

# PLANNING AND BUILDING NETWORKS-

EXAMPLES OF NETWORK INSTALLATIONS - FROM SMALL TO LARGE





# Profile of EFB-Elektronik

EFB-Elektronik GmbH is a leading manufacturer and system provider of networking technology and industrial system solutions. Our expertise ranges from structured cabling using certified high-end products for data centres to custom developments for industrial clients.

Our team services customers worldwide from our headquarters in Bielefeld, Germany. Our customer base includes renowned household names from the IT and security industry, as well as medium sized companies and large corporations.

Our membership in the international TKH Group based in the Netherlands, with more than 6,500 employees and production facilities around the globe, gives us additional leverage for the benefit of our customers. The EFB group of companies has 240 employees across nine locations in Europe, five of them in Germany and three subsidiary companies located in Istanbul, Copenhagen and Vienna.

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# From the individual product to the finished installation

The construction of network installations presents challenges - regardless of the type of building. We support you during the planning phase with the appropriate product proposals: From copper and fiber optic components to cabinet systems and multimedia cabling. Why not benefit from prepared tender texts for copper and fiber optic connection technology for structured building cabling?

This brochure will give you an insight into various network installations of different types and the necessary components.



**INSTALLATIONS FOR NETWORKS**  
in different applications explained in a  
simple and comprehensible way



**HIGHEST PRODUCT QUALITY**  
due to multi-stage controls



**PERSONAL**  
and competent consultants



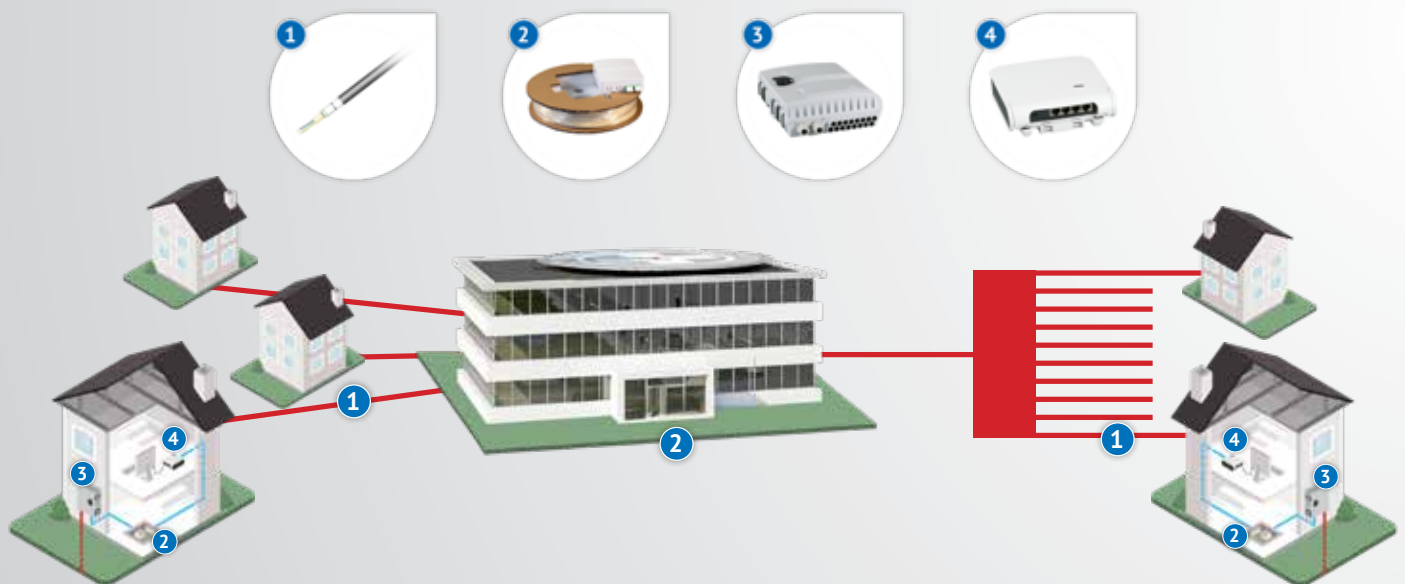
More information at:

[en.efb-highlights.de/ftth](http://en.efb-highlights.de/ftth)

# Support of the FTTH-planning by means of preconceived solutions

- Request tender texts for national and international planning
- Discover perfectly matched products for carriers and communal telecommunication providers

## The possible FTTH topologies



### POINT TO POINT

With this type of connection, it is possible to transport the information from the intermediary without an intermediate station on the direct connection route to the end user.

The advantages: There are better conditions for increasing the bandwidth and the connection can be flexibly upgraded.

### POINT TO MULTIPOINT

With point-to-multipoint technology, a connection can be established from one point to several end points in order to carry information for several subscribers from the exchange to the distribution point in the residential area. (Also called a multipoint connection, which is a passive optical network (PON)). Many passive optical splitters divide the information onto several optical fibres and transport it to the end user.

#### Transmission method:

- Time division multiplexing (TDM -PON) or
- Wavelength division multiplexing (WDM-PON)

# Rely on the right partner for planners

- Simple component selection: You plan your network, we offer the appropriate product solutions to you
- Get advices by your personal contact person
- Simply integrate the various texts into your tenders

## More than FTTH products: Cost group 450



- Extensive selection of tender texts for components according to cost group 450 in German & English
- All system-relevant materials from one supplier: jumpers, laying cables, small distributors, subscriber equipment

## Everything for subscriber connection: Cost group 457

- The FTTH product portfolio offers solutions for the network levels NE3, NE4 and NE5
- Discover: Fibers in G657, House connection points in IP54/ IP65 (HAP/AP), House handover points (HÜP), POP Point of Presence (POP) equipment



# 1

## Planning of the network infrastructure: single family building



### Network equipment

for a single-family building with 8-12 participants or connections



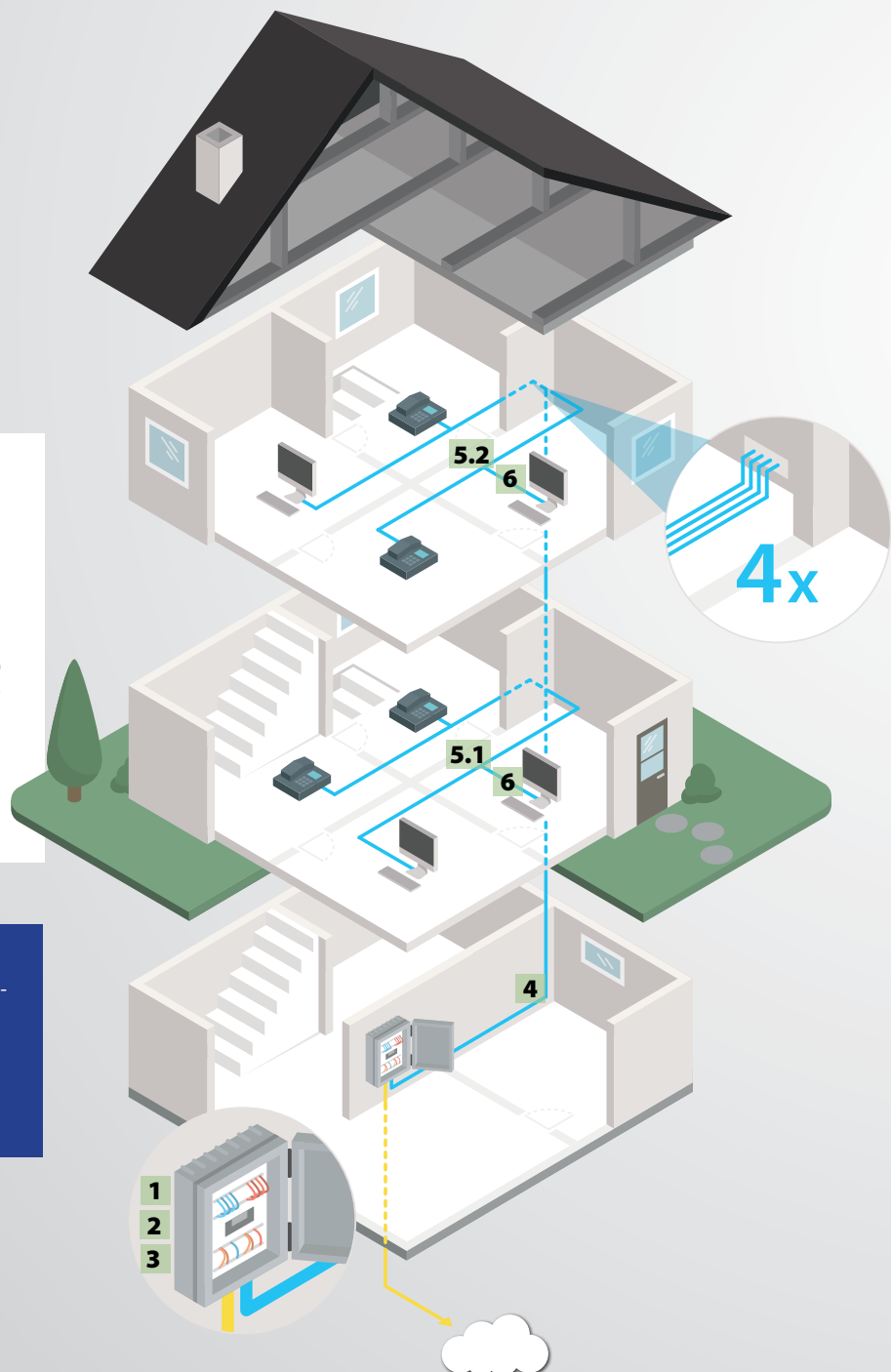
### On categories Cat.6 – 6a or 1Gbit, 2,5Gbit, 5Gbit, 10Gbit

with possibility of Wifi equipment and remote powering (4PPOE)



### Perfectly prepared

for home office, IoT (Internet of things) and/or smart home: To ensure perfect WLAN illumination, a WLAN repeater in every room with a subscriber connection



### Fire protection

In single-family buildings, the minimum requirement Eca applies to permanently installed cables within the framework of fire protection and the building products regulation, as usually few cables are installed. Nevertheless, we recommend the installation of a higher fire protection class, Dca: Due to the sheathing properties of the cables, higher safety in case of fire is guaranteed.

The fire protection class can always be found on the data sheet. For EFB products, it can be read directly on the jacket.

After installation is completed, the network should be tested to ensure the transmission characteristics

### Network certifiers and qualifiers

- WX500
- WX4500

# 1 Product selection

**Network connection**

**1 Switch / Router**



**1Gbit**  
**8 Port Gigabit Switch**  
 GSW-0807

**For more connection:**  
 12 / 16 Port Switch/ Router with 12 Port Patch Panel

The N1000x.V1-xx installation set contains all the essential components you need to set up a shielded house or office network.

**LINK**

**2 Patch cable**



**Up to 5Gbit**  
**Cat.6 Patch cable**  
 K5510.x

**10Gbit**  
**Cat.6A Patch cable**  
 K5525Fxx.x



**Main connection**

**3 Patchpanel**



**Up to 5Gbit**  
**Cat.6 8-Port 10" Patch Panel**  
 37736.8

**10Gbit**  
**Cat.6A 8-Port 10" Patch Panel**  
 37737.8



**INSTALLATION CABLE**

**4 Installation cable**



**Up to 5Gbit**  
**Cat.6A/ Cat.7 Installation cable**  
 99978.x-CPR

**10Gbit**  
**Cat.6A/ Cat.7 Installation cable**  
 99980.x-CPR



**Network termination**

**5.1 Data outlet**



**1**  
**Up to 5Gbit**  
**Cat.6 Data outlet**  
 ET-25211.2V1

**2**  
**10Gbit**  
**Cat.6A Data outlet**  
 ET-25130.1V1

**Expert tip:**  
 Connecting Wifi/ WLAN devices

**5.2 Keystone with frame**

**1**  
**Up to 5Gbit**  
**Cat.6 Keystone**  
 E-20072

**2**  
**10Gbit**  
**Cat.6A Keystone**  
 E-20070



**Expert tip:**  
 Use flexible cable

**Accessories:**  
 Frame design capable, ET-25085V2

**Local Loop**

**6 Patch cable**



**Up to 5Gbit**  
**Cat.6 Patch cable**  
 K5510.x

**10Gbit**  
**Cat.6A Patch cable**  
 K5525Fxx.x



# 2

## Planning of the network infrastructure: Office buildings



### Network equipment

for an office building with 12 participants or connections on one floor



### On categories Cat.6 – 6a or 1Gbit, 2,4Gbit, 5Gbit, 10Gbit

with the possibility of Wifi equipment and remote powering (4PPOE): perfect WLAN illumination must be adapted to the building's layout and the distribution of the offices. Use WLAN repeaters for this purpose



### For faster connection

of the floor switches, the connection is implemented on a fiber optic basis

■ With Multimode / OM3 you can achieve a transmission length of up to 100 metres at 40 Gbit. For comparison: With a Cat.8-based copper cabling line you can only reach 26 metres at the same speed.



### Conversion to multimode or singlemode basis

possible

■ For a future-proof configuration of the network we recommend single mode fiber. This allows speeds of up to 400Gbit.

### Fire protection

The rule of thumb is: the larger the building, the higher the security requirements.

In escape routes it is necessary to use cables with the highest fire protection class - these are flame-retardant! Information on the fire protection class can be found on the data sheet, in the case of EFB products also directly on the sheathing.

### Remote Powering - maintain network participants without external power supply

Remote Powering is the power supply via the network. The highest possible power transfer is possible with the standard 4PPOE with up to 90 watts.

Measuring and testing technology for fiber optic networks: cleaning materials, microscopes and OTDR

- FX5000-QU (OTDR)
- 39843.2 (cleaning set)
- WX\_FX\_INSP\_KIT (microscope)







For power, control and communication cables in buildings, groups are prescribed according to various criteria (heat release and flame propagation, etc.).

Building classes according to the MBO			Fire classes	
Class	Description		Minimum requirement	
			Building (except escape route)	Escape Routes
S1	high-rise buildings	exceeding 22 m	C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S2	construction works	exceeding 30 m	C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S3	buildings	with the largest floor space of 1600 m <sup>2</sup> , except for residential buildings and garages	C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S4	sales outlets	exceeding 800m <sup>2</sup>	C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S5	office/ administration	rooms exceeding 400 m <sup>2</sup>	C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S6	buildings with single rooms	single rooms can be used with more than 100 persons	C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S7	places of assembly	more than 200 persons	C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S8	restaurants/ hotels	for more than 40 guests in buildings, more than 12 beds, casinos more than 150 m <sup>2</sup>	C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S9	buildings with functional units provided for care or assistance dependent people	more than 6 persons, need for intensive care	B2 <sub>ca</sub> s1 d1 a1	B2 <sub>ca</sub> s1 d1 a1
S10	hospitals		B2 <sub>ca</sub> s1 d1 a1	B2 <sub>ca</sub> s1 d1 a1
S11	other facilities for accommodating people like residences		C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S12	day-care facilities for children, disabled people and elderly		B2 <sub>ca</sub> s1 d1 a1	B2 <sub>ca</sub> s1 d1 a1
S13	schools, universities or similar facilities		C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S14	penal institution and construction works for psychiatric hospital treatments		C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S16	leisure/ amusement parks		C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
S18	warehouse shelves with top of the load higher exceeding 7.5 m		E <sub>ca</sub>	B2 <sub>ca</sub> s1 d1 a1
S19	construction works for storage of substances with increased fire hazard		B2 <sub>ca</sub> s1 d1 a1	B2 <sub>ca</sub> s1 d1 a1
	Industry		C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1
	server rooms		B2 <sub>ca</sub> s1 d1 a1	B2 <sub>ca</sub> s1 d1 a1
	road tunnels		B2 <sub>ca</sub> s1 d1 a1	B2 <sub>ca</sub> s1 d1 a1
	rail tunnels		B2 <sub>ca</sub> s1 d1 a1	B2 <sub>ca</sub> s1 d1 a1
	underground parking		C <sub>ca</sub> s1 d2 a1	B2 <sub>ca</sub> s1 d1 a1

# 2 Product selection Floor distributors

## 1 Floor distributor



**19" Network cabinet**  
PRO-4288GR.G1SV

**Matching accessories:**

Cabinet accessories can be found on page 18

## 2 Switch / Router



**Up to 1Gbit**  
**Managed Gigabit Switch, 2x SFP/RJ45 Combo**  
GEL-2681

**10Gbit**

**Managed Gigabit Switch, 2x 10G SFP+**  
GTL-2881



## 3 SFP+



**Up to 1Gbit**  
**SFP Transceiver MM 1G**  
BO05C856S5D-BO

Multi Mode

**10Gbit**

**SFP Transceiver MM 10G**  
BO35J8563D-BO

Multi Mode



## 4 Splice box



**Up to 5Gbit**  
**Splice box 19" 1U MM OM3 LC**  
BA71901.24OM3

OM3

**10Gbit**

**Splice box 19" 1U MM OM4 LC**  
B71901.24OM4

OM4



Completely equipped with couplings & pigtails, pigtails already set down (ready to splice)

## 5 Copper Patch Panel



**Up to 5Gbit**  
**19" 1U Patch Panel Cat.6**  
37667.1M

**10Gbit**

**19" 1U Patch Panel Cat.6A**  
37666.1M



## 6 Fiber Patch Cable



**Up to 5Gbit**  
**LWL Patch cable LC/LC OM3**  
O0312.x

OM3

**10Gbit**

**LWL Patch cable LC/LC OM4**  
O0319.x

OM4




# 2 Product selection Network


## 7 Patch cable in distributor Use the different colours for better cable management




**Up to 5Gbit**  
**RJ45 Patch cable**  
 K8017.x

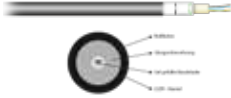
 Very good shielding properties due to 360° shielding

**10Gbit**  
**Cat.6A Patch cable**  
 MK6001.xx




 Slim sleeve for simplified insertion

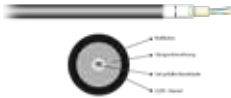
## 8 U-DQ cable Use cable in escape route areas according to building products regulation B2Ca: 56312.3L0M3-CPR




**1Gbit** OM3  
**U-DQ Installation cable OM3**  
 54524.1L-CPR


 Maximum transmission length: 550m

**10Gbit** OM4  
**U-DQ Installation cable OM4**  
 54524.2L-CPR




 Maximum transmission length: 550m

## 9 Cat.7 Installation cable Use cable in escape route areas according to building products regulation B2Ca: 56312.3L0M3-CPR



**Up to 5Gbit**  
**Cat.7 Installation cable**  
 99981.x-CPR

**10Gbit**  
**Cat.7A Installation cable**  
 999830.x-CPR




### 10.1 Option 1 with data outlet



**Up to 5Gbit**  
**Cat.6 Data outlet**  
 ET-25211.2V1

 **Expert tip:**  
 Connection of a Wifi/WLAN device

**10Gbit**  
**Cat.6A Data outlet**  
 ET-25130.1V1





### 10.2 Option 2 with Keystone and frame




**Up to 5Gbit**  
**Cat.6 Keystone and Frame**  
 E-20072 + ET-25111K

**10Gbit**  
**Cat.6A Keystone and Frame**  
 E-20091 + ET-25111K




 Look for certifications to ensure the compatibility of the components

### 11 Patch cable at the local loop



**Up to 5Gbit**  
**RJ45 Patch cable**  
 K8017.x

**10Gbit**  
**Cat.6A Patch cable**  
 MK6001.xx



# 3

## Planning of the network infrastructure: Campus



**Network equipment**  
for one campus (several buildings)



**On categories Cat.6 – 6a or 1Gbit, 2,5Gbit, 5Gbit, 10Gbit**  
with possibility of Wifi equipment and remote powering (4PPOE)



### HOW DOES OM5 WORK?

If you want to understand how OM5 works, you need to take a closer look at SWDM technology. Here, an optical signal is generated in the transmitter (e.g. an SFP module) and divided into several wavelengths. You can imagine this as if you were to direct the beam of a torch at a prism that splits the light beams into several light colours. In this case, the different light colours represent the different transmission channels. The light beams can then be re-focused and processed by a demultiplexer located at the receiver (e.g. an SFP module). With reference to our prism example: The different light colours are now bundled into one light beam again.



**For faster connection**

of the floor switches and the connection of the buildings to each other, the connection is realised on a fiber optic basis



**Conversion to multimode or singlemode basis possible**



**Possibility of equipping a training room**

(multimedia cabling p. 16) and a conference room (multimedia cabling p. 17)



**THINK SUSTAINABLE:  
More security through certification and system warranties**

Pay attention to reliable system warranties for sustainable building cabling: When planning, pay particular attention to manufacturer warranties and the properties of tested cabling systems.

Operators and users also benefit from the certification of their installers, who have been trained on the systems by the manufacturers. The advantage: a much higher level of investment protection and thus also future-oriented sustainability.

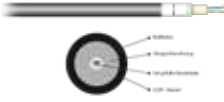
Are you interested in a 25-year system warranty on Copper and fiber optic networks? You can find out more here:

[www.infralan.de/en](http://www.infralan.de/en)




# 3 Product selection

## 1 U-DQ cable



**5Gbit**  
**U-DQ Installation cable OM5**  
 54524.1OM5-CPR


OM5



**10Gbit**  
**U-DQ Installation cable SM**  
 54424.1L-CPR

Single Mode

## 2 Floor distributor




**19" Network cabinet**  
 PRO-4288GR.G1SV

## 3 Cat.7 Installation cable



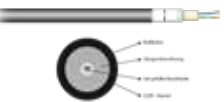
**Up to 5Gbit**  
**Cat.7 Installation cable**  
 MK7100.x-CPR

 Suitable for laying in sensitive areas (e.g. escape routes), as B2Ca laying cable



**10Gbit**  
**Cat.7A Installation cable**  
 99985.x-CPR

## 4 UDQ cable



**1Gbit**  
**U-DQ Installation cable OM5**  
 54524.1OM5-CPR

OM5



**10Gbit**  
**U-DQ Installation cable SM**  
 54424.1L-CPR

Single Mode

# 3 Product selection

## 5.1 Data outlet



**Up to 5Gbit**  
**Cat.6 Data outlet**  
ET-25211.2V1

**Expert tip:**

Connection of a Wifi/WLAN device

**10Gbit**  
**Cat.6A Data outlet**  
ET-25130.1V1



## 5.2 Keystone and Frame



**Up to 5Gbit**  
**Cat.6 Keystone and Frame**  
E-200100 + ET-25111K

**10Gbit**  
**Cat.6A Keystone and Frame**  
E-20095 + ET-25111K



**Expert tip:** Slimdesign: higher packing density possible, in combination with INFRALAN® distribution panel 48 ports on 1U

## 6 Patch cable



**Up to 5Gbit**  
**Cat.6A Patch cable**  
K3130.x

**Expert tip:** PUR-jacket, UV-resistant

**Expert tip:**

Use flexible cable

**10Gbit**  
**Cat.6A Patch cable**  
MK7001.xx



**Expert tip:** Narrow grommet for simplified plugging process, Cat.7 raw cable

## 7 Fiber Patch Cable



**Up to 5Gbit**  
**Fiber Patch cable LC/LC OM5**  
O0319.xOM5

OM5

**10Gbit**  
**Fiber Patch cable LC/LC Uniboot**  
DJP-LCLCOS2-UNI-xx



Single Mode

**Expert tip:** Easy unplugging due to unlocking tab

# Option 1: Training room Cabling via extender

**Expert tip:**

Wifi / WLAN device



## Video conferencing with the right technology

In video conferences, a smooth picture and synchronous real-time sound transmission are desired. Cabling is the highest source of risk for poor data transmission. Therefore, cables should be selected that are designed for telecommunications, messaging and computer technology and that allow fast connections. Structured, future-proof cabling with Cat.7 is able to meet these requirements: the cable standard allows high data transmission rates of up to 10 Gbit/s, which are necessary for video conferences - and installation is just as uncomplicated as with other copper data cables.

A modern conference room with well-functioning video technology promotes communication, melts distances and saves immense costs for business trips and staff absences in the long term. However, the transmission of live video images requires a high data bandwidth, and all technical equipment must be designed for this. If you are thinking about the future, it is best to plan for even more resources.



## HDMI data outlet



**Frame for HDMI Keystone**  
ET-25188.1

**HDMI Keystone**  
EB479V2



## Video Extender



**HDMI Video Extender 4K**  
IDATA-EXT-E70-4K2

**HDMI Video Extender 1080p**  
IDATA-EXT-E70



## HDMI cable



**HDMI Connection cable**  
K5431SW.x

## Cat.7 Installation cable



**Up to 5Gbit**  
**Cat.7 Installation cable**  
99981.x-CPR

**10Gbit**  
**Cat.7A Installation cable**  
999830.x-CPR



For direct connection to the Extender, you need a field-terminated plug 88035-1  
Longlink RJ45 patch cable can be used instead of a K5537GR.x laying cable up to 90 metres



# Option 2: Conference room Cabling via AOC cable



## Active optical cable (AOC)

For HDMI™ AOC cables, transmission distances of 100 metres are no problem at all. Due to the cable combination of fiber optics and copper wires, significantly longer distances are possible than with bare copper cables. In addition, AOC cables are convincing due to their significantly better electromagnetic compatibility, the smaller space requirement and their low weight. Since existing HDMI™ AOC solutions do not require a power source, they prove to be the most flexible among the cabling options mentioned.

## HDMI data outlet



**Frame for HDMI Keystone**  
ET-25188.1



**HDMI Keystone**  
EB479V2

## HDMI AOC cable



**HDMI AOC Glasfaser Video Kabel**  
K5431AOC.30V2

Perfect 4K / 60Hz transmission up to 100 meters

## HDMI Connection Cable

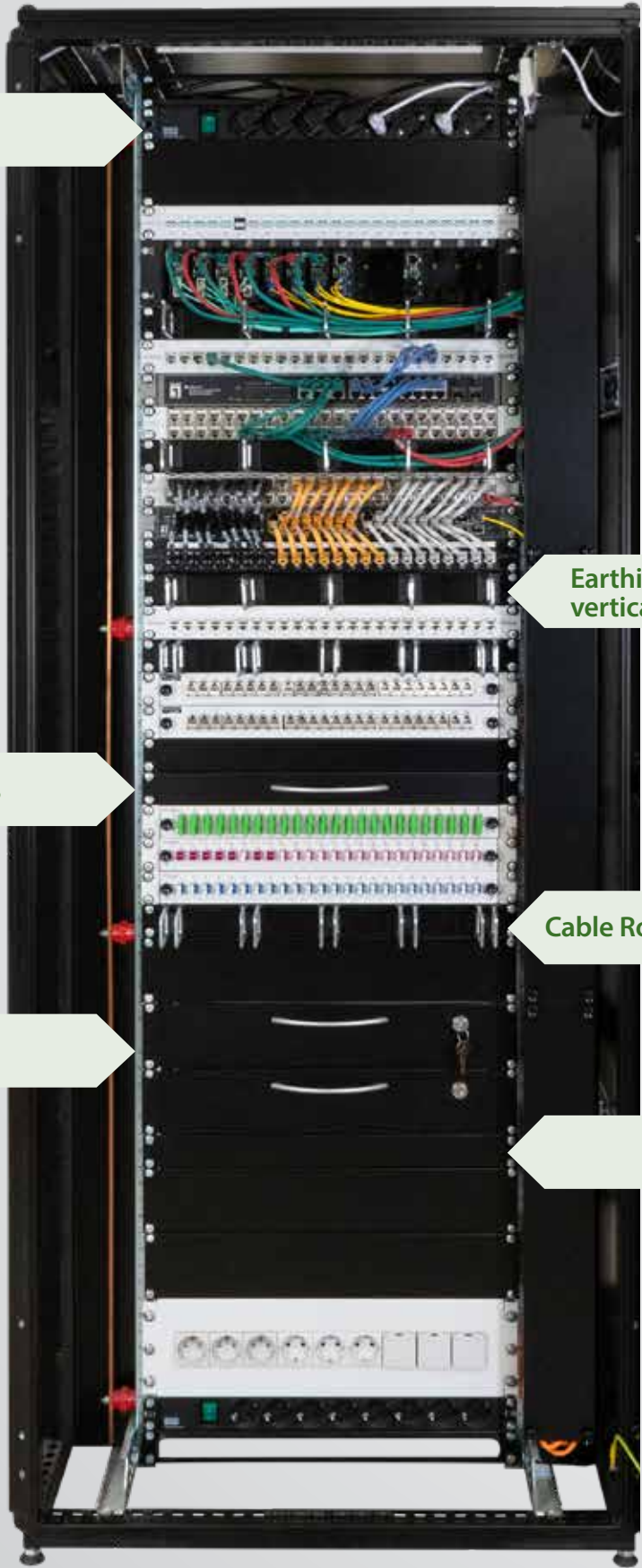
**Ultra HighSpeed HDMI Cable**  
K5440HQS.W.x



Resolution up to 8K at 60Hz

# 3 Floor distributor accessories

You want to configure your own product?



Socket Strip, 691689SW

Earthing Set for Cabinets 42U, vertically, K3930V42

Pull-Out Shelf 691651TS.8

Cable Routing Panel, 699981TS.1

2U Drawers, 691646TS.1

Dummy Plates 1U, 691265TS

## MORE THAN WELL-ADVISED ONSITE

# OUR SERVICE OFFER



### EFB PRODUCTS

WIDE RANGE AVAILABLE ONLINE

Visit our EFB-Elektronik online shop and have a look at our wide product range. A versatile selection awaits you – from fiber optic or copper cabling, cabinet systems and multimedia all the way to active components – everything from a single source.



### EFB-NEWSLETTER

ALWAYS STAY WELL INFORMED

Take a minute and sign up to receive our free newsletter containing innovations and interesting facts relating to our product highlights, as well as special events, product launches, exclusive offers and free admission tickets to events.



### WIDE RANGE OF PRINTED MATERIALS

Explore our wide range of printed materials: Catalogues, brochures, informational materials, certificates and operating manuals. These are easy and convenient to download. Alternatively, you can also have them sent to you as print version. This service is free of charge.



### OUR WEBSITE TAILORED TO MEET YOUR REQUIREMENTS

Check out our website to find out everything about EFB-Elektronik, our products and services.



## GERMAN LOCATIONS

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