

- CPU Unit: **L**488
- CON Unit: **R**488

All devices in the K488 series are technically compatible with devices in the K47x and K48x series.

3.3.2 Chassis

Model	Description
474-BODY2	Empty chassis for up to 2 boards, 1x external power supply unit
474-BODY2R	Empty chassis for up to 2 boards, 1x external power supply unit, preparation for redundancy for a second power supply unit (external)
474-BODY2N	Empty chassis for up to 2 boards, 1x internal power supply unit, preparation for redundancy for a second power supply unit (external)
474-BODY4	Empty chassis for up to 4 boards, 1x external power supply unit
474-BODY4R	Empty chassis for up to 4 boards, 1x external power supply unit, preparation for redundancy for a second power supply unit (external)
474-BODY6R	Empty chassis for up to 6 boards, 1x internal power supply unit, preparation for redundancy for a second power supply unit (external)

Model	Description
474-BODY6BP	Empty chassis for up to 6 boards, active backplane, 2x internal power supply unit (redundancy)
474-BODY6BPF	Empty chassis for up to 6 boards, active backplane, 2x internal power supply unit (redundancy) with connectors on rear side
474-BODY21/4U	Empty chassis for up to 21 boards, 1x internal power supply unit, preparation for redundancy for a second power supply unit (internal)

3.3.3 KVM Extender Modules

Model	Description
L488-BIPEx	Single-Head IP CPU extender module for 1x Single Link (up to 1920x1200), 2x USB-HID and 2x USB 2.0 embedded
L488-BIPExR	Single-Head IP CPU extender module for 1x HDMI Single Link (up to 1920x1200) with 2x USB-HID, USB 2.0 embedded and redundant connector for interconnect cables

3.3.4 Monitoring Modules

Model	Description
474-SNMP	SNMP module for monitoring of extenders in the chassis 474-BODY6BP/F and 474-BODY21

3.4 Accessories Upgrade Kits

Model	Description
474-2RMK	19"/1U rack mount kit for 2-fold chassis
474-2NRMK	19"/1U rack mount kit for 2-fold chassis with internal PSU
474-4RMK	19"/1U rack mount kit for 4-fold chassis
474-6RMK	19"/1U rack mount kit for 6-fold chassis
474-VPLATE	Fastening strips for screw or snap on for 2-, 4- and 6-fold chassis
474-BRACKET	Mounting bracket with screws for 2-, 4- and 6-fold chassis
474-OPTRED	Retrofitting for redundant power supply option (without power supply) for 2- and 4-fold chassis
474-PSU2	Power supply for 2-fold chassis (spare or redundancy)
474-PSU4	Power supply for 4-fold chassis (spare or redundancy)
474-PSU6	Power supply for 6-fold chassis (spare or redundancy)
474-PSU21	Power supply for 6-fold-chassis (spare or redundancy)
474-BLND1	Blind plate 3U/4HP for 2-, 4- and 6-fold chassis
474-BLND2	Blind plate 3U/8HP for 2-, 4- and 6-fold chassis
474-6FAN	Fan option for chassis 474-BODY6BP/F

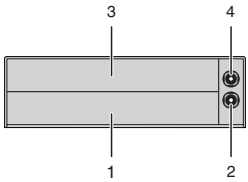
3.5 Accessories

Model	Description
026-2A	Serial cable 1.8 m (RS232)
247-U1	USB cable 1.8 m (Type A to B)
260-5G	International power supply unit 100...240VAC / 5VDC / 3 A
260-5U	International power supply unit 100...240VAC / 5VDC / 4 A
436-AA	VGA cable 1.8 m (VGA to DVI-I)
436-HD	HDMI cable 1.8 m (DVI-D)
436-DVHD	Adapter DVI-D male to HDMI female
445-2H	DVI-D splitter cable
455-CK	Stereo jack cable 1.6 m (3.5 mm Stereo)
455-CR	RCA cable 2.5 m (Cinch male connector)
455-CT	TOSLINK cable 1.8 m (F05 male connector)
455-CX	Mini-XLR cable 1.8 m (3 pole)
474-IECLOCK	IEC connection cable for power supply lockable

3.6 Device Views

3.6.1 2-fold Vario Chassis 474-BODY2/2R

CPU and CON Unit



Rear View

1 Slot for modules #1

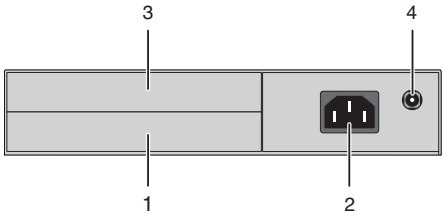
2 Connect to 5VDC power supply (standard)

3 Slot for modules #2

4 Connect to 5VDC power supply (redundancy, optional)

3.6.2 2-fold Vario Chassis 474-BODY2N

CPU and CON Unit



Rear View

1 Slot for modules #1

2 Connect to power supply (standard)

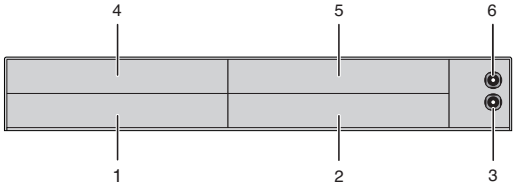
3 Slot for modules #2

4 Connect to 5VDC power supply (redundancy)

The 2-fold vario chassis with an internal power supply is not equipped with a fuse on its primary side. Therefore the protection against excessive currents has to be provided by the electrical installation of the building.

3.6.3 4-fold Vario Chassis 474-BODY4/4R

CPU and CON Unit



Rear View

1 Slot for modules #1

2 Slot for modules #3

3 Connect to 5VDC power supply (standard)

4 Slot for modules #2

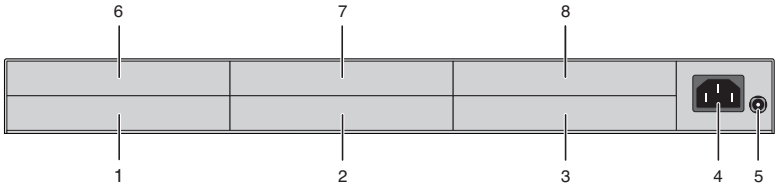
5 Slot for modules #4

6 Connect to 5VDC power supply (redundancy, optional)

For operation with three KVM Extender CON modules and a USB 2.0 CON module in a 4-fold vario chassis, an external power supply has to be connected to the second 5VDC power supply for proper operation. In this case, redundancy is inapplicable.

3.6.4 6-fold Vario Chassis 474-BODY6R

CPU and CON Unit



Rear View

1 Slot for modules #1

2 Slot for modules #3

3 Slot for modules #5

4 Connect to power supply (standard)

5 Connect to 5VDC power supply (standard)

6 Slot for modules #2

7 Slot for modules #4

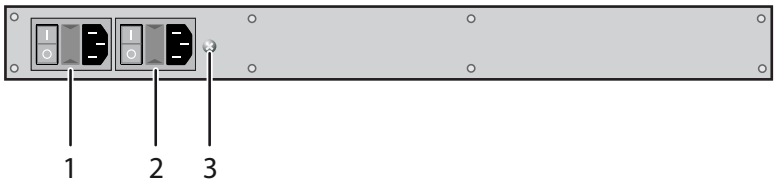
8 Slot for modules #6

For operation with KVM Extender modules in a 6-fold vario chassis, two power supplies are necessary. In this case, redundancy is inapplicable.

The 6-fold vario chassis is not equipped with a fuse on its primary side. Therefore the protection against excessive currents has to be provided by the electrical installation of the building.

3.6.5 6-fold Vario Chassis 474-BODY6BP

CPU and CON Unit

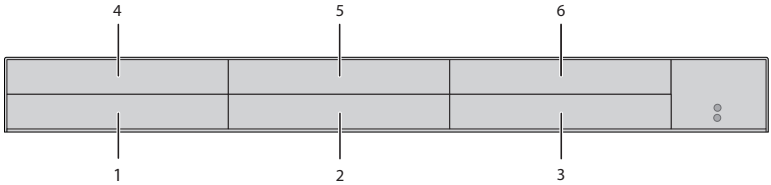


Front View

1 Connect to power supply 1

2 Connect to power supply 2 (redundancy)

3 Grounding



Rear View

1 Slot for modules #5

2 Slot for modules #3

3 Slot for modules #1

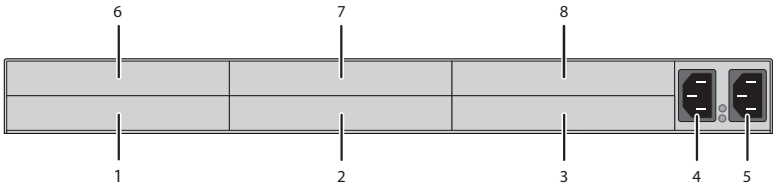
4 Slot for modules #6

5 Slot for modules #4

6 Slot for modules #2

3.6.6 6-fold Vario Chassis 474-BODY6BPF

CPU and CON Unit

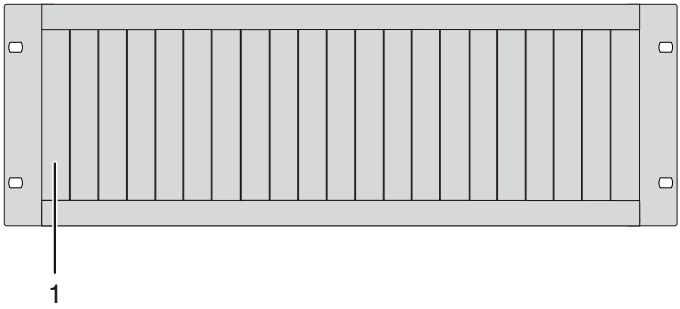


Rear View

1 Slot for modules #1
2 Slot for modules #3
3 Slot for modules #5
4 Connect to power supply 1
5 Connect to power supply 2 (redundancy)
6 Slot for modules #2
7 Slot for modules #4
8 Slot for modules #6

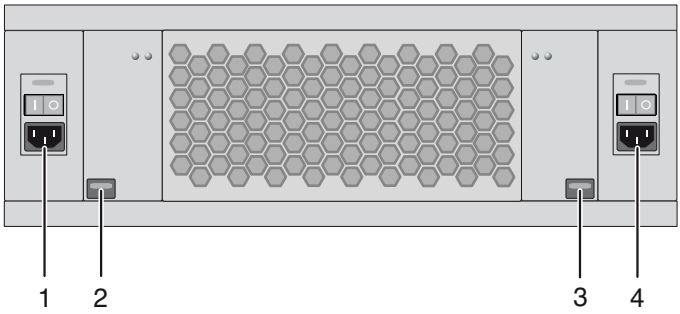
3.6.7 21-fold Vario Chassis 474-BODY21R

CPU and CON Unit



Rear View

1 Slots for modules #1 - #21



Front View

1 Connect to power supply 2 (optional)

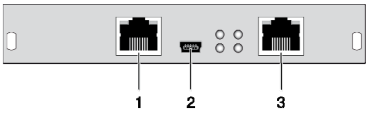
2 Locking for power supply 2 (optional)

3 Locking for power supply 1 (standard)

4 Connect to power supply 1

3.6.8 Model L488-BIPEC / -BIPECR

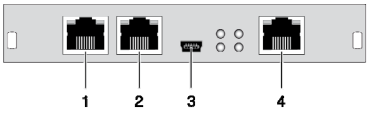
CPU Module



Rear View

1 Connect to interconnect cable
2 Service port
3 To CPU: TCP/IP network

CPU Module

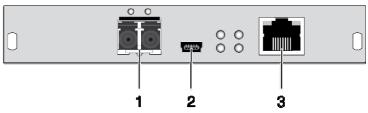


Rear View

1 Connect to interconnect cable 1
2 Connect to interconnect cable 2
3 Service port
4 To CPU: TCP/IP network

3.6.9 Model L488-BIPES / -BIPESR

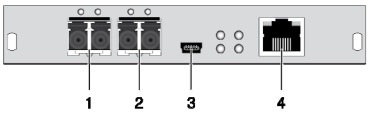
CPU Module



Rear View

1 Connect to interconnect cable
2 Service port
3 To CPU: TCP/IP network

CPU Module

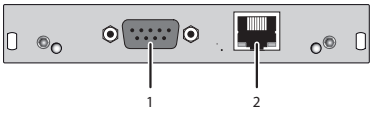


Rear View

1 Connect to interconnect cable 1
2 Connect to interconnect cable 2
3 Service port
4 To CPU: TCP/IP network

3.6.10 Model 474-SNMP

Control Unit



Rear View

1 Connect to serial (D-Sub 9)

2 Connect to network (RJ45)

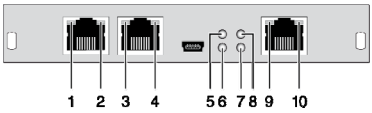
The 474-SNMP module can be only used with the chassis 474-BODY6BP/F and 474-BODY21 with a production date later than March 2014.

3.7 Status LEDs

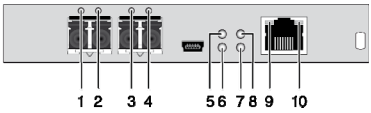
3.7.1 Status KVM Extender Module

The KVM Extender module is fitted with a multi color LED on both sides for overall status indication and with two further LEDs on the back side for indication of the connection status.

CPU Module



Rear View



Rear View

LED 1-4: Connection Status Link

Pos.	LED	Status	Description
1, 3	**Failure LED** (red)	Off	Connection available
		On or Flashing	Connection failure (flashing for about 20 s following a connection failure)
2, 4	**Status LED** (green)	Flashing	No connection via interconnect cable
		On	Connection available

LED 5 and 6: USB and Video Status

LED color		Description
Red		Device ready
Violet		Connection and USB signal (interconnect) available
Green		Connection and video signal available
Light Blue		Connection, USB and video signal available (operating status)

LED 7: Compute Module Status

LED color		Description
Red		Compute module available, kernel and application not available
Violet		Kernel available, application not available
Light Blue		Kernel and application available

LED 8: USB 2.0 embedded Status

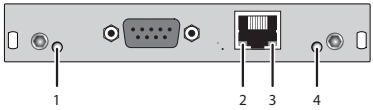
LED color		Description
Green		Active USB 2.0 embedded link to CON Unit
Light Blue/green flashing		USB 2.0 host detected
Light blue flashing		USB 2.0 host and devices detected

LED 9 and 10: Connection Status TCP/IP (network)

Pos.	LED	Status	Description
9	**Traffic LED** (green)	Off	No network traffic
		Flashing	Network traffic available
10	**Link LED** (green)	Off or flashing	No network connection available
		On	Network connection available

3.7.2 Status Monitoring Module SNMP

The monitoring module SNMP is fitted with a multi color LED on both sides for overall status indication and with two further LEDs for indication of the network status:



Rear View

Status LEDs of the SNMP board

Pos.	LED	Status	Description
1	**Status 1**	White	SNMP board is in registration process
		Blue flashing	Registration of the SNMP board has started
		Red flashing	Registration in progress
		Green flashing	Operating condition
		Green	SNMP board de-registered
4	**Status 2**	White	SNMP board is in registration process
		Status	Description
		White	SNMP board is in registration process

Due to variations in LED type "white" might also appear as light purple or light blue.

Status LEDs of the network port

Pos.	LED	Status	Description
2	**Link status** (orange)	Off	Port not activated
		Flashing	Port activated, no connection via network cable
3	**Link status** (green)	Off	Port not activated
		Flashing	Port activated, no connection via network cable

4 Installation

4.1 Package Contents

Your extender package contains the following items:

KVM Extender:

- KVM Extender (CPU Unit)
- Draco vario chassis incl. power supply
- 1x (redundancy 2x) country-specific power cord
- Quick Setup

If anything is missing, contact your dealer.

4.2 System Setup

First time users are recommended to setup the system with the CPU Unit and the CON Unit in the same room as a test setup. This will allow you to identify and solve any cabling problems, and experiment with your system more conveniently.

➔ Please verify that interconnect cables, interfaces, and handling of the devices comply with the requirements (see Chapter 7, Page 42).

KVM Extenders and the power supply units can get warm and must not be installed in closed rooms with no air circulation.

For rack-mount installations, at least 0.5 U (height unit) is required above the KVM Extender for ventilation.

4.2.1 KVM Extender Setup

1. Switch off all devices.

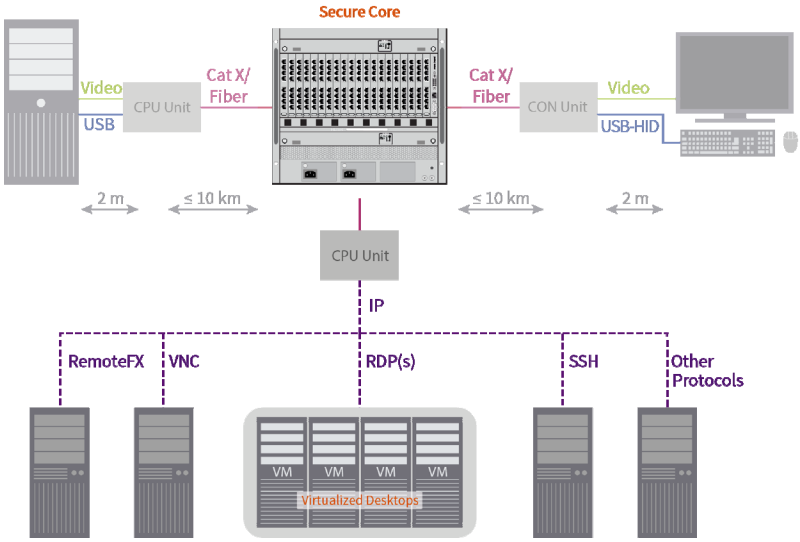
CPU Unit Installation

2. Connect the TCP/IP network cable to the CPU Unit. Please ensure the cables are not strained.
3. Connect the CPU Unit to the interconnect cable(s).
4. Connect the 5VDC power supply to the CPU Unit.
5. Power up the system.

To power up the system, the following sequence is recommended: Monitor – CON Unit – CPU Unit – source.

4.3 Example Applications

This section illustrates a typical installation of IP CPU KVM Extenders:



IP CPU KVM extender installation example

5 Configuration

5.1 Transmission Parameters

The device operates with a proprietary compression method.

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.

In exceptional cases the displayed video image may exhibit "frame dropping" (loss of single pictures) or color effects.

5.2 DDC Settings

By default, the device transmits the factory preset DDC information to the CPU. This information is suitable in most cases.

Downloading of the DDC information of the console monitor can be performed during normal operation (see Chapter 6.1, Page 40).

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

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

The data area of the unit is now accessible as a flash drive "Extender".

Uploading DDC Information

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

The current DDC information is replaced.

Retrieving DDC Information

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

To open the binary file, you have to install a suitable software, e.g. WinDDCwrite, on your computer. Contact your dealer for this purpose.

Reset to Factory DDC Information

Delete the file called "DDC-EDID.bin" on the flash drive of the CPU Unit.

By deleting this file, the factory DDC Information is restored.

5.3 Command Mode

During normal use, the console keyboard functions in the usual manner. However, for all KVM Extenders with USB-HID support, you can set the keyboard into a Command Mode by using a specific 'Hot Key' sequence. While in Command Mode, several functions are performed via keyboard commands. To exit Command Mode, press <Esc>.

While in Command Mode, the **Shift** and **Scroll** LEDs on the console keyboard will flash.

In Command Mode normal keyboard and mouse operation will cease. Only selected keyboard commands are available.
If no keyboard command is executed within 10 s after activating Command Mode, it will be automatically deactivated.

The following table lists the keyboard commands to enter and to exit Command Mode and to change the 'Hot Key' sequence:

Function	Keyboard Command
Enter Command Mode (default)	2x <Left Shift> / ('Hot Key')
Exit Command Mode	<Esc>
Change 'Hot Key' sequence	<current 'Hot Key'>, <c>, <new 'Hot Key' code>, <Enter> Until 2011-30-09: <Left Ctrl> + <Left Shift> + <c>, <'Hot Key' Code>, <Enter>

<Key> + <Key>	Press keys simultaneously
<Key>, <Key>	Press keys successively
2x <Key>	Press key quickly, twice in a row (similar to a mouse double-click)

All keyboard commands refer to the QWERTZ keyboard layout. If you are not using a QWERTZ keyboard, use the QWERTZ keyboard layout. Example: On the AZERTY keyboard the key assignment of the letter **A** is equivalent to the letter **Q** on the QWERTZ keyboard.

The 'Hot Key' sequence to enter Command Mode can be changed. The following table lists the 'Hot Key' Codes for the available key sequences:

'Hot Key' Code	'Hot Key'
0	Freely selectable (from 2012-01-12)
2	2x <Scroll>
3	2x <Left Shift>
4	2x <Left Ctrl>
5	2x <Left Alt>
6	2x <Right Shift>
7	2x <Right Ctrl>
8	2x <Right Alt>

Set freely selectable 'Hot Key' (exemplary)

In order to set a freely selectable 'Hot Key' (e.g. 2x <Space>), use the following keyboard sequence:

<current 'Hot Key'>, <c>, <0>, <Space>, <Enter>

Reset 'Hot Key'

In order to set a 'Hot Key' back to default settings of the extender, press the key combination <Right Shift> + <Del> within 5 s after plugging in a keyboard.

5.4 USB-HID Ghosting

This function allows specific keyboard and mice descriptors (device descriptions) to be permanently stored in the CPU unit. This 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 (computer, CPU) by two or more consoles within a KVM matrix.

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

Function	Keyboard Command
Writes the device descriptions of the input devices connected to the CON Unit into the CPU Unit. Activating the emulation in the CPU Unit.	<'Hot Key'>, <h>, <w>, <Enter>
Activates the emulation of already stored device descriptions in the CPU Unit	<'Hot Key'>, <h>, <e>, <Enter>
Deactivates 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 (computer, CPU).	<'Hot Key', <h>, <d>, <Enter>
Deactivates 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 (computer, CPU).	<'Hot Key', <h>, <r>, <Enter>

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.

5.5 Configuration File

The KVM Extender contains a configuration file (Config.txt) to set specific parameters and to read out device and video information. You can find it on the flash drive of the KVM Extender. 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.

After setting a parameter, the KVM Extender needs to be restarted.

To ensure correct identification and acceptance of the parameters, the start command **#CFG** has to be written into the first line of the Config.txt file.

5.5.1 Parameters for CPU Units

You can write the following parameters into the configuration file of a CPU Unit.

DDC-Management

Parameter	Function
ENAHPDET	Enable hotplug switch for K238-5x series
LOCKEDID	Activate DDC write protection

Digital-Audio

Parameter	Function
SRC32000	Activate sample rate conversion, sample rate 32 kHz (only with digital audio upgrade module)
SRC44100	Activate sample rate conversion, sample rate 44,1 kHz (only with digital audio upgrade module)
SRC48000	Activate sample rate conversion, sample rate 48 kHz (only with digital audio upgrade module)
SRC96000	Activate sample rate conversion, sample rate 96 kHz (only with digital audio upgrade module)
SRC_NONE	Deactivate sample rate conversion (only with digital audio upgrade module)

Compression

Parameter	Function
MEDCPRATE	Activate medium compression rate
MINCPRATE	Activate low compression rate
MAXCPRATE	Activate high compression rate
ENADITHER	Activate dithering filter for Mac OS systems

Shared Operation

Parameter	Function
RELEASETIME=n	Release timer n = 0...9 seconds for Mouse and Keyboard Connect, without parameter = 2 seconds

General Settings

Parameter	Function
DISPLAY2	Show video channel 2 per default after switching on the respective Dual-Head unit (482 series only)

5.6 Remote Access Configuration

The IP CPU KVM extender requires an individual configuration to be able connecting to a source (computer, CPU) via TCP/IP network. The configuration must be performed solely via Draco tera KVM matrix and consists of the following types of configuration:

- IP Session configuration
- IP CPU EXT Unit configuration
- Assignment of the IP Session to the IP CPU Device

The following firmware minimum requirements are necessary for configuration:

- Draco tera KVM matrix: version V03.06
- Java tool (Tera tool): version 3.6.0.0

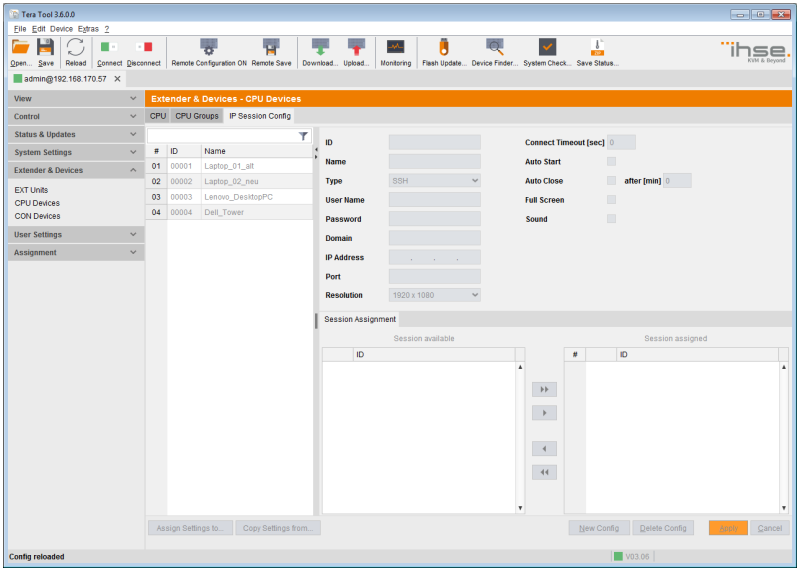
You have the following option to perform the configuration:

In order to configure the IP CPU extender, proceed as follows.

IP Session Configuration

The configuration of the IP session includes the relevant settings for the remote connections.

1. Connect to the Draco tera KVM matrix via Java tool.
2. Select **Definition > CPU Devices** in the task area of the Java tool and open the tab **IP Session Config**.



*Menu **Extender & Devices – CPU Devices***

3. Press the button **New Config**.

   A new IP Session Config will be created.

Generally, an IP Session Config can be used for multiple IP CPU KVM extenders.

4. Name the IP Session Config in the input field **Name**.
5. Select the **Type** of remote access in the corresponding field.
6. Insert a **User Name** and **Password** for the IP session user. The user can be a local user or part of a domain.
7. If the user is a domain user, enter the **Domain** name into the corresponding field.
8. If the network ports of the remote access type are not the standard ones (e.g. RDP port: 3389), enter the respective port into the input field **Port**.
9. Select the resolution of the remote connection (default: 1920x1080).
10. If the remote connection should be performed in **Full Screen**, check the corresponding check box.
11. If you want to transmit digital HDMI audio, check the box **Sound**.

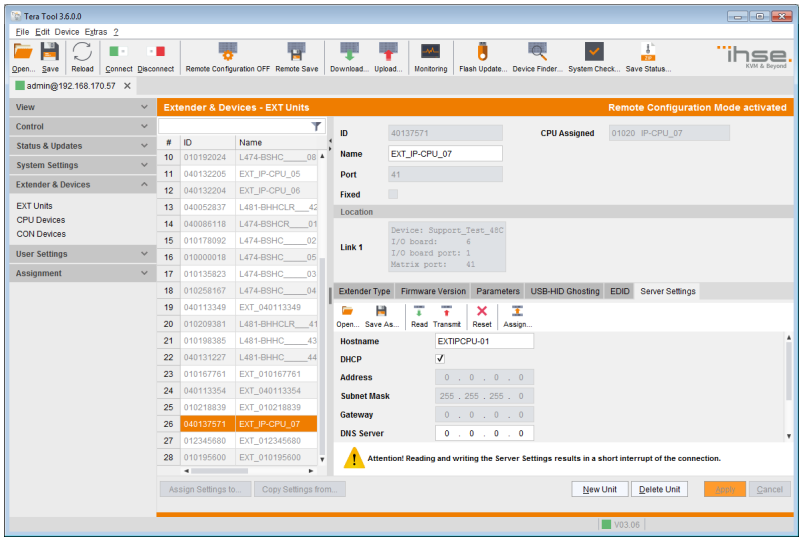
12. Press the button **Apply** to confirm your configuration settings.

Any IP session config can be assigned to multiple IP CPU Devices at the same time. Each IP CPU Device supports up to 8 simultaneous sessions.

IP CPU EXT Unit Configuration

The configuration of the IP CPU EXT Unit refers to the the respective network settings of the IP CPU extender (compute module).

1. Ensure that the IP CPU extender is physically connected to the Draco tera matrix and switched on. It can take up to 30 sec. until the it is finally registered at the KVM matrix.
2. Select **Definition > EXT Units** in the main menu of the Java tool.
3. Select the IP CPU EXT Unit to be configured in the **EXT Units** list and open the tab **Server Settings**.



*Menu **Extender & Devices – EXT Units***

4. Press the button **Read** to show the current server settings of the IP CPU EXT Unit.
5. Enter a **Hostname** into the corresponding input field.
6. If you want to use a DHCP server, check the box **DHCP**.

7. Configure the remaining server settings as follows:
   – Mandatory settings: **Address, Subnet Mask, Gateway, NTP server, TimeZone** and **Keyboard Layout**
   – Optional setting: **DNS Server**

Direct IP Session Assignment

This type of configuration allows the exclusive access of one IP session only.

In order to assign a single IP session to an IP CPU Device, proceed as follows:

1. Select **Definition > CPU Devices** in the main menu of the Java tool and open the tab **CPU**.
2. Select the IP CPU Device to be configured in the list of Devices.
3. Select an IP Session Config in the field **IP Direct Config**.

   The selected IP Session Config will be directly assigned to the IP CPU Device.
4. Repeat the assignment for each IP CPU Device individually.

   The IP CPU Devices are now configured and so the IP CPU KVM extenders can be used.

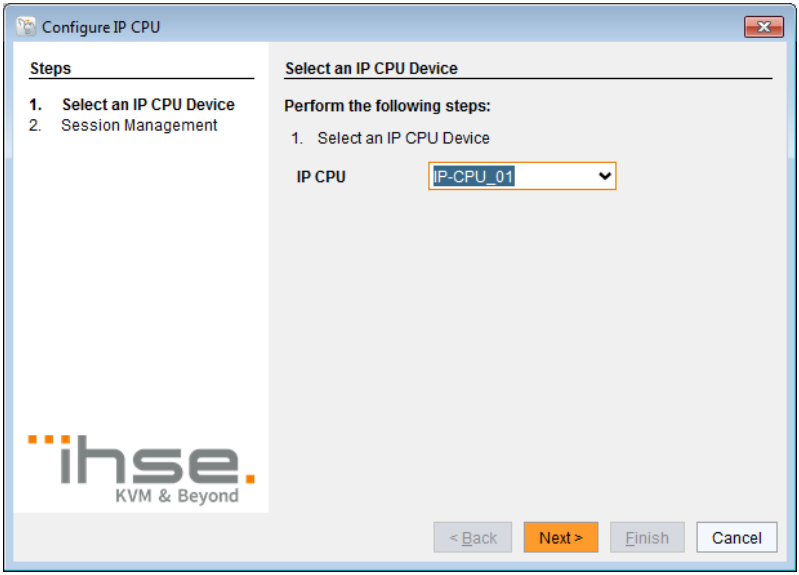
Assignment of multiple IP session configs

This type of configuration allows the parallel access of multiple different IP sessions.

In order to assign multiple IP session configs to an IP CPU Device, proceed as follows:

1. Select **Definition > CPU Devices** in the main menu of the Java tool and open the tab CPU.
2. Press the Button **Configure IP CPU** on the bottom of the working area.

   A pop-up window will appear.



*Menu **Configure IP CPU***

3. Follow the instructions of the configuration wizard and perform the assignment accordingly.

   After finishing the configuration wizard, the IP CPU Devices are configurated and the IP CPU KVM extenders can be used.

6 Operation

6.1 Download of DDC Information

By default, data from the internal DDC list is reported to the source (computer, CPU). If these are not optimal settings for the display device, the DDC information of the console monitor can be downloaded and stored internally. The devices have to be configured accordingly (see Chapter 5.2, Page 29).

On all KVM Extenders with USB-HID support, the user can load the DDC information of the console monitor via keyboard command under operating conditions.

1. Enter Command Mode with the 'Hot Key' (see Chapter 5.3, Page 30).
2. Press the <a> key to download the DDC information of the console monitor.

   The screen will go black for a short time.

   At the same time Command Mode is closed and the keyboard LEDs return to previous status.
3. Restart the corresponding source (computer, CPU).

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

   The DDC information of the console monitor was loaded once. Reloading is possible by repeating the operation.

6.2 Shared Operation of redundant CPU Units

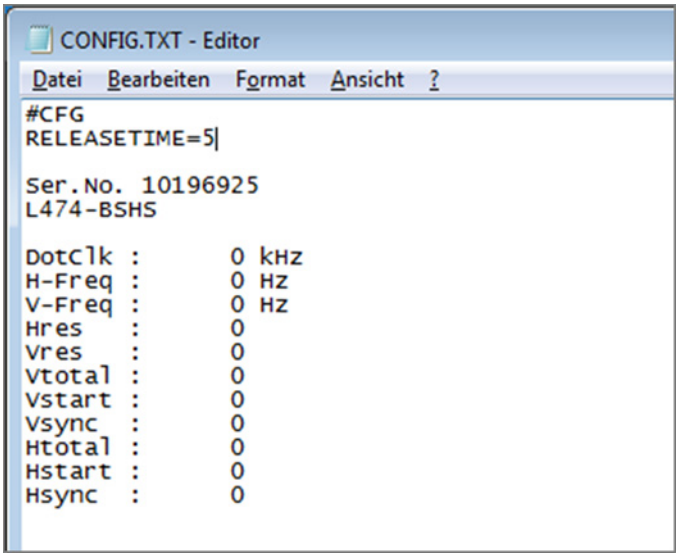
CPU Units with a redundant connector for interconnect cables offer the possibility for a competing control by two connected CON Units.

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.

In order to configure a redundant CPU Unit for the operation with two competing CON Units, proceed as follows:

1. Connect a redundant CPU Unit to any source (computer, CPU) by using a mini USB connection.

2. Open the file "Config.txt" that is located on the appearing flash drive of the extender.
3. 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.
4. Save your changes.
5. Reboot the CPU Unit.



*Example View – **Config.txt***

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

7 Specifications

7.1 Interfaces

7.1.1 Single Link

Video

The audio / video interface can transmit monitor resolutions such as 1920x1200@60Hz, Full HD (1080p) or 2K HD (up to 2048x1152). Data rate is limited to 165 MPixel/s and 8 bit.

Audio

Various digital audio formats can be transmitted through the interface.

Standards	Stereo Linear Pulse Code Modulation (LPCM), DTS, DTS-HD (5.1), Dolby Digital, Dolby Digital Plus (5.1)
Bit Depth	16 to 24 bit
Sample Rate	32 to 192 kHz

7.1.2 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.

Mouse

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

Other USB-HID devices

The proprietary USB emulation also supports certain other USB-HID devices, such as specific touch screens, graphic tablets, barcode scanners or special keyboards. Support cannot be guaranteed, however, for every USB-HID device.

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 HID devices allowed.
To support other USB 'non-HID' devices, such as scanners, web cams or memory devices, choose our devices with transparent USB support.

7.1.3 USB 2.0 (transparent)

KVM Extender models with transparent USB 2.0 support allow the connection of **all** types of USB 2.0 devices (without restriction). USB 2.0 data transfer is supported, depending on the upgrade module, with USB high speed (max. 480 Mbit/s) or USB embedded (max. 36/100/480 Mbits, depending on extender type).

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 provides a maximum of 500 mA (high power) and 2 connectors a maximum of 100 mA.

7.1.4 RJ45 (Interconnect)

Communication between Cat X devices requires a 1000BASE-T connection.

Connector wiring must comply with EIA/TIA-568-B (1000BASE-T), with RJ45 connectors at both ends. All four cable wire pairs are used.

7.1.5 Fiber SFP Type LC (Interconnect)

Communication of fiber devices is performed via Gigabit SFPs that are connected to suitable fibers fitted with connectors type LC (see Chapter 7.2.2, Page 45).

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

SFP modules can be damaged by electrostatic discharge (ESD).
➔ Please consider ESD handling specifications.

7.2 Interconnect Cable

7.2.1 Cat X

A point-to-point connection is required. Operation with several patch fields is possible. Routing over an active network component, such as an Ethernet Hub, Router or Matrix, is not allowed.

➔ Avoid routing Cat X cables along power cables.

To maintain regulatory EMC compliance, correctly installed shielded Cat X cable must be used throughout the interconnection link.

To maintain regulatory EMC compliance, all Cat X cables need to carry ferrites on both cable ends close to the device. Failure to do so will result to invalidity of the CE declaration of conformity.

Type of Interconnect Cable

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

Cat X Solid-Core Cable AWG24	S/UTP (Cat 5e) cable according to EIA/TIA-568-B. Four pairs of wires AWG24. Connection according to EIA/TIA-568-B (1000BASE-T).
Cat X Patch Cable AWG26/8	S/UTP (Cat 5e) cable according to EIA/TIA-568-B. Four pairs of wires AWG26/8. Connection according to EIA/TIA-568-B (1000BASE-T).

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

Maximum Acceptable Cable Length

Cat X Installation Cable AWG24	140 m (400 ft)
Cat X Patch Cable AWG26/8	70 m (200 ft)

7.2.2 Fiber

A point-to-point connection is necessary. Operation with multiple patch panels is allowed. Routing over active network components, such as Ethernet Hubs, Switches or Routers, is not allowed.

Type of Interconnect Cable

(Cable notations according to VDE)

Type of cable	Specifications
Single-mode 9µm	• Two fibers 9µm • I-V(ZN)H 2E9 (in-house patch cable) • I-V(ZN)HH 2E9 (in-house breakout cable) • I/AD(ZN)H 4E9 (in-house or outdoor breakout cable, resistant) • A/DQ(ZN)B2Y 4G9 (outdoor cable, with protection against rodents)
Multi-mode 50µm	• Two fibers 50µm • I-V(ZN)H 2G50 (in-house patch cable) • I/AD(ZN)H 4G50 (in-house or outdoor breakout cable, resistant)
Multi-mode 62.5µm	• Two fibers 62.5µm • I-V(ZN)HH 2G62.5 (in-house breakout cable) • A/DQ(ZN)B2Y 4G62.5 (outdoor cable, with protection against rodents)

Maximum Acceptable Cable Length

Type of cable	Maximum Acceptable Cable Length
Single-mode 9µm	10,000 m (32,800 ft)
Single-mode 9µm XV	5,000 m (16,400 ft)
Multi-mode 50µm (OM3)	1,000 m (3,280 ft)
Multi-mode 50µm	400 m (1,300 ft)
Multi-mode 62.5µm	200 m (650 ft)

If you use single-mode SFPs with multi-mode fibers, you normally can double the maximum acceptable cable length.

Type of Connector

Connector	LC Connector

7.3 Supported Peripherals

7.3.1 USB-HID Devices

The KVM Extender will support most USB-HID devices, including the vast majority of keyboards and mice currently on the market. Many other kinds of HID devices such as bar-code scanners and touch screens may also be compatible

It is not possible to guarantee support for all available USB-HID devices. In certain cases, custom firmware may be required.

USB-HID (and other) devices that are not supported as standard will normally operate with our devices featuring transparent USB support.

Please note that concurrent operation of more than two USB-HID devices is not possible even if you use a USB hub.

7.3.2 USB 2.0 Devices

KVM Extender models featuring a transparent USB 2.0 connection use Extreme USB Technology from Icron Technologies.

This technology supports **all** types of USB 2.0 devices, however the manufacturer cannot guarantee compatibility with every device on the market. Please contact your dealer if any issues are found.

7.4 Supported Network Protocols

The KVM Extender supports various common network protocols for the TCP/IP connection between a source (computer, CPU) and the IP CPU KVM extender.

Remote Desktop Protocol (RDP)

Proprietary protocol (Microsoft) to connect to a source (computer, CPU) via network using RDP server software based on a graphical interface.

RemoteFX

Enhanced remote desktop protocol (Microsoft) to handle graphics-intensive applications.

Virtual Network Computing (VNC)

Platform-independent graphical desktop sharing system to remotely control a source (computer, CPU).

Secure Shell (SSH)

Cryptographic network protocol for operating network services securely over an unsecured network in a client-server architecture.

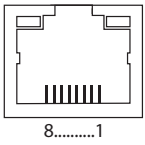
If you require the support of additional protocols, please contact your dealer.

7.5 Connector Pinouts

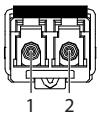
Connector Mini USB Type B

Picture	Pin	Signal	Color
	1	VCC (+5VDC)	Red
	2	Data –	White
	3	Data +	Green
	4	n.c.	–
	5	GND	Black

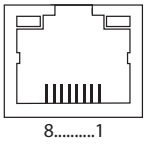
RJ45 (interconnect)

Picture	Pin	Signal	Pin	Signal
	1	D1+	5	D3–
	2	D1–	6	D2–
	3	D2+	7	D4+
	4	D3+	8	D4–

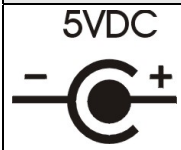
Fiber SFP Typ LC

Picture	Diode	Signal
	1	Data OUT
	2	Data IN

RJ45 (TCP/IP network)

Picture	Pin	Signal	Pin	Signal
	1	D1+	5	n.c
	2	D1–	6	D2–
	3	D2+	7	n.c
	4	n.c	8	n.c

Power Supply

Picture	Pin	Signal
	Inside	VCC (+5VDC)
	Outside	GND

7.6 Power Supply

AC Power Supply

Model	Max. Current	Max. Voltage	Frequency
474-BODY2N	700 mA max.	100-240 V	50/60 Hz
474-BODY6R	1,400 mA max.	100-240 V	47-63 Hz
474-BODY6BP	1,300 mA max.	100-240 V	50/60 Hz
474-BODY6BPF	1,300 mA max.	100-240 V	50/60 Hz
474-BODY21/4U	4,000 mA max.	2x 100-240 V	50/60 Hz

DC Power Supply

Model	Max. Current	Max. Voltage
474-BODY2/2R	3,000 mA	5 VDC
474-BODY2N	5,000 mA	5 VDC
474-BODY4/4R	5,000 mA	5 VDC
474-BODY6R	8,000 mA	5 VDC

Power Requirement

Power Requirement (per Unit)	**KVM Extender:** • Non-redundant devices: max. 1,400 mA • Redundancy devices: max. 1,650 mA

7.7 Environmental Conditions

Operating Temperature	41 to 113°F (5 to 45°C)
Storage Temperature	–13 to 140°F (–25 to 60°C)
Relative Humidity	Max. 80% non-condensing
Operating Altitude	Max. 2,500 m (7,500 ft)

Noise Emission

Sound Pressure Level (SPL)	max .21 dBA per fan (474-6FAN)

Heat Dissipation

Thermal output	Corresponds to power consumption in Watt (W) (see extender configurator on the website)

7.8 Size

Devices in the 2-fold Vario Chassis 1

CPU Unit / CON Unit	145 x 147 x 44 mm (5.7" x 5.8" x 1.7")
Shipping Box	210 x 140 x 165 mm (8.3" x 5.5" x 6.5")

Devices in the 2-fold Vario Chassis 2

CPU Unit / CON Unit	221 x 147 x 44 mm (8.7" x 5.8" x 1.7")
Shipping Box	550 x 365 x 115 mm (21.7" x 14.4" x 4.5")

Devices in the 4-fold Vario Chassis

CPU Unit / CON Unit	293 x 147 x 44 mm (11.5" x 5.8" x 1.7")
Shipping Box	550 x 365 x 115 mm (21.7" x 14.4" x 4.5")

Devices in the 6-fold Vario Chassis 6R

CPU Unit / CON Unit	442 x 147 x 44 mm (17.4" x 5.8" x 1.7")
Shipping Box	760 x 365 x 115 mm (29.9" x 14.4" x 4.5")

Devices in the 6-fold Vario Chassis 6BP / 6BPF

CPU Unit / CON Unit	442 x 250 x 44 mm (17.4" x 9.8" x 1.7")
Shipping Box	550 x 372 x 155 mm (21.7" x 14.6" x 6.1")

Devices in the 21-fold Vario Chassis

CPU Unit / CON Unit	482 x 462 x 176 mm (19.0" x 18.2" x 6.9")
Shipping Box	645 x 574 x 368 mm (25.4" x 22.6" x 14.5")

7.9 Shipping Weight

Devices in the 2-fold Vario Chassis 1

CPU Unit / CON Unit	0.7 kg (1.5 lb)
Shipping Box	2.5 kg (5.5 lb)

Devices in the 2-fold Vario Chassis 2

CPU Unit / CON Unit	1.1 kg (2.4 lb)
Shipping Box	2.9 kg (6.4 lb)

Devices in the 4-fold Vario Chassis

CPU Unit / CON Unit	0.9 kg (2.0 lb)
Shipping Box	3.4 kg (7.5 lb)

Devices in the 6-fold Vario Chassis 6R

CPU Unit / CON Unit	1.9 kg (4.2 lb)
Shipping Box	5.1 kg (11.2 lb)

Devices in the 6-fold Vario Chassis 6BP

CPU Unit / CON Unit	2.5 kg (5.5 lb)
Shipping Box	3.5 kg (7.7 lb)

Devices in the 21-fold Vario Chassis

CPU Unit / CON Unit	10.0 kg (22.1 lb)
Shipping Box	14.5 kg (32.0 lb)

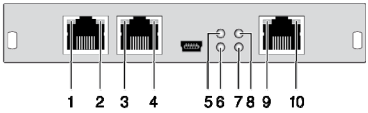
8 Troubleshooting

8.1 General Failures

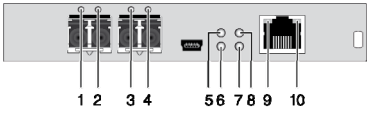
Diagnosis	Possible Reason	Measure
Config.txt parameter without function	Parameter not set or saved	➔ Write parameter into Config.txt file and save changes.
	Start command #CFG not set	➔ Write start command #CFG into first line of the Config.txt file.
	Parameter written incorrectly	➔ Check correct spelling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

8.2 Blank Screen

CPU Module



Rear View

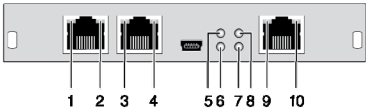


Rear View

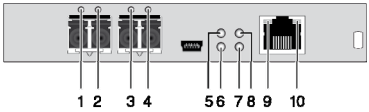
Diagnosis	Possible Reason	Measure
LED **5, 6** off	Power supply	➔ Check power supply units and the connection to the power network.
LED **1, 3** flashing or LED **2, 4** off	Connection between CON Unit and CPU Unit	➔ Check interconnect cables and connections.
CPU Unit: LED **5, 6** violet	No video signal detected by source (computer, CPU)	➔ Check DVI-D cable to CPU ➔ Download DDC information from console monitors (see Chapter 6.1, Page 40) Reboot CPU if necessary.
CON Unit: LED **3** violet	No monitor detected	➔ Check connection, length and quality of the DVI-D cable to monitor, tighten cable thumbscrews.
	No video signal detected from CPU Unit	➔ Check connection, length and quality of interconnect cables between the units. ➔ Download DDC information from console monitors (see Chapter 6.1, Page 40) Reboot CPU if necessary.

8.3 USB-HID

CPU Module



Rear View

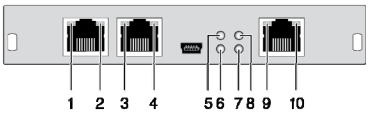


Rear View

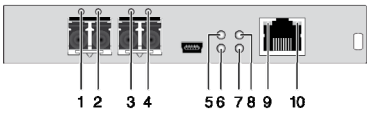
Diagnosis	Possible Reason	Measure
Keyboard LEDs **Shift** and **Scroll** are blinking	Keyboard in Command Mode	➔ Press <Esc> to leave Command Mode.
CPU Unit: LED **5, 6** green or light blue/green flashing	No USB connection to CPU	➔ Check connection of USB cable to CPU; select another USB port if necessary. ➔ Remove USB and power cable and restart CPU. Connect power cable first.
CON Unit: LED **3** green or violet	Problems with USB connection	➔ Check connection of USB cable to USB-HID device. ➔ Remove DVI and power cable and restart CON Unit. Connect power cable first.
USB device without function	No USB-HID device	➔ Connect USB-HID device.
	USB-HID device is not supported	➔ Contact dealer if necessary.

8.4 USB 2.0 embedded

CPU Module



Rear View

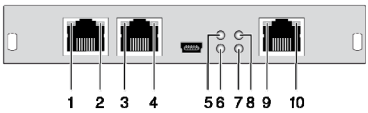


Rear View

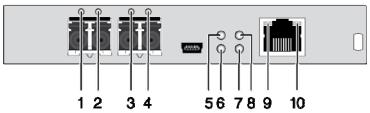
Diagnosis	Possible Reason	Measure
CPU Unit: LED **8** off	No connection to CPU	➔ Check connection USB cable to CPU; select another USB port if necessary. ➔ Remove USB and power cable and restart CPU. Connect power cable first.
CPU Unit: LED **2, 4** off	No connection between CON Unit and CPU Unit	➔ Check interconnect cable and connectors.
CPU Unit: LED **8** flashing green	No USB 2.0 device	➔ Connect USB 2.0 device.
	USB 2.0 device is not supported	➔ Check installation at the CPU, also the necessary drivers. ➔ New connection of the USB 2.0 device. ➔ Contact dealer if necessary.

8.5 Compute Module

CPU Module



Rear View



Rear View

Diagnosis	Possible Reason	Measure
CPU Unit: LED **7** red	Kernel not active	➔ Check TCP/IP network cable to CPU Unit. ➔ Repower IP CPU Unit.
CPU Unit: LED **7** violet	Application not active	➔ Check application on compute module. ➔ Repower IP CPU Unit.
CPU Unit: LED **10** flashing or off	TCP/IP network connection failure	➔ Check connected network devices (e.g. network switch). ➔ Check TCP/IP network cable connection.

9 Technical Support

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

9.1 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 device)
- Date and number of sales receipt, name of dealer 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

9.2 Shipping Checklist

1. To return your device, contact your dealer to obtain a RMA number (Return-Material-Authorization).
2. Package your devices carefully, preferably using the original box. Add all pieces which you received originally.
3. Note your RMA number visibly on your shipment.

Devices that are sent in without a RMA number cannot be accepted. The shipment will be sent back without being opened, postage unpaid.

10 Certificates

10.1 CE Declaration Of Conformity

The products listed below in the form as delivered comply with the provisions of the following European Directives:

2014/30/EU Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

2014/35/EU Council Directive on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

CE Marking

Product list:

488 Series

The products comply with the following harmonized standards for Information Technology Equipment:

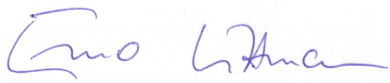
- EN 55032:2012
- EN 55024:2010 + A1:2015
- EN 61000-3-2:2014
- EN 61000-3-3:2013
- EN 61000-6-2:2005
- EN 60950-1:2006/A2:2013

Manufacturer:

IHSE GmbH
Benzstraße 1
88094 Oberteuringen
Deutschland

Oberteuringen, March 1st, 2017

The Management



Use 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.

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety instructions and installation guidelines noted in this manual shall be considered in detail. Compliance with the specifications for cable lengths and types is mandatory.

10.2 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.

10.3 Product Safety

The following devices comply with defined standards concerning product safety due to construction and design:

474-BODY2N

474-BODY6R

474-BODY6BP/F

474-BODY21/4U

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

- IEC 60950-1/A1:2010
- EN 60950-1/A12:2011/A1:2010/A11:2009
- UL 60950-1-2007
- CAN/CSA-C22.2 60950-1-07

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

10.4 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.

10.5 RoHS/RoHS 2

This device complies with the Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2, RoHS II).

The device labels carry a respective marking.

11 Glossary

The following terms are commonly used in this guide or in video and KVM technology:

Term	Explanation
AES/EBU	Digital audio standard that is officially known as AES3 and that is used for carrying digital audio signals between devices.
Cat X	Any Cat 5e (Cat 6, Cat 7) cable
CGA	Color Graphics Adapter (CGA) is an old analog graphic standard with up to 16 displayable colors and a maximum resolution of 640x400 pixels.
Component Video	Component Video (YPbPr) is a high-quality video standard that consists of three independently and separately transmittable video signals, the luminance signal and two color difference signals.
Composite Video	Composite Video is also called CVBS and it is part of the PAL TV standard.
CON Unit	Component of a KVM Extender 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 or Media Extender to connect to a source (computer, CPU)
CVBS	The analog color video baseband signal (CVBS) is also called Composite Video and it is part of the PAL TV standard.
DDC	Display Data Channel (DDC) is a serial communication interface between monitor and source (computer, CPU). It allows a data exchange via monitor cable and an automatic installation and configuration of a monitor driver by the operating system.
DisplayPort	A VESA standardised interface for an all-digital transmission of audio and video data. It is differentiated between the DisplayPort standards 1.1 and 1.2. The signals have LVDS level.
Dual Access	A system to operate a source (computer, CPU) from two consoles

Term	Explanation
Dual Link	A DVI-D interface for resolutions up to 2560x2048 by signal transmission of up to 330 MPixel/s (24-bit)
Dual-Head	A system with two video connections
DVI	Digital video standard, introduced by the Digital Display Working Group (http://www.ddwg.org). Single Link and Dual Link standard are distinguished. The signals have TMDS level.
DVI-I	A combined signal (digital and analog) that allows running a VGA monitor at a DVI-I port – in contrast to DVI-D (see DVI).
EGA	The Enhanced Graphics Adapter (EGA) is an old analog graphic standard, introduced by IBM in 1984. A D-Sub 9 connector is used for connection.
Fiber	Single-mode or multi-mode fiber cables
HDMI	An interface for an all-digital transmission of audio and video data. It is differentiated between the HDMI standards 1.0 to 1.4a. The signals have TMDS level.
KVM	Keyboard, video and mouse
Mini-XLR	Industrial standard for electrical plug connections (3 pole) for the transmission of digital audio and control signals
Multi-mode	62.5µ multi-mode fiber cable or 50µ multi-mode fiber cable
OSD	The On-Screen-Display is used to display information or to operate a device.
Quad-Head	A system with four video connections
RCA (Cinch)	A non-standard plug connection for transmission of electrical audio and video signals, especially with coaxial cables
S/PDIF	A digital audio interconnect that is used in consumer audio equipment over relatively short distances.
SFP	SFPs (Small Form Factor Pluggable) are pluggable interface modules for Gigabit connections. SFP modules are available for Cat X and fiber interconnect cables.

Term	Explanation
Single Link	A DVI-D interface for resolutions up to 1920x1200 by signal transmission of up to 165 MPixel/s (24-bit). Alternative frequencies are Full HD (1080p), 2K HD (2048x1080) and 2048x1152.
Single-Head	A system with one video connection
Single-mode	9µ single-mode fiber cable
S-Video (Y/C)	S-Video (Y/C) is a video format transmitting luminance and chrominance signals separately. Thereby it has a higher quality standard than CVBS.
TOSLINK	Standardized fiber connection system for digital transmission of audio signals (F05 plug connection)
Triple-Head	A system with three video connections
USB-HID	USB-HID devices (Human Interface Device) allow for data input. There is no need for a special driver during installation; "New USB-HID device found" is reported. Typical HID devices include keyboards, mice, graphics tablets and touch screens. Storage, video and audio devices are **not** HID.
VGA	Video Graphics Array (VGA) is a computer graphics standard with a typical resolution of 640x480 pixels and up to 262,144 colors. It can be seen as a follower of the graphics standards MDA, CGA and EGA.