Planning Overview

for the receive paths SAT, broadband, IP and optical SAT distribution

KATHREIN
Digital Systems GmbH

KATHREIN | Digital Systems GmbH

Who we are and **what** we stand for

We ensure the best possible radio and TV reception

KATHREIN Digital Systems is the market leader for digital satellite, terrestrial, cable or IP reception and signal distribution in buildings and caravans. Our high-quality and reliable product portfolio for modern TV and radio reception is constantly being expanded to include innovative solutions in the field of building technology.

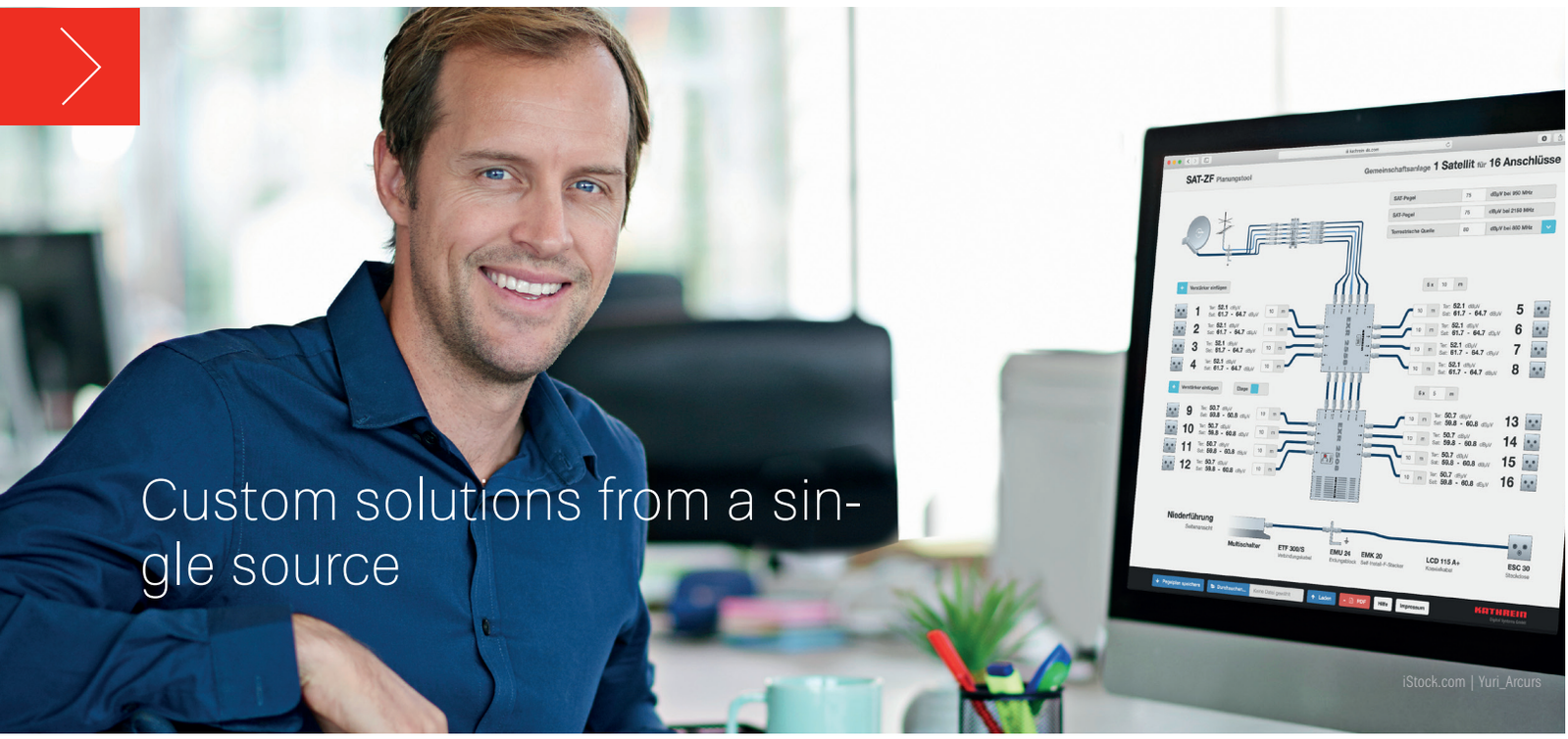
Thanks to extensive know-how in development and unsurpassed quality standards in production, our solutions and systems are among the best in their class. High-quality satellite reception systems in conjunction with sophisticated solutions for signal distribution, whether in single-family homes or in large building complexes, bring the signals to the receiving equipment in best HD quality.

New technologies such as SAT>IP, optical SAT distribution or modular headend technology for hotel TV close the gap between traditional signal distribution and modern optical fibre and network technology.

KATHREIN Digital System's advanced solutions are also the best choice for mobile TV reception in caravans and mobile homes.

Find out more about us at **www.kathrein-ds.com**

Our awards in 2019:



Below you will find descriptions of some components and examples of their installation for satellite reception systems.These are offered as a practical aid towards planning and costing your installation – though with no guarantee of completeness.

Quality made in Germany

Of course, the examples described do not cover all the possible installations that occur daily in the industry. Rather, they provide a small insight into the diverse and variable application possibilities of the reception systems presented.

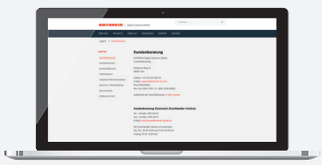
Nevertheless, we hope that the examples shown will provide some guidance even for those systems whose installation is not depicted. Our planning team (anlagenplanung@kathrein-ds.com) is at your disposal for the planning of individual installations. Our expert advisers in your sales region and our customer technical support service (support@kathrein-ds.com) will be glad to assist you with expert advice and practical help.

An important part of Kathrein's environmental policy is to make sure that with the development of new products the environmental burden is kept as low as possible. As such, products are only awarded the Kathrein environmental label that feature especially environmentally-friendly characteristics in the following respects:

umweltschonend Energiesparer ökonomisch

- Energy efficiency in operational and stand-by modes
- Eco-friendly packaging
- Avoidance of dangerous substances
- Optimal use of resources in production processes
- Recycling and environmentally-friendly disposal

Support



Support at www.kathrein-ds.com

We provide you with extensive multimedia support on our website.
At https://www.kathrein-ds.com/support/kundenberatung/ you will find lots of useful content, including:

Online tools
You can use our special calculation tools to easily plan and realise professional TV reception and distribution systems:

- Planning/signal calculation tool for community satellite systems
- "CLIKulator" calculation tool for optical sat distribution systems

Videos
At https://www.kathrein-ds.com/newsroom/mediacenter/ our videos provide clear and practical information about the different installation options for all receive paths:

- The optical Sat-IF distribution system with CLIK!
- SAT>IP with EXIP
- Easy home networking via coaxial cable with K-LAN
- UFOcompact plus® – the headend system from Kathrein

Use this QR code to access support:

Use this QR code for the videos:

Lyngsat

Overviews of transponder assignments for almost all European and international satellites, updated every day, can be found at www.lyngsat.com. After selecting the appropriate satellite and its footprint, you will find all free and encrypted receivable TV channels and their reception frequencies.

Planning and signal calculation tool for community satellite systems

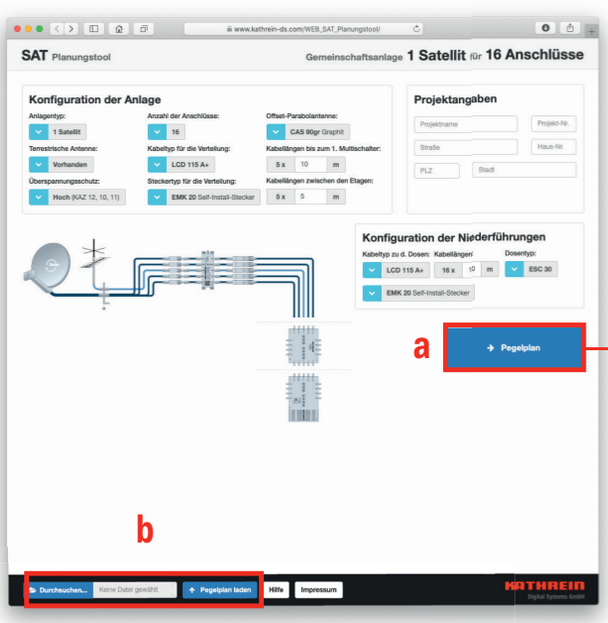
With the new satellite planning tool, we offer DIY tradesmen a free tool for designing satellite receiver systems. You can use it to easily configure building distributions or even complex communal units for up to four satellite positions.

Regardless of the size of the system being planned, tradesmen can get an overview of all level values, information about cable lengths and advice on positioning appropriate amplifiers. In addition, all necessary cable types, including the corresponding packaging units, are calculated.

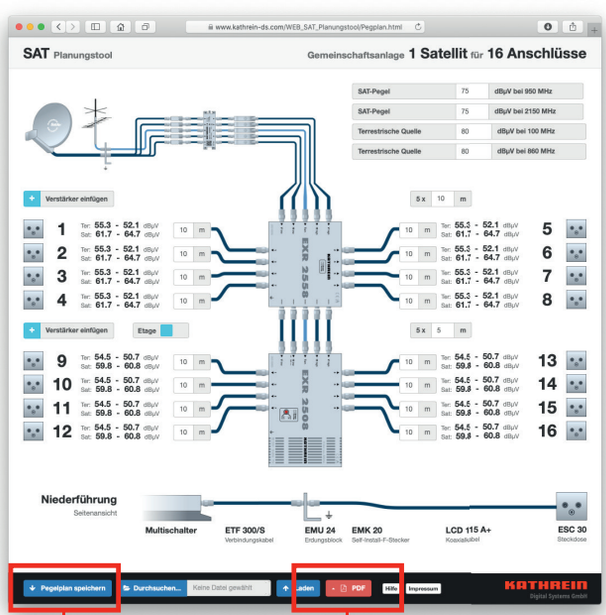
It is possible to export and save a design and to import it for subsequent editing or to order all the components. For complete and time-saving documentation, the signal level plan and the product article list can be saved in PDF format.

Next page ▶

1 Planning of the installation (a) or loading a saved signal level plan (b)



2 Signal level plan for installation



Save signal level plan

Store the signal level plan as a file on your PC for subsequent editing. The SPT file is saved to the Downloads folder on your PC.

Save material list

Store the material list and the signal level plan as PDF files on your PC.

The key feature is the ELBRIDGE interface, available for the first time in the satellite industry. It automatically transfers all the articles required for the configured installation to the shopping basket of one of the 60 resellers currently connected to the system.

All highlights at a glance:

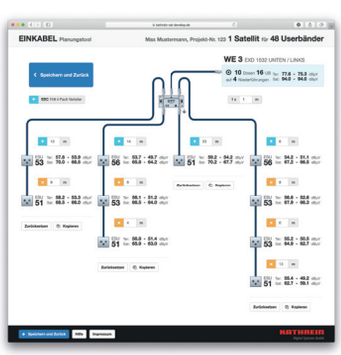
- User-friendly design of simple and complex satellite reception systems
- Complete overview of all level values for the entire installation
- Planning of tailored cable lengths and placement of amplifiers
- Calculation of the relevant cable types and packaging units
- Saving, loading and editing configurations
- Creation of a signal level plan (PDF) for the entire installation
- Creation of a material list (PDF) with all required components
- Automatic transfer of all articles to a reseller's shopping basket via EL-BRIDGE interface

Use this QR code to access the planning tool directly:

You will find our helpful planning tool at https://www.kathrein-ds.com/WEB_SAT_Planungstool

Planning and signal level calculation tool for single-cable systems

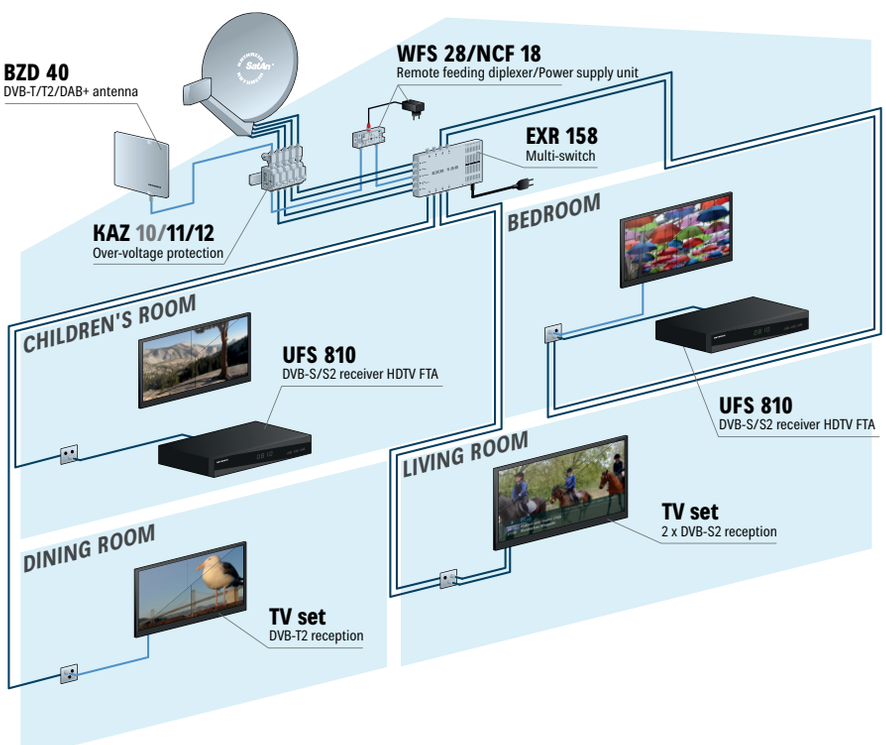
The planning and signal level calculation tool for single-cable systems is currently in production, and is scheduled for publication in the first half of 2020. As soon as the tool is available online, we will inform you in our newsletter (https://www.kathrein-ds.com/newsletter/).



The Sat IF distribution system

Limitless variety guaranteed

Regardless of whether you opt for a satellite reception system when building a new property or when updating an existing installation: the advantages for you and your customers are self-evident. While the number of receivable channels provided by other transmission methods is greatly limited, with satellite reception you will experience almost limitless variety, especially when receiving multiple satellites. And there are practically no limits to the number of subscribers.



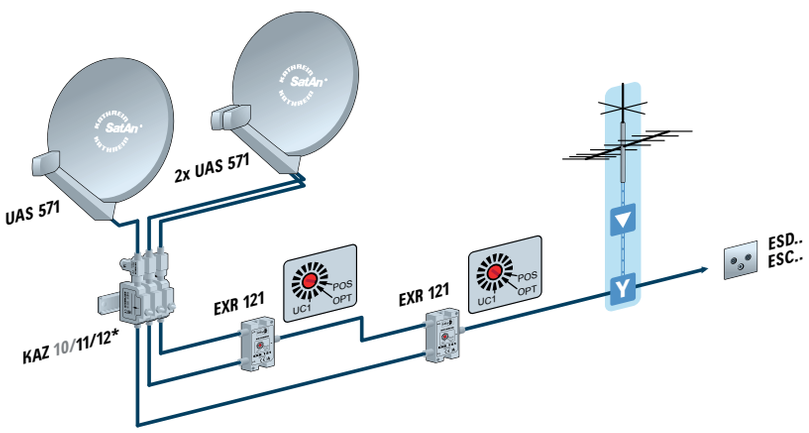
With our intelligently designed system components, supported by our smart planning tool, low-cost installations featuring large numbers of connections and meeting a wide range of requirements can be implemented. Given that many sat channels are free-to-air – even in HD – and no additional equipment is required, a high-tech sat IF system will have paid for itself in just a few years, especially when installed in a multi-dwelling apartment building.

Thanks to state-of-the-art distribution technology, a single parabolic antenna can supply entire housing blocks with the variety of channels provided by multiple satellites. Signal splitting via multi-switches, in combination with distribution network amplifiers, means almost any installation can be realised easily and flexibly. Combination options with other signals, such as DVB-T/-T2 or cable TV, are not excluded.

Your customers will also have almost unlimited choice when it comes to the range of digital terminal equipment. Resellers offer a wide range of satellite receivers and recording and storage media. From low-cost entry-level systems for the smaller budget to high-end receivers for the more discerning, all users are sure to find the right product for them.

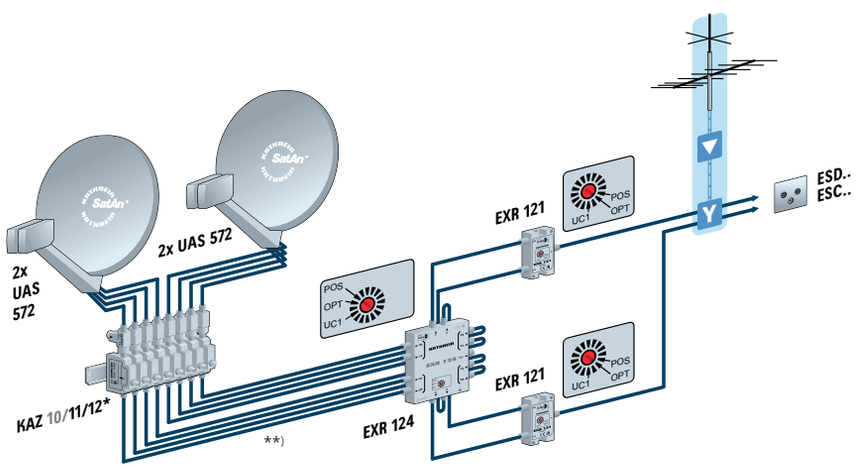
Individual reception systems (4 × Sat IF)

2 and 3 satellites, DiSEqC™ switch, not cascadable, multi-feed



Individual reception systems (4 × Sat IF)

2 and 4 satellites, DiSEqC™ switch, multi-feed



*) Over-voltage protection

**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

CONFIGURATION

- 2 and 3 satellites
- 1 connection
- Not extendable

Switch settings:

2 sat positions selectable

With cascading up to 4 sat positions selectable

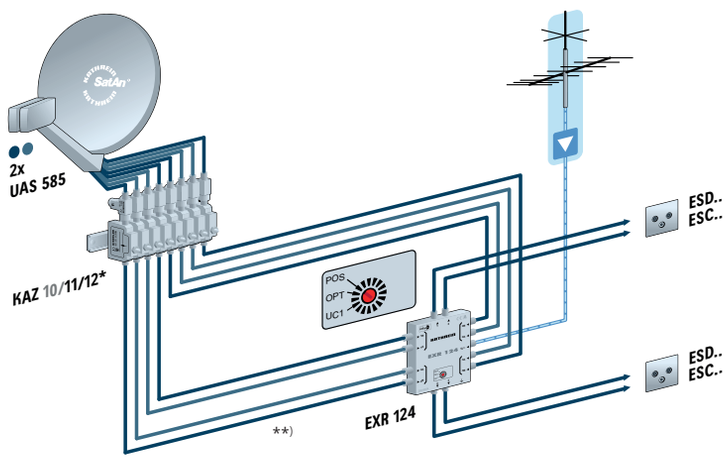
With cascading up to 64 sat positions selectable

CONFIGURATION

- 4 satellites
- 2 connections
- Not extendable

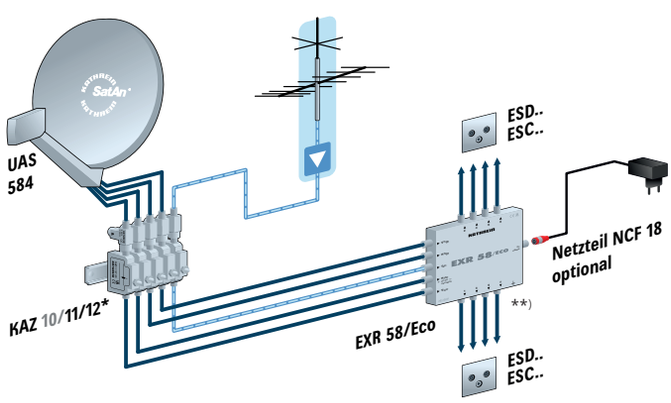
Individual reception systems (4 × Sat IF)

2 satellites, DiSEqC™ switch, multi-feed



Communal units (4 × Sat IF)

1 satellite, not cascadable, ECO variant



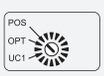
*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

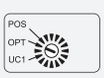
CONFIGURATION

- 2 satellites
- 4 connections
- Not extendable

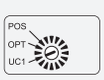
Switch settings:



2 sat positions selectable



With cascading up to 4 sat positions selectable

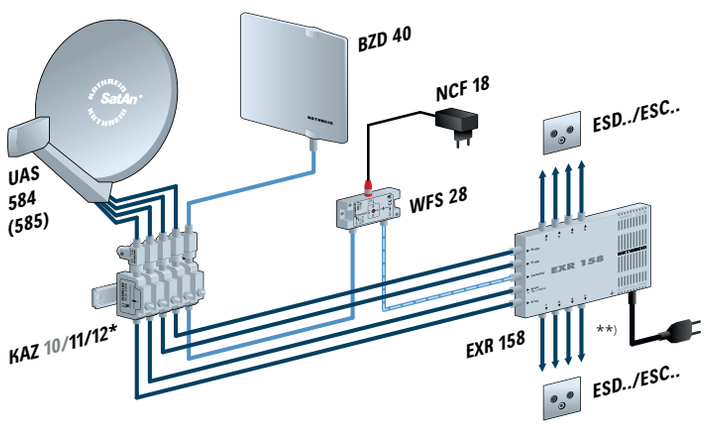


With cascading up to 64 sat positions selectable

CONFIGURATION

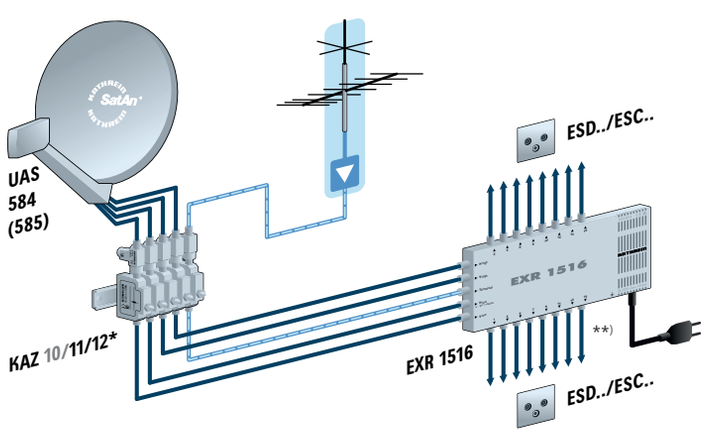
- 1 satellite
- 8 connections
- Not extendable

Communal units
1 satellite, not cascadable



CONFIGURATION

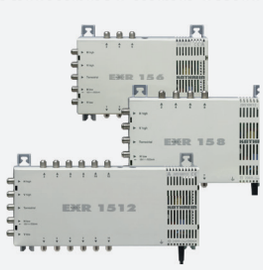
- 1 satellite
- 8 connections
- With DVB-T/T2 antenna BZD 40 and feed diplexer WFS 28



CONFIGURATION

- 1 satellite
- 16 (6/8/12) connections

Alternative multi-switches:



- EXR 156 for 6 connections
- EXR 158 for 8 connections
- EXR 1512 for 12 connections

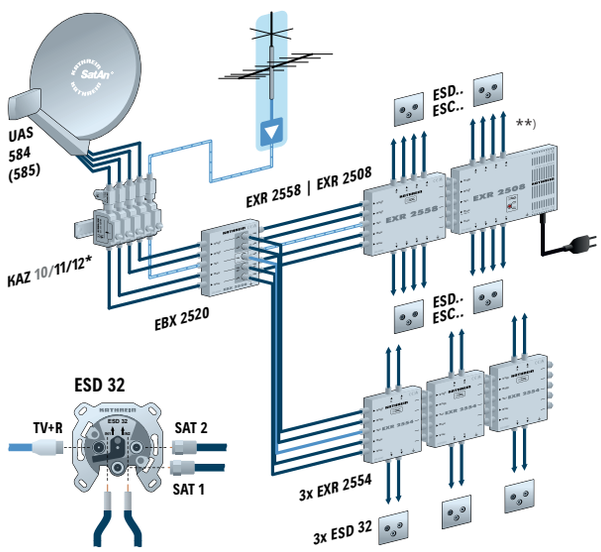
ESC 30 connections:

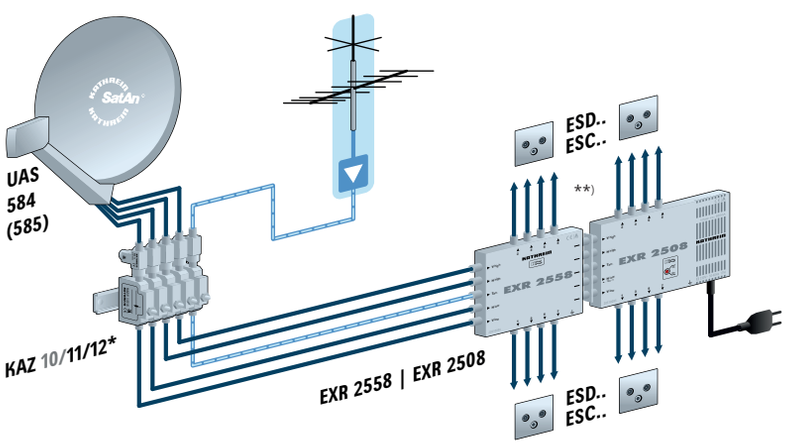
- TV: Male connector (IEC 61169-2)
- Radio: F connector (IEC 61169-2)
- Sat: F connector (IEC 61169-24)

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82. The LCD 115 A+ cable is particularly suitable for outdoor use thanks to its UV resistance. For underground installation, please use our LCM cables.

Communal units (4 × Sat IF)
1 satellite, cascadable





*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

CONFIGURATION

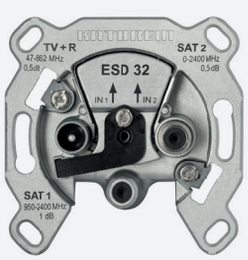
- 1 satellite
- 28 connections
- Extendable

Terrestrial signals can be fed in via the FM antenna and the VCA 28 compact amplifier.

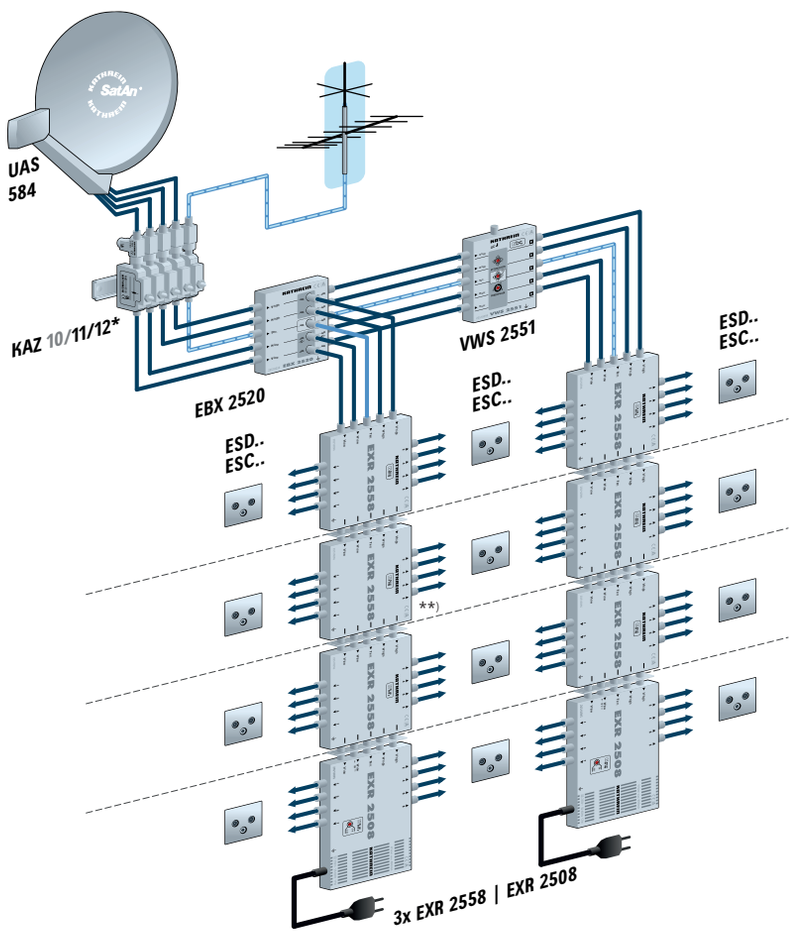
CONFIGURATION

- 1 satellite
- 16 connections
- Extendable

ESD 32 connections:



- TV + radio: Male connector (IEC 61169-2)
- Sat 2: F connector (IEC 61169-24)
- Sat 1: F connector (IEC 61169-24)



*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

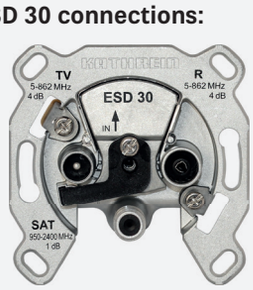
For detailed information on grounding satellite systems, see page 82.

CONFIGURATION

- 1 satellite
- Up to 64 connections
- Floor star distribution
- Extendable with splitter EBX 2520

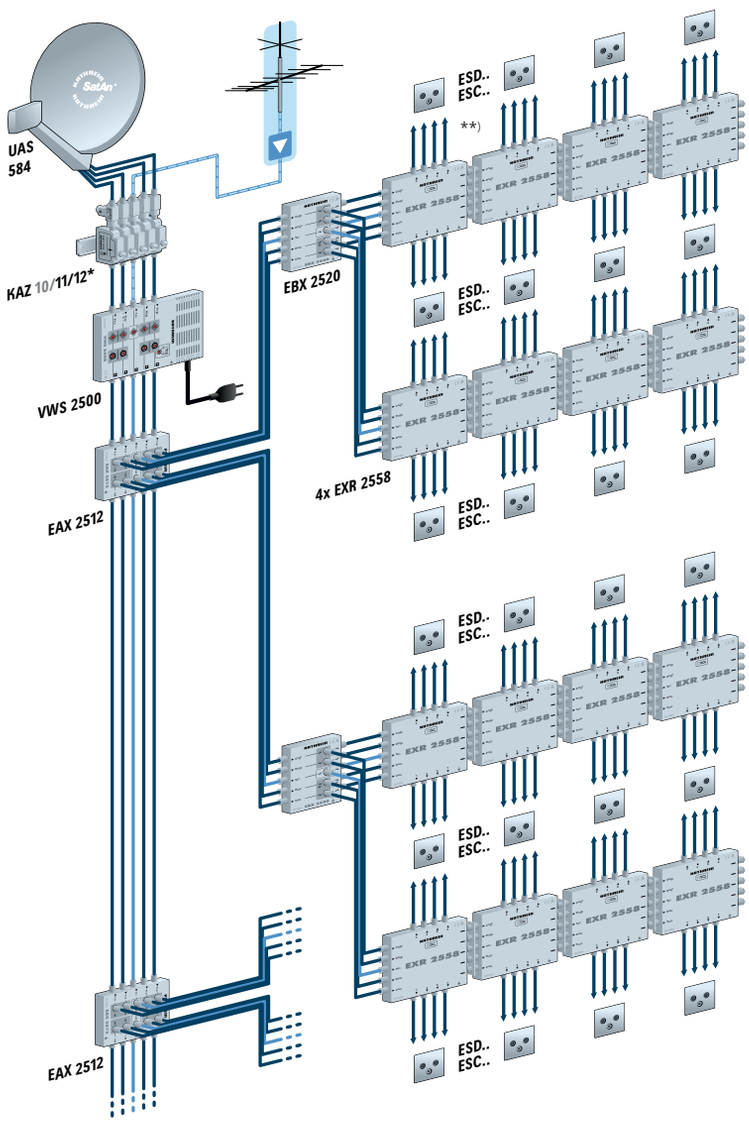
The actual feasibility of these installations is given by the calculation of the signal voltage. The use of suitable amplifiers (such as VWS 2551) depends on the respective cable lengths.
Use our planning tool for calculations. You will find the relevant QR code on page 9.

ESD 30 connections:



- TV: Male connector (IEC 61169-2)
- Radio: F connector (IEC 61169-2)
- Sat: F connector (IEC 61169-24)

Communal units (4 × Sat IF)
1 satellite, cascadable



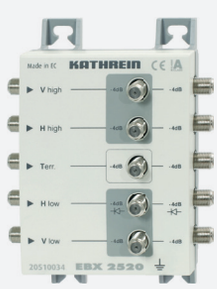
*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

CONFIGURATION

- 1 satellite
- n connections
- Floor star distribution

The actual feasibility of these installations is given by the calculation of the signal voltage. The use of suitable amplifiers (such as VWS 2500) depends on the respective cable lengths.

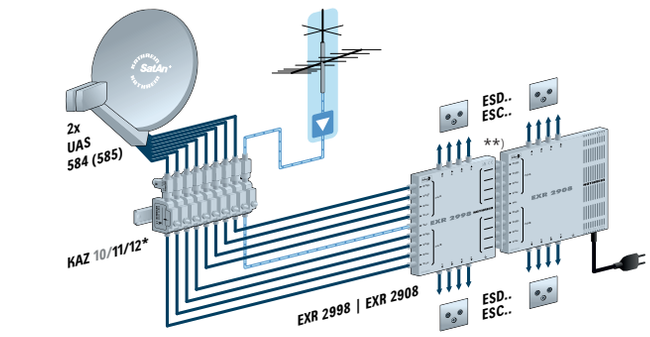


EBX 2520 features:

- Remote-feed capable via input → trunk output and splitter output "horizontal low" (diode decoupling to trunk output); isolating capacitors on remaining splitter outputs
- 2-way splitter (4 × Sat IF) to distribute a trunk line to two 5-line multi-switch cascades
- Five 2-way splitters (4 × Sat IF and 1 × terrestrial range) in one housing

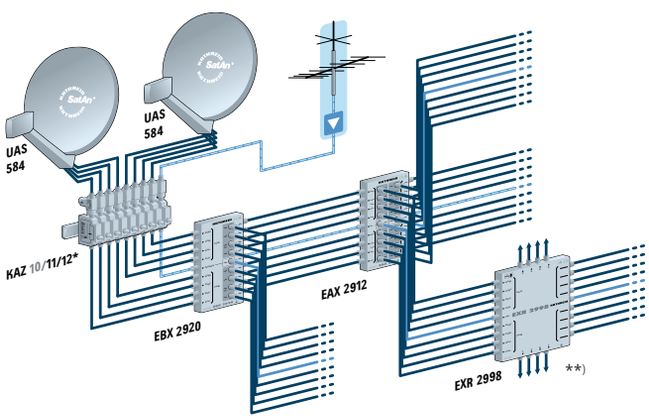
Communal units (8 × Sat IF)

2 satellites, cascadable, multi-feed



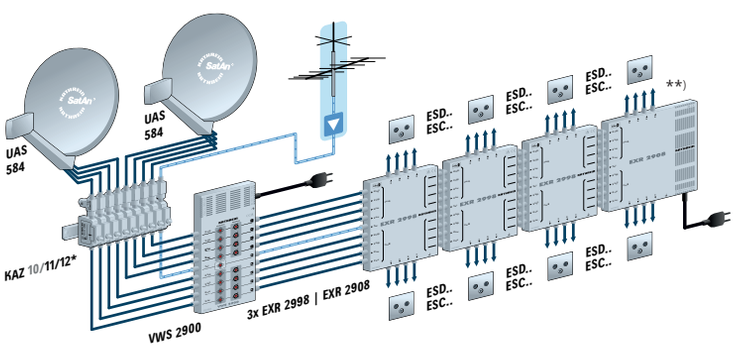
CONFIGURATION

- 2 satellites
- 16 connections
- Extendable
- Multi-feed



CONFIGURATION

- 2 satellites
- n connections
- Extendable
- Multi-feed
- With tap EAX 2912 and splitter EBX 2920



CONFIGURATION

- 2 satellites
- 40 connections
- Extendable
- Multi-feed

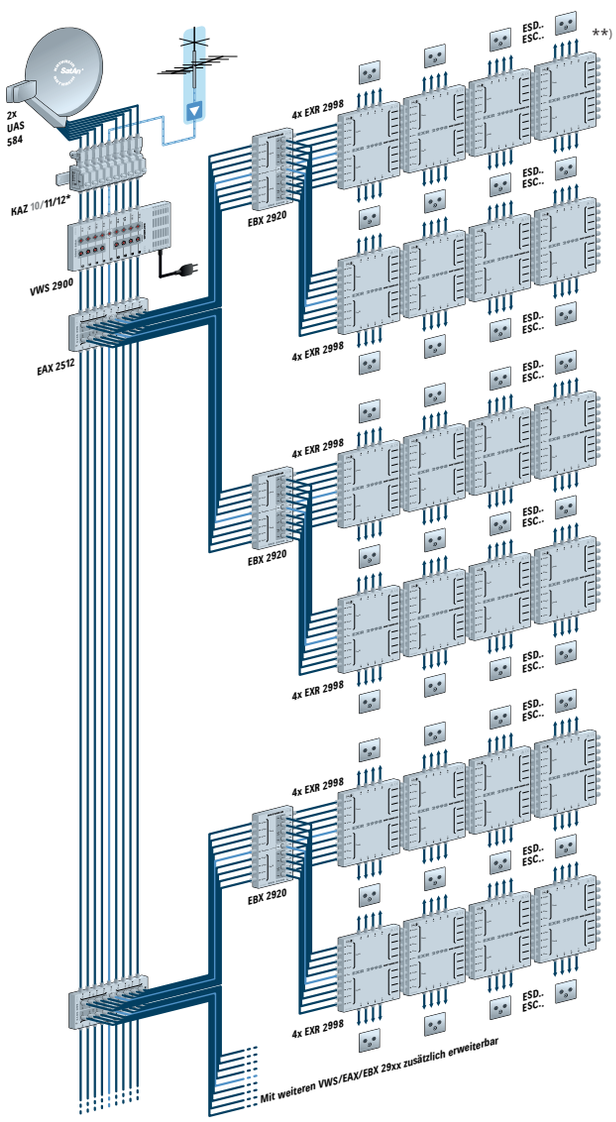
*) Over-voltage protection

**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

Communal units (8 × Sat IF)

2 satellites, cascadable, multi-feed



*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

CONFIGURATION

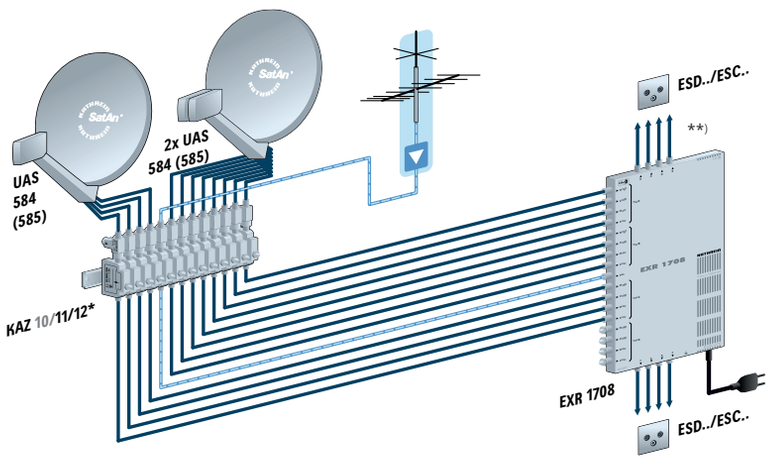
- 2 satellites
- n connections
- Extendable
- Multi-feed
- With amplifier VWS 2900

The actual feasibility of these installations is given by the calculation of the signal voltage. The use of suitable amplifiers (such as VWS 2900) depends on the respective cable lengths. Use our planning tool for calculations. You will find the relevant QR code on page 9.

You can get help on individual system planning from our planning team at anlagen-planung@kathrein-ds.com, from our field service, or from our customer support team support@kathrein-ds.com

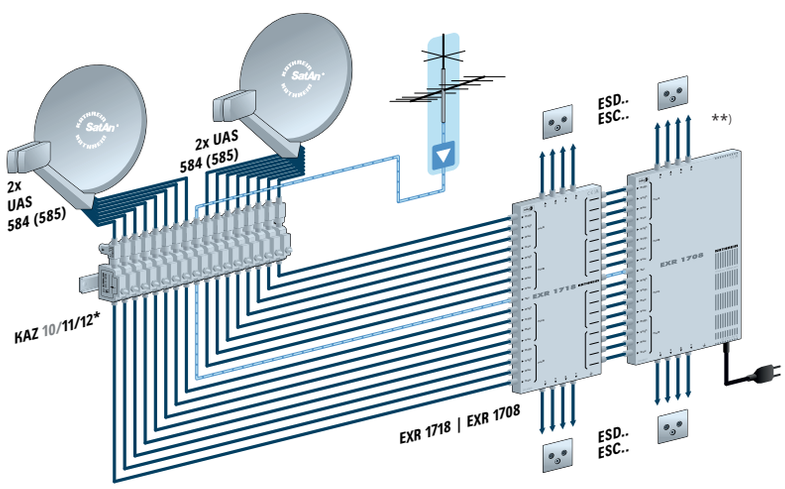
Communal units (16 × Sat IF)

3 and 4 satellites, cascadable, multi-feed



CONFIGURATION

- 3 satellites
- 8 connections
- Possible satellite positions (example): ASTRA 19,2°, EUTELSAT 16° and TürkSat 42°



CONFIGURATION

- 4 satellites
- 16 connections

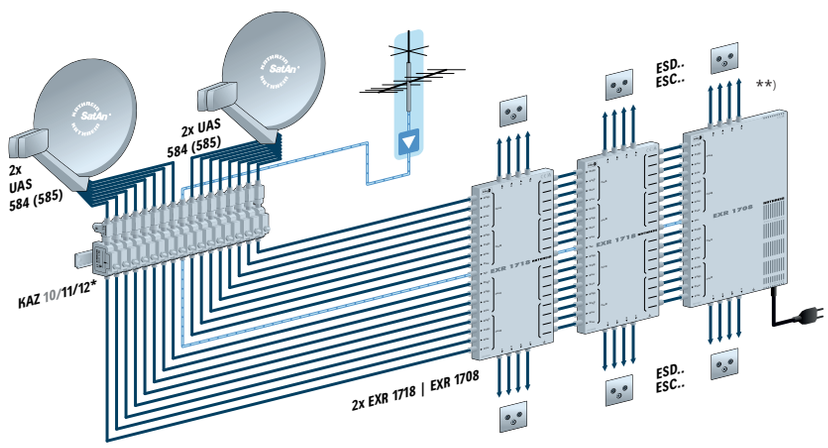
*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

Terrestrial signals can be fed in via the FM antenna and the VCA 28 compact amplifier.

For detailed information on grounding satellite systems, see page 82.

Communal units (16 × Sat IF)

4 satellites, cascadable, multi-feed



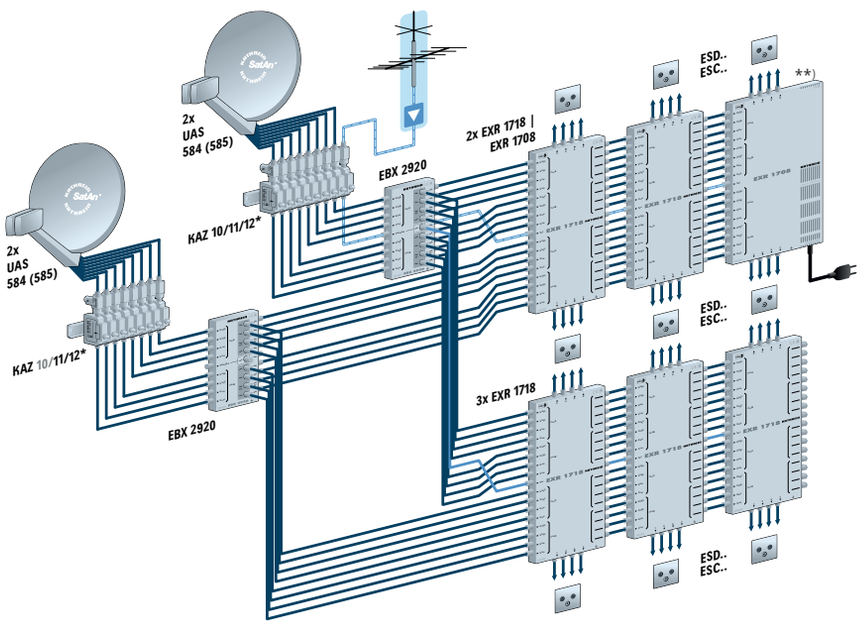
CONFIGURATION

- 4 satellites
- 24 connections
- Multi-feed
- Extendable

The actual feasibility of these installations is given by the calculation of the signal voltage. The use of suitable amplifiers (such as VWS 2900) depends on the respective cable lengths.

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.



CONFIGURATION

- 4 satellites
- 48 connections
- Multi-feed
- Extendable

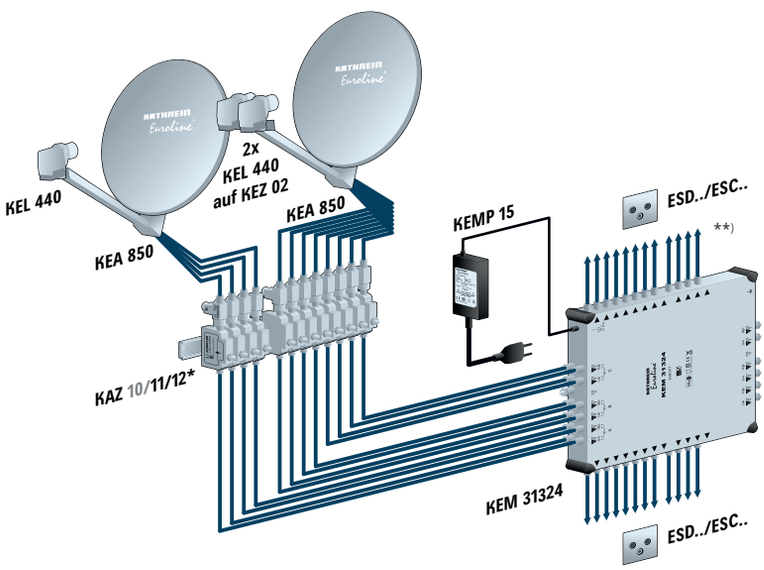
The actual feasibility of these installations is given by the calculation of the signal voltage. The use of suitable amplifiers (such as VWS 2900) depends on the respective cable lengths.

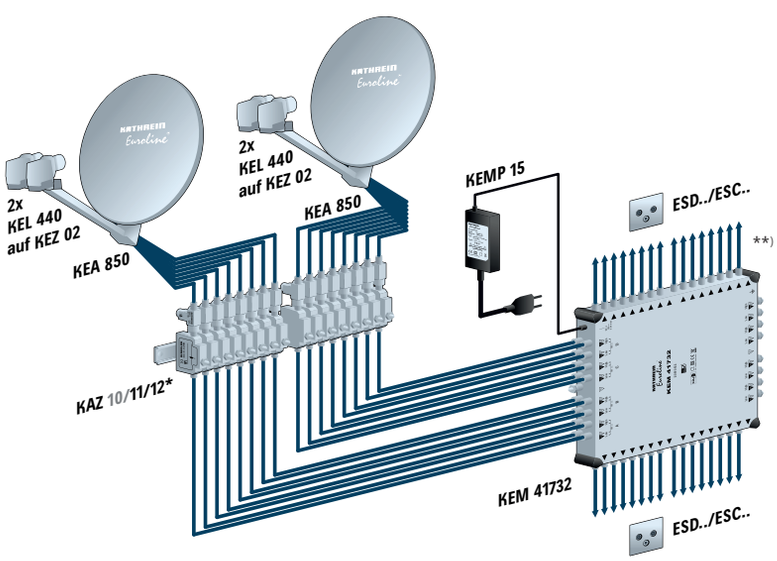
*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

Communal units (12/16 × Sat IF) Euroline

3 and 4 satellites, cascadable, multi-feed





*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

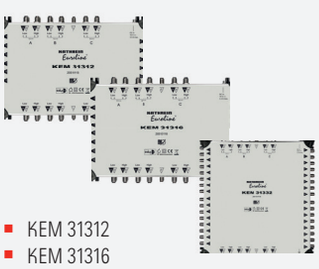
For detailed information on grounding satellite systems, see page 82.

KATHREIN Euroline®

CONFIGURATION

- 3 satellites
- 12/16/24/32 connections

Alternative multi-switches:

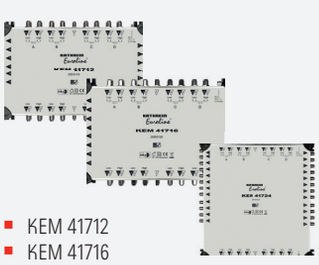


- KEM 31312
- KEM 31316
- KEM 31332

CONFIGURATION

- 4 satellites
- 12/16/24/32 connections

Alternative multi-switches:



- KEM 41712
- KEM 41716
- KEM 41724

Terrestrial signals can be fed in via the FM antenna and the VCA 28 compact amplifier.

DVB Digital Video Broadcasting geeignet für DVB-T/-T2

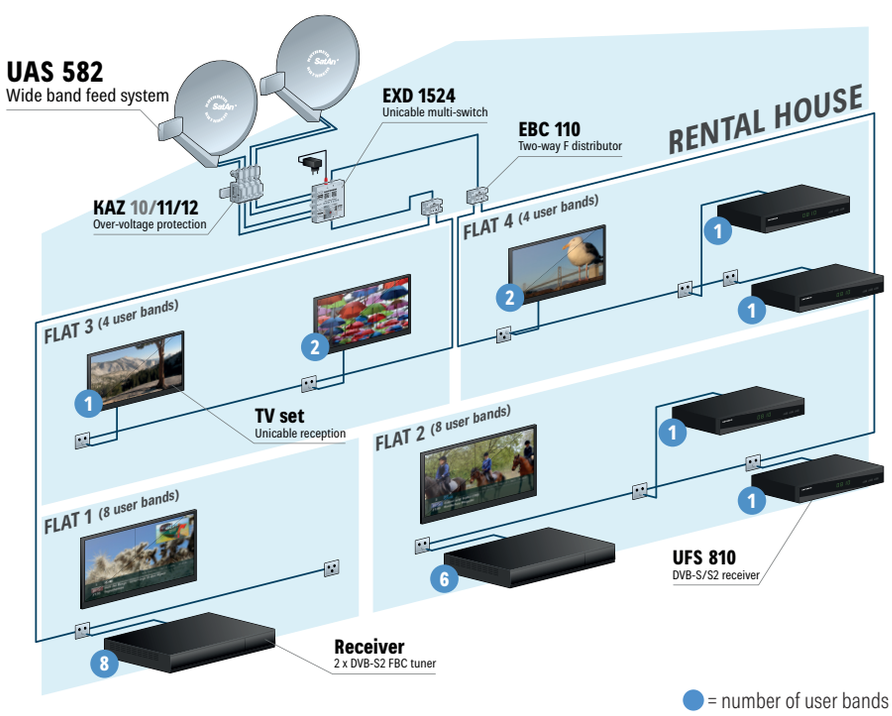
Quality made in Germany

Wideband

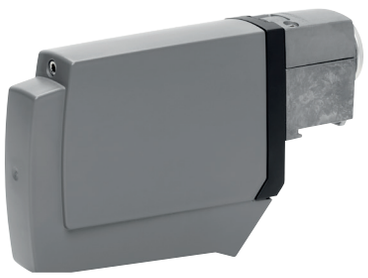
Reduced cabling – only two cables per LNB and satellite

Multi-switches are usually used to supply multiple terminal devices with satellite signals. For this, one LNB per satellite is connected to the multi-switch, with four cables. When using the UAS 582 (wideband LNB), only two cables rather than four are required from the LNB to the multi-switch. With multi-feed, this means that two satellites can be received with only four cables.

If you are already updating an existing installation with a wideband LNB and want to continue using the old multi-switch, you can use the UWS 24 to split the signal again from two to four planes in front of the already installed multi-switch, meaning you do not need to make any changes in your further installation.



Wideband LNB
UAS 582

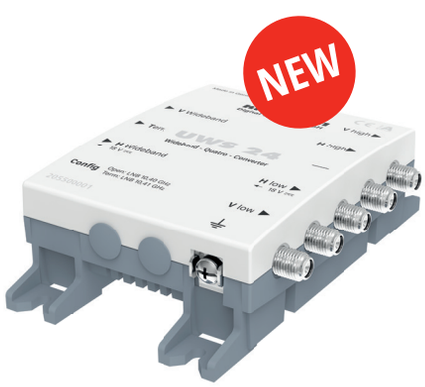


- For reception of satellites in the Ku-band, such as ASTRA, EUTELSAT and TürkSat
- The feed system complies with the ASTRA specifications for universal wideband LNB
- Energy-saving – just 1.2 Watt power consumption
- Power supply via coaxial cable
- Compact design makes it suitable for multi-feed
- Complete protection of LNB and cable connections in a ventilated housing, protection class: IP 54

Quality made in Germany

5 JAHRE GARANTIE KATHREIN Qualität

Wideband to Quatro converter
UWS 24



- Converter for two wideband signals on four sat IF planes
- Adaptation to oscillator frequency of the LNB (10.40 or 10.41 GHz) with EMK 03 terminating resistor (order no.: 237169) possible
- Supply via horizontal low trunk
- Terrestrial signals can be received in the 5-862 MHz range even when the satellite receiver is switched off
- Mounting on EXR 25xx with coupler EMU 250 (order no.: 20510044) possible
- Kathrein Power-Saving: If no receivers are active in an installation with Kathrein Power-Saving, the converter is switched off in addition to the LNB.

Quality made in Germany

To prevent overloading of the inputs, the level must not exceed 80 dBµV per transponder. At higher input levels (> 80 dBµV), the use of an attenuation attachment (e.g. ERE 01 at 6 dB, Order no.: 274854) is recommended.

KLASSE A CLASS

DVB Digital Video Broadcasting geeignet für DVB-T/-T2

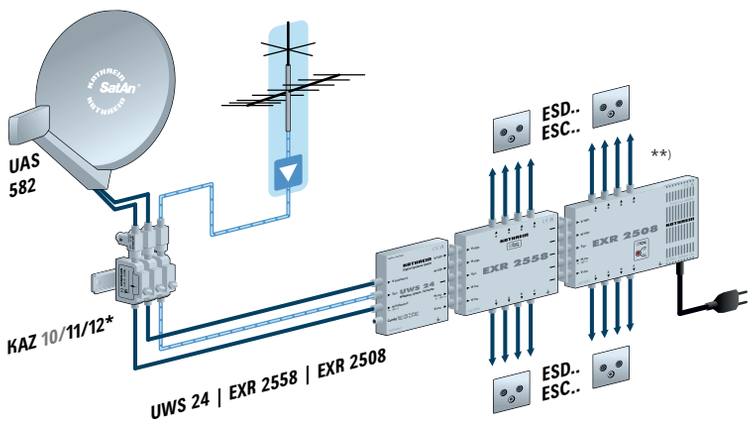
Quality made in Germany

Energiesparer

Power Saving

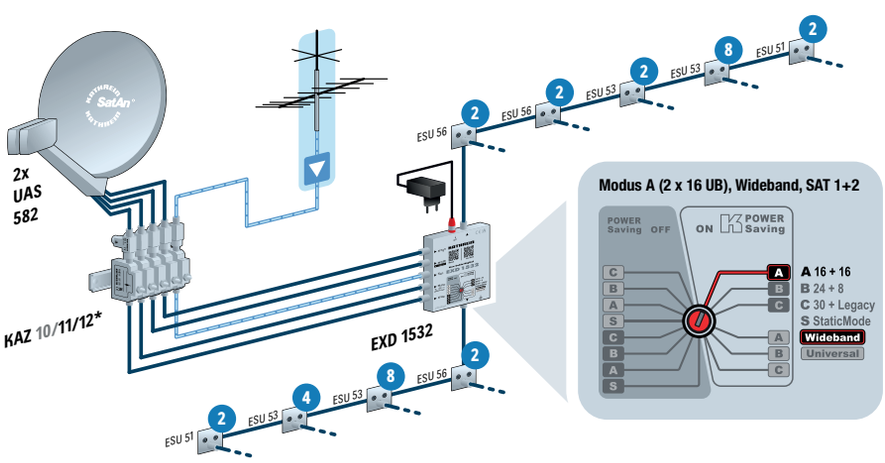
Communal units with wideband LNB

1 and 2 satellites, cascadable



CONFIGURATION

- 1 satellite
- 16 connections
- Back-converting with UWS 24 on four planes



CONFIGURATION

- 2 satellites
- 30 + Legacy or 16+16 or 24+8
- n in static mode (virtually any number of subscribers possible)

● = number of user bands

*) Over-voltage protection

**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

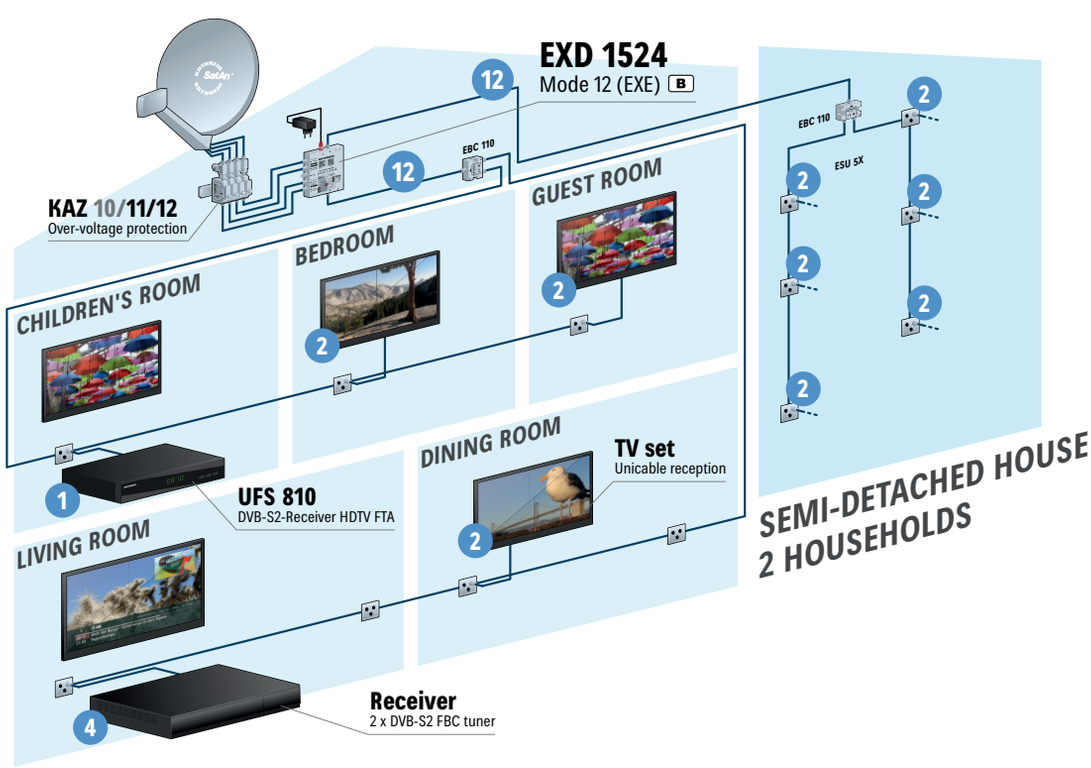
The single-cable system

All channels through just one cable

Updating reception systems in residential buildings usually entails high remodelling and installation costs. This can be avoided, however, if you opt for a professional state-of-the-art single-cable solution from Kathrein.

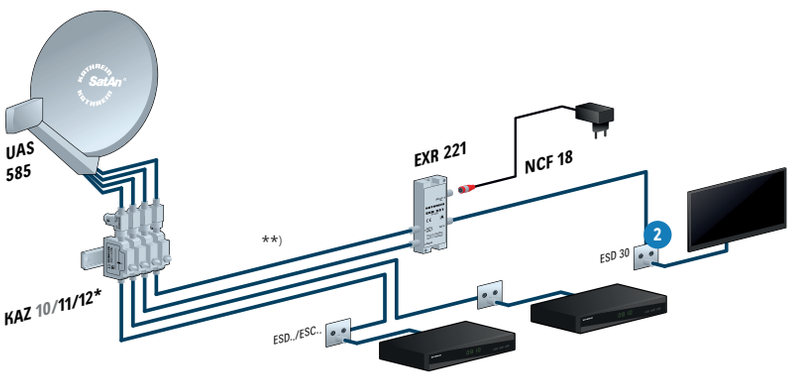
The first single-cable systems on the market supported only a limited number of channels due to the technical constraints at the time. Using the first generation of the new single-cable multi-switches (EN 50494 and EN 50607), there is no restriction on the variety of channels, though the number of user bands is limited to a maximum of 8 or 12 respectively. The latest-generation digital multi-switches support up to 32 user bands, depending on the configuration. To be able to use them without restrictions, the receivers must implement the EN 50607 standard.

With the complete system from Kathrein, consisting of digital multi-switches, programmable ESU 5x socket outlets and the EXIP 4124 Sat>IP server, the full range of channels is now available without restriction (whether SD, HD, 3D and/or UHD TV). Maximum flexibility is offered by the possibility of installing the single-cable system across multiple dwellings. Each connection in the building can be allocated and utilise multiple user bands. The installation may be a star or tree structure, or a combination of the two. This makes single-cable technology particularly suitable for switching from cable TV to satellite reception.



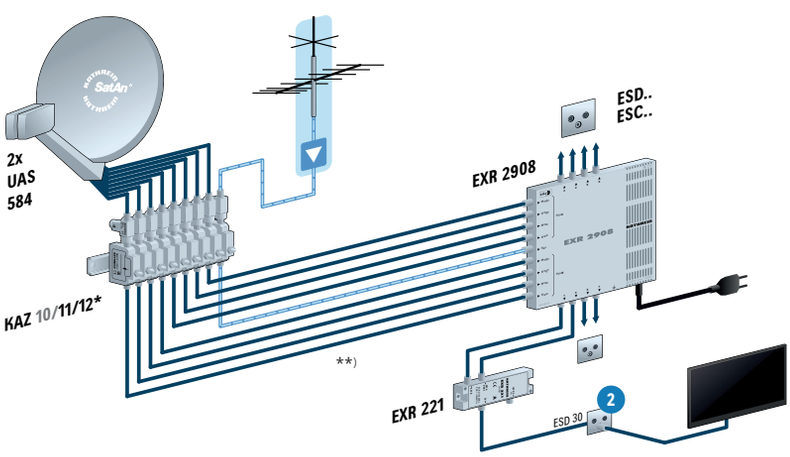
Individual reception systems

1 and 2 satellites, not cascadable, mini multi-switch



CONFIGURATION

- 1 satellite
- 2 addresses



CONFIGURATION

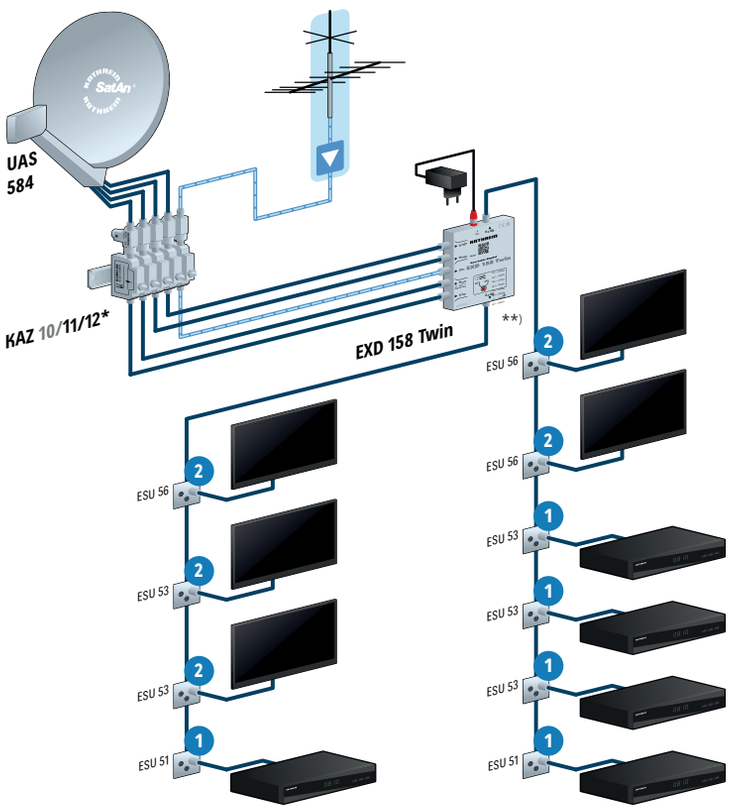
- 2 satellites
- 6 connections/2 addresses
- Multi-feed

● = number of user bands

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

Individual reception systems
1 satellite, cascadable



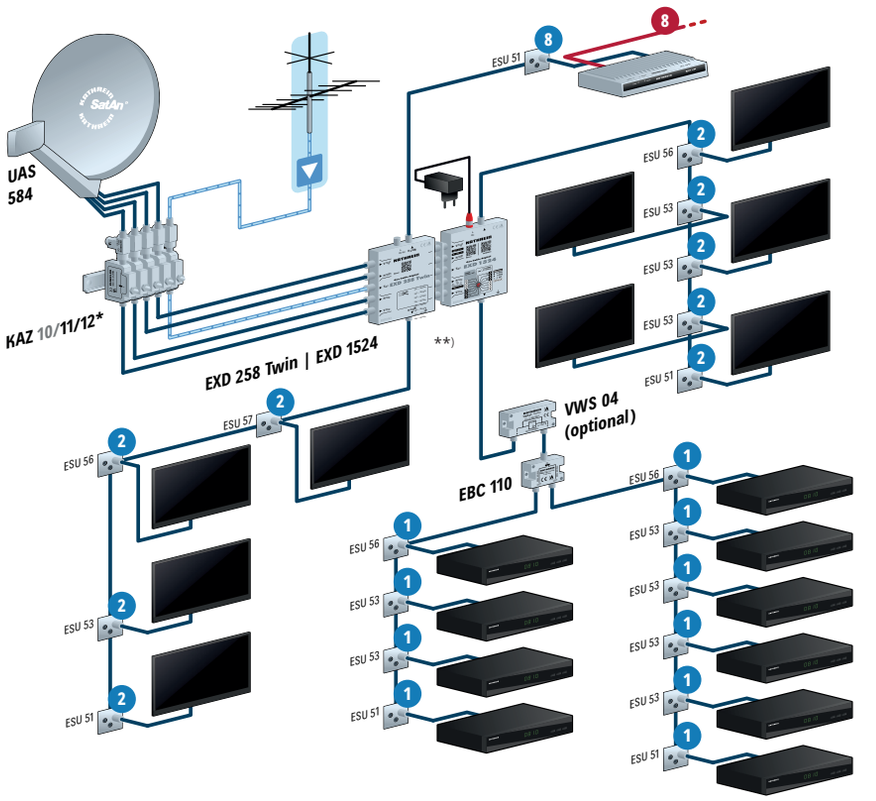
● = number of user bands

CONFIGURATION

- 1 satellite
- 16 (2 × 8) addresses
- With Kathrein Power-Saving

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.



● = number of user bands
● = number of Sat>IP streams

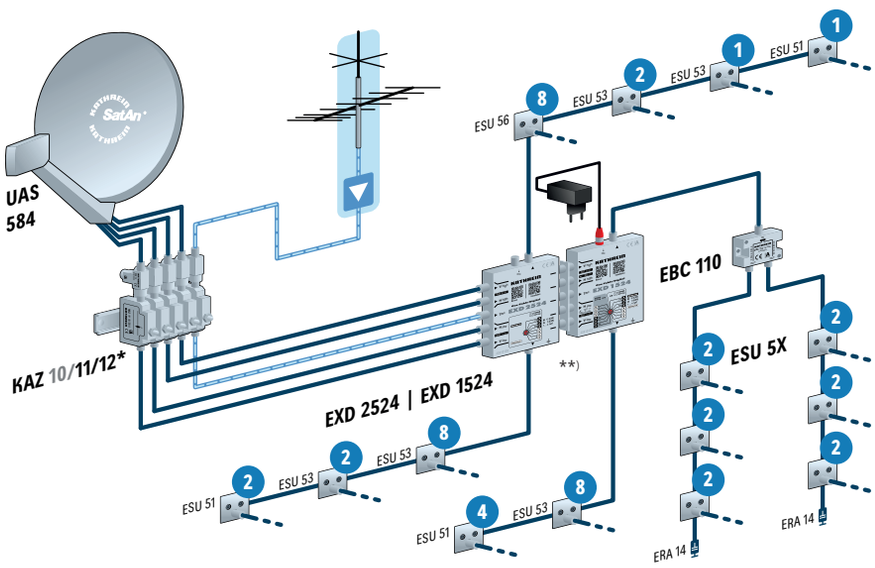
CONFIGURATION

- 1 satellite
- 40 addresses
- Extendable
- With Kathrein Power-Saving
- VWS 04 optional (depending on cable lengths)

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

Individual reception systems
1 satellite, cascadable



= number of user bands

CONFIGURATION

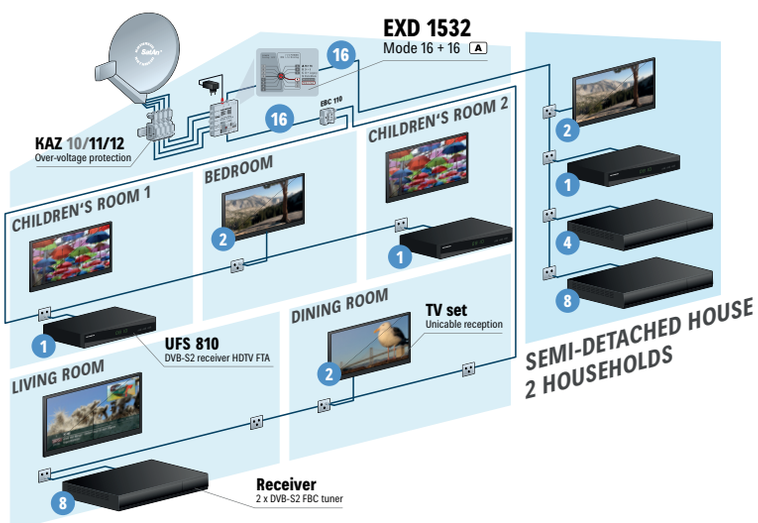
- 1 satellite
- 48 addresses
- Extendable
- With Kathrein Power-Saving

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

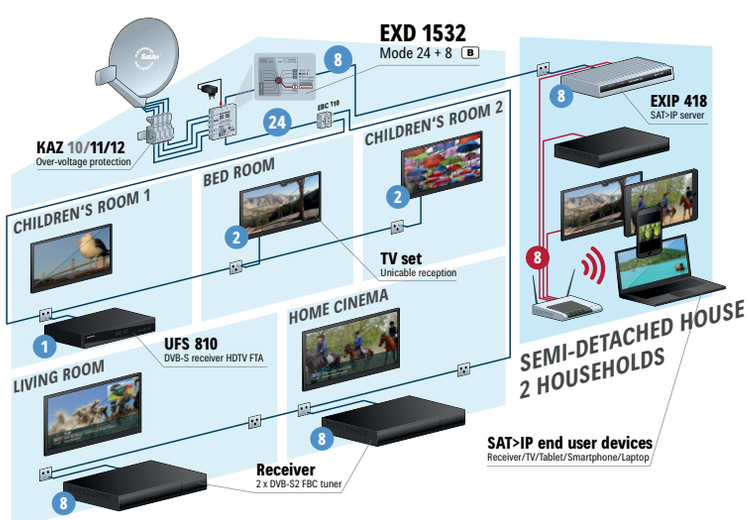
Communal units

1 satellite, cascadable, digital multi-switches



CONFIGURATION

- Mode 16 + 16
- Digital multi-switches

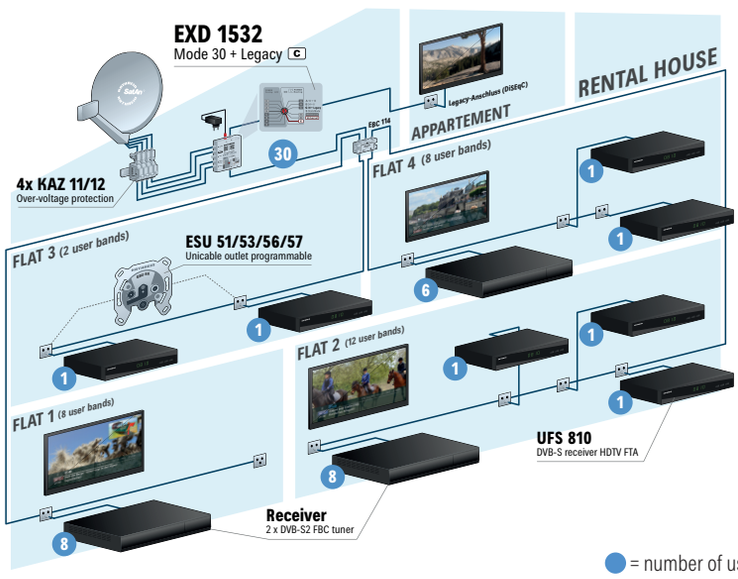


CONFIGURATION

- Mode 24 + 8
- Digital multi-switches

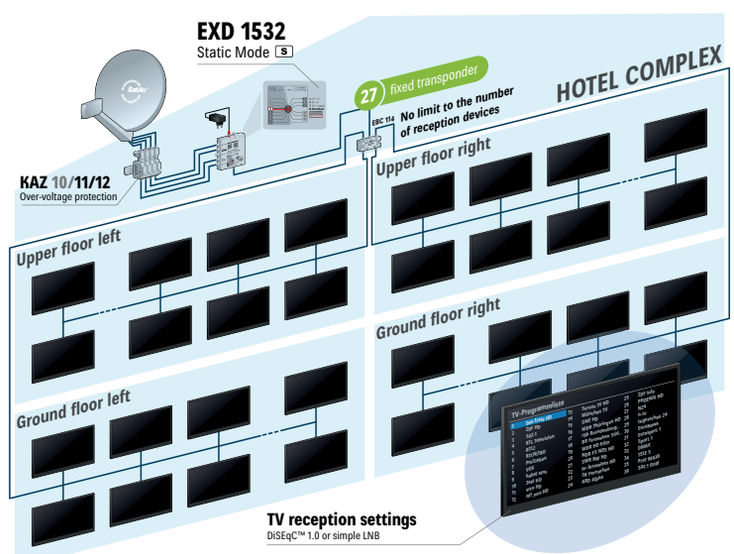
= number of user bands
= number of Sat>IP streams

Communal units
1 satellite, cascadable, digital multi-switches



CONFIGURATION

- Mode 30 and Legacy
- Digital multi-switches



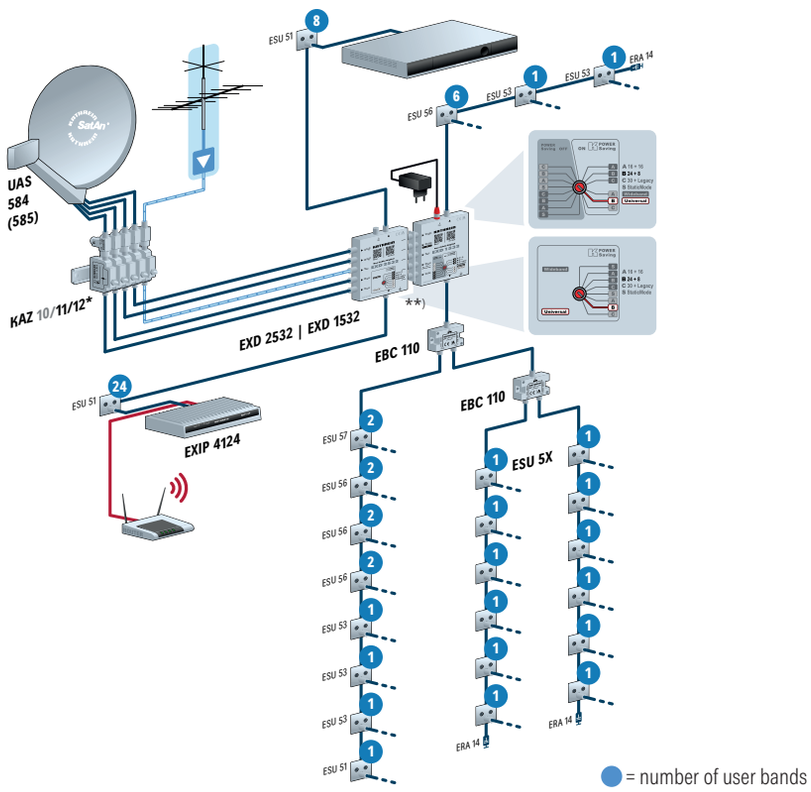
CONFIGURATION

- Static mode*
- Digital multi-switches

* See also p. 29 bottom

When using static mode in a multi-dwelling installation, ESU 5x series outlets can be used, for example.
If using other TADs (ESD 44), attention must be paid to DC block.

For detailed information on grounding satellite systems, see page 82.



*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

CONFIGURATION

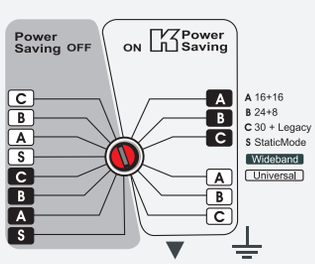
- 1 satellite
- Up to 64 addresses
- Extendable
- Digital multi-switches with programmable outlets

No terminating resistors are required when using the ESU 51 terminated end outlet.

Rotary switch modes

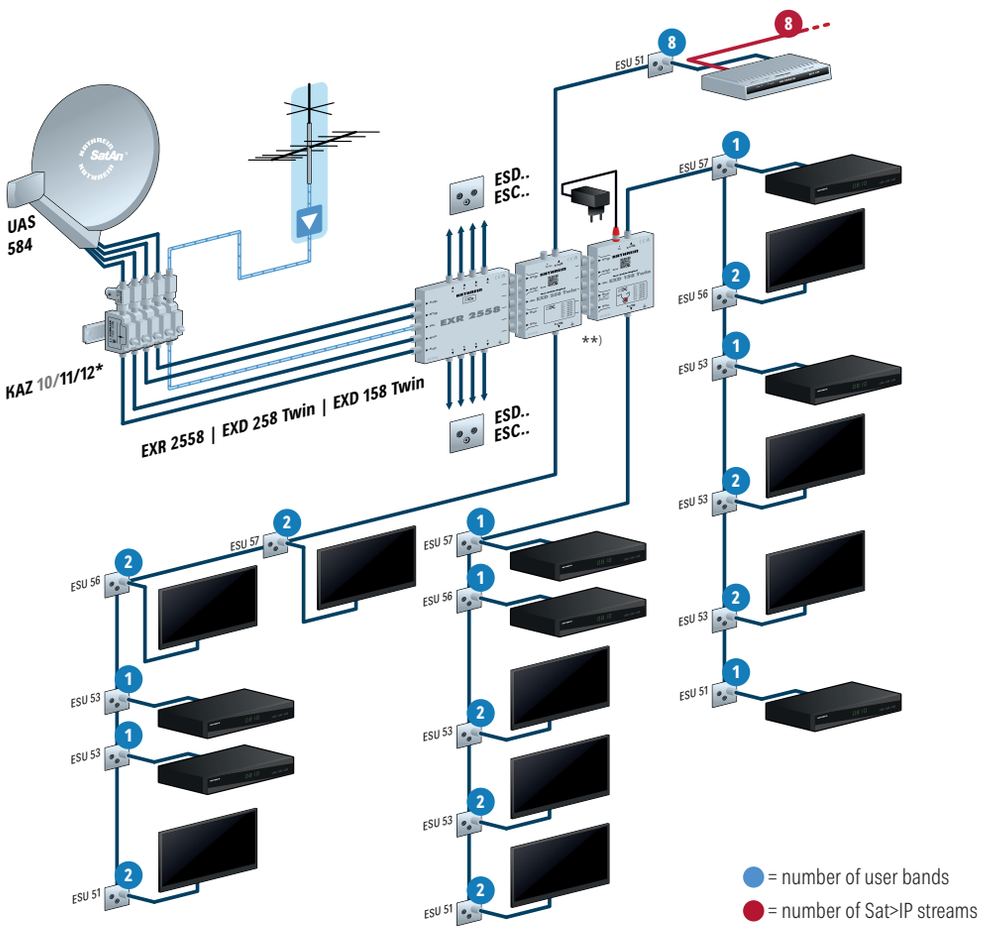
There are four different modes that can be set:

- **A:** 2 × 16 UB: 16 user bands at each of the two outputs
- **B:** 1 × 24 UB and 1 × 8 UB: 8 user bands at the upper output, 24 at the lower output
- **C:** 1 × 30 UB and Legacy: 30 user bands available at the bottom connection, the top connection is a Legacy (14/18 V – 0/22 kHz), for receivers without single-cable standard
- **S:** (Static mode): Here 27 transponders are converted to fixed output frequencies. These cannot be changed by receivers. Any number of receivers can be connected. The level ratios must be taken into account in the distribution. No DiSEqC™ supply is required. The 27 transponders can be increased to a maximum of 32. Programming is carried out at customers' request by our support team support@kathrein-ds.com. For more information please refer to the relevant equipment manual, which you can download from our website (www-kathrein-ds.com).



In mode C, note that the bandwidth of the user band is 40 MHz.
There may be satellites transmitting transponders with bandwidth higher than 40 MHz. Such transponders may be subject to interference, or not receivable at all.

Communal units
1 satellite, cascadable

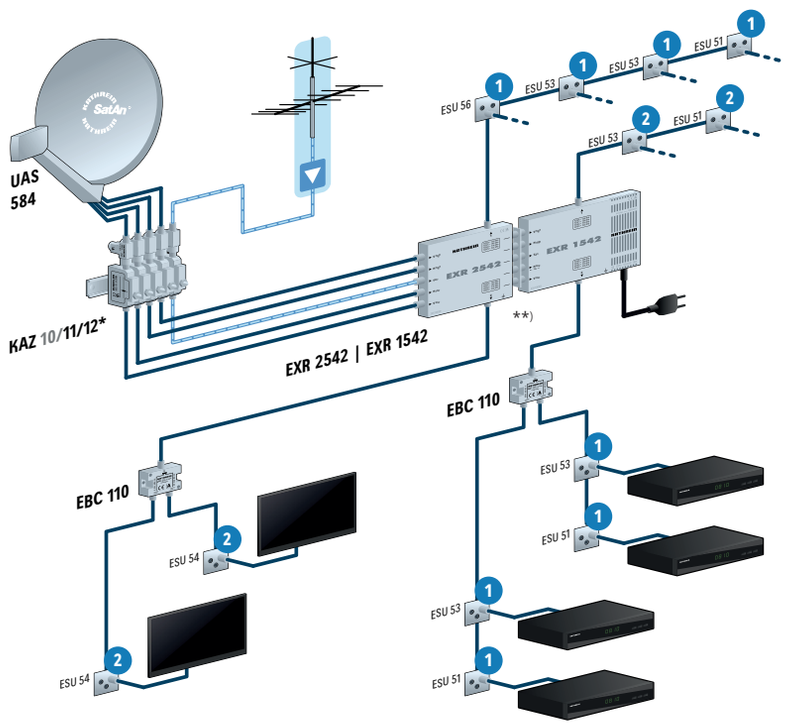


CONFIGURATION

- 1 satellite
- 8 connections + 32 addresses
- Combination example with multi-switches
- With Kathrein Power-Saving

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.



● = number of user bands

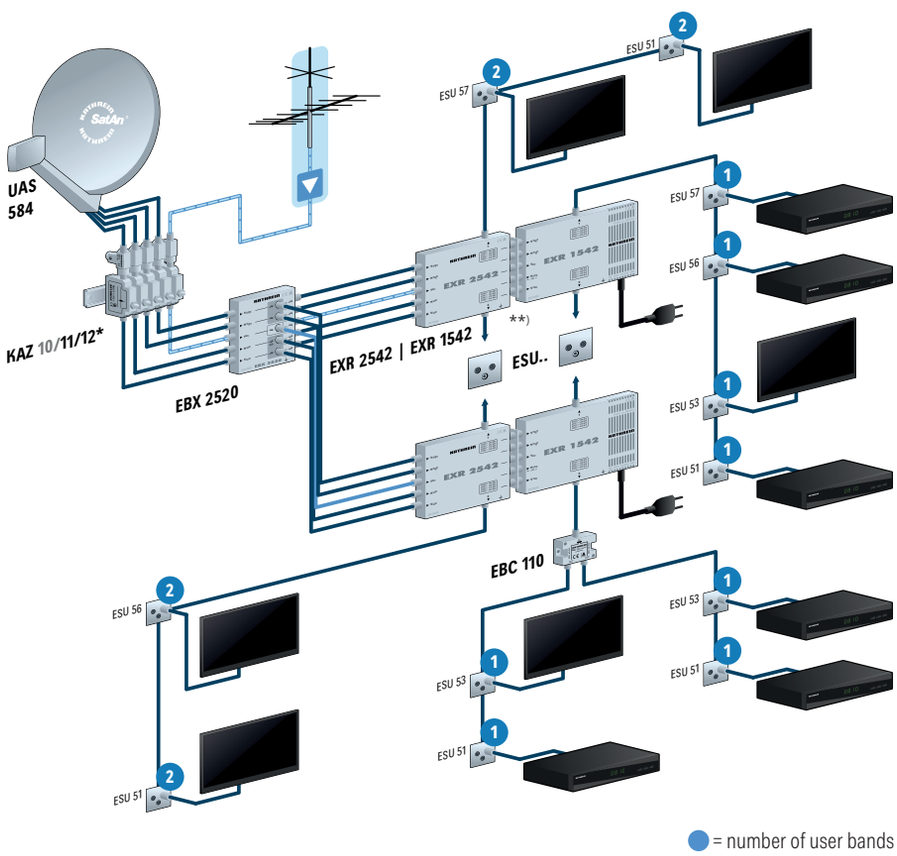
CONFIGURATION

- 1 satellite
- 16 addresses
- 4 connections per dwelling

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

Communal units
1 satellite, cascadable



CONFIGURATION

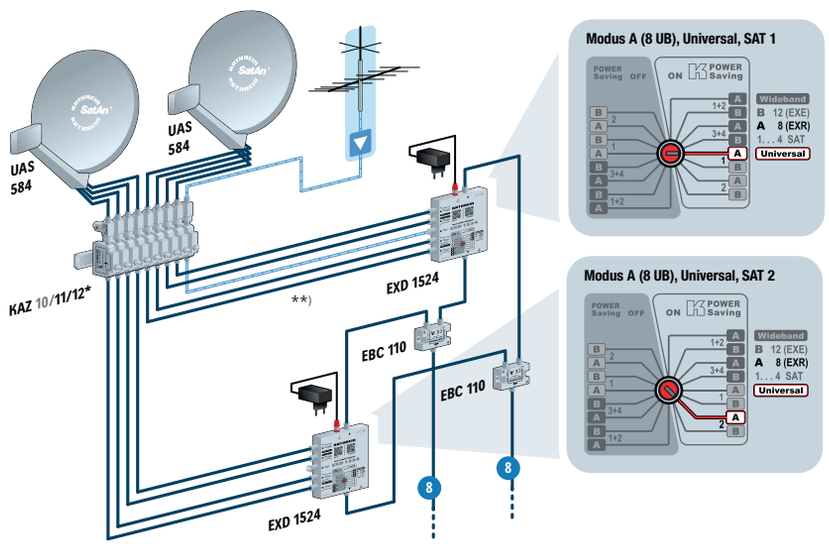
- 1 satellite
- 32 addresses
- 4 connections per dwelling

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

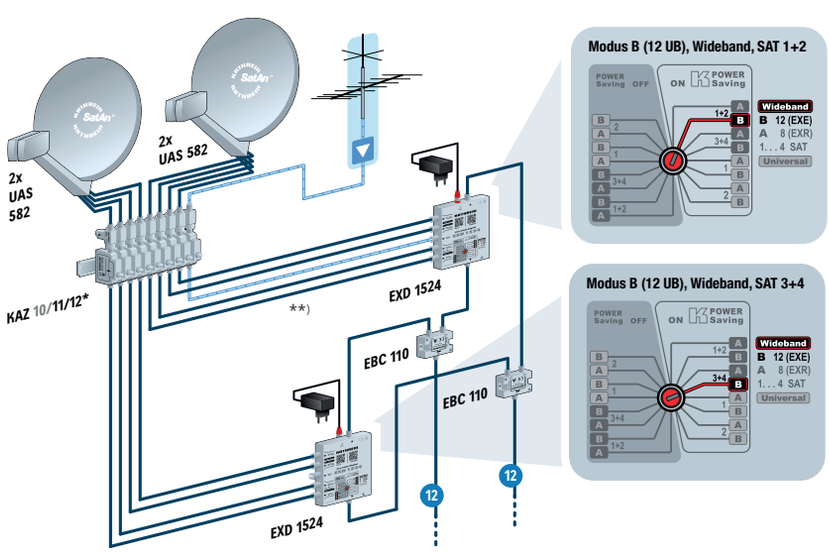
Communal units

2 or 4 satellites, digital multi-switches



CONFIGURATION

- 2 satellites
- 2 × 8 addresses
- Multi-feed



CONFIGURATION

- 4 satellites
- 2 × 12 addresses
- Multi-feed
- Wideband

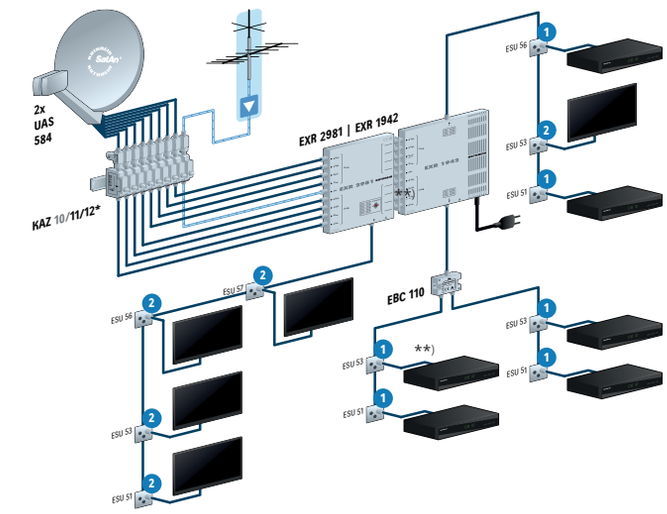
*) Over-voltage protection

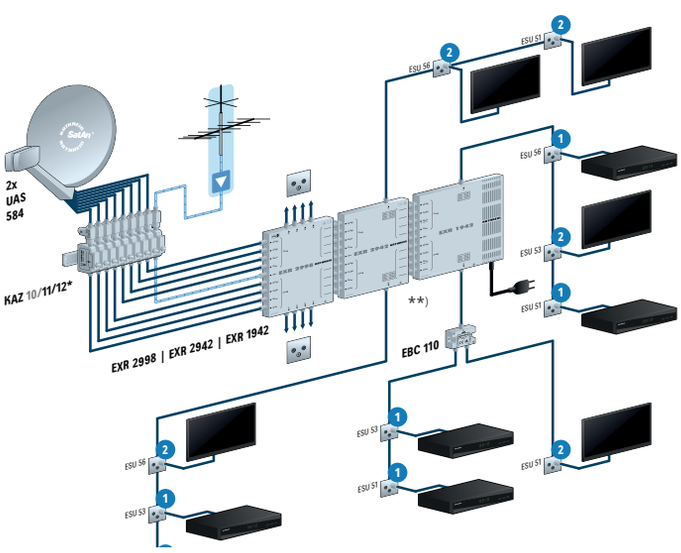
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

= number of user bands

Communal units
2 satellites, cascadable





CONFIGURATION

- 2 satellites
- 16 addresses
- 4 connections per dwelling
- Multi-feed

CONFIGURATION

- 2 satellites
- 8 connections + 16 addresses
- Multi-feed

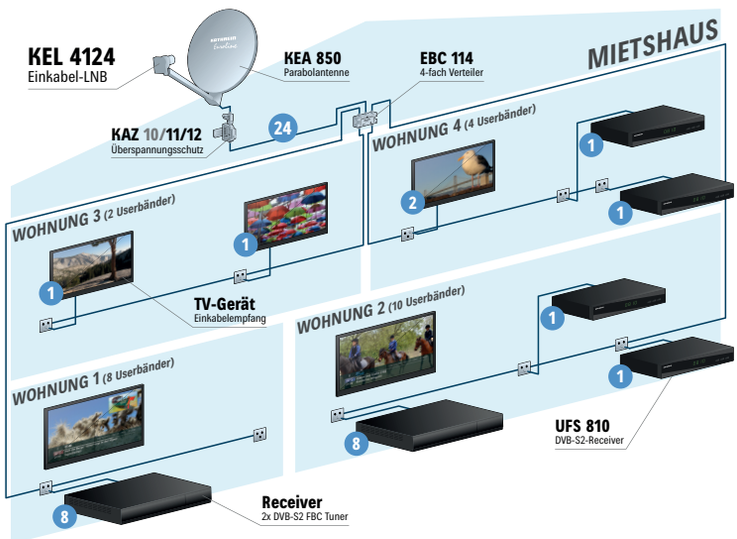
*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

KLASSE A CLASS · DVB Digital Video Broadcasting geeignet für DVB-T/-T2 · Quality made in Germany

● = number of user bands

Communal units
1 satellite, not cascadable



● = number of user bands

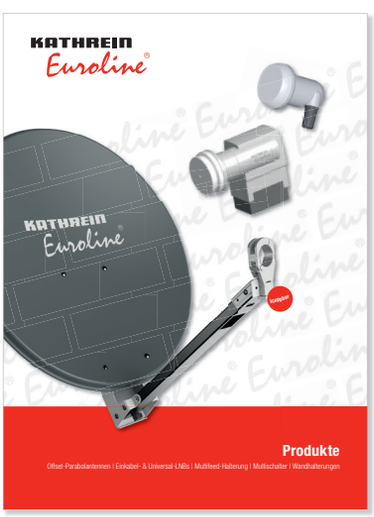
KATHREIN Euroline®

CONFIGURATION

- 1 satellite
- Up to 24 addresses

"Euroline Products" brochure

For more information on Euroline products, please refer to our Euroline brochure, which you can download and order at https://www.kathrein-ds.com/kataloge/.



Contents

- Offset parabolic antennas
- Single-cable and universal LNBs
- Multi-feed holders
- Multi-switches
- Wall supports

Use this QR code to access the catalogues directly:

Programmable single-cable outlets ESU 5x
ESU 51, ESU 53, ESU 54, ESU 56, ESU 57

The programmable single-cable outlets from the ESU 5x series ensure interference-free reception in single-cable satellite receivers. These single-cable outlets can be used to program the user bands. The single-cable outlets contain a microcontroller that monitors the signalling inside single-cable systems. A user ID check ensures that only the enabled user bands are transmitted from the end device to the multi-switch via the socket.

Together with the “Kathrein ESU” app, the SWP 50 programming device makes it possible to configure the ESU 50 series single-cable outlets from Kathrein. The configuration of the single-cable outlets ensures that connected devices can only use enabled user bands. If a terminal device is configured incorrectly, is incompatible with a single-cable system or in first installation mode, it will not affect the devices connected to other programmed sockets. This enables the entire single-cable satellite system to operate permanently across multiple dwellings with failure-free operation.
The SWP 50 programming device makes it possible to set and configure the ESU 5x series single-cable outlets. The programming device is used to configure the user

Programming device
SWP 50

bands in the single-cable outlets. This ensures that the subscribers in a single-cable system do not interfere with each other (installation across multiple dwellings).

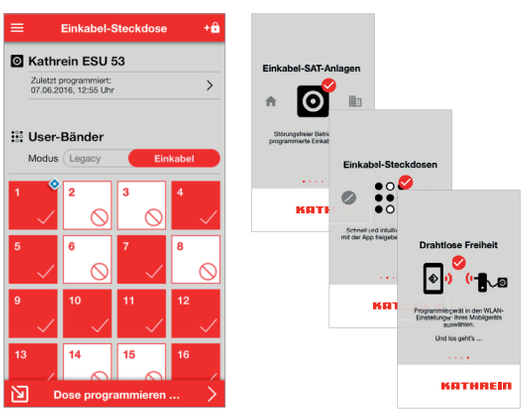
The programming device can be accessed via tablet, smartphone or a PC with Windows OS.

The SWP 50 function for setting and programming the ESU 5x series is also integrated into the MSK 140/OHD and MSK 240/OIA meters.

“Kathrein ESU” app for Android/iOS/Windows

Configuration of the single-cable outlets

Check and change the configuration of a programmable single-cable outlet using “Kathrein ESU”. This app allows you to disable and enable user bands on a single-cable outlet quickly and intuitively. You can also use a PIN to protect the outlet’s configuration against unauthorised modification. Together with the SWP 50 programming device, “Kathrein ESU” is the professional tool for you.



Features

- Easily configure the outlet connected to the programming device over a wireless connection or via USB cable
- Quickly and intuitively enable or disable user bands
- Use a PIN to protect the configuration of each outlet against unauthorised modification
- Check and change the programming device's network settings
- Download free of charge for the Android, iOS and Windows operating systems
- English and German user interface and integrated operating instructions
- Compatible with the SWP 50 programming device

“Kathrein ESU” is available free of charge for the Android, iOS and Windows operating systems. Use the QR codes below to download it, or search Google Play™ or the App Store for “Kathrein ESU”.

Use this QR code to download the “Kathrein ESU” app:

JETZT BEI Google Play

Laden im App Store

Overview of single-cable multi-switches with available user bands (UB) and associated subscriber frequencies

Multi-switches	EXD 158 EXD 258	EXD 1524 EXD 2524		EXD 1532 EXD 2532			
Number of UBs	**8**	**8**	**12**	**8**	**16**	**24**	**30**
	Subscriber frequency (MHz)/SCR address						
UB 1	1284	1284	974	975	975	975	970
UB 2	1400	1400	1076	1025	1025	1025	1010
UB 3	1516	1516	1178	1075	1075	1075	1050
UB 4	1632	1632	1280	1125	1125	1125	1090
UB 5	1748	1748	1382	1175	1175	1175	1130
UB 6	1864	1864	1484	1225	1225	1225	1170
UB 7	1980	1980	1586	1275	1275	1275	1210
UB 8	2096	2096	1688	1325	1325	1325	1250
UB 9			1790		1375	1375	1290
UB 10			1892		1425	1425	1330
UB 11			1994		1475	1475	1370
UB 12			2096		1525	1525	1410
UB 13					1575	1575	1450
UB 14					1625	1625	1490
UB 15					1675	1675	1530
UB 16					1725	1725	1570
UB 17						1775	1610
UB 18						1825	1650
UB 19						1875	1690
UB 20						1925	1730
UB 21						1975	1770
UB 22						2025	1810
UB 23						2075	1850
UB 24						2125	1890
UB 25							1930
UB 26							1970
UB 27							2010
UB 28							2050
UB 29							2090
UB 30							2130

Receiver must support single-cable standard SCD 2 according to EN 50607

This frequency assignment can also be retrieved using the QR code on the right on the front of the multi-switch.

Multi-switches	EXD 154	EXE 159 EXE 259	EXE 1512 EXE 2512	EXE 1581 EXE 2581	EXI 3591	EXR 1942 EXR 2942	EXR 561/Eco
Number of UBs	**4 × 16**	**9**	**12**	**8**	**9**	**2 × 4**	**6**
	Subscriber frequency (MHz)/SCR address						
UB 1	975	974	974	1284	974	1284	1284
UB 2	1025	1076	1076	1400	1076	1400	1400
UB 3	1075	1178	1178	1516	1178	1516	1516
UB 4	1125	1280	1280	1632	1280	1632	1632
UB 5	1175	1382	1382	1748	1382		1748
UB 6	1225	1484	1484	1864	1484		1864
UB 7	1275	1586	1586	1980	1586		
UB 8	1325	1688	1688	2096	1688		
UB 9	1375	1790	1790		1790		
UB 10	1425		1892				
UB 11	1475		1994				
UB 12	1525		2096				
UB 13	1575						
UB 14	1625						
UB 15	1675						
UB 16	1725						

Receiver must support single-cable standard SCD 2 according to EN 50607

When using programmable outlets, programming is not frequency-dependent, but instead depends solely on the user band.

The planning and signal level calculation tool for single-cable systems is currently in production, and is scheduled for publication in the first half of 2020. As soon as the tool is available online, we will inform you in our newsletter (https://www.kathrein-ds.com/newsletter/).

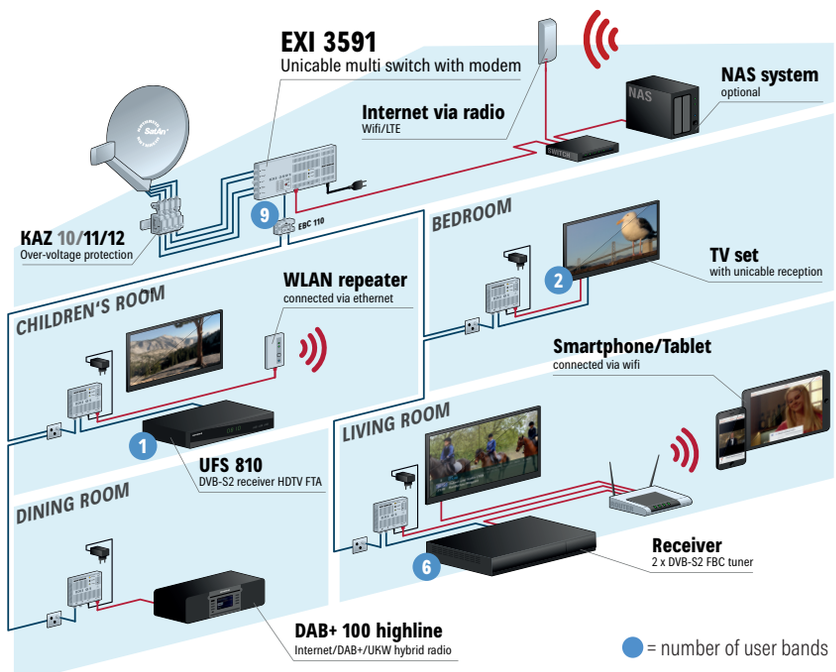
The K-LAN IP-over-coax system

Set up networks easily via coaxial cable

Looking to set up a home network without having to renew the existing cabling in the house? Then the products from the K-LAN series are just right for you. Just use the existing coaxial cable structure of your building's satellite or cable TV system: with no major intervention or installation effort. As K-LAN is configured automatically, you do not need any software.

The K-LAN system is ideal to connect receivers,TV sets and Blu-ray players into a single network. In addition, PCs and other network-capable devices can easily be connected via a router (such as Fritz!Box). The IP data packets and the IP traffic are transmitted via the existing terrestrial distribution system – with no interference, and over a distance of up to 700 metres.

The EXI 01 modem is required to convert back the IP data at the subscriber outlets. If the multi-switch in your satellite receiver is not an EXI 3591, you will need an additional EXI 01 modem to feed the IP frequency range from the router into the coax network. This can be done at any point in the coaxial distribution system. For optimum performance we recommend using the EXI 30 outlet, which has been specially developed for the K-LAN system. This outlet offers the return path range on the satellite connection so that a modem can be remotely fed by the satellite receiver, and the modem's power supply unit is not required. It is essential to ensure that the entire distribution system carrying the terrestrial frequencies (including the outlets) supports the frequency range 5-68 MHz.

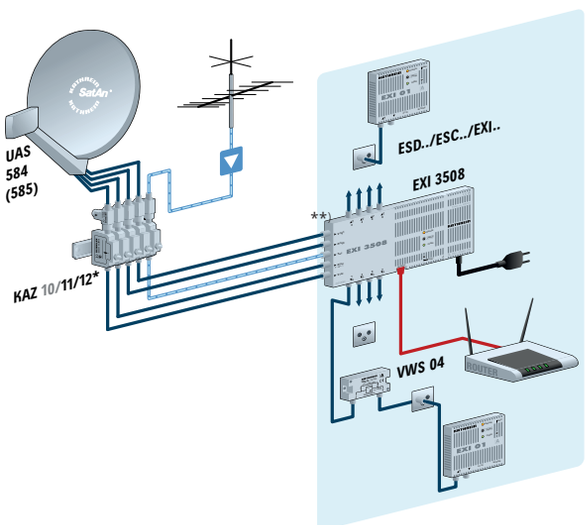


Video

Our video "Easy home networking via coaxial cable with K-LAN" provides clearly illustrated and practical information on the wide-ranging installation options of the K-LAN IP-over-coax system. You can find the video at https://www.kathrein-ds.com/newsroom/mediacenter/

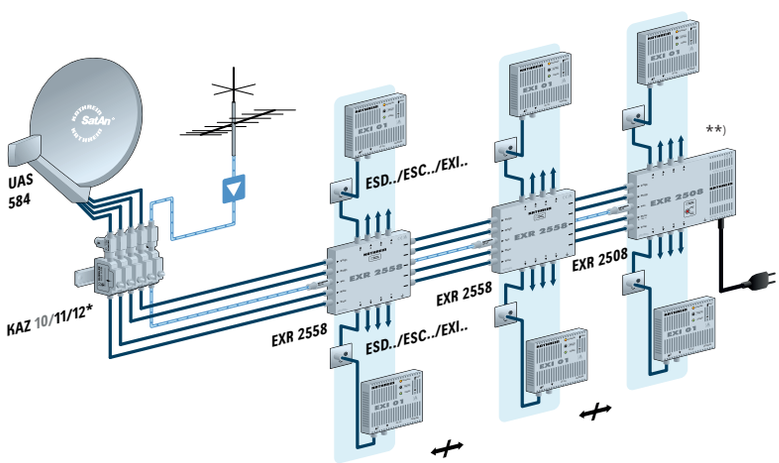
Use this QR code to access the video portal directly:

Individual installations and communal units



CONFIGURATION

- 1 satellite
- Sat-IF



CONFIGURATION

- 1 satellite
- Sat-IF
- EXI 90 high-pass filter

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

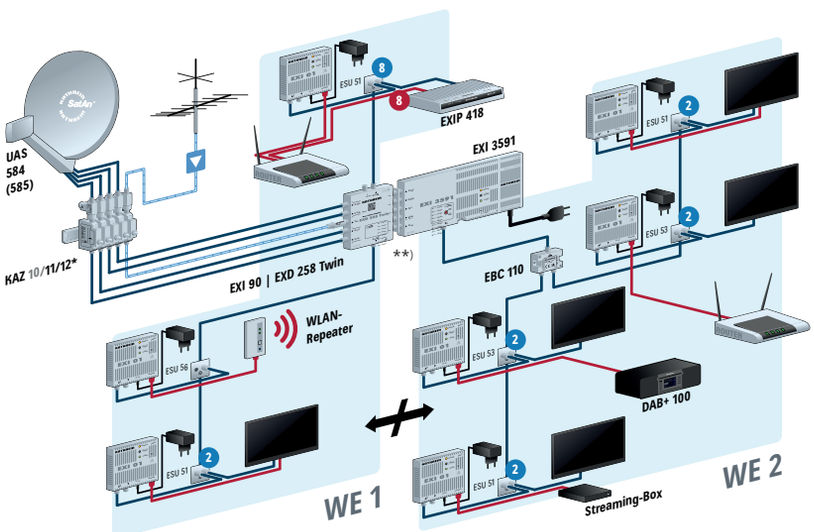
All modems within a cluster can communicate with each other.

Network/cluster

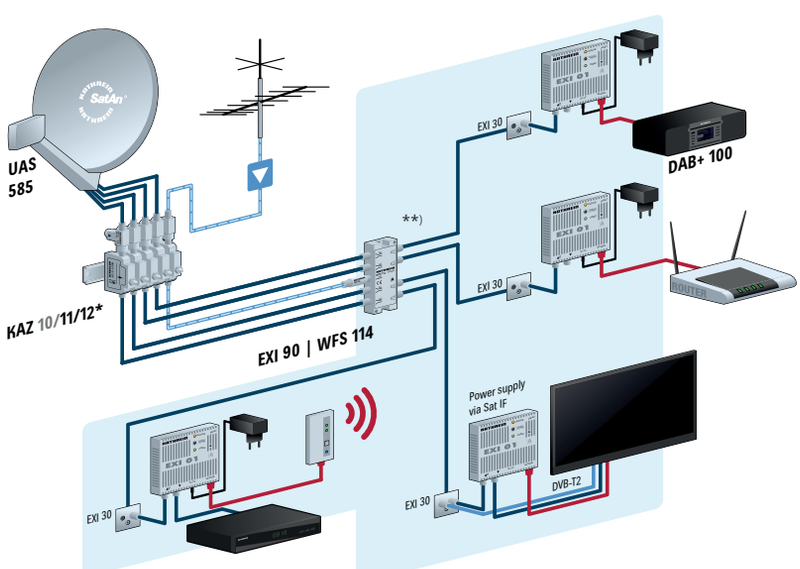
Communication possible

Clusters are isolated - no communication between clusters possible

Single-cable multi-switch with built-in modem
EXI 3591



= number of user bands



*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

CONFIGURATION

- 1 satellite
- Single-cable
- Kathrein Power-Saving

CONFIGURATION

- 1 satellite
- Sat-IF

All modems within a cluster can communicate with each other.

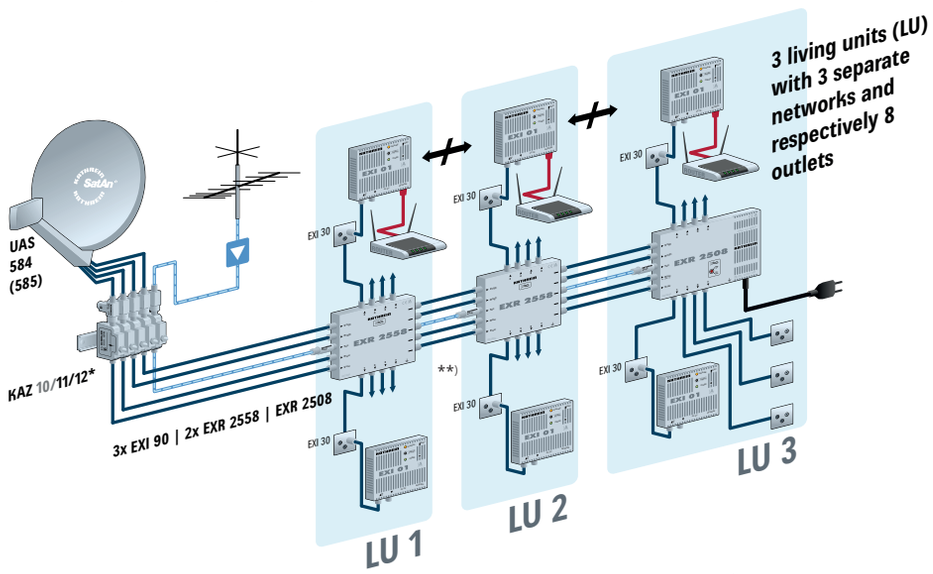
Network/cluster

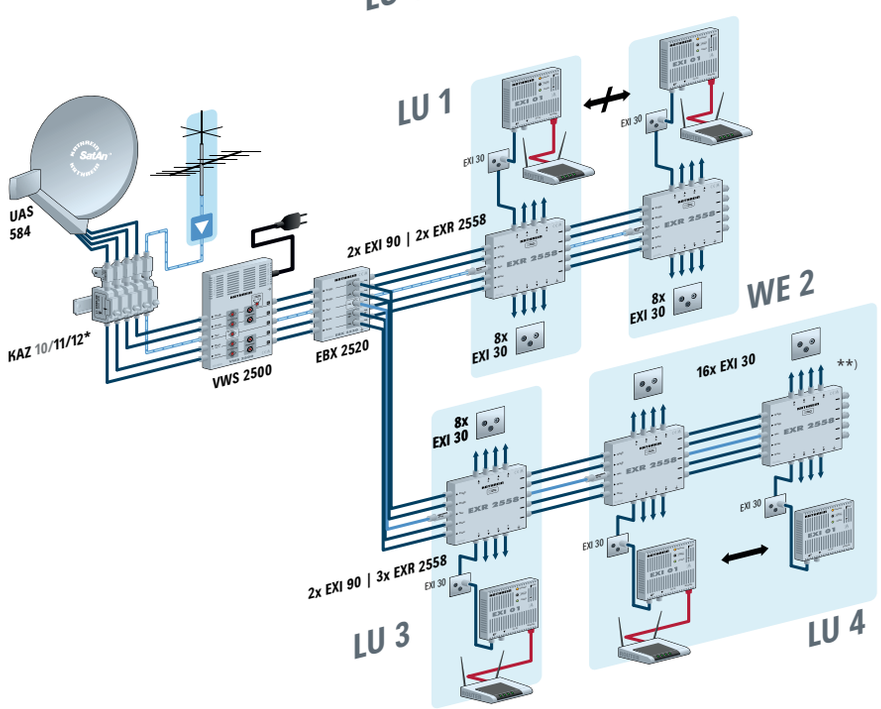
Communication possible

Clusters are isolated - no communication between clusters possible

Accessories and software

EXI 01, EXI 30, EXI 90, EXI 700





*) Over-voltage protection

**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

CONFIGURATION

- EXI 01 modem
- Satellite single connection box EXI 30
- EXI 90 high-pass filter
- EXI 700 software

CONFIGURATION

- EXI 01 modem
- Satellite single connection box EXI 30
- EXI 90 high-pass filter
- EXI 700 software

All modems within a cluster can communicate with each other.

A maximum of 64 EXI 01 can be used in one cluster.

Network/cluster

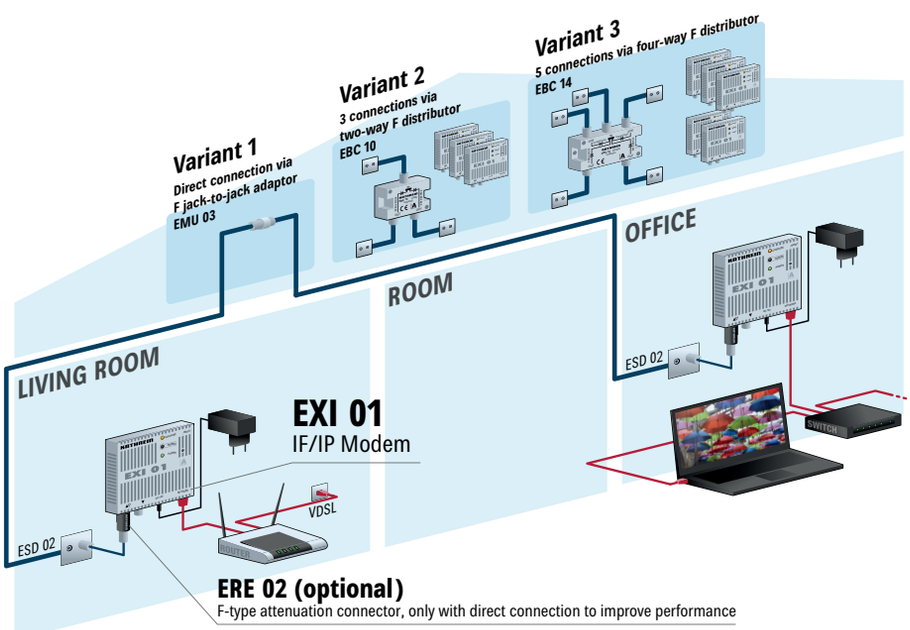
Communication possible

Clusters are isolated - no communication between clusters possible

Variant without satellite system

If a network cable cannot be retrofitted, distribution of the IP signal via the existing coaxial cable installation offers an excellent alternative. It does not matter whether the coaxial cable installation is a satellite or cable TV system. The IP signal is fed in via the EXI 01 modem, and can be placed anywhere in the coaxial distribution system. The EXI 01 modem is likewise used to convert back the IP data at the subscriber outlets.

The example variants 1-3 represent possible connections of lines that were not previously connected, or have been dormant for example. The key here is that the signals are not restricted by a splitter in any of the examples – there is a connection between all lines and directions through the splitter.



CONFIGURATION

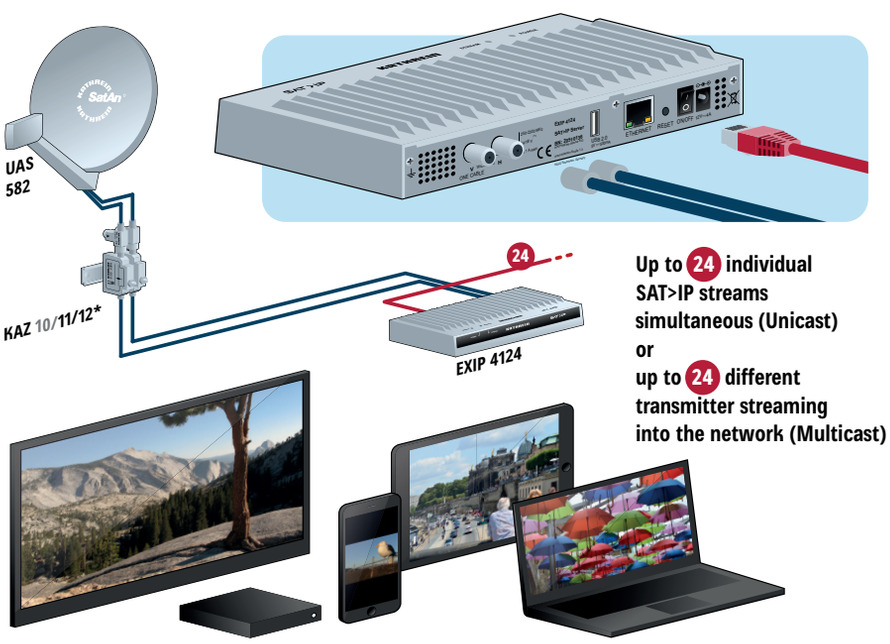
- **Ideal for retrofitting**
- **Distances up to 700 m possible**
- **No software necessary**

The required frequency range of 5-68 MHz must be supported by the outlet being used.

The Sat>IP system

Sat TV without a satellite receiver: Sat>IP makes it possible

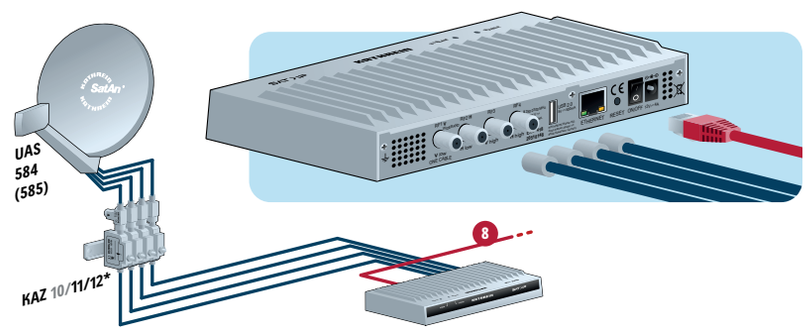
With Sat>IP you can offer your customer additional added value in respect of information media and entertainment media. This means that in addition to the classic satellite reception terminals such as receivers or TV sets, Internet-based terminals such as PCs, laptops/tablets, smartphones, games consoles and media players in the household can be supplied with TV channels. It is the Sat>IP communications protocol which enables this, as it converts the signals from the satellite into the IP world. This allows top-quality satellite TV reception even on devices that are not equipped with their own satellite receivers. The digital signals can be transported over any IP infrastructure, with or without cable.



To use Sat>IP, you need a special server that demodulates the signals at the reception point, converts them, and relays them to a router. The channels can then be transported to the clients via this router and any IP networks, such as WLAN, Ethernet, Power Line, fibre optic cable or K-LAN. Thanks to the fully IP-based processing of the TV signals, there are no restrictions dictated by the satellite intermediate frequency with regard to cable lengths and transmission forms.

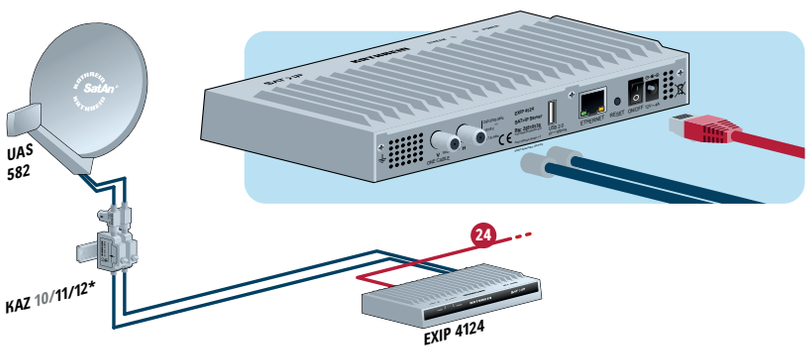
In a Sat>IP environment, each IP device is automatically suitable for the reception of satellite signals as soon as it has the required software – whether tablets, PCs, laptops, smartphones, connected TVs, games consoles, media players, or IP set-top boxes etc. Many require only a software update or an app to make the respective hardware Sat>IP-capable. The advantages for your customers are self-evident. Viewers can watch TV channels on various mobile and stationary devices and screens without changing media or needing additional cabling – and without having to use an Internet connection. Other than for hardware (server) and software (clients), there are no additional costs. Similarly, the transmission of linear Free-TV channels to local networks is free of charge. Encrypted (paid) TV channels can also be fed into the home network.

Sat>IP servers EXIP 418 and EXIP 4124



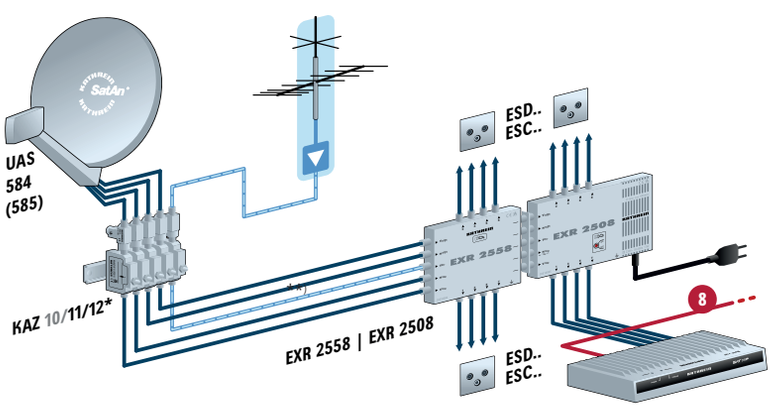
CONFIGURATION

- Operation directly on LNB
- No multi-switch necessary



CONFIGURATION

- Operation directly on wideband LNB
- No multi-switch necessary



CONFIGURATION

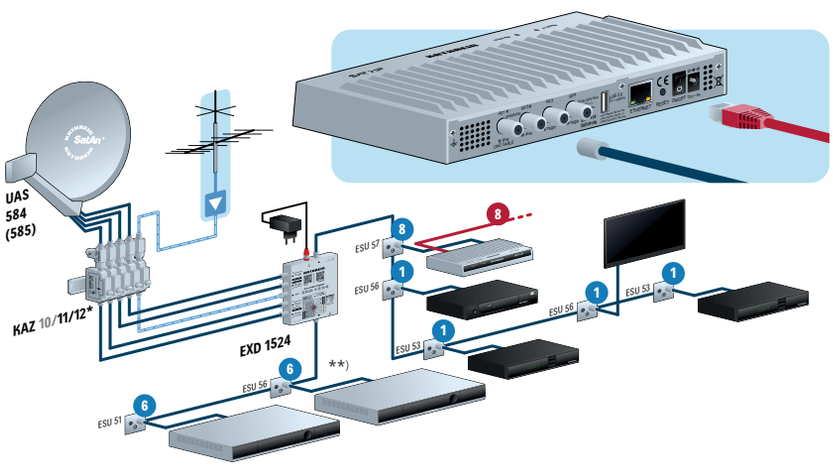
- Operation on multi-switch

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

● = number of Sat>IP streams

For detailed information on grounding satellite systems, see page 82.

Sat>IP server EXIP 418

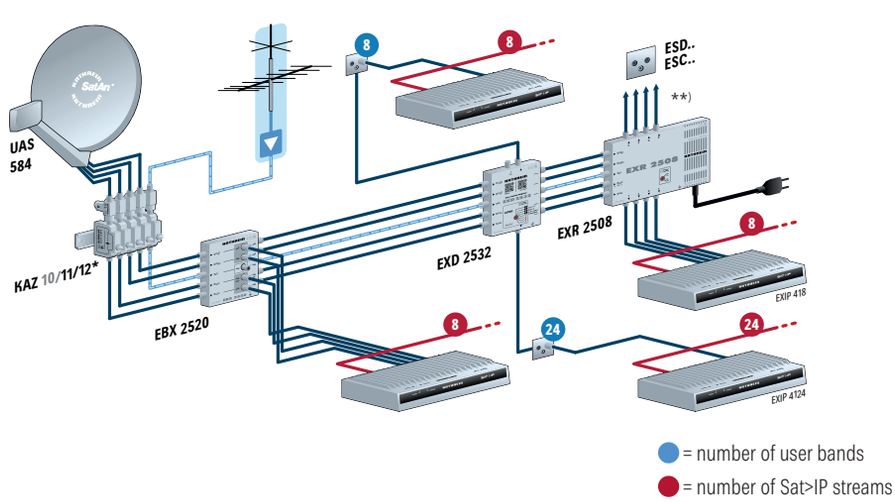


CONFIGURATION

- Operation on single-cable multi-switch

Possible types of input signals in large systems

- 14V/18V multi-switch
- DiSEqC™ multi-switch
- Single-cable multi-switch
- Sat IF splitter



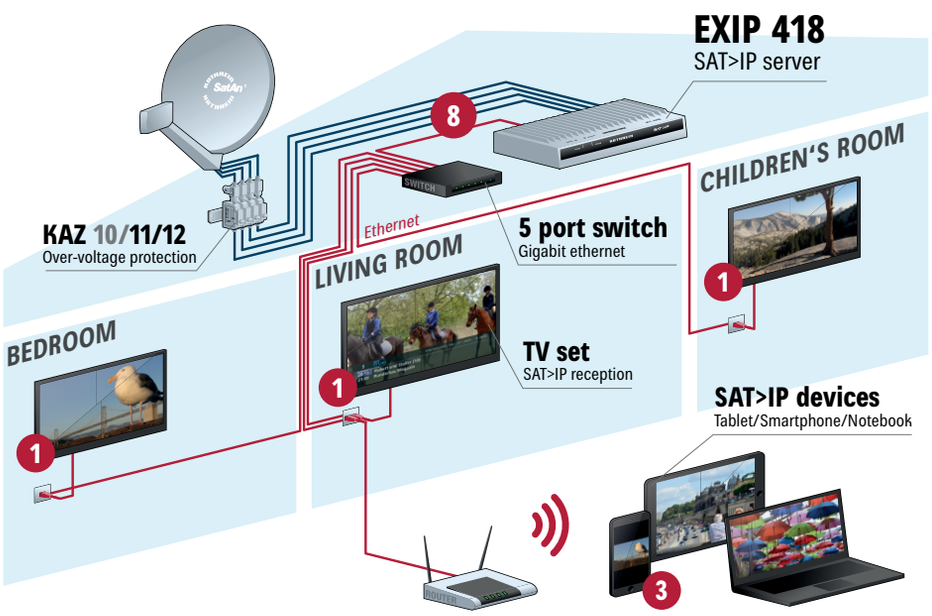
CONFIGURATION

- Reception via multi-switch

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

For detailed information on grounding satellite systems, see page 82.

System example for a Sat>IP system



● = number of Sat>IP streams

Video

Our video animation "Sat>IP with EXIP" shows you how you can receive top-quality satellite TV on terminals that are not equipped with their own satellite receivers.
It can be called up at https://www.kathrein-ds.com/newsroom/mediacenter/

Use this QR code to access the video portal directly:

The optical satellite splitter

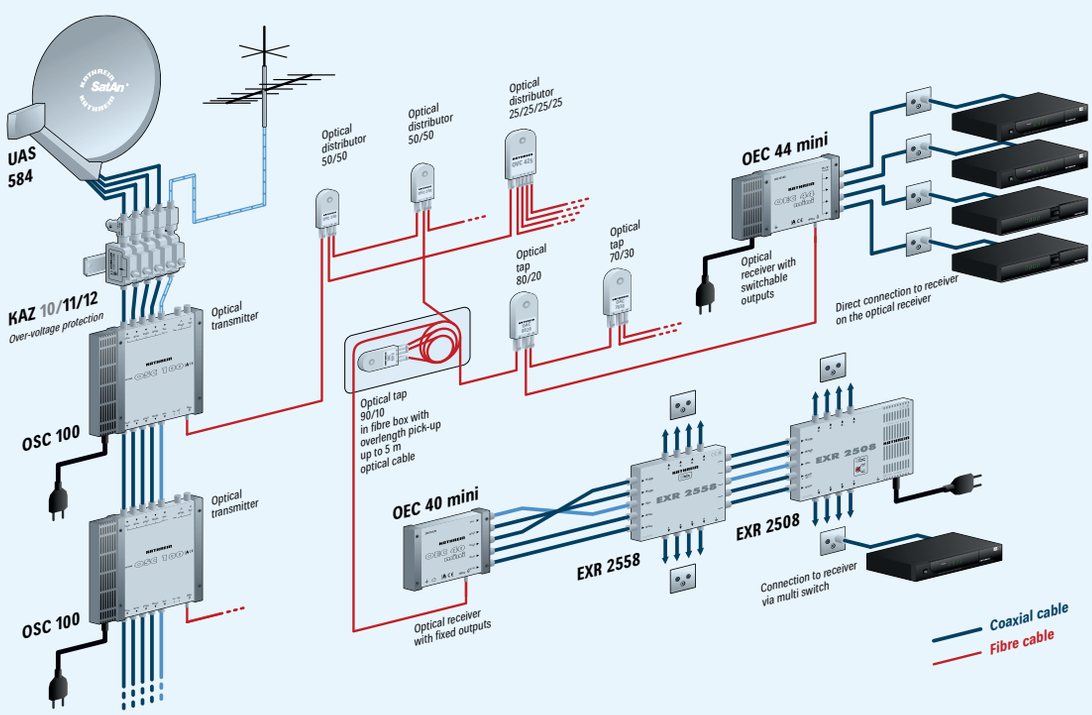
Advantages upon advantages

Transmit four satellite reception planes over a very thin fibre-optic cable with minimal attenuation? The CLIK! system convinces with extremely easy handling of the fibre-optic cables, slim connectors with guide lugs, and a smart connection system. A perfectly coordinated system – from the transmitter, the miniaturised distribution material, the space-saving design, through to the receiver.

For you as a practitioner, this means that the fibre- optic cables can be very easily pulled into empty conduits with the help of the pull-in eyelet, and the distribution material can be very easily fastened by a screw or invisibly stowed in a fibre box. The audible connector engagement into the output port is an immediate confirmation that a perfect connection has been made. It doesn't get any easier than this.
The use of optical transmitters means Quatro feed systems can be used. Additional transmitters can be easily cascaded to extend the system. The antenna is calibrated using a conventional IF receiver. There is no need to purchase new meters.

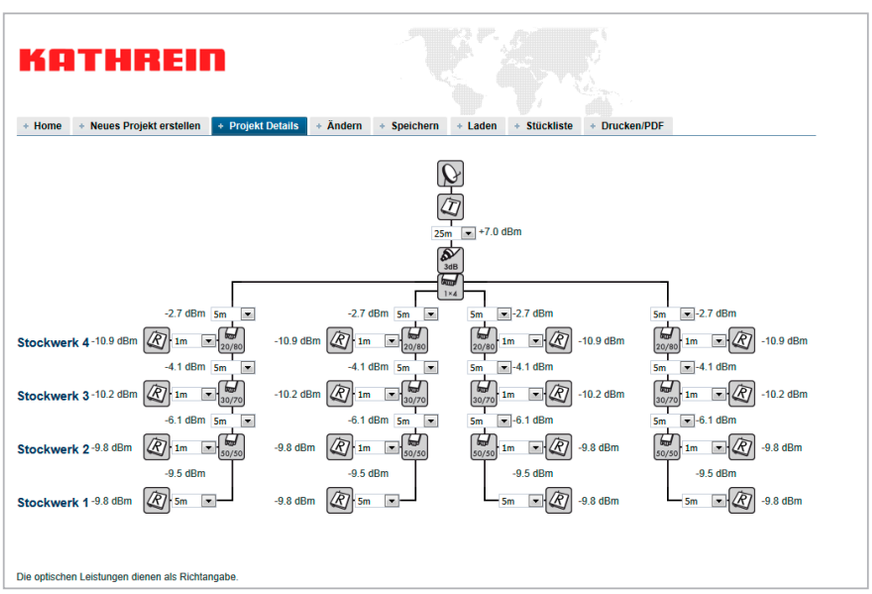
The high optical "link budget" allows you to cable large-sized housing blocks or underground parking garages easily and economically. Terrestrial signals can also be fed into the system. As there is no metallic screening, potential differences between the different buildings are a thing of the past – as is the use of additional amplifiers. That's a key financial aspect which also positively influences the system's energy balance.

Operating principle of satellite TV via glass fibre

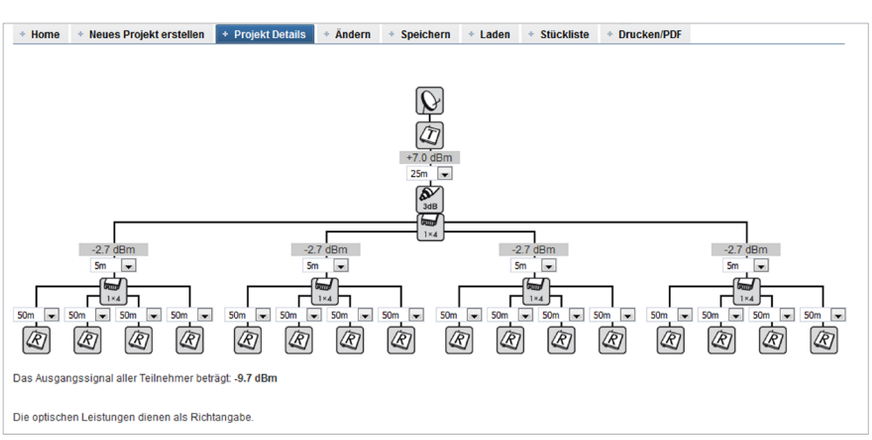


The “CLIKulator” calculation tool

Kathrein's optical satellite distribution products are the perfect solution for TV/radio reception in large distribution systems, such as housing complexes, high-rise buildings, underground parking garages, etc. The “CLIKulator” is a sophisticated calculation tool that makes the planning of optical satellite distribution systems even easier, with just a few mouse clicks. The scalable optical Sat distribution system consists of optical transmitters, matched optical receivers and all necessary passive distribution components. You can access the “CLIKulator” via the following link: https://www.kathrein-ds.com/support/software-tools/kalkulationstool-optik/



System example
Star network



ADVANTAGES

- **Easy installation due to miniaturised design**
- **Quick and easy creation of custom projects with a complete installation scheme and**

“CLIKulator” parts list can also be found via the following QR code:

Video

Our video “The optical Sat-IF distribution system with CLIK!” provides information on the various options when planning optical distribution systems. You can find it at https://www.kathrein-ds.com/newsroom/mediacenter/

Use this QR code to access the video portal directly:

Meters

MSK 30/L for sat/TV

- Level measurement of analogue and digital TV signals (DVB-S/-S2, DVB-C, DVB-T/-T2, TV)
- 4.3" touch TFT colour display (480 × 272 pixels), splash-proof
- Sat-finder function
- Constellation diagram display
- Automatic measuring range selection

MSK 140/OHD for sat/TV/FM/DAB+/return path and optic

- Level measurement for analogue and digital radio and TV signals (DVB-S/S2/-S2X, DVB-C, DVB-T/-T2, TV, DAB+, FM) including return path
- 9" touch TFT colour display (800 × 480 pixels), splash-proof
- DAB+: Signal evaluation and decoding for playback (built-in speaker)
- Programming of the ESU 5x single-cable outlets as with the SWP 50
- Visual display of digital TV signals according to Codec H.265/HEVC up to resolution of 1080p (e.g. DVB-T2 in Germany)

MSK 240/OIA for sat/TV/FM/H.265/HEVC/DAB+/CI interface

Scope of functionality comparable to MSK 140/OHD, but additionally with:

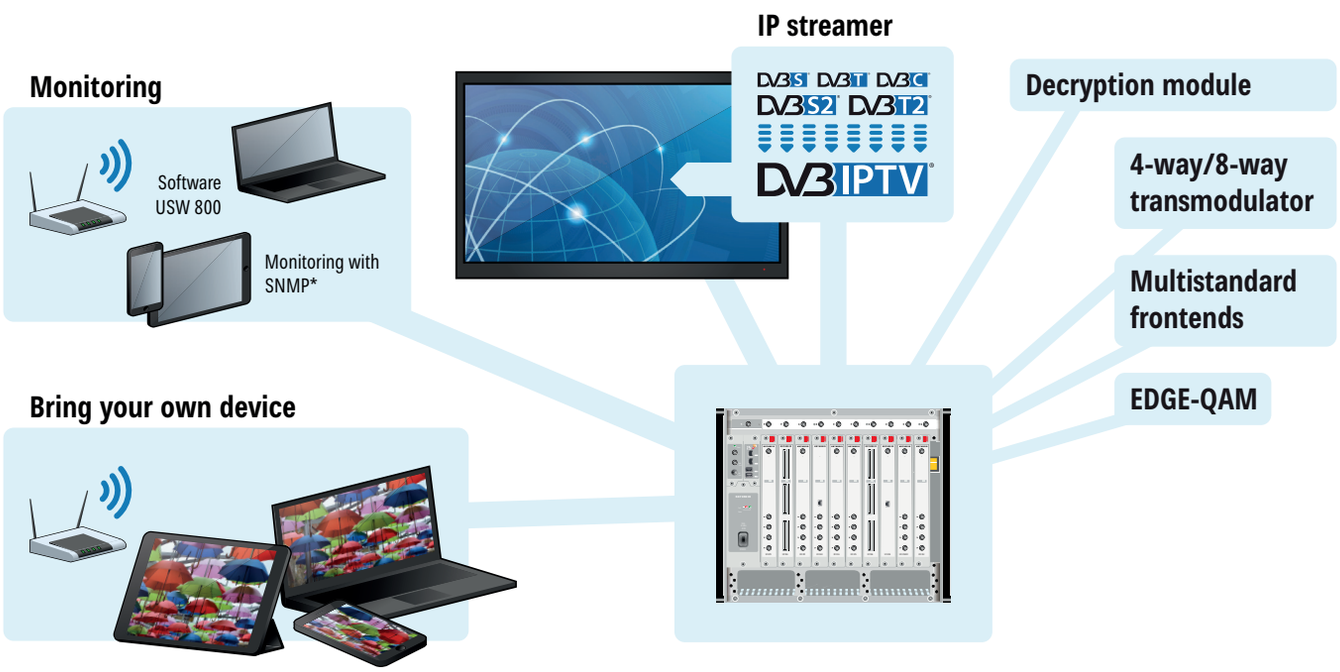
- TA analysis functions of all DVB input signals (regardless of the physical measurement input)
  - Measurement of transport stream, service and stuffing bit rates, service lists
  - MPEG-2 transport stream analysis: Priority 1, 2 and 3 errors [1)]
  - Analysis of PSI/SI tables: PAT, CAT, NIT and SDT [2)]
- IPTV measurements for SPTS and MPTS transport streams: Protocol type (UDP/RTP), VBR/CBR, packet number and length, FEC type, lost packets, lock failure, visual display
- ASI in/out measuring function

[1)] TS sync loss, sync byte error, PAT error, continuity counter error, PMT error, PID error, transport error, CRC error, PCR error, PCR accuracy error, PTS error, CAT error, NIT error, SI repetition error, non-referenced PID error, SDT error, EIT error, RST error, TDT error

[2)] PSI (program-specific information), SI (service information), PAT (program association table), CAT (conditional access table), NIT (network information table), SDT (service description table)

Modern headend technology

Operating principle of a modern and modular IP headend



* For more information, please refer to our price list and our support.

High-performance broadband networks are a key technology for the digital society and form the basis of economic growth. In future, hybrid cable networks will combine coaxial and fibre-optic technology.

Broadband network providers are currently investing accordingly. HFC networks represent an existing, really powerful broadband technology that is not only suitable for both urban agglomerations and rural areas, but also allows for further expansion.

In order to make sure that customers can be provided with multimedia applications that are fit for the future, cable networks are being upgraded to ensure they are future-proof and expanded to make them capable of working with return paths. For the industry, this translates into a need to keep on meeting increased demands in terms of reliability and ease of servicing by offering sophisticated products, excellent customer service and a great deal of technical expertise.

The following chapter introduces you to the four headend systems from Kathrein: There's UFOcompact plus®, which impresses with its range of innovative features, maximum flexibility and variety of combination options. This top-class headend is easily capable of meeting all current and future signal processing requirements. Then there's the UFOmini headend family, which is characterised by an extremely high level of energy efficiency and a remote configuration option. The third system we will present to you is the inexpensive, yet fully technically developed, UFOnano standalone headend, which offers a number of advantages specifically when modernising existing properties. Last but not least, there's the new UFO 19" series, a standalone headend in a space-saving 19" design (1 U).

UFOcompact plus®

UFO compact plus

Remote configuration via USW 800 PC software

UFOcompact plus® is the headend system combining innovation and tradition in a way that is totally unique. It provides the user with the technological basis for current and future challenges in signal processing.

Functions that were previously completely implemented in special devices can now be mapped efficiently and cost-effectively in the overall system, such as: decoding or recoding of the transport streams of transmodulator modules in combination with the UFZ 896 6-way CI module. The durable aluminium die-cast housings provide excellent thermal properties. All UFOcompact plus® modules are characterised by extremely low energy consumption.

UFO 878

UFZ 896

UFX 894

UFO 848

Features

- Modular, expandable, future-proof headend system
- Simultaneous reception of any DVB standards (DVB-S/-S2/-T/-T2/-C/-IPTV)
- Transmodulation to DVB-C/-T/-IPTV
- IP streamer
- Re-multiplex
- Flexible series or parallel decoding and recoding
- EDGE-QAM/COFDM
- Monitoring (SNMP)
- NIT generation and adjustments/modification options
- LCN wizard, support for multiple LCN standards (NorDig, IEC 62216 and FRAN SAT PRO)
- High level of energy efficiency
- m3u list wizard for Panasonic TV sets
- Redundancy

UFO 19" series

UFO 97-18, UFO 97-18/CI, UFO IP512, UFO IP512/CI

The UFO 19" series headend family enables combined reception of eight DVB-S/-S2 signals and reception from two DVB-S, -S2, -T, -T2 and -C signal multi-standard frontends. The standalone headend with space-saving 19" design (1 U) has 6-way decryption capability (CI) on the output side, either as a transmodulator or IP version. The UFO 19" series also has a very high level of energy efficiency and a remote configuration option. Extensive baseband signal processing with programme filter functionality, NIT, support of different LCN standards and flexible decryption capability ensure various applications. The USW 800 management software providers an intuitive, user-friendly interface specially adapted for operation of the UFO 19" series.

Features

- Two redundant wideband power supply units with automatic redundancy and fan monitoring
- 8 Sat IF inputs with DiSEqC™ 1.0 functionality for Sat multi-switches, flexible distribution to 2 × 8 frontends plus one input (non-switchable DVB-S(2)) for the two multi-standard frontends
- Power supply for two LNBs and one active antenna
- All transmission parameters can be set using the USW 800 configuration software
- 6-way decoding function (serial or parallel decoding)
- Hot swap capability for the power supply unit and fan
- SNMP preparation

UFO 97-18/UFO 97-18/CI

- Unlimited cascading via IP network or the internal switch (system network). Joint administration and configuration of system network (NIT, LCN, channel assignment etc.)

UFO IP512/UFO IP512/CI

- Simultaneous service pool with 494 SPTS and 18 MPTS or 512 SPTS
- Service names and channel renaming
- Supports SAP (Session Announcement Protocol) and M3U
- Unlimited cascading via IP network or the internal switch (system network).
  Joint administration and configuration of system network

UFO 19"-Series

SPECIAL FEATURES

- **19" design, only 1 U**
- **Standalone headend**
- **Remote configuration possible**
- **Redundant power supply unit**

UFO 97-18

UFO 97-18/CI

UFO IP512

UFO IP512/CI

UFOmini

UFO 83, UFO 83/CI, UFO 87, UFO 87/CI, UFO 87-18, UFO 87-18/CI

The UFOmini headend enables combined reception of DVB-S/-S2/-T/-T2/-C signals. The standalone headend in a compact design also offers a six-way decryption capability (CI) and 18 flexibly adjustable output channels in DVB-C or DVB-T.

UFOmini also features a very high level of energy efficiency and a remote configuration option. Extensive baseband signal processing with programme filter functionality, NIT, support of different LCN standards and flexible decryption capability ensure various applications.

Features

- All-in-one solution
- Simultaneous reception of any DVB standards (DVB-S/-S2/-T/-T2/-C)
- Completely flexible input, output and baseband configuration
- Fanless design (no noise)
- Remote feeding for LNBs and active DVB-T/-T2 antennas
- NIT generation
- Six CI slots for flexible individual or serial decoding
- Pre-programmed
- High level of energy efficiency (34 - 46 watts)
- Remote configuration via USW 800 PC software
- LCN wizard, support for multiple LCN standards (NorDig, IEC 62216 and FRAN SAT PRO)

UFOmini variants:

- UFO 83:
  Eight output channels in DVB-T
- UFO 83/CI:
  Eight output channels in DVB-T with six CI slots
- UFO 87:
  Eight output channels in DVB-C
- UFO 87/CI:
  Eight output channels in DVB-C with six CI slots
- UFO 87-18
  18 output channels in DVB-C
- UFO 87-18/CI
  18 output channels in DVB-C with six CI slots

UFOnano
UFO 80

Features

- Converts eight QPSK/8PSK modulated DVB-S2 signals into eight QAM-modulated DVB-C output signals
- TV and radio channels pre-programmed
- Four Sat IF inputs A/B/C/D configurable
- All the transmission parameters can be set using the USW 800 management program
- To change the standard configuration, a USB-A connector/mini-USB cable is additionally required
- MPEG transport stream processor:
  - To set a constant output data rate (stuffing) with PCR correction
  - With channel filter to remove individual TV and radio channels
- Fanless design for wall mounting (no noise)

UFOnano

SPECIAL FEATURES

- **Standalone headend with built-in power supply unit**
- **8-way DVB-S(2) – DVB-C (J.83A)**
- **Outstanding values due to direct implementation as FPGA solution**
- **High energy efficiency, power consumption: Typical 28 W**

USW 800 central management software

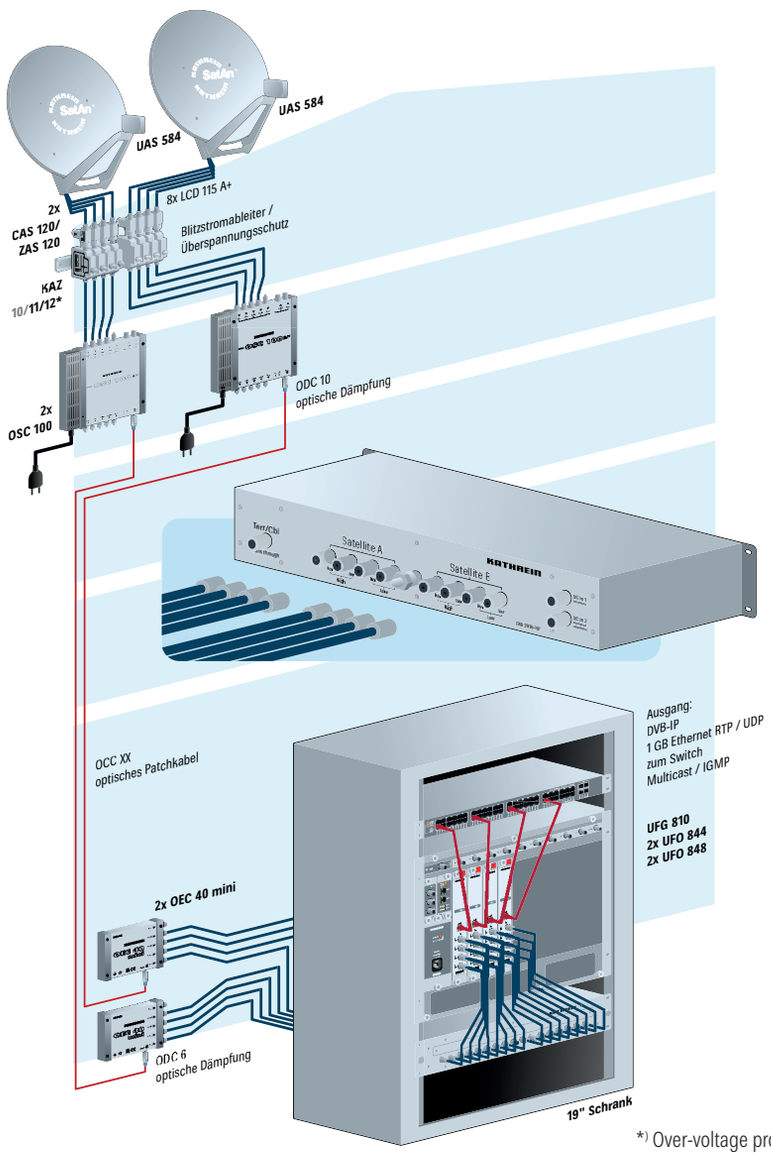
Use this QR code to access the software directly:

The USW 800 software is required for operation of a UFOcompact plus®-, UFO 19" series or UFOmini signal processing system. It can be downloaded free of charge, for Windows or Linux, from https://www.kathrein-ds.com/support/software-tools/usw-800/.

Features

- Easy remote access over TCP/IP connection
- Supports centralised software update for modules
- Offline configuration and favourite lists for efficient management of large systems (e.g. in the hospitality sector)
- For the central control and high-performance set-up of all parameters of the UFOcompact plus® and UFO®compact modules inserted in the UFOcompact plus® signal processing system
- User-friendly user interface for easy system set-up thanks to assistants (e.g. NIT/LCN) and tool tips
- Simplified programming of channel units thanks to use of updatable channel lists and configuration templates
- Transmission of stored configurations and channel lists in other systems

UFOcompact plus® connection example
with 19" multi-switch



*) Over-voltage protection

CONFIGURATION

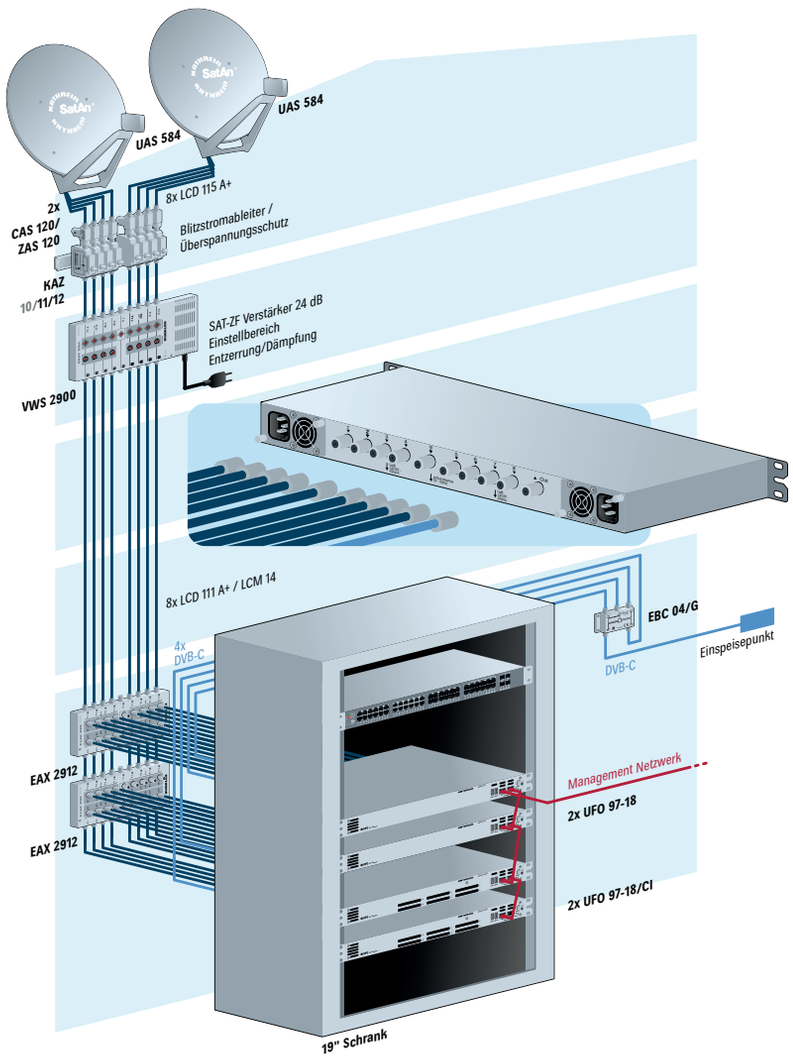
- 2 satellites
- Satellite reception
- Flexible output:
  DVB-C/-T/-IPTV

Video

Our video "UFOcompact plus® – the new headend system from Kathrein" shows you the wide-ranging options for state-of-the-art signal processing in cable networks. You can view it at https://www.kathrein-ds.com/newsroom/mediacenter/.

Use this QR code to access the video portal directly:

UFO 19" series connection example
for UFO 97-18 (CI)

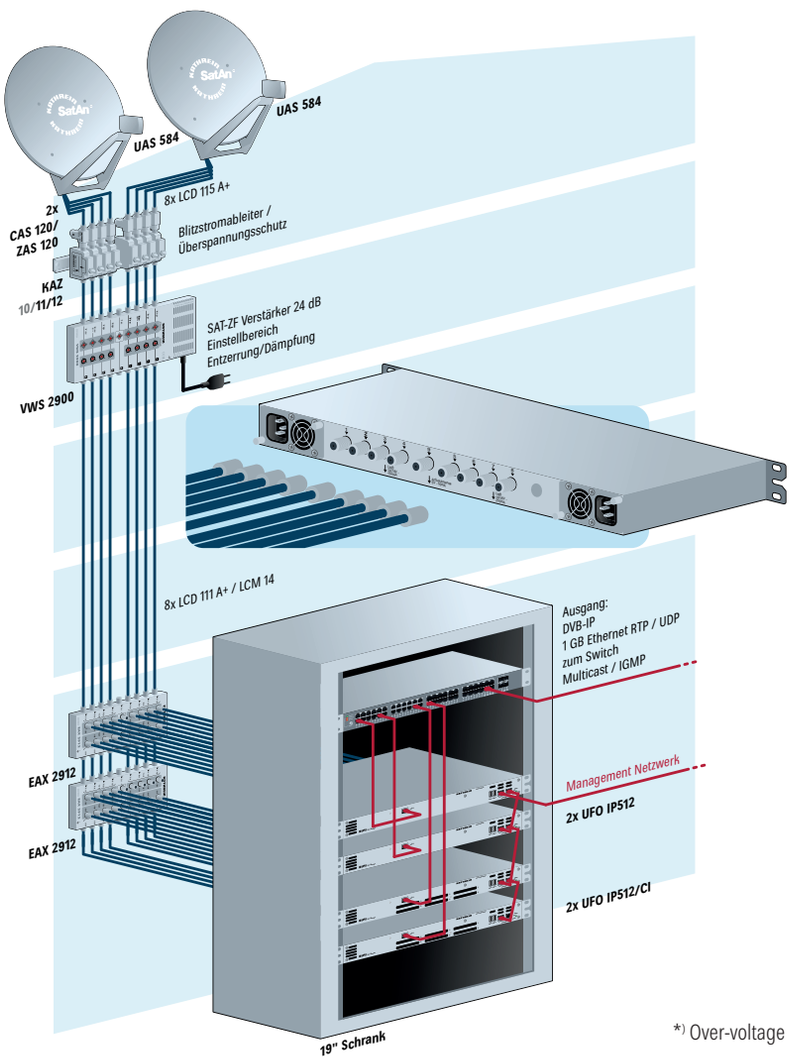


*) Over-voltage protection

CONFIGURATION

- 2 satellites
- Satellite reception
- DVB-C

UFO 19" series connection example
for UFO IP 512 (CI)

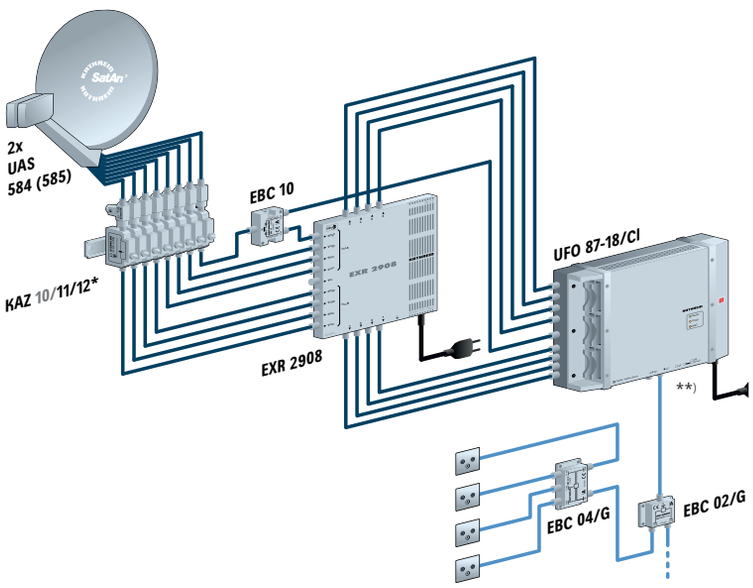


*) Over-voltage protection

CONFIGURATION

- 2 satellites
- Satellite reception
- DVB-IP

UFOmini connection example
for UFOmini with DiSEqC™ control



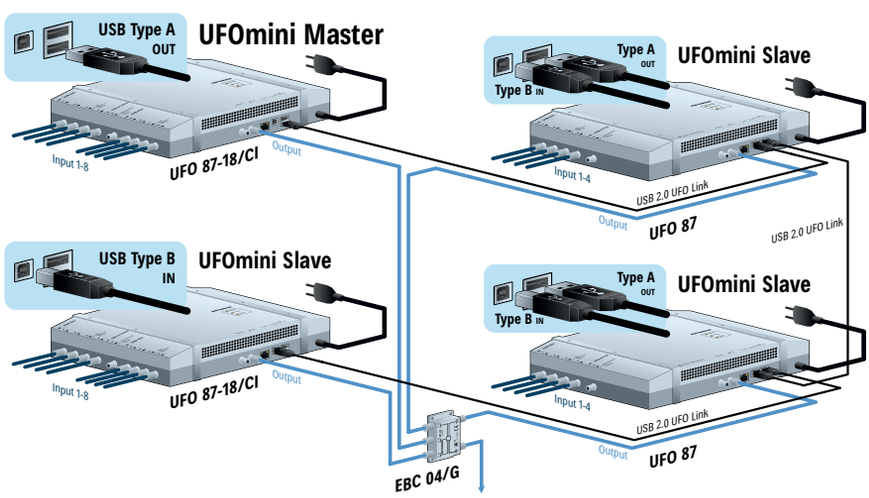
*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

CONFIGURATION

- 2 satellites
- Satellite reception
- Output: DVB-C

The CI versions offer you the possibility to decode encoded signals directly in the headend.

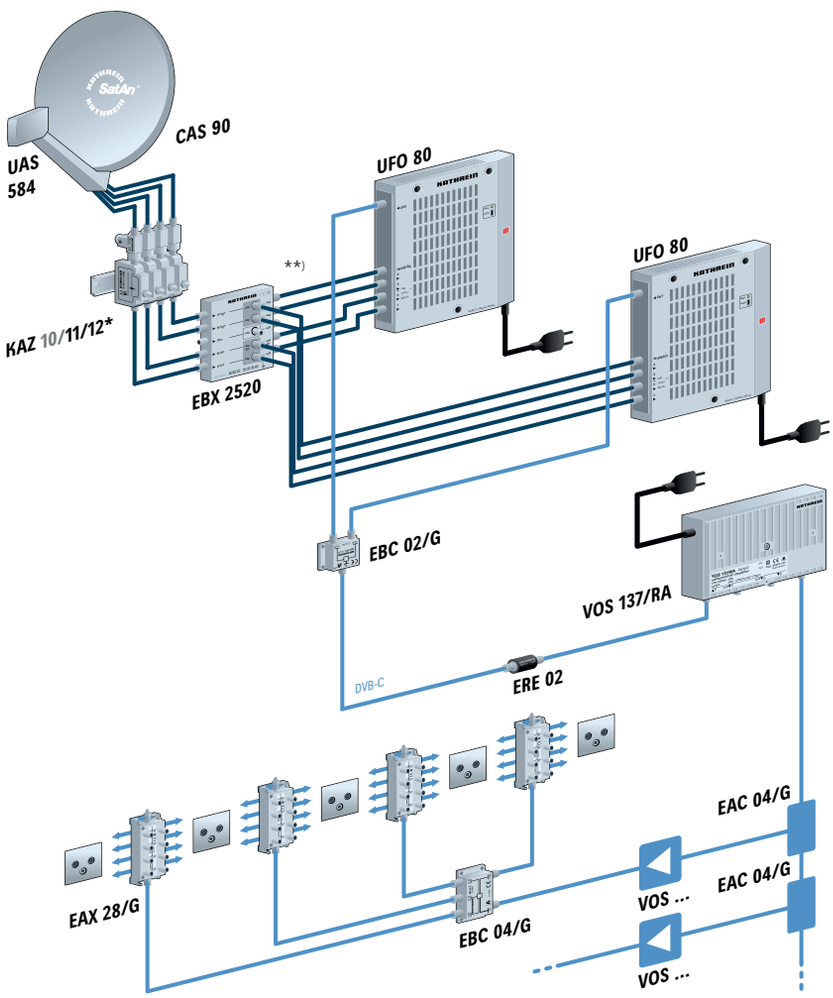
UFOlink connection example
UFO 87-18 and UFO 87 system network



CONFIGURATION

- Up to 72 transponders
- 2 satellites
- Satellite and terrestrial reception

UFOnano connection example



CONFIGURATION

- 1 satellite
- Satellite reception
- Output: DVB-C

*) Over-voltage protection
**) F grounding bracket/potential equalisation in the supply cables to the multi-switch and to the outlets

Amplifier systems for modern 1 GHz networks

With the multimedia-compliant extension of CATV networks, the demands on house distribution networks in network level 4 (NL 4) have also continuously increased. In addition to analogue and digital TV/radio signals, other services, such as Internet, telephony and video-on-demand, are also to be transmitted. To accommodate these additional services, high decoupling between subscriber connections and the lowest possible noise addition in the return path must be guaranteed. When planning NL 4, the following points must be taken into account:

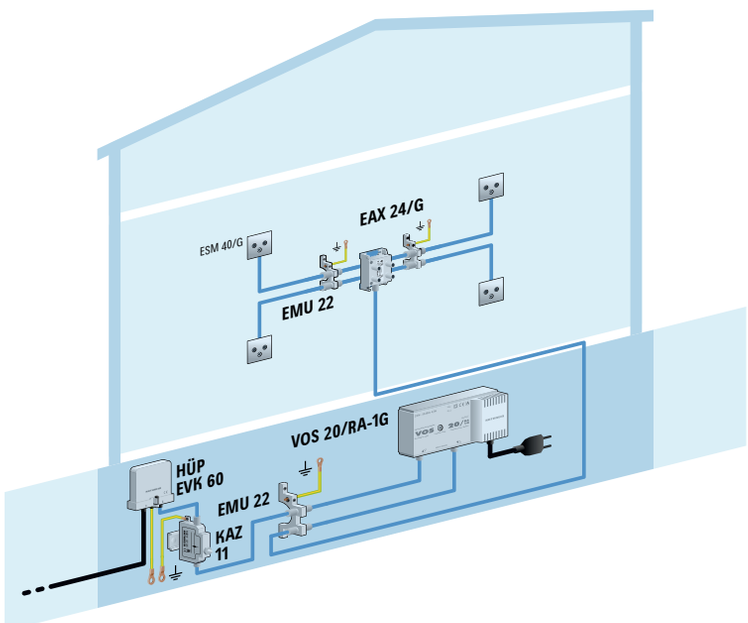
- Creation of mainly star structures
- Installation of special modem outlets when using multimedia services
- Use of components and assemblies bearing the Class A symbol

Key criteria when selecting a suitable amplifier

Modern house connection amplifiers
In the house connection amplifiers that are used at network level 4 this generally involves very versatile units that need to meet highly varied requirements and tasks. As a rule, their sizing will depend on the maximum number of residential units or the number of those that need to be supplied in the building. The amplifiers that are used at network level 4 are frequently supplied with 230 V AC from a local power supply, this being done by a separate infeed and fuse system from the power supply lines. Remote powered units are also used.

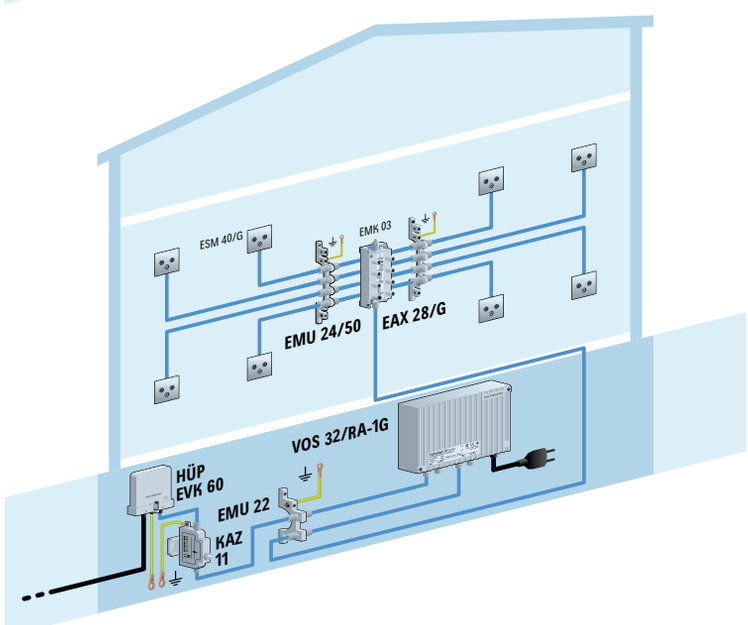
- **Transmission range**
  For future-proof networks, only components designed for a transmission frequency range up to 1006 MHz should be used.
- **Operating level**
  The required operating level depends on the distribution loss inside the building and the necessary minimum level at the outlets inside the dwelling.
- **Gain in the forward path**
  The required gain in the forward path is dependent on the transfer signal level at the house transfer point (HTP) and on the required operating level.
- **Return path amplification**
  The choice of suitable return path amplifier depends on the attenuation inside the building and also on the connection loss to the line network and its return path dimensions. For this reason, the choice of a suitable return path amplifier and its adjustment should be made only after consultation with the operator of the respective line network.

Multimedia-capable house distribution networks



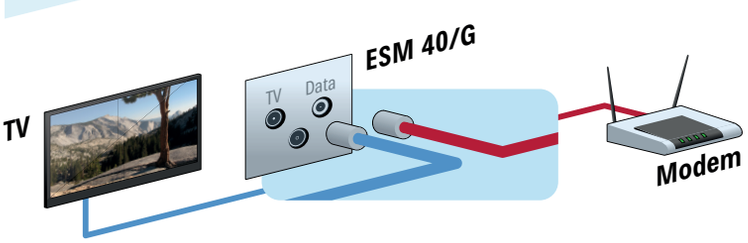
CONFIGURATION

- 4 connections
- EAX 24/G tap for star distribution and modem single outlets

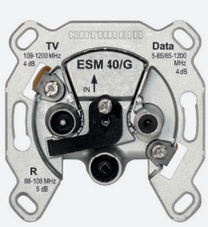


CONFIGURATION

- 8 connections
- EAX 28/G tap for star distribution and modem single outlets

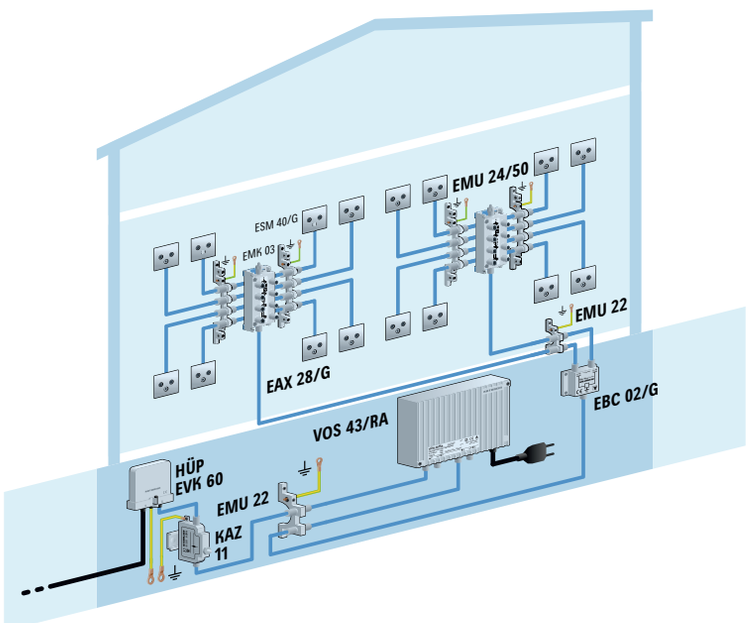


ESM 40/G features:



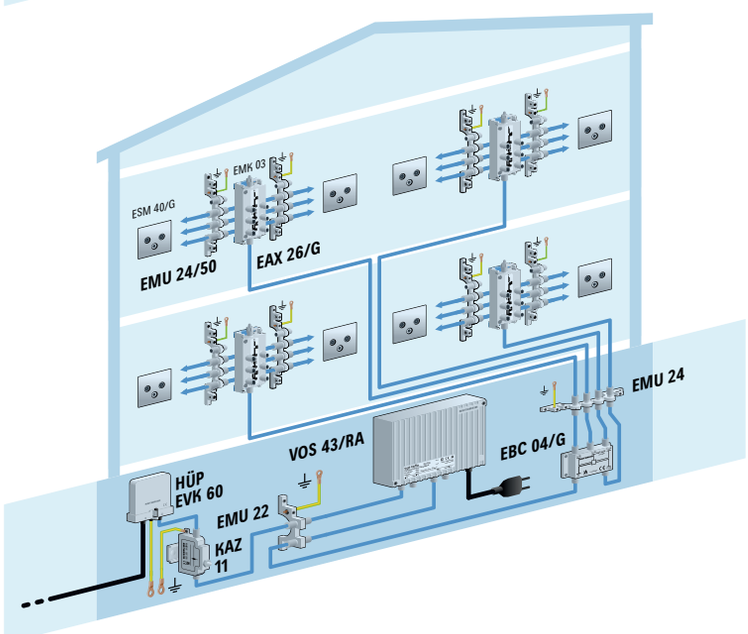
- Single outlet for stub and star-wired distribution systems with very low connection loss (3.5 dB, return path: 1 dB)
- Very high decoupling between the modem connection and the TV/radio connection prevents interference on TV/radio reception by the modem
- Connections: TV: IEC (male); Radio - IEC (female); Modem - F type (female)

*) Over-voltage protection



CONFIGURATION

- 16 connections
- EAX 28/G tap for star distribution and modem single outlets

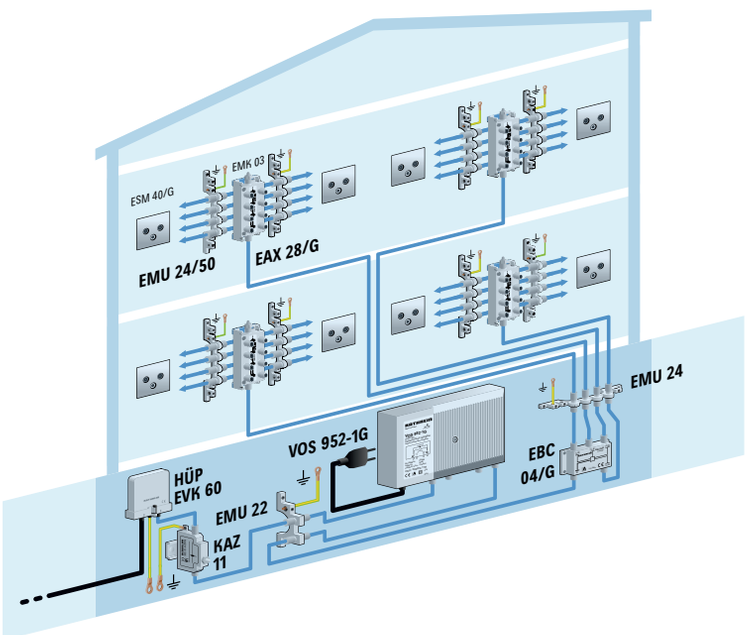


CONFIGURATION

- 24 connections
- EAX 26/G tap for star distribution and modem single outlets

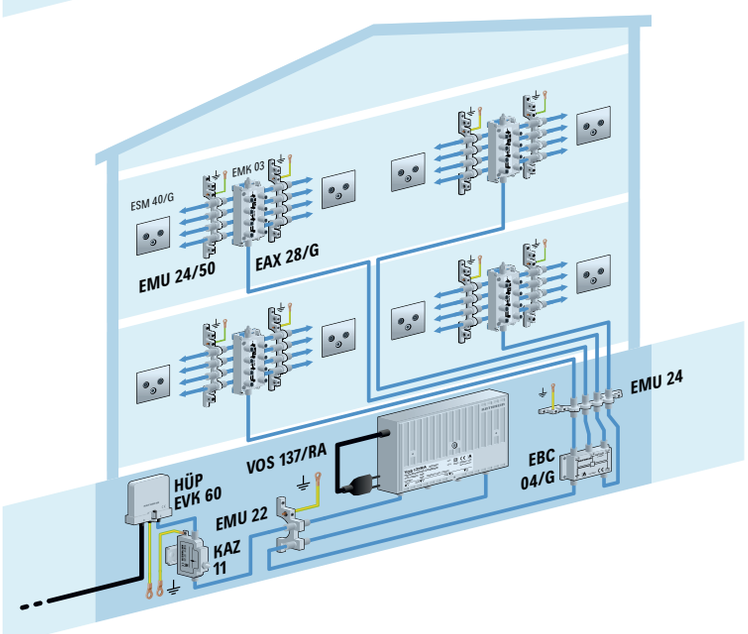
*) Over-voltage protection

Multimedia-capable house distribution networks



CONFIGURATION

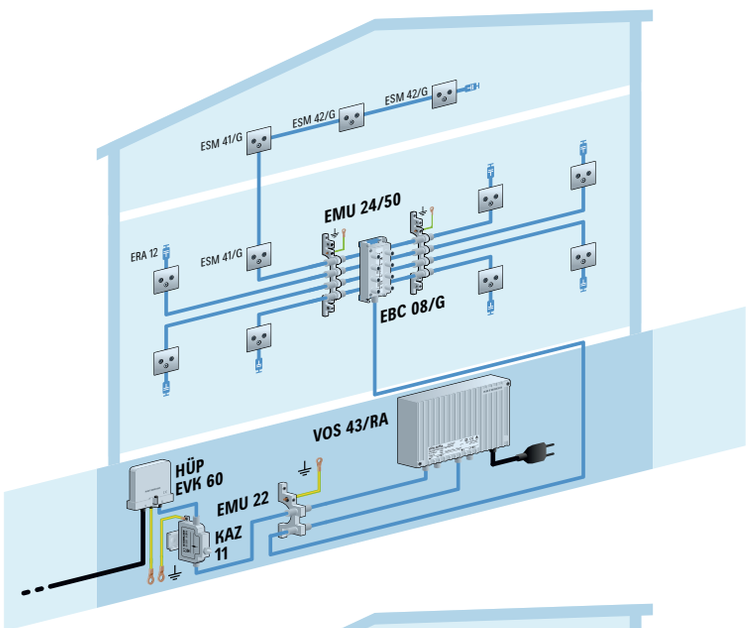
- 32 connections
- EAX 28/G tap for star distribution and modem single outlets
- with VOS 952-1G



CONFIGURATION

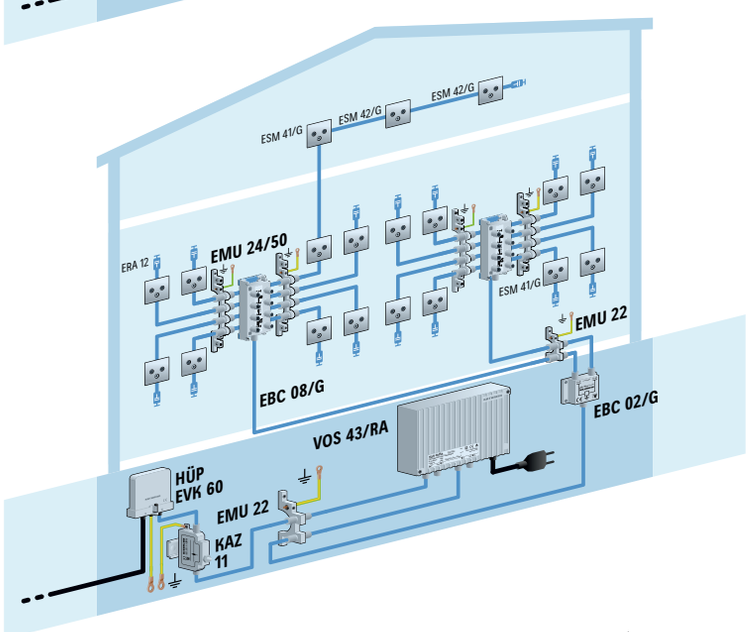
- 32 connections
- EAX 28/G tap for star distribution and modem single outlets
- with VOS 137/RA

*) Over-voltage protection



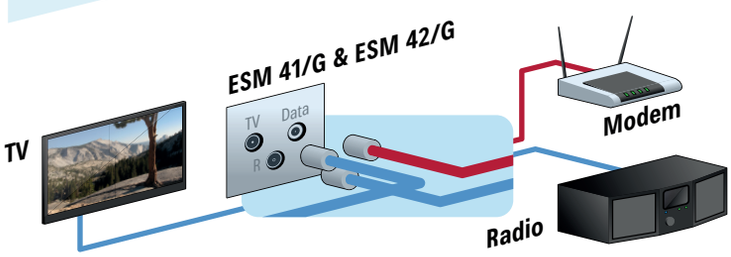
CONFIGURATION

- Single-family dwelling
- Star distribution with EBC 08/G splitter and loop-through outlets in the dwelling units

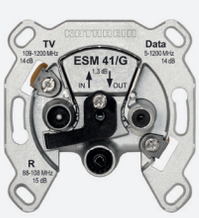


CONFIGURATION

- Multi-dwelling unit
- Star distribution with EBC 08/G splitter and loop-through outlets in the dwelling units



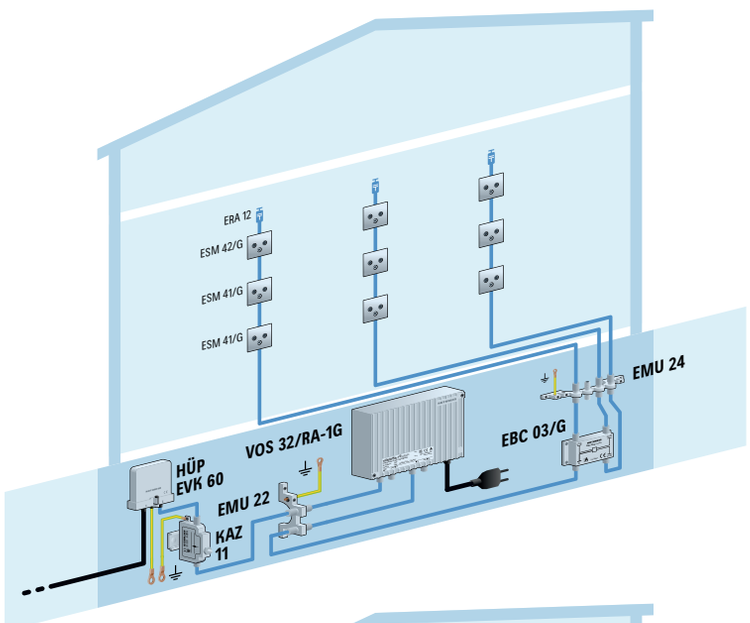
ESM 41/G, 42/G features:



- Directional coupler outlet for loop-through systems, connection loss: ESM 41/G: 14 dB, ESM 42/G: 10 dB
- Very high decoupling between the modem connection and the TV/radio connection prevents interference on TV/radio reception by the modem
- Connections: TV: IEC (male); Radio - IEC (female); Modem - F type (female)

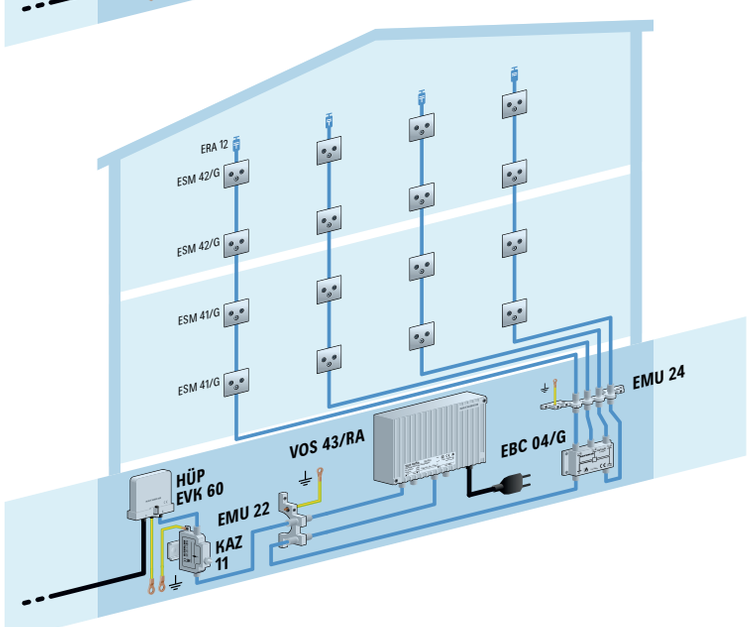
*) Over-voltage protection

Multimedia-capable house distribution networks



CONFIGURATION

- 9 connections
- Series distribution with splitter and loop-through outlets in the dwelling units



CONFIGURATION

- 16 connections
- Series distribution with splitter and loop-through outlets in the dwelling units

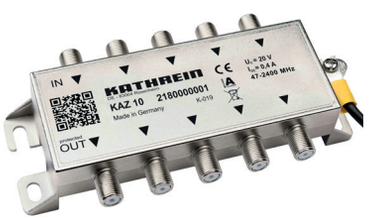
*) Over-voltage protection

Accessories

Over-voltage protection equipment
KAZ 10/11/12

- To protect system components in SAT, broadband and DVB-T reception and distribution systems
- Passage for 22-kHz and DiSEqC™ signals
- For indoor installation

KAZ 10
- Installing the KAZ 10 increases the surge discharge capability of KAZ 11 and KAZ 12
- Also usable on its own as middle protection in densely built-up environments with tall buildings
- Fulfils categories C2/C3/B2/D1 in accordance with EN 61643-21
- Remote feeding for DC voltages from 0 to +20 V / max. 0.4 A



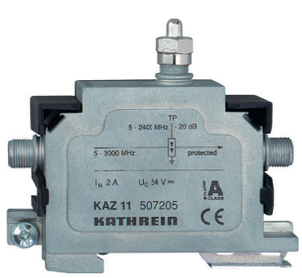
KAZ 10

KAZ 11
- Reduces over-voltages between inner and outer conductors to safe values
- Fine protection, must be installed as close to the object to be protected as possible

KAZ 12

- Conforms to: EN 61643-21

KAZ 12
- Installing the KAZ 12 increases the surge discharge capability of the KAZ 11
- Coarse protection, install as close to the house connection as possible
- Installation in accordance with the lightning arrester zone concept on interfaces LPZ 0A-1 and higher
- Fulfils categories A2/C2/C3/B2/D1 in accordance with EN 61643-21
- Includes gas discharge conductor. These are the classic over-voltage protection elements used in coaxial networks
- Accessories included: 1 × EMU 21 ground connection block, 2 x EMK 01 F connector



KAZ 11

F-type grounding* blocks
EMU 21, EMU 22, EMU 24, EMU 50, EMU 90

- Screening factor: > 90 dB
- Remote feed max: 65 V/2 A

EMU 21: 1-way
EMU 22: 2-way
EMU 24: 4-way
EMU 50: 5-way
EMU 90: 9-way

* For connection of cable screens to the potential equalisation. The components do not withstand lightning current and may therefore only be used for potential equalisation.

EMU 24

EMU50

Rafter brackets
ZAS 40, ZAS 41, ZAS 46

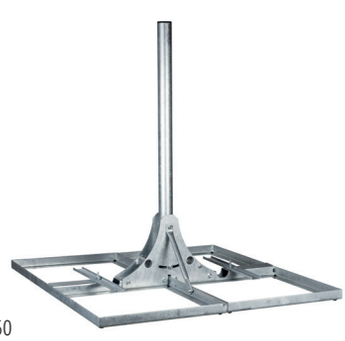
- ZAS 40 for one parabolic antenna
- ZAS 41 for one parabolic antenna and an additional FM antenna
- ZAS 46 for one parabolic antenna up to 1.30 m diameter
- Designed to withstand lightning current (100 kA, 10/350 µs, as per DIN VDE 0855-300)
- Mounting from the outside directly onto the rafters or battens

ZAS 46

Flat roof antenna mount
ZAS 140, ZAS 150

- Material: hot-dip galvanised steel to EN ISO 1461
- ZAS 140 suitable for offset parabolic antennas up to 90 cm diameter, e.g. CAS 06, CAS 60, CAS 80, CAS 90, KEA 650, KEA 750, KEA 850, BAS 65
- ZAS 150 suitable for offset parabolic antennas up to 1.30 m diameter

ZAS 150



Coaxial connector with simplest assembly and high screening

Type	Order no.	Description	
EMK 01	273167	F-type screw-on connector for cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 90 dB; screening class A	
EMK 02	21210014	F-type screw-on quick connector for cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 90 dB; screening class A	
EMK 104	273195	F-type cable fitting for LCM 33 cable, for outdoor installation, screening factor 90 dB; screening class A	
EMK 105	273196	F-type cable fitting for LCM 50 cable, for outdoor installation, screening factor 90 dB; screening class A	
EMK 106	273197	F-type cable fitting for LCM 96 cable, for outdoor installation, screening factor 90 dB; screening class A	
EMK 11	273263	F-type crimp connector for cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 90 dB; screening class A	
EMK 12	21210018	F-type compression connector for coaxial cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 120/105 dB; screening class A+	
EMK 15	273276	F-type screw-on connector for LCD 89 cable, screening factor > 90 dB; screening class A	
EMK 17	273291	F-type screw-on connector for cables LCM 14 A+, LCM 17 A+; screening factor > 90 dB; screening class A	
EMK 18	21210013	F-type crimp connector for cables LCM 14 A+, LCM 17 A+; screening factor > 90 dB; screening class A	
EMK 19	21210019	F-type compression connector for cables LCM 14 A+, LCM 17 A+; screening factor > 120/105 dB; screening class A+	
EMK 20	21210024	F-type self-install connector for cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 120/105 dB; screening class A+	
EMK 21	273120	IEC connector (m) for cables with D = 4-7 mm: LCD 89, LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; FM screening factor > 75 dB, UHF > 65 dB	
EMK 62	273123	IEC connector (f) for cables with D = 4-7 mm: LCD 89, LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; FM screening factor > 75 dB, UHF > 65 dB	
EMK 63	21210030	IEC compression connector (m) for coaxial cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 85 dB; screening class A	
EMK 64	21210031	IEC compression connector (f) for coaxial cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 85 dB; screening class A	

Connector installation sets

for quick, professional installation

ZAH 12 | 21410008

- Compression connector set, comprising: Plastic box, 100 EMK 12 compression connectors, ZAW 13 compression pliers (suitable for EMK 12/19)
- Cable stripper RG 6/59

ZAH 15 | 21410013

- Self-install connector set, comprising: Plastic box, 100 EMK 20 self install connectors, ZAW 16 stripping tool

Features and benefits of Kathrein coaxial cables

- The cables meet the electrical requirements of the cable companies (except LCD 89 and LCD 90)
- The CE Declarations of Conformity comply with the following standards and directives: EN 50575, EN 60728-11, EN 50581, EN 50117-2-3/-2-4 and RoHS

		LCD 89	LCD 90	LCD 111 A+	LCD 115 A+
Order no.	100 m (one-way coil)	21510004	21510015	21510025	21510028
	250 m (reel-off box)	✗	✗	✗	✗
	250 m (one-way coil)	✗	✗	21510026	✗
	500 m (one-way drum)	✗	21510017	21510027	21510029
	Special lengths on request	✗	✗	✗	✗
Features	Attenuation	Low	Low	Very Low	Very Low
	Screening	Good	Good	Extremely good	Extremely good
	Cost per metre	Low	Very Low	Low	Low
	Fire classification	Low	Low	Low	High
	Diameter	Extra thin/flex.	Standard	Standard	Standard
	UV-resistant	✓	✓	✓	✓
Method of laying the cables	Inside buildings	✓	✓	✓	✓
	Outside buildings	✗	✗	✗	✓
	Underground	✗	✗	✗	✗
Dimensions	Centre conductor	0.75 mm Cu	1.0 mm steel clad	1.13 mm Cu	1.13 mm Cu
	External sheathing	5 mm	6.8 mm	6.9 mm	6.9 mm
Fire classification	CPR 305/2011	Eca	Eca	Eca	Cca s1a d1 a1
External sheathing	Material	PVC white	PVC white	PVC white	Halogen-free/ black
Screening class		A	A	A++	A++
Screening attenuation typ./100 m	5-2400 MHz	90 dB	90 dB	130 dB	130 dB
Attenuation typ./100 m	50 MHz	6.3 dB	4.3 dB	4.1 dB	4.1 dB
	450 MHz	18.3 dB	13.4 dB	12.0 dB	12.0 dB
	862 MHz	26.1 dB	18.4 dB	17.1 dB	17.1 dB
	1000 MHz	28.0 dB	20.1 dB	18.5 dB	18.5 dB
	2150 MHz	43.1 dB	30.5 dB	28.4 dB	28.4 dB
	2400 MHz	45.0 dB	32.6 dB	29.9 dB	29.9 dB
Return loss typ./100 m	5-2400 MHz	≥ 20–16 dB	≥ 26-20 dB	≥ 26-18 dB	≥ 26-18 dB
Coupling resistance DOCSIS 3.1 return path	5-30 MHz	< 5 mΩ/m	< 10 mΩ/m	≤ 0.9 mΩ/m DOCSIS 3.x	≤ 0.9 mΩ/m DOCSIS 3.x
Suitable connectors	Threaded	EMK 15	EMK 01/EMK 02/ EMK 21/EMK 62	EMK 01/EMK 02/ EMK 21/EMK 62	EMK 01/EMK 02/ EMK 21/EMK 62
	Crimpable F-male	✗	EMK 11	EMK 11	EMK 11
	Compress. F-male	✗	EMK 12	EMK 12	EMK 12
	Self-install F-male	✗	EMK 20	EMK 20	EMK 20
	Compress. IEC male	✗	EMK 63	EMK 63	EMK 63
	Compress. IEC female	✗	EMK 64	EMK 64	EMK 64

- The cables comply with the Construction Products Regulation 305/2011; valid since 1 July 2017 (Fire Safety Regulations)
- The cables have metre and jacket markings (manufacturer's name)

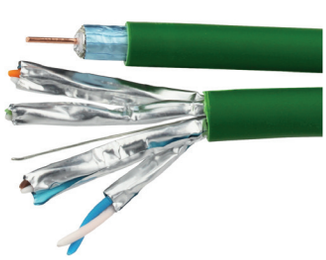
						
LCD 120 A+	**LCD 130 A+**	**LCM 14 A+**	**LCM 17 A+**	**LCM 33**	**LCM 50**	**LCM 96**
21510036	21510039	21510030	21510034	✗	✗	✗
21510043	21510042	✗	✗	✗	✗	✗
✗	✗	✗	✗	✗	✗	✗
21510038	21510041	21510031	21510035	271623	271622	271624
✗	✗	✗	✗	24510061	24510062	24510063
Low	Very Low	Very Low	Very Low	Extremely low	Extremely low	Extremely low
Extremely good	Extremely good	Extremely good	Extremely good	Extremely good	Extremely good	Extremely good
Very Low	Low	Low	Low	Average	Average	Average
Low	Very high	Medium	Low	Low	Low	Low
Standard	Standard	Large	Large	1 qKx broadband cable	1 nKx broadband cable	1 iKx broadband cable
✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✗	✗	✗	✗
✗	✗	✓	✓	✓	✓	✓
✗	✗	✗	✓	✓	✓	✓
1.02 mm Cu	1.13 mm Cu	1.63 mm Cu	1.63 mm Cu	3.3 mm Cu	2.2 mm Cu	1.1 mm Cu
6.8 mm	6.9 mm	10.4 mm	10.4 mm	17 mm	12.5 mm	11.0 mm
Eca	B2ca s1a d0 a1	Dca s1a d1 a1	Fca	Underground cable/Fca	Underground cable/Fca	Underground cable/Fca
PVC white	Halogen-free/white	Halogen-free/black	PE black	PE black	PE black	PE black
A+	A++	A+	A+	A++	A++	A++
130 dB	130 dB	120 dB	120 dB	120 dB	120 dB	115 dB
4.3 dB	4.1 dB	2.8 dB	2.8 dB	1.2 dB	1.8 dB	3.6 dB
12.9 dB	12.0 dB	8.6 dB	8.6 dB	4.0 dB	6.0 dB	11.5 dB
18.2 dB	17.1 dB	12.2 dB	12.2 dB	5.5 dB	8.7 dB	16.0 dB
19.7 dB	18.5 dB	13.1 dB	13.1 dB	7.0 dB	10.0 dB	18.3 dB
29.9 dB	28.4 dB	20.3 dB	20.3 dB	10.6 dB	16.2 dB	29.2 dB
31.8 dB	29.9 dB	21.8 dB	21.8 dB	11.5 dB	17.7 dB	31.7 dB
≥ 26-18 dB	≥ 26-18 dB	≥ 26-20 dB	≥ 26-20 dB	≥ 28-20 dB	≥ 28-20 dB	≥ 28-20 dB
≤ 2.5 mΩ/m	≤ 0.9 mΩ/m DOCSIS 3.x	≤ 2.5 mΩ/m	≤ 2.5 mΩ/m	≤ 0.1 mΩ/m DOCSIS 3.x	≤ 0.1 mΩ/m DOCSIS 3.x	≤ 0.3 mΩ/m DOCSIS 3.x
EMK 01/EMK 02/ EMK 21/EMK 62	EMK 01/EMK 02/ EMK 21/EMK 62	EMK 17	EMK 17	EMK 104	EMK 105	EMK 106
EMK 11	EMK 11	EMK 18	EMK 18	✗	✗	✗
EMK 12	EMK 12	EMK 19	EMK 19	✗	✗	✗
EMK 20	EMK 20	✗	✗	✗	✗	✗
EMK 63	EMK 63	✗	✗	✗	✗	✗
EMK 64	EMK 64	✗	✗	✗	✗	✗

Network cables
LCL 110

- Network cable CAT7A S/FTP
- Metre marking
- Construction Products Regulation 305/2011, EN 50575, fire classification: Cca s1a,d1,a1
- Halogen-free
- Suitable for installation in the home
- Available in 250 m, 500 m and 1000m lengths
- Compatible RJ45 network connector:
  EML 12 (order no: 212500001), field-configurable without tools

CE

Hybrid cables
LCH 120



- Hybrid cables: Network cable CAT7 and coaxial cable class A+
- Metre marking
- Construction Products Regulation 305/2011, EN 50575, fire classification: Eca
- Halogen-free
- Suitable for installation in the home
- Available in 100 m and 250 m lengths

CE KLASSE A CLASS

Network socket
ESN 100

- 2-way network box CAT6A
- Concealed, compatible with all standard switch ranges (UAE)
- Class EA (500 MHz) 10 GigaBit in compliance with ISO/IEC 11801
- 40° outlet, LSA terminals
- RJ45 contacts made of phosphor-bronze, 40-80 µ" nickel-plated, contact area flash gold-plated
- Wire thickness suitable for AWG22/1 to AWG26/1
- Marking plate with transparent cover
- Fully screened die-cast aluminium housing
- Including centre piece DIN49075 50 × 50 mm and ABS cover frame 80 × 80 mm
- Suitable for installation in switch boxes, cavity wall boxes and re-cessed channels
- POE-compatible in compliance with IEEE 802.3af 15.4 W, IEEE 802.3at 30 W and IEEE 802.3bt 90 W

CE

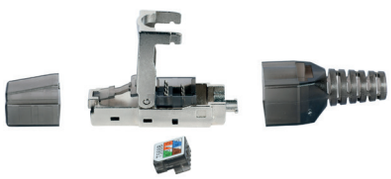
Hybrid network outlet
ESN 300

- Hybrid network CAT6A and TV/SAT (F socket) box
- POE-compatible in compliance with IEEE802.3af (44-57 V, 15.4 W) and IEEE802.3at (44-57 V, 25.5 W)
- For use as a wall-mounted or concealed box, consisting of:
  - CAT6A keystone module, fully screened
  - F antenna module
  - 2-way support frame, multi-design
  - Wall outlet frame
- CAT6A 500 MHz RJ45 module 10 GBit fully screened:
- For AWG22/1 to AWG24/1
- No LSA tools required
- Installation in modular splitter fields up to 24-port/1U
- Connection box 1-3 port
- Pair management for IDC strip 568A/B coded
- Strain relief by cable clips
- CAT6A components certified (delta)

CE

Network connector
EML 12

- Field configurable RJ45 connector CAT6A
- Suitable for LCL 110 and LCH 120
- Wire thickness suitable for AWG22 to AWG27 (6-9 mm)
- Connector contacts made of phosphorous/bronze alloy, 3 µm gold plated
- Metal screening with zinc alloy



F-type connector (m)
EMK 04

- F-type screw-on connector for hybrid cable LCH 120
- Screening factor > 95 dB
- Packaging unit/weight (pc./kg): 10 (100, 2000)/0.015

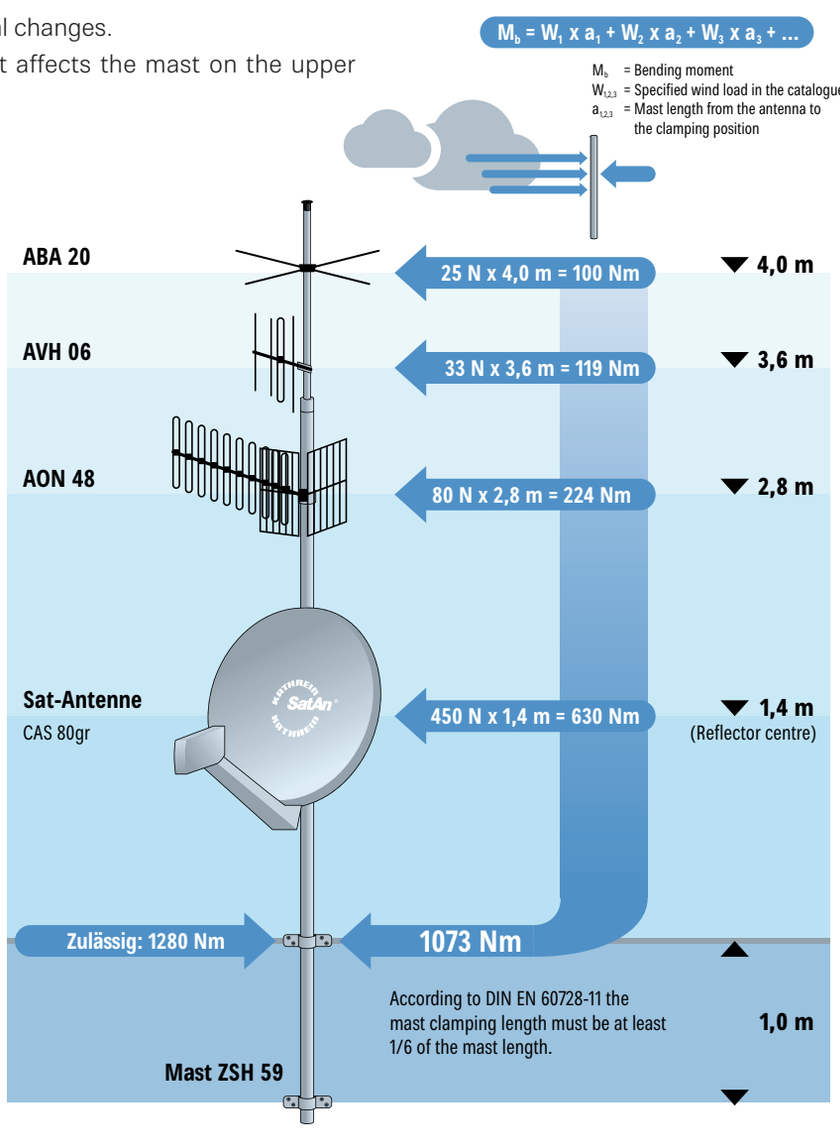
Planning and installation instructions

Mast calculation

The calculation values for the mechanical stability of the antenna superstructures (wind loads and bending moments) comply with EN 60728-11. When selecting the installation site, take into account the structural features of the building, such as susceptibility to oscillation, roof characteristics, installation on cylindrical structures, which could lead to increased wind loads, in accordance with DIN 1055, part 4/2005-03 or DIN 4131. The dynamic properties of the antenna and the structure can interact and cause detrimental changes.

The bending moment affects the mast on the upper attachment point for all antennas. The wind load on the mast must be included in the calculation.

The overall bending moment is not to exceed the maximum permitted bending moment of the mast and must not be greater than **1,650 Nm**. If the bending moment is greater, a static engineer is required to provide verification of the transfer of forces into the structure of the building.

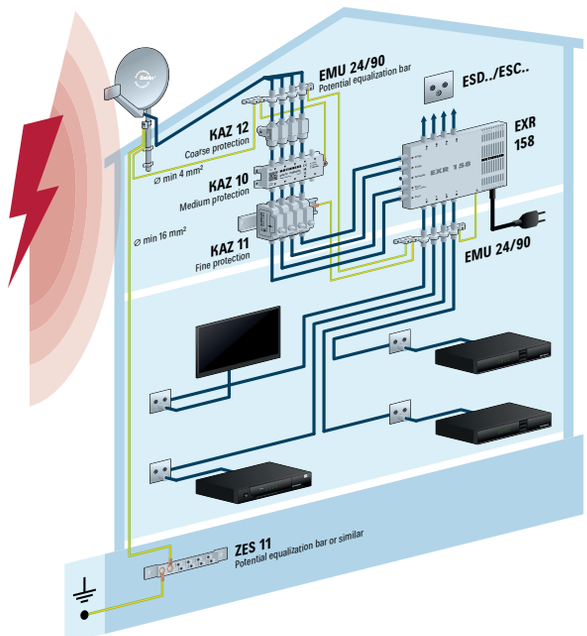


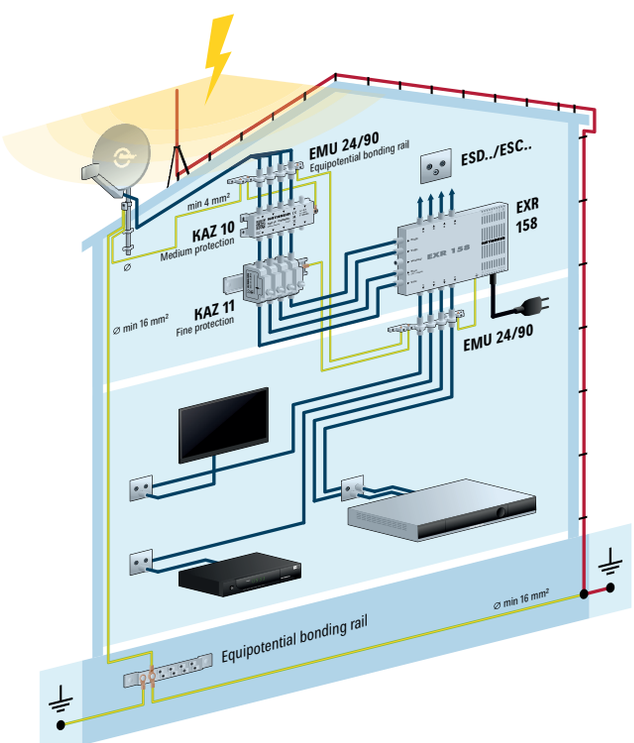
Grounding and lightning protection

Because of the serious consequences if the work is not done properly, grounding and lightning protection work may be performed only by specially trained electricians. Never perform grounding and lightning protection work if you are not a specialist with the appropriate skills. The instructions given below are not an invitation to non-specialists to perform grounding and lightning protection work on their own account; they are meant solely as additional information for the specialists whom you employ. The antenna must be erected to DIN EN 60728-11 and grounded as specified.

Antennas are only exempt from the grounding requirement if:

- More than 2 m below the edge of the roof, and
- less than 1.5 m from buildings.





For grounding, the mast must be connected by means of a suitable ground conductor to the lightning protection system of the building, using the shortest route. If no lightning protection system is installed, it must be connected to the building ground. Connection to the lightning protection system may be made only by a qualified lightning protection system installation engineer.

Please also note the new provisions of the DIN VDE 0100-443 and -534 over-voltage protection standards. All plans with a start date of 01 October 2016 or later must meet these new standards.

a) Suitable ground conductors:

- A single solid wire with a cross-section of min. 16 mm^2 copper, min. 25 mm^2 aluminium or min. 50 mm^2 steel.

b) Unsuitable ground conductors:

- Outer conductors of the antenna cable;
- Metallic in-house installations (such as the metal pipework of a water or heating system), as the permanence of the electrical connection cannot be guaranteed;
- or the protective ground conductor or neutral conductor of the mains power supply.

c) Routing of ground conductors

- Antenna cables and ground conductors must not be routed through rooms used for storing easily flammable substances (such as hay or straw) or in which an explosive atmosphere can develop (such as gases, vapours).
- If the parabolic antenna is used in an integrated antenna system (e.g. a distribution system), the grounding measures must be designed in such a way that grounding protection is still maintained if individual units are removed or replaced.

Hazards may be caused not only by thunderstorms (lightning), but also by static charges and short circuits in the connected units. For safety reasons, therefore, in general for all antenna systems 4 mm^2 copper potential equalisation must be provided. The cable screens of all coaxial antenna downlink cables must be connected to the mast with an equipotential bonding conductor.

Planning values for the house connection amplifiers

The maximum operating level for the amplifiers is specified with 6 dB interstage pre-emphasis. The explanatory notes on output level, EMC limit values and noise factor can be found in chapters 85 and following. The permitted gain decrease from the nominal (= maximum value in range amplifiers) is 4 dB (in accordance with ZVEI). In amplifiers with additional current consumption, the power consumption from the mains applies to the maximum current consumption. In the planning and installation of cable systems, the applicable guidelines and standards must be observed and implemented.

Type	Gain (dB)	Max. operating level CENELEC channel plan (dBµV)	Noise factor (dB) Forward path | Return path
		60-dB-CTB/-CSO	
VOS 11/F	11	95/94	5 | –
VOS 20/F	20	95/94	5 | –
VOS 20/FR	20	95/94	6 | –
VOS 20/RA-1G	22	96/96	6 | 5
VOS 29/RA-1G	30	96/96	6 | 5
VOS 32/RA-1G	26/32	102/102	7/6 | 5
VOS 43/RA	34/40	107/110	8/6 | 5
VOS 32/F	26/32	102/102	7/6 | 5 (with VGR 28/xx)
VOS 137/RA	40/34/40	113/116	6/7/7 | 5
VOS 138/RA	40/34/40	113/116	6/7/7 | 5
VOS 139/RA	40/34/40	113/116	6/7/7 | 5
VOS 952-1G	39.5	112/116	4/5/5 | 5
VOS 953-1G	39.5	112/116	4/5/5 | 5

Maximum operating level

The maximum operating level for range/multi-range amplifiers for community antenna networks with a maximum of 12 TV channels depends on the catalogue value for the maximum output level and the number of transmission channels. The maximum operating level is the lower of the following two values:

- Output level for 66 dB XMod minus level reduction or
- Output level for 60 dB IMod 2nd order (applies to interfering signal stability amplifiers only in the FM range).

Output level reduction

If more than two channels (up to a maximum of 12 channels) are transmitted, reduce the output level in accordance with the adjacent table. If FM channels are transmitted approx. 10 dB lower than the TV signal levels, these can be disregarded. If the levels are the same, they should be counted like the TV channels. The level reduction should only be carried out for the output levels of 60 dB and 66 dB XMod. The output level values for 60 dB disturbance ratio 2nd order need not be reduced. When cascading at the same disturbance ratio per doubled number of cascaded amplifiers, the output level is to be reduced by 3 dB each time.

Number of transmission channels	Level reduction (dB)
2	0
3	2
4	3.5
5	4.5
6	5
7	5.5
8	6
9	6.5
10	7
11	7.5
12	8

EMC limit values

For **active** devices, in accordance with EN 50083-2, the following values apply to the maximum permitted **radiated interference power**:

	Frequency range (MHz)	Max. permitted radiated interference power (dBpW)
Radiated interference power Active devices	5-30	27-20
	30-950	20
	950-2500	43

For **passive** devices, in accordance with EN 50083-2, the following values apply to the **screening factor**:

	Frequency range (MHz)	Class A Limit value (dB) Class B	
Screening factor Passive devices	5-30	85	75
	30-300	85	75
	300-470	80	75
	470-950	75	65
	950-3000	55	50

The following limit values for **coupling resistance** and **screening attenuation** apply for **coaxial cable** according to EN 50117:

Coupling resistance	Frequency range (MHz)	Limit value (mΩ/m) Class B			
		Class A++*)	Class A+	Class A	Class B
	5-30	≤ 0.9	≤ 2.5	≤ 5	≤ 15
Screening attenuation	**Frequency range (MHz)**	**Class A++*)**	**Class A+**	**Class A**	**Class B**
	30-1000	≥ 105	≥ 95	85	75
	1000-2000	≥ 95	≥ 85	75	65
	2000-3000	≥ 85	≥ 75	65	55

*) Limit values up to 1000 MHz in accordance with EN 50117-2-3

Signal-to-noise ratio / noise figure

The signal-to-noise ratio is the difference between the level of the useful signal and the noise level. The noise factor indicates by how many dB an amplifier additionally reduces the signal-to-noise ratio. The noise level of a 75-Ω resistor, in reference to the bandwidth of a TV channel (5 MHz), is 2 dBµV.

Signal-to-noise ratio = level at amplifier input - noise factor - 2 dBµV

Calculation example:
Antenna level = 50 dBµV, noise factor = 4 dB

▸ **signal-to-noise ratio = 50 dBµV - 4 dB - 2 dBµV = 44 dB**

Signal-to-noise ratio/image quality

Signal-to-noise ratio	more than 46 dB	37 dB	30 dB	less than 26 dB
noise	noise-free	visible, but not annoying	clearly visible, annoying	noise predominates
picture quality	Very good	Good	Poor	Useless

Limit values for useful levels

Limit values for useful levels at antenna outlets (as per EN 60728-1)		
Range	**Min. level (dBµV)**	**Max. level (dBµV)**
FM (mono/stereo)	40/50	70
AM-RSB-TV-Radio	60	77*
Frequency modulated TV signals	47	77
DVB-C (64 QAM)	47	67
DVB-C (256 QAM)	54	74
DVB-S2 (QPSK, 8 PSK, 16 APSK, 32 APSK)	47	77
DVB-T (16 QAM; FEC 2/3)	36	74
DVB-T (64 QAM; FEC 2/3)	45	74
DVB-T2 (16 QAM; FEC 2/3)	35	74
DVB-T2 (64 QAM; FEC 2/3)	39	74
DAB & DAB+ (OFDM/COFDM in band III)	28	94

*) 80 dBµV for systems with fewer than 20 channels

Additional power requirements for digitally modulated signals
(in accordance with EN 60728-1)

Bit error rate BER

For quasi-uninterrupted service, the bit error rate (BER) for a DVB signal prior to Reed-Solomon error correction must be less than 10^{-4}. The bit error rate does not apply to DVB-x2.

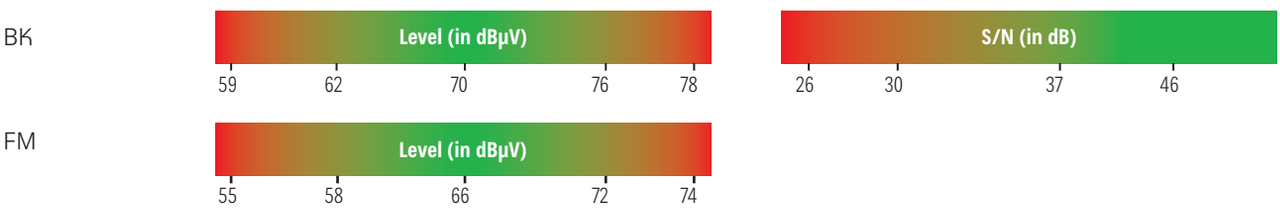
Modulation error ratio MER

This power requirement is for information only. For each DVB signal, the modulation error ratio (MER) must not be less than the value given in the adjacent table:

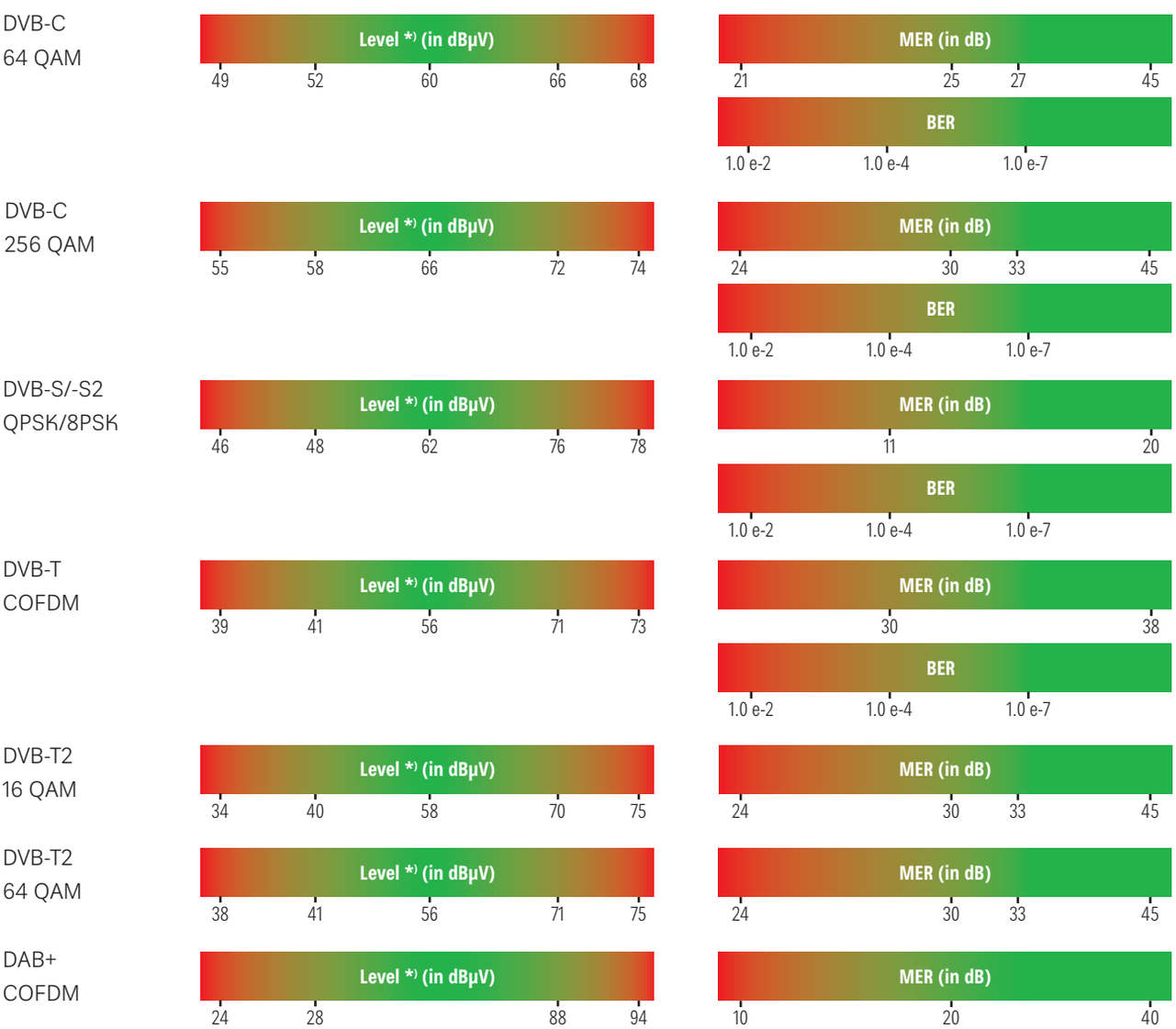
Signal modulation	Modulation error ratio MER (dB)
QPSK	11
8 PSK	14
16 APSK	16
32 APSK	18
16 QAM	20
64 QAM	26
256 QAM	32
COFDM (DVB-T)	26
COFDM (DVB-T2)	32
COFDM (DAB+)	10

Signal evaluation/limit values

Analogue signals



Digital signals



*) Limit values for useful levels at antenna outlets (as per EN 50083-7). All values are approximates.

Award-winning products from KATHREIN Digital Systems:

- SAT>IP: EXIP 4124

- Satellite reception: BAS 66 Skew

- Satellite reception: CAS 80

- Satellite receiver: UFS 810

- DVB-T antenna: BZD 40

- Multi-switch: EXR 158

- General:

Winner of the Auerbach Verlag readers' choice

- **2017:** in the field of satellite, satellite antennas (CAS series)
- **2016:** in the field of satellite and cable, satellite antennas (CAS series)
- **2016:** in the field of satellite and cable, multi-switch systems (EXR series)

For your notes

For your notes

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