

This Tech Note lists all HW components mandatory or optional and describes how they have to be combined into a Klippel Endurance Test (KET) system. It will also be used as an HW selection guide during the ordering process.

1 Measurement device

Measurement devices for the KET system are audio amplifiers from the *Powersoft Mezzo* or *Powersoft Unica* series with included voltage and current sensing and Dante™ network signal streaming.

1.1 Supported measurement devices / amplifiers of Powersoft MEZZO series

Powersoft amplifier type	Description	Item-No.
MEZZO 324 AD	80W/4-channel Compact Amplifier with DSP and Dante™ recommended for micro-speakers and headphones	2700-040
		
MEZZO 604 AD	150W/4-channel Compact Amplifier with DSP and Dante™ Klippel recommended KET amplifier	2700-041
		
↑ Above listed 4 channel amplifiers are recommended due to their flexibility and cost-efficiency. ↑ Klippel will typically have the 4 channel types in stock.		
↓ Below listed 2 channel amplifiers could optionally be used for small setups. ↓ The 2 channel types are on request and typically not in stock at Klippel.		
MEZZO 322 AD	80W/2-channel Compact Amplifier with DSP and Dante™ Alternative KET amplifier for systems limited to 2 channels	on request
		
MEZZO 602 AD	150W/2-channel Compact Amplifier with DSP and Dante™ Alternative KET amplifier for systems limited to 2 channels	on request
		
MEZZO 322 A, 324 A, 602 A, 604 A with DSP are not supported by the Klippel Endurance Test (KET).		
MEZZO 322 A+, 324 A+, 602 A+, 604 A+ with DSP and AES67 are not supported by the KET.		

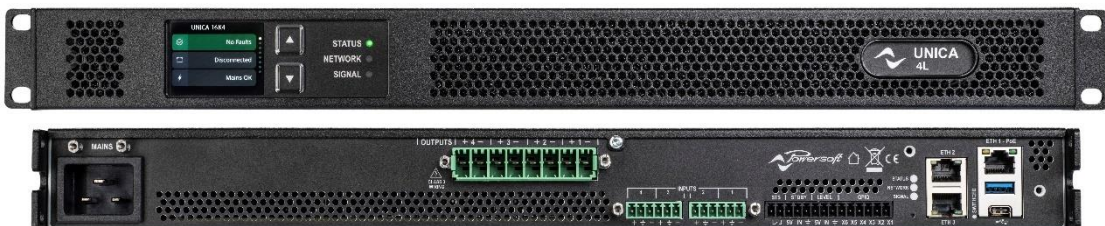
1.2 Supported measurement devices / amplifiers of Powersoft UNICA 8M series

Powersoft amplifier type	Description	Item-No.
UNICA 1K8	125W/8-channel Amplifier with DSP and Dante™ Comparable to 2x MEZZO 604 AD	on request
UNICA 2K8	250W/8-channel Amplifier with DSP and Dante™ Klippel recommended KET amplifier	2700-042
UNICA 4K8	500W/8-channel Amplifier with DSP and Dante™	on request
UNICA 8K8	1000W/8-channel Amplifier with DSP and Dante™ Klippel recommend KET amplifier (high power-density)	2700-043



1.3 Supported measurement devices / amplifiers of Powersoft UNICA 4L series

Powersoft amplifier type	Description	Item-No.
UNICA 5K4	1000W/4-channel Amplifier with DSP and Dante™ Comparable to UNICA 8K8	on request
UNICA 9K4	2250W/4-channel Amplifier with DSP and Dante™	on request
UNICA 12K4	3000W/4-channel Amplifier with DSP and Dante™	on request
UNICA 16K4	4000W/4-channel Amplifier with DSP and Dante™ Klippel recommend KET amplifier (max. power)	2700-044



1.4 Supply voltage, supply frequency, connector type, and current consumption

All supported Powersoft Mezzo series amplifiers have a wide range power supply input for worldwide usage.

If ordered from Klippel, just the required mains connector type has to be selected in the chapter *Your KET Setup*.

If ordered locally, it will be delivered with the locally typical power cable.

According to Powersoft's [current draw and thermal dissipation documentation](#), even 64-channel setups with 16 Mezzo amplifiers could be operated at a typical 16 A fused power socket. 64 channels used for one measurement with an identical test signal could draw increased peak currents. This has to be considered selecting the fuse type by its switching characteristic. Depending on the loads to be measured and test signal levels it could be required to separate groups of Mezzo amplifiers to separately fused power lines.

The more powerful UNICA amplifiers could require separately fused power sockets if driven with high power loads. See the manufacturer specification for the current consumption of the different models.

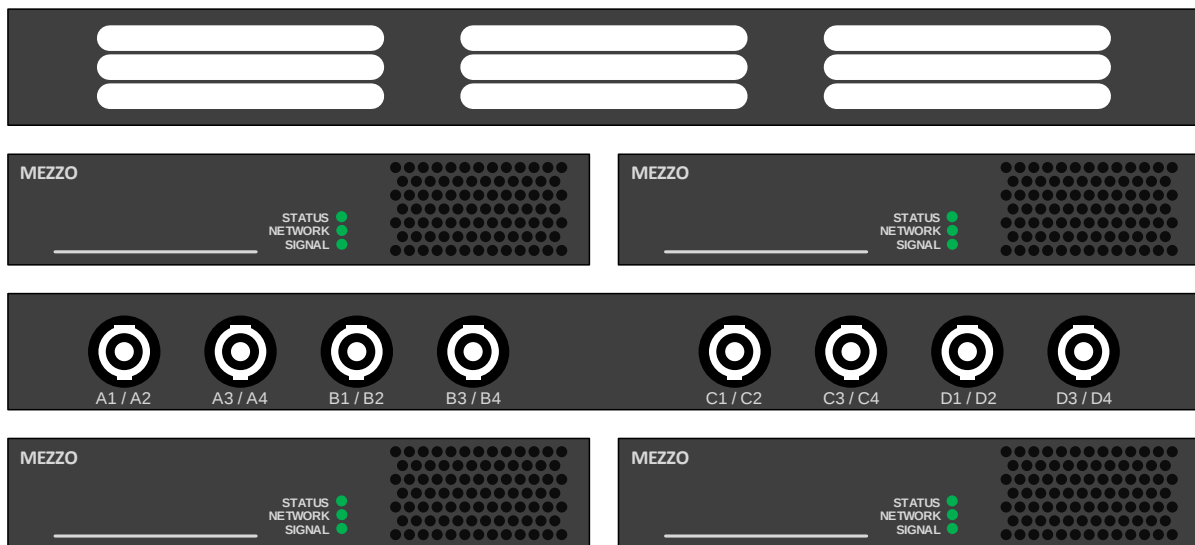


Figure 1.1 - KET Dante setup with 16 channels / 4 Mezzi with patch-bay and dummy plate

The picture above shows a typical KET cluster for 16 channels with 4 Mezzo amplifiers, the 16-channel KET Patch-Bay, and a dummy plate above. This cluster could easily be multiplied for larger KET setups.

1.5 Installation

All Powersoft Mezzo series amplifiers have an included rack mount kit for 19" standard racks. One or two amplifiers may be mounted into one height unit (1U). Brackets and screws to mount the brackets to the amplifiers are included. Only the screws for mounting it to the rack, typically supplied with the rack are not included.

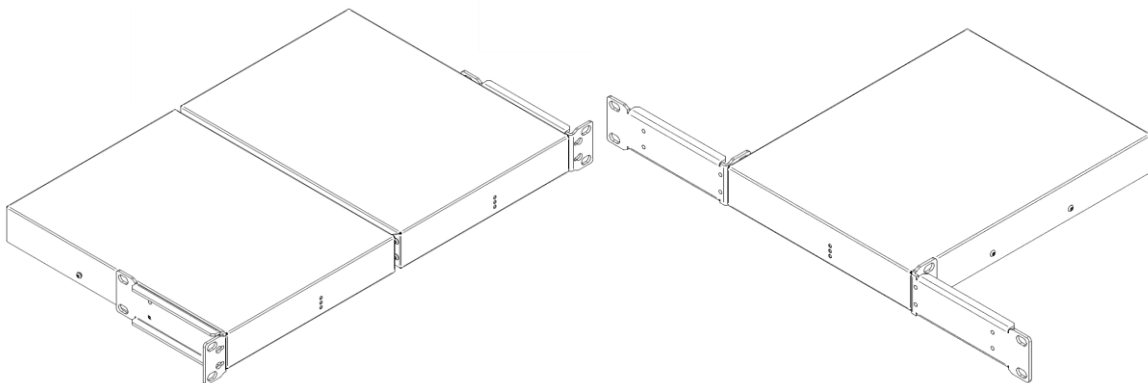


Figure 1.2 - 2 Mezzi mounted in 1U

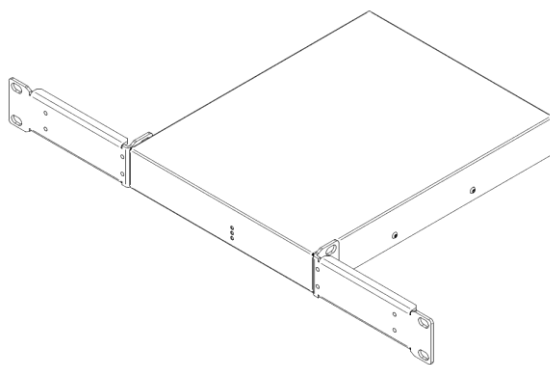


Figure 1.3 - 1x Mezzo mounted in 1U

Although the Mezzo amplifiers are very efficient and Powersoft allows to stack 4 Mezzo amplifiers on top of each other, it is recommended to install them with some clearance for cooling if they are used for long-term tests with continuous test signals. In the recommended setup above, for every height unit with two Mezzo amplifiers, one height unit with the optional KET Patch-Bay or a 1U dummy plate should be added.

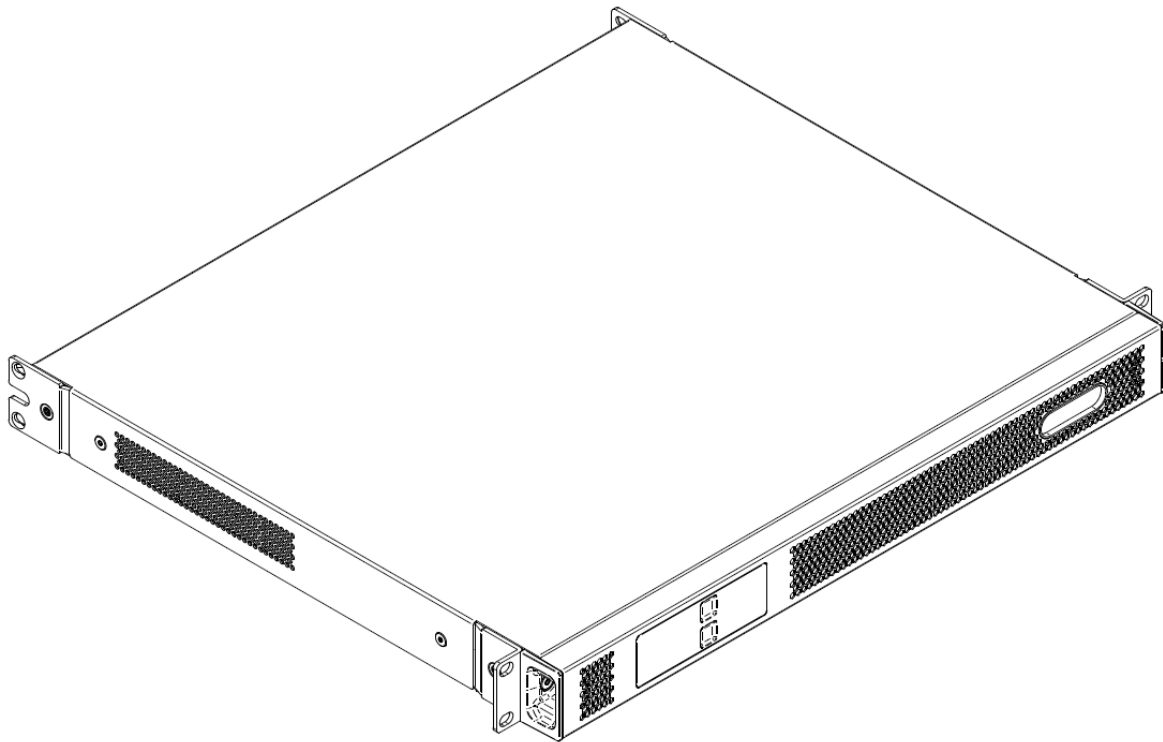


Figure 1.4 - Unica mountable in 1U

All Powersoft Unica series amplifiers are coming with fixed mounted rack brackets for 19" standard racks. One amplifier may be mounted into one height unit (1U). The screws for mounting it to the rack, typically supplied with the rack are not included.

Although the Unica amplifiers are very efficient and Powersoft allows to stack 4 Unica amplifiers on top of each other, it is recommended to install them with some clearance for cooling if they are used for long-term tests with continuous test signals. In the recommended setup above, shown in figure 1-1 for 4 Mezzo amplifiers, for every height unit with two Mezzo or one Unica amplifiers, one height unit with the optional KET Patch-Bay or a 1U dummy plate should be added. For setups with the 4-channel Unica amplifiers two Unica amplifiers below and two Unica amplifiers above the KET Patch-Bay should be installed.

2 KET control device

The KET control device could be any PC fulfilling the [Klippel PC requirements](#). HW interface requirements for this PC are just a LAN connection. A Dante™ Virtual Soundcard license enables the LAN connection to be an audio streaming network. Using a separate LAN connection exclusively for the Dante streaming is recommended for high operational safety although it is not required.

3 Dante™ network signal streaming

3.1 Measurement channel configurations – daisy-chained setups

Channel	Configuration
<= 16	<u>Setup:</u> Up to 16 test channels could be set up in a very simple configuration without the need of additional network switches. Up to 4 amplifiers can be daisy chained (connected in serial). <i>See: Figure 3.1 - KET Dante setup with 16 channels / 4 Mezzi “daisy-chained”</i>
	<u>LAN switch:</u> A network switch is not required for such a cost-effective setup but could increase reliability.
	<u>Rack space:</u> 16 test channels = 4 Mezzo 4-channel amplifiers = 2U minimum required rack space = 2 UNICA 8M amplifiers = 2U minimum required rack space = 4 UNICA 4L amplifiers = 4U minimum required rack space → 4U in total with additional 1U for a 16 CH KET Patch-Bay and 1U clearance for cooling for Mezzo or Unica 8M setups → 6U in total with additional 1U for a 16 CH KET Patch-Bay and 1U clearance for cooling for Unica 4L setups
<= 32 only with UNICA 8M	<u>Setup:</u> Up to 32 test channels could be set up in a very simple configuration without the need of additional network switches. Up to 4 UNICA 8M amplifiers can be daisy chained (connected in serial).
	<u>LAN switch:</u> A network switch is not required for such a cost-effective setup but could increase reliability.
	<u>Rack space:</u> 32 test channels = 4 UNICA 8M amplifiers = 4U minimum required rack space → 8U in total with additional 2U for two 16 CH KET Patch-Bays and 2U clearance for cooling.

3.2 Measurement channel configurations – distributed setups

Channel	Configuration
<= 32	<u>Setup:</u> Up to 32 test channels are the maximum recommended and verified configuration the KET software supports on one PC. See: Figure 3.3 - KET Dante setup with 32 channels / 2x 4 Mezzi in "star" topology See: Figure 3.4 - KET Dante setup with 32 channels / 2x 4 Mezzi in "tree" topology
	<u>LAN switch:</u> A Dante™ supported network switch with at least 9 ports is required. Alternatively, 3 Dante™ supported 5 port network switches could be used in a multiple-star topology. See chapter: Network topology
	<u>Rack space:</u> 32 test channels = 8 Mezzo 4-channel amplifiers = 4U minimum required rack space = 4 UNICA 8M amplifiers = 4U minimum required rack space = 8 UNICA 4L amplifiers = 9U minimum required rack space (1U for cooling) → 8U in total with additional 2U for two 16 CH KET Patch-Bays and 2U clearance for cooling for Mezzo or Unica 8M setups → 12U in total with additional 2U for two 16 CH KET Patch-Bays and 2U clearance for cooling for Unica 4L setups
32 * X	<u>Setup:</u> The KET software supports up to 64 test channels on one PC. Although it is recommended to set up separate PCs each controlling a 32 test channel KET configuration for stability reasons, if multiples of 32 test channels are required. See: Figure 3.5 - KET Dante setup with 64 channels / 4x 4 Mezzi in "tree" topology with 2 KET PCs with separate Dante network
	<u>LAN switch:</u> A Dante™ supported network switch with enough ports for all included devices is required. Alternatively, several Dante™ supported 5 port network switches could be used in a multiple-star topology. See chapter: Network topology
	<u>Rack space:</u> Multiples of the above-described 32 test channel clusters could be stacked in one rack.
<= 128	Dante™ supports up to 128 test channels, thus up to 4 PCs each controlling a 32 test channel KET setup can share the same Dante™ network. See: Figure 3.6 - KET Dante setup with 64 channels / 4x 4 Mezzi in "tree" topology with 2 KET PCs with combined Dante network
1U = 1 height unit (1¼") in a standardized 19" rack	

3.3 Network topology

Dante™ audio streaming uses the default LAN network topology. All devices in a Dante™ network should be connected either in a “star” topology if only one switch is needed or in a “tree” or “multiple-star” topology with several distributed switches.

For compact setups with up to 16 (32) test channels, the Powersoft Mezzo and Unica 4L (8M) series amplifiers offer to change the topology to a serial so-called daisy-chain connection. The amplifiers offer a primary and secondary LAN connection, which could be used to connect them in series. In this configuration, no network switch will be required. It is recommended to limit this serial setup to a maximum of 4 Mezzo or Unica amplifiers. The Powersoft Mezzo and Unica amplifiers are delivered in “Switched Mode” network setup, which supports the described “star”, “tree” or “multiple-star” topology as well as daisy-chaining out of the box. The “Split Redundant Mode” using two separate LAN ports for separating control traffic from the Dante™ audio streaming or redundant Dante™ audio streaming is not supported by the KET software.

All following setups are illustrated by using Mezzo amplifiers. Unica amplifiers could be used in the same way.

KET 16 Channel Compact Setup

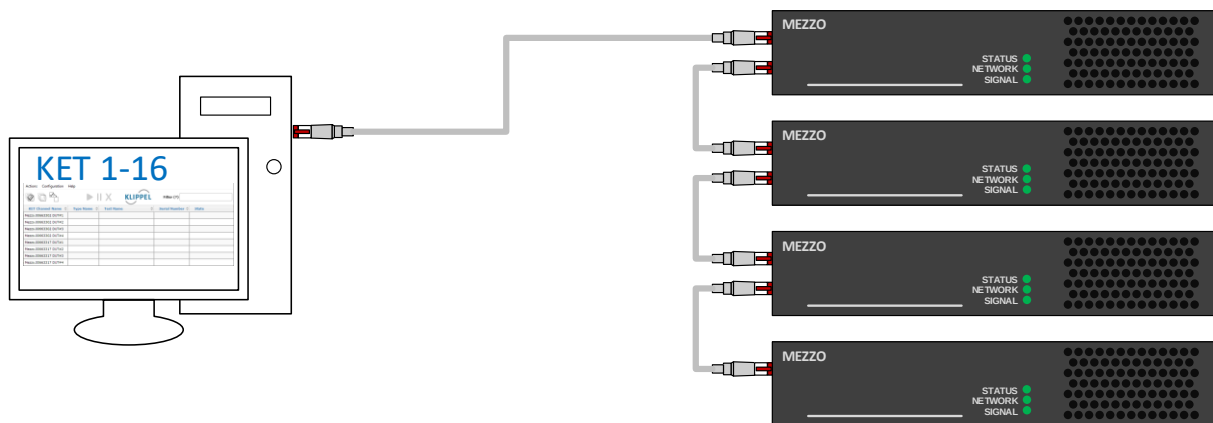


Figure 3.1 - KET Dante setup with 16 channels / 4 Mezzi “daisy-chained”

For increased reliability and for setups with up to 128 test channels, a Dante-supported network switch may be added. Shown for 16 test channels and 4 Mezzo amplifiers, as in the example above, it could be extended up to 32 (64) channels and 8 (16) Mezzo amplifiers controlled by 1 PC and up to 128 channels and 32 Mezzo amplifiers controlled by 4 (2) PCs, requiring larger network switches.

KET 16 Channel Default Setup

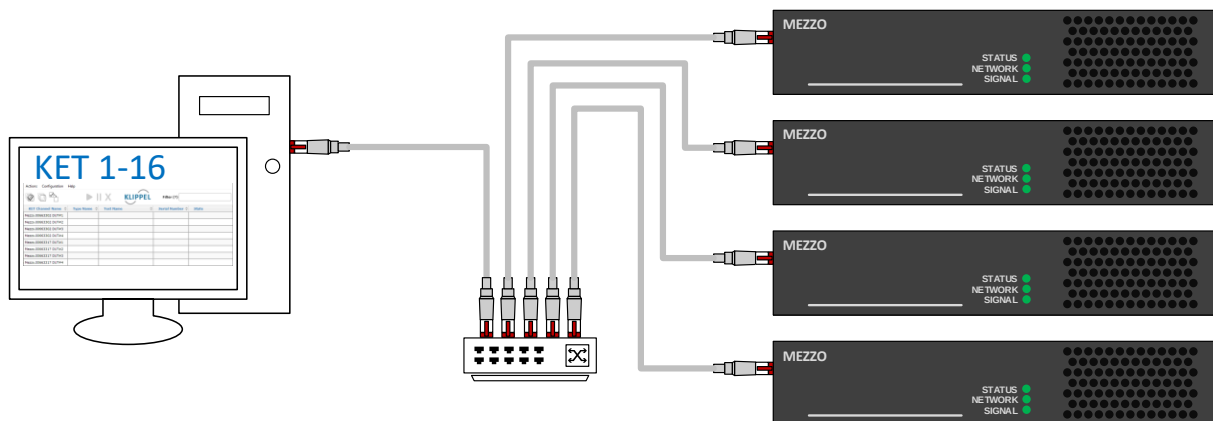


Figure 3.2 - KET Dante setup with 16 channels / 4 Mezzi in “star” topology

For distributed setups, where clusters of test channels will be needed at different locations e.g., climate chambers the setup could be distributed by adding additional network switches.

KET 32 Channel Default Setup

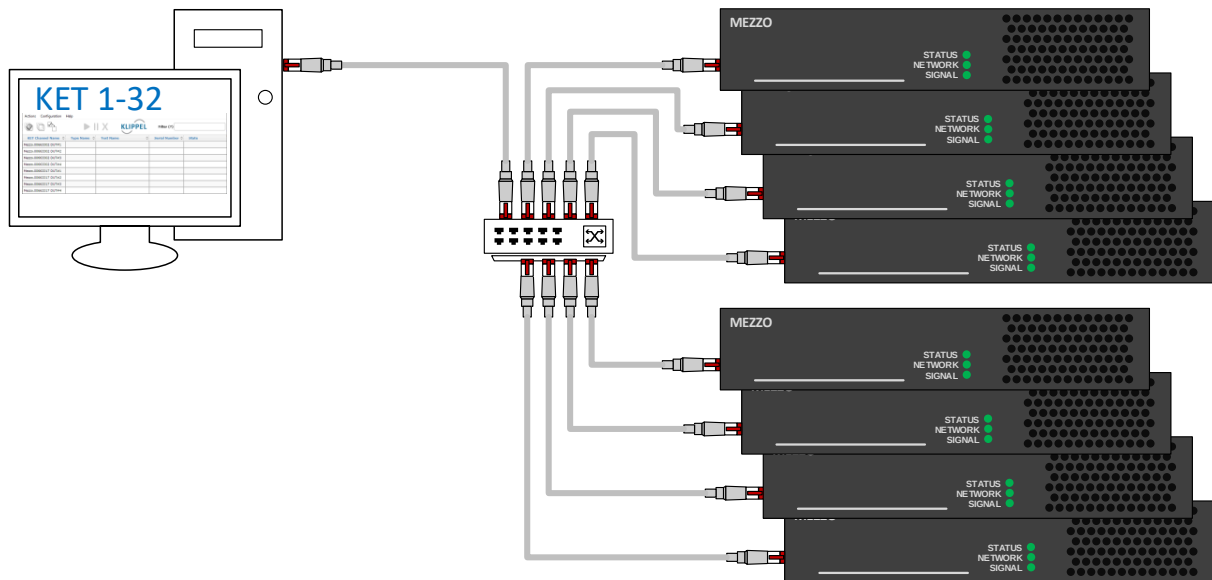


Figure 3.3 - KET Dante setup with 32 channels / 2x 4 Mezzi in "star" topology

KET 32 Channel Distributed Setup

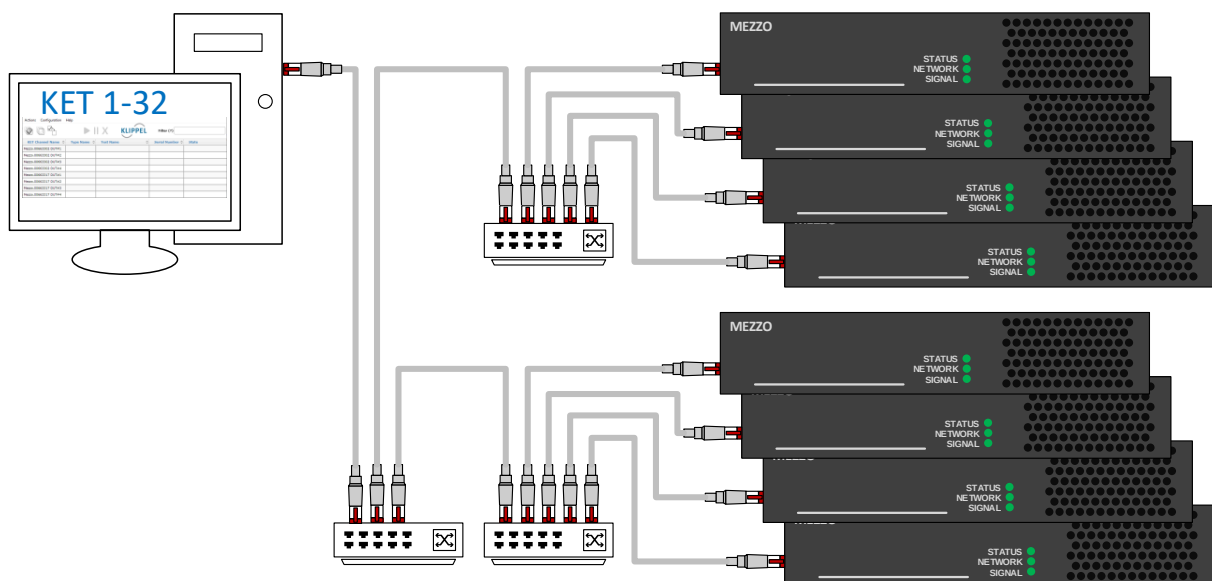


Figure 3.4 - KET Dante setup with 32 channels / 2x 4 Mezzi in "tree" topology

Up to 4 clusters of 32 test channels each controlled by 1 KET PC could share one Dante™ network. Although separating the Dante™ networks is not required up to 128 channels, it causes negligible additional costs and could give more flexibility and robustness, especially if not all channels are used in parallel tests at the same time. Shown below for 64 test channels controlled by 2 PCs with separate Dante™ networks and with sharing the Dante™ network in the 2nd example.

KET 64 Channel Default Setup

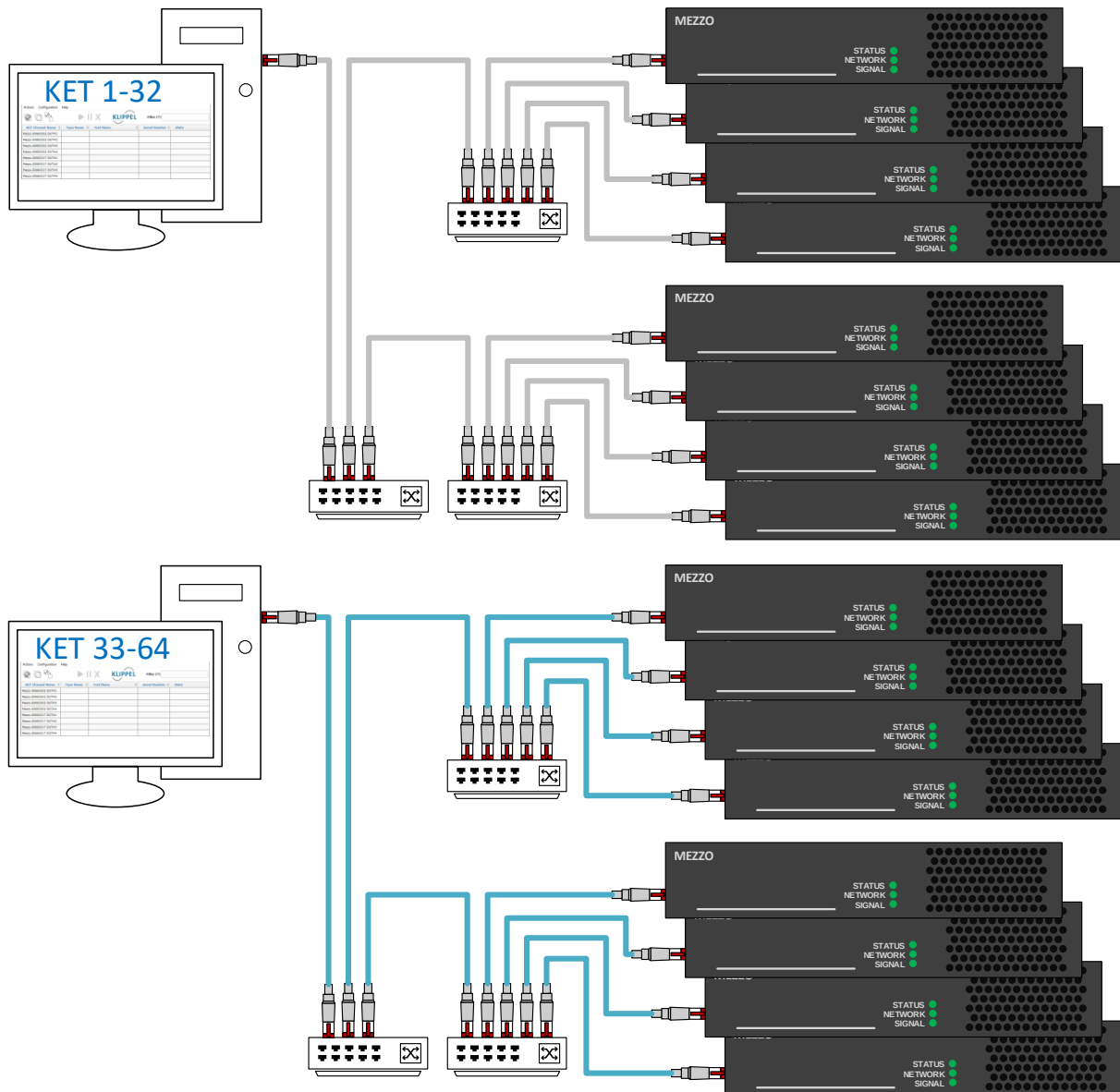


Figure 3.5 - KET Dante setup with 64 channels / 4x 4 Mezzis in “tree” topology with 2 KET PCs with separate Dante network

Redundant parallel network structures, as they are common in the live sound environment using Dante™ are not supported by the DVS – Dante™ Virtual Soundcard KET uses.

Using a separate network for the KET setup for the highest possible operational safety by adding a 2nd dedicated network card to the PC makes sense. (1st LAN-card for company network, 2nd LAN-card for KET)

But adding a 3rd LAN card for a redundant Dante™ network is not supported as long as the DVS – Dante™ Virtual Soundcard will be used, even if the Powersoft amplifiers would support this.

For a redundant Dante™ network a Dante™ HW card, e.g. Dante™ PCIe card will be required. This is not tested by KLIPPEL yet.

KET Redundant Dante™ Setup

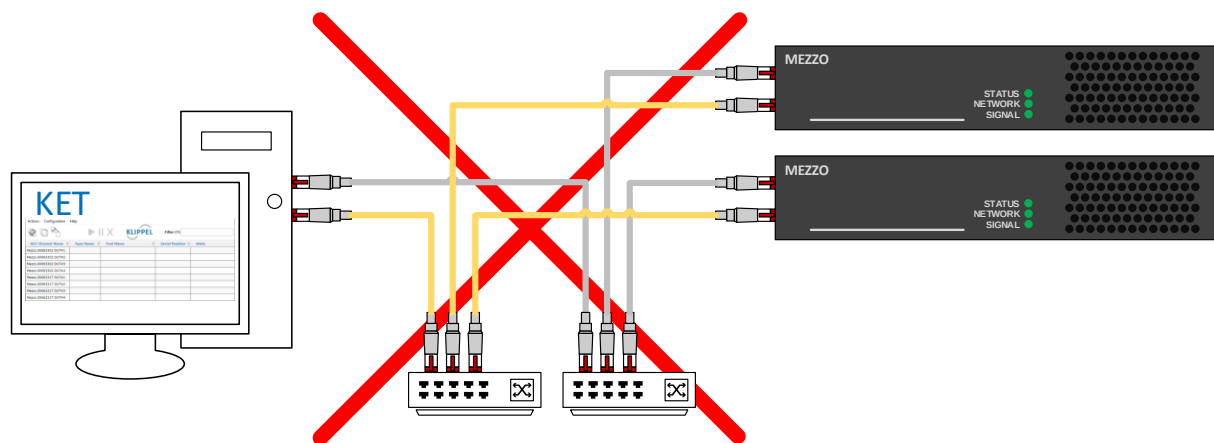


Figure 3.7 - Redundant KET Dante setups are not supported

3.4 Network Components

Information for the Dante™ network administration can be found on the [Audinate website](#).

Documents with all relevant information for the [network administration and supported components](#) are available as well as the [Dante Controller User Guide](#).

In short words:

- CAT5e or better cables should be used
- DHCP is supported
- Broadcasting must be enabled at the LAN for supporting Dante™
 - This is typically the reason requiring a separate KET-LAN or at least a separate KET-VLAN
- Energy Efficient Ethernet (EEE) or “Green ethernet” (IEEE 802.3az) is not supported / should be disabled

3.5 LAN ports & POE+ Support

The Mezzo amplifiers do not support POE or POE+. Use the LAN ports “CTRL + Dante / Dante” or/and “CTRL + Dante / CTRL” for LAN input and daisy-chaining the next device

The Unica amplifiers support POE+ for system check functions while the mains could remain switched off.

- If system check via POE(+) is not needed,
- if the used network switch could not provide the required POE(+) power level, or
- if using POE(+) should be avoided

Use the LAN ports Eth-2 or/and Eth-3 for LAN input and daisy-chaining the next device.

4 Connection of the DUTs

The Powersoft Mezzo and Unica amplifiers are dedicated to fixed installations. Therefore, they are using standardized 4-pin COMBICON connectors with a 5.08 mm (0.2") spacing for the Mezzo and 7.62 mm (0.3") spacing for the Unica amplifiers. Screwable connectors for mounting solid wires, litz wires, and litz wires with crimped ferrules are included with the amplifiers. The connectors could be equipped with cables with a wire diameter of up to 2.5mm² for the Mezzo and 6mm² for the Unica amplifiers. As wire length, type, and connector at the DUT side highly depend on the needs of the certain KET installation, speaker cables are not included.

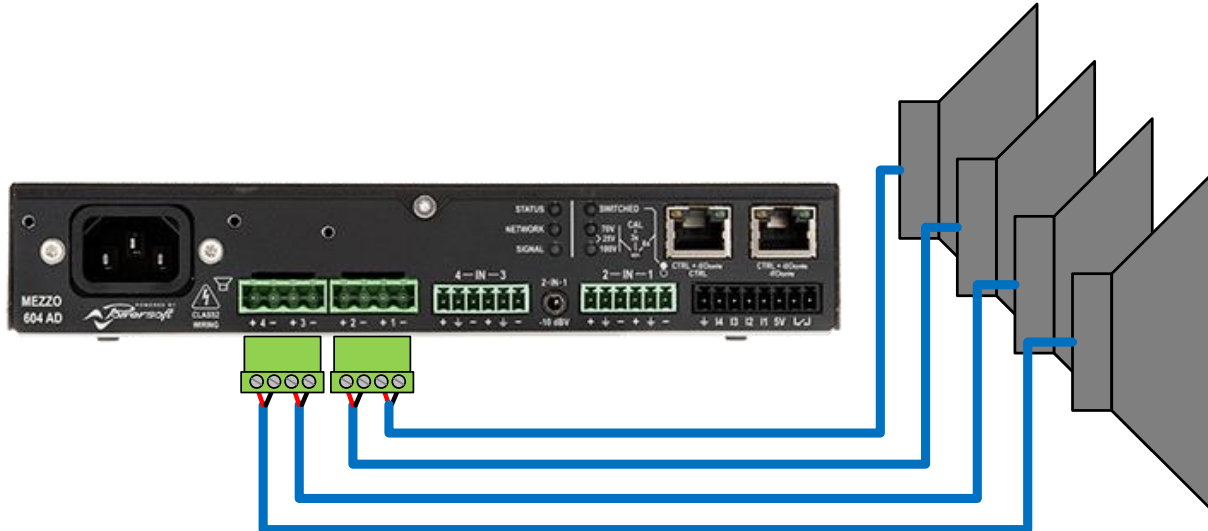


Figure 4.1 - KET setup with 4-channel Mezzo and 4 DUTs connected directly

KET Patch-Bay

For complete out-of-the-box packages, the following optional accessories could be chosen:

- A KET Patch-Bay is available for:
 - Exchanging the DUTs quickly at the front side of the rack
 - Using cables with standardized speakON-connectors
 - Klippel Speaker Cables could be used, and alligator clips could be used
 - speakON-extension cables could be used.
 - For cost-effective and environmentally friendly setups one speakON-connector at the Patch Bay feeds two DUT channels. The Patch-Bay with its 8 speakON-connectors feeds 16 DUTs.
 - Klippel Speaker Cables allow connecting two DUTs which could be separated up to 1 m.
 - The KET Patch-Bay comes with COMBICON connectors mounted as a plug-and-play solution together with the Mezzo or Unica amplifiers. Two versions of the KET Patch-Bay are available.

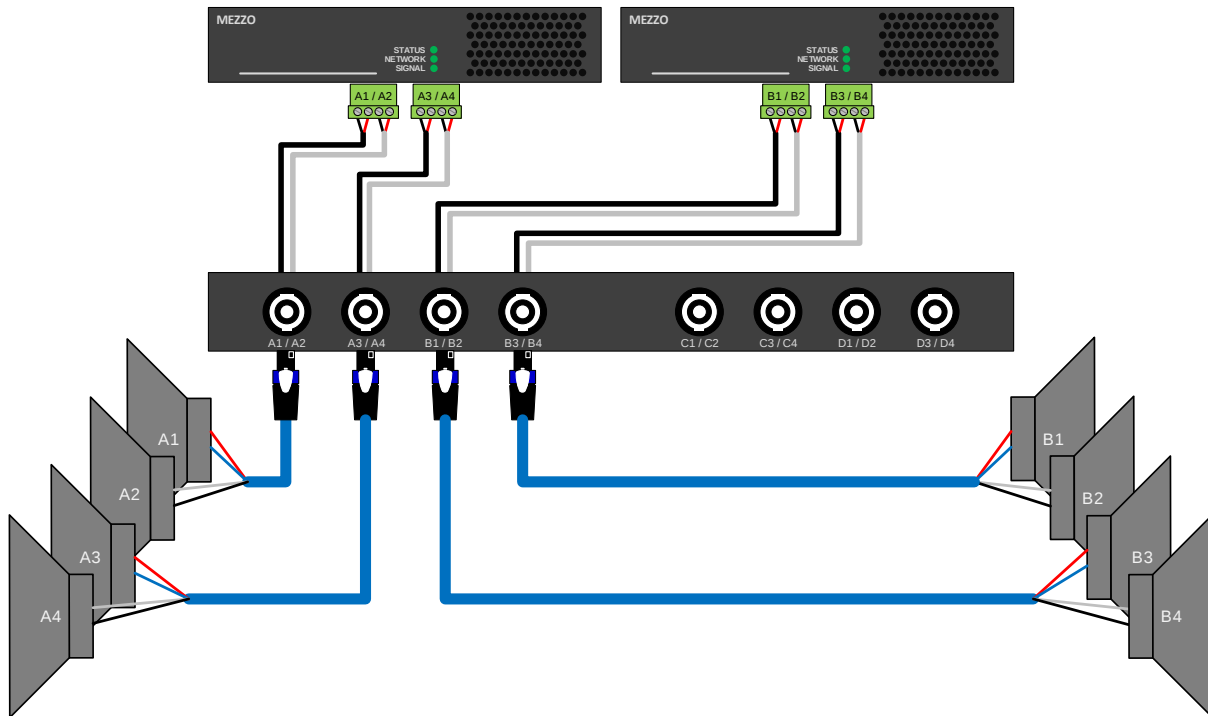


Figure 4.2 - KET setup with 8 channels / 2 Mezzi with KET Patch-Bay

Available Speaker cables and speakON-extension cables could be found in the [Amplifier and Speaker Cables specification](#).

4.1 KET setup with 16 channels / 4 Mezzi with KET Mezzo Patch-Bay

KET HW components

The schematic, table and pictures below show all components for a plug-and-play 16-channel KET system with up to 8m between the KET rack and the DUTs. This is just an example that could be modified to every application and HW requirements.

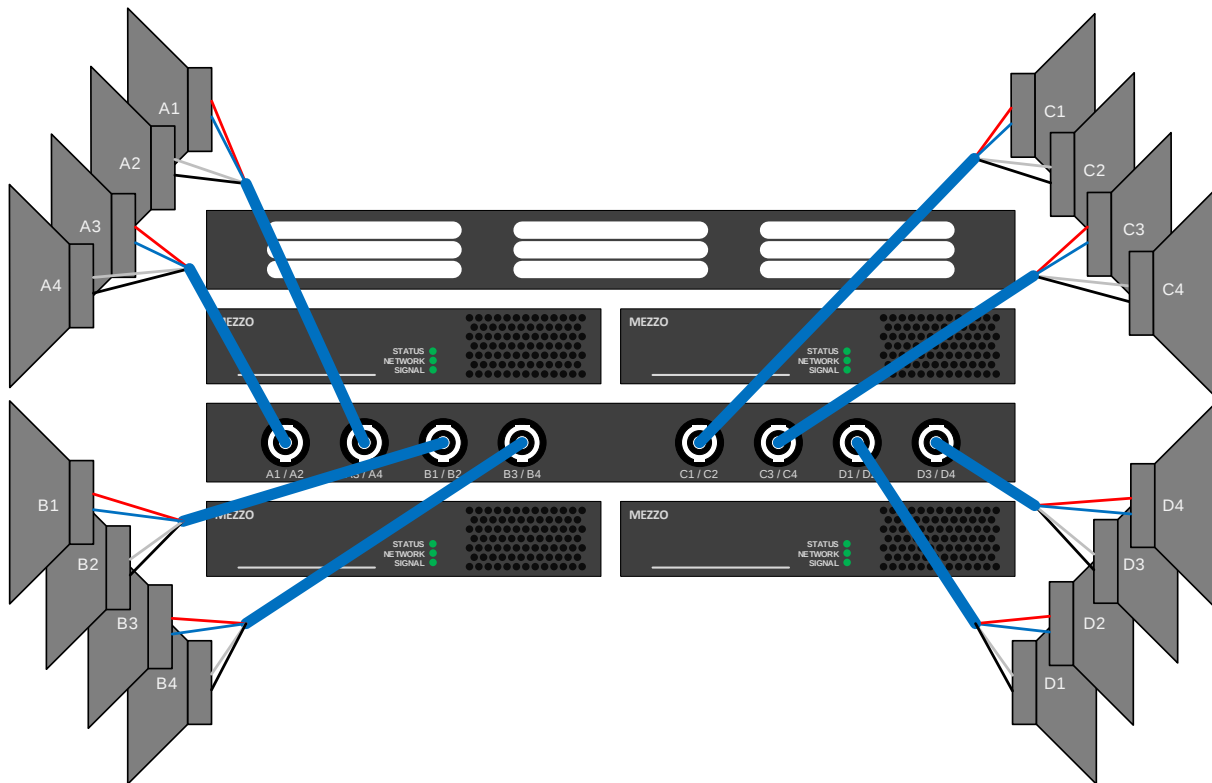


Figure 4.3 - KET Dante setup with 16 channels / 4 Mezzi with KET Patch-Bay

KET component	Item-No.	quantity
MEZZO 604 AD / MEZZO 324 AD	2700-041 / 2700-040	4
KLIPPEL-Dongle, USB License Key for KET SW	incl. in KET Base SW	1
KET MEZZO Patch-Bay 1U; 8x speakON male – 8x COMBICON 4 pin	2300-500	1
optional: 19" / 1U blank plate with ventilation grid	self-supplied	1
Cable; speakON female - male, 5m, 4x4mm ²	2300-032	8
Speaker Cable without clips, 3m "Speaker"	2300-036	8
Alligator Clip; large, red & black, set	2300-020	16



Figure 4.4 - KET setup with 16 channels / 4 Mezzi with KET Mezzo Patch-Bay – front side



Figure 4.5 - KET setup with 16 channels / 4 Mezzi with KET Mezzo Patch-Bay – back side

4.2 KET setup with 16 channels / 2(4) Unica with KET Unica Patch-Bay

KET HW components

The table and pictures below show all the components for a plug-and-play 16-channel KET system with up to 8m between the KET rack and the DUTs. This is just an example that could be modified to every application and HW requirements.

KET component	Item-No.	quantity
UNICA 2K8 / UNICA 8K8 (UNICA 16K4)	2700-xxx / 2700-xxx	2(4)
KLIPPEL-Dongle, USB License Key for KET SW	incl. in KET Base SW	1
KET UNICA Patch-Bay 1U; 8x speakON male – 4x COMBICON 8 pin	2300-510	1
optional: 19" / 1U blank plate with ventilation grid	self-supplied	1
Cable; speakON female - male, 5m, 4x4mm ²	2300-032	8
Speaker Cable without clips, 3m "Speaker"	2300-036	8
Alligator Clip; large, red & black, set	2300-020	16



Figure 4.6 - KET setup with 16 channels / 2 Unica with KET Unica Patch-Bay – front side



Figure 4.7 - KET setup with 16 channels / 2 Unica with KET Unica Patch-Bay – back side

5 Your KET Setup

5.1 Amplifier type

Powersoft amplifier type	Item-No.	Quantity	Comment
MEZZO 322 AD			self-supplied or upon request
MEZZO 324 AD	2700-040		go ahead with 5.2 to 5.4
MEZZO 602 AD			self-supplied or upon request
MEZZO 604 AD	2700-041		go ahead with 5.2 to 5.4
UNICA 1K8			self-supplied or upon request
UNICA 2K8	2700-xxx		go ahead with 5.2 to 5.4
UNICA 4K8			self-supplied or upon request
UNICA 8K8	2700-xxx		go ahead with 5.2 to 5.4
UNICA 5K4 / 9K4 / 12K4			self-supplied or upon request
UNICA 16K4	2700-xxx		go ahead with 5.2 to 5.4

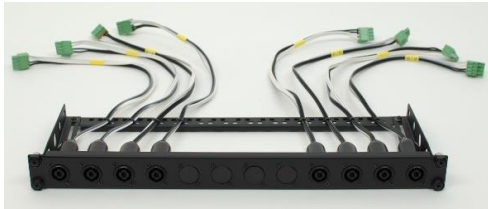
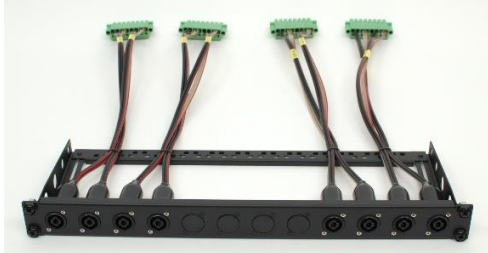
5.2 Power supply connector

Select the mains connector type for your local KET installation:

Type	Picture	Region	Selection
Type E & F		EU	
Type I		China	
Type B		US	
Type G		UK	

5.3 Accessories for DUT connection

Select the accessories according to your needs:

Accessory / Item-No.	Picture	Selection
KET MEZZO Patch-Bay 1U; 8x speakON male – 8x COMBICON 4 pin Item No.: 2300-500 <i>Note: 1 Patch-Bay <= 16 DUT channels</i>		
KET UNICA Patch-Bay 1U; 8x speakON male – 4x COMBICON 8 pin Item No.: 2300-510 <i>Note: 1 Patch-Bay <= 16 DUT channels</i>		
Cable; speakON female - male, 5m, 4x4mm ² Item No.: 2300-032		
Cable; speakON female - male, 10m, 4x4mm ² Item No.: 2300-031		
Cable; speakON female - male, 15m, 4x4mm ² Item No.: 2300-033		
Cable; speakON female - male, 20m, 4x4mm ² Item No.: 2300-038		
"Speaker" cable, speakON female - 4mm male, 3m, 4x2.5mm ² Item No.: 2300-036 <i>Note: 1 cable = 2 DUT channels</i>		
Alligator Clip; large, red & black, set Item No.: 2300-020 <i>Note: 1 set / pair = 1 DUT channels</i>		

5.4 Accessories for Dante™ / LAN network distribution

Plan the needed network distribution components:

- LAN cables
- LAN switches

6 References

Specification	S16 - KET Klippel Endurance Test A3 - Amplifier and Speaker Cables
Documentation	Powersoft Mezzo current draw and thermal dissipation documentation Klippel R&D and QC System Computer Requirements Dante network administration and supported components Dante Controller User Guide

Find explanations for symbols at:

<http://www.klippel.de/know-how/literature.html>

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