

Documentation | EN

KL2798

Bus terminal, 8-channel solid state output, 30 V AC, 48 V DC,
2 A, potential-free



Table of contents

1 Foreword	5
1.1 Notes on the documentation.....	5
1.2 Safety instructions	6
1.3 Documentation Issue Status.....	7
2 Product overview	8
2.1 Introduction.....	8
2.2 Technical data	9
3 Presentation KL2798 within TwinCAT	10
4 Mounting and wiring	11
4.1 Instructions for ESD protection.....	11
4.2 Installation on mounting rails	12
4.3 Connection system	14
4.4 Connection and LED displays	18
5 Appendix	19
5.1 Support and Service	19

1 Foreword

1.1 Notes on the documentation

Intended audience

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.

It is essential that the documentation and the following notes and explanations are followed when installing and commissioning these components.

It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement.

No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

Trademarks

Beckhoff®, TwinCAT®, TwinCAT/BSD®, TC/BSD®, EtherCAT®, EtherCAT G®, EtherCAT G10®, EtherCAT P®, Safety over EtherCAT®, TwinSAFE®, XFC®, XTS® and XPlanar® are registered trademarks of and licensed by Beckhoff Automation GmbH. Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702 with corresponding applications or registrations in various other countries.



EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Copyright

© Beckhoff Automation GmbH & Co. KG, Germany.

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization are prohibited.

Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of instructions

In this documentation the following instructions are used.
These instructions must be read carefully and followed without fail!

DANGER

Serious risk of injury!

Failure to follow this safety instruction directly endangers the life and health of persons.

WARNING

Risk of injury!

Failure to follow this safety instruction endangers the life and health of persons.

CAUTION

Personal injuries!

Failure to follow this safety instruction can lead to injuries to persons.

NOTE

Damage to environment/equipment or data loss

Failure to follow this instruction can lead to environmental damage, equipment damage or data loss.



Tip or pointer

This symbol indicates information that contributes to better understanding.

1.3 Documentation Issue Status

Version	Comment
1.1.0	<ul style="list-style-type: none"> • Technical data updated • Chapter <i>Instructions for ESD protection</i> added • Design of the safety instructions adapted to IEC 82079-1 • New title page
1.0.0	<ul style="list-style-type: none"> • First release

Firmware and hardware versions

Documentation Version	KL2798-0000	
	Firmware	Hardware
1.1.0	-	01
1.0.0	-	00

The firmware and hardware versions (delivery state) can be taken from the serial number printed on the side of the terminal.

Syntax of the serial number

Structure of the serial number: WW YY FF HH

WW - week of production (calendar week)

YY - year of production

FF - firmware version

HH - hardware version

Example with serial number 40 15 1A 00:

40 - week of production 40

15 - year of production 2015

1A - firmware version 1A

00 - hardware version 00

2 Product overview

2.1 Introduction

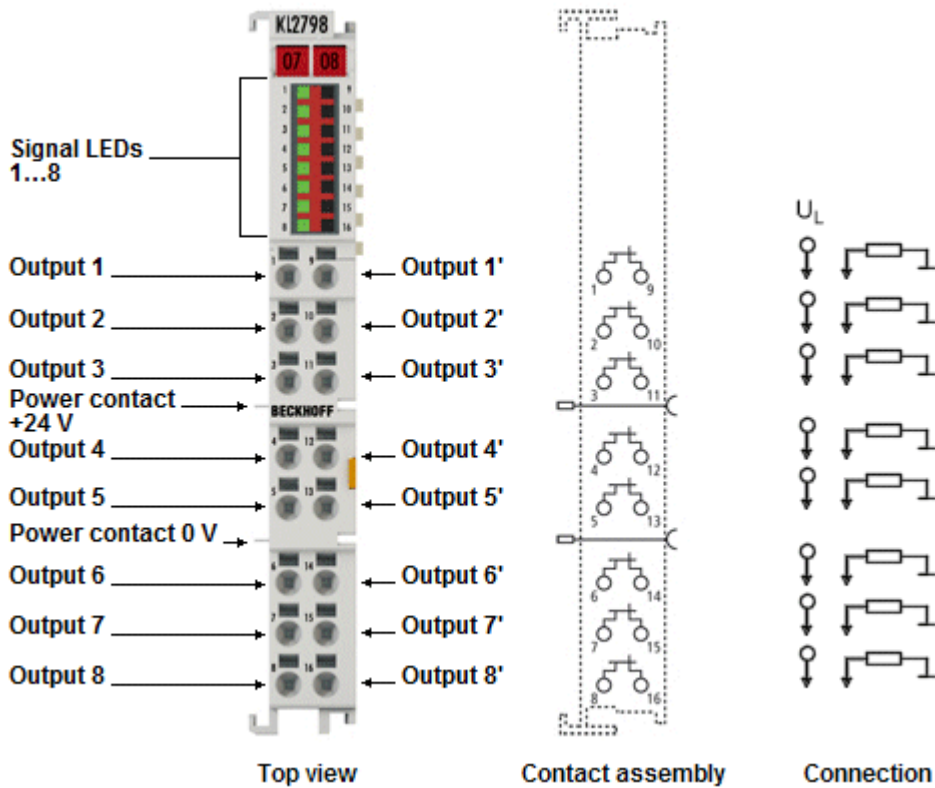


Fig. 1: KL2798 - Bus terminal, 8-channel solid state output, 30 V AC, 48 V DC, 2 A, potential-free

The digital KL2798 Bus Terminal provides eight switches that can be used like a relay contact for AC/DC voltages. The electronic switch is realized through high-performance MOSFET transistors with low switch-on resistance. The switch itself is not short-circuit-proof, but due to its high pulse current capability it can cope with current until an external fuse triggers a switch-off.

Wear resistance increases the availability of the application. Resistive and inductive loads can be switched up to a rated voltage of 30 V_{AC/DC}, completely resistive loads also up to a rated voltage of 48 V_{DC}.

High peak voltages and electromagnetic interference pulses are prevented.

2.2 Technical data

Technical data	KL2798-0000
Connection technology	2-wire
Number of outputs	8 make contacts
Rated load voltage	0 ... 30 V _{AC/DC} (only ohmic load: 0 ... 48 V _{DC})
Peak current	max. 2 A per channel (Σ 10 A)
Breakdown voltage	80 V
Peak current	5 A (100 ms), < 50 A (10 ms)
Short circuit current	not short-circuit-proof, see peak current
Reverse voltage protection	–
Isolation voltage (channel/channel)	< 200 V
Electrical isolation	500 V (K-bus/field potential)
Switching on speed	typ. 1.8 ms, max. 5 ms
Switching off speed	typ. 30 ms, max. 50 ms
On-resistance	typ. 0.03 Ω
Current consumption power contacts	–
Current consumption K-bus	80 mA
Bit width in the process image	8 output bits
Special features	substitute for relay contacts, potential-free
Dimensions (W x H x D)	app. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Weight	app. 50 g
Mounting [▶ 11]	on 35 mm mounting rail according to EN 60715
Permissible ambient temperature range at operation	0 ... +55°C
Permissible ambient temperature range for storage	-25...+85°C
Permissible relative air humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Installation position	variable
Protection class	IP20
Approvals / markings	CE, cULus

3 Presentation KL2798 within TwinCAT

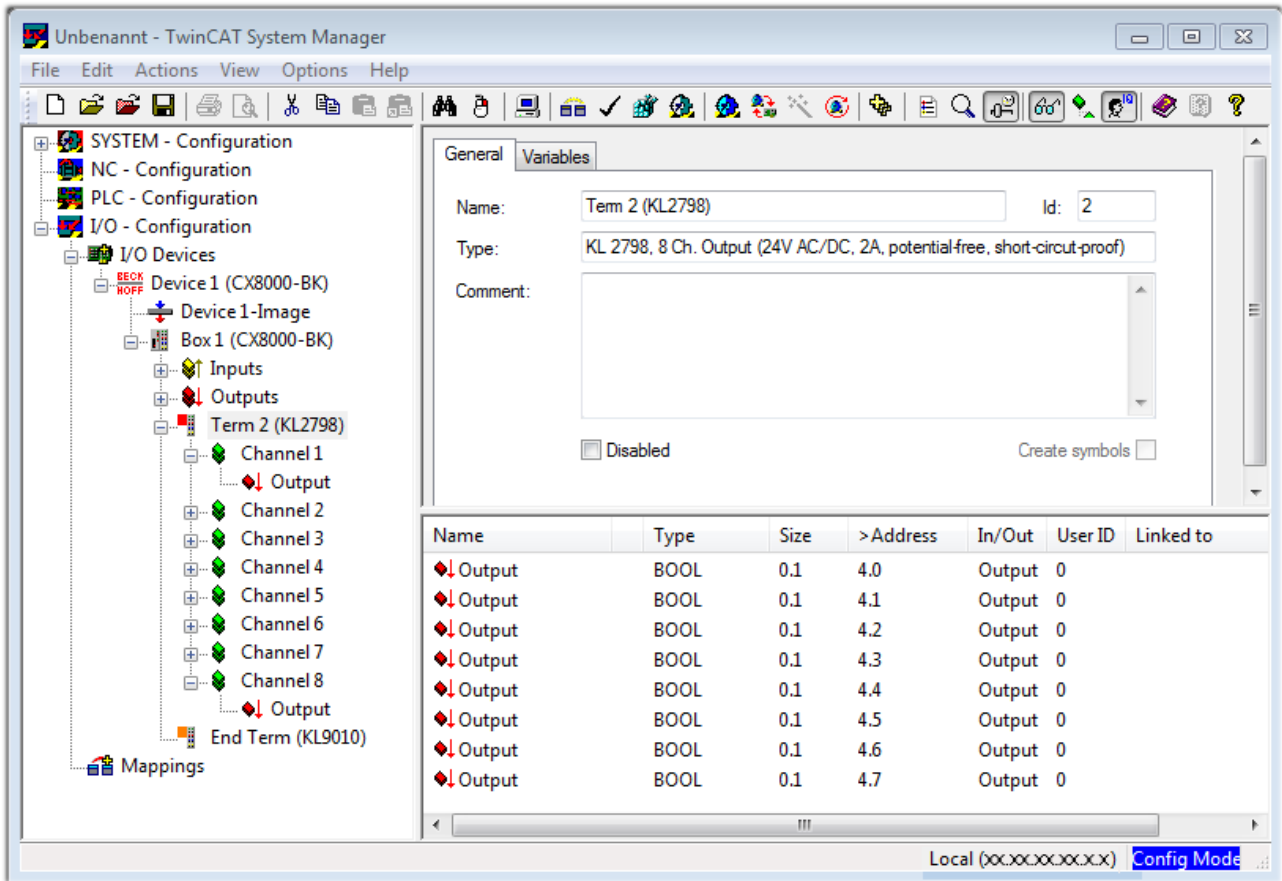


Fig. 2: KL2798 within TwinCAT 2.11

4 Mounting and wiring

4.1 Instructions for ESD protection

NOTE

Destruction of the devices by electrostatic discharge possible!

The devices contain components at risk from electrostatic discharge caused by improper handling.

- Please ensure you are electrostatically discharged and avoid touching the contacts of the device directly.
- Avoid contact with highly insulating materials (synthetic fibers, plastic film etc.).
- Surroundings (working place, packaging and personnel) should be grounded probably, when handling with the devices.
- Each assembly must be terminated at the right hand end with a KL9010 bus end terminal, to ensure the protection class and ESD protection.

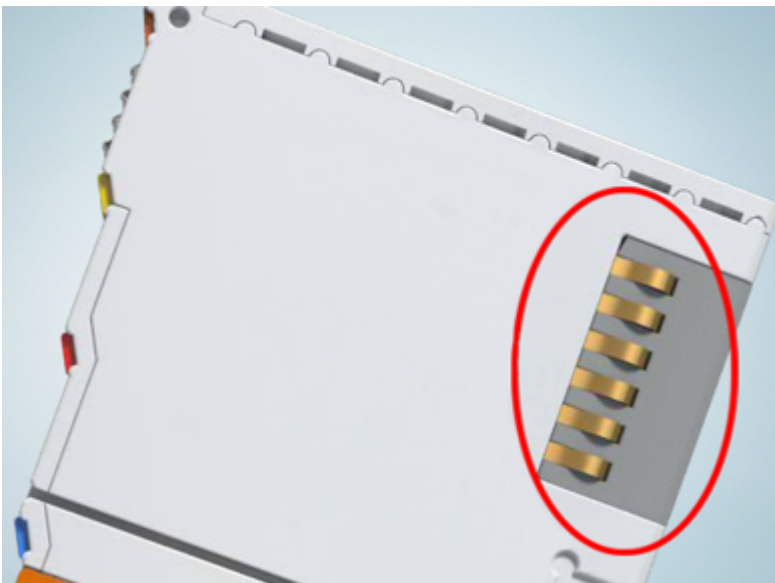


Fig. 3: Spring contacts of the Beckhoff I/O components

4.2 Installation on mounting rails

⚠ WARNING

Risk of electric shock and damage of device!

Bring the bus terminal system into a safe, powered down state before starting installation, disassembly or wiring of the bus terminals!

Assembly

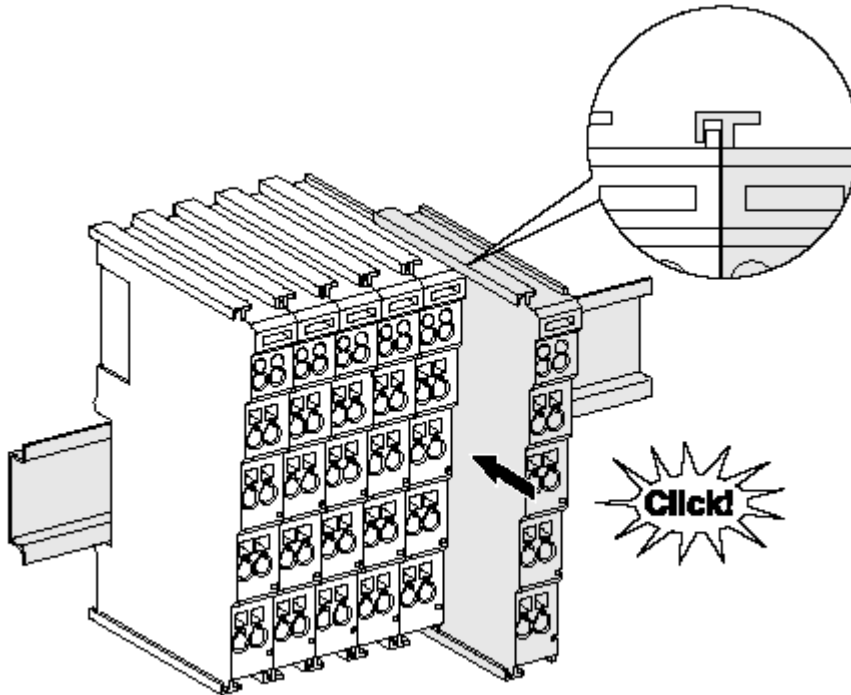


Fig. 4: Attaching on mounting rail

The bus coupler and bus terminals are attached to commercially available 35 mm mounting rails (DIN rails according to EN 60715) by applying slight pressure:

1. First attach the fieldbus coupler to the mounting rail.
2. The bus terminals are now attached on the right-hand side of the fieldbus coupler. Join the components with tongue and groove and push the terminals against the mounting rail, until the lock clicks onto the mounting rail.

If the terminals are clipped onto the mounting rail first and then pushed together without tongue and groove, the connection will not be operational! When correctly assembled, no significant gap should be visible between the housings.

i Fixing of mounting rails

The locking mechanism of the terminals and couplers extends to the profile of the mounting rail. At the installation, the locking mechanism of the components must not come into conflict with the fixing bolts of the mounting rail. To mount the mounting rails with a height of 7.5 mm under the terminals and couplers, you should use flat mounting connections (e.g. countersunk screws or blind rivets).

Disassembly

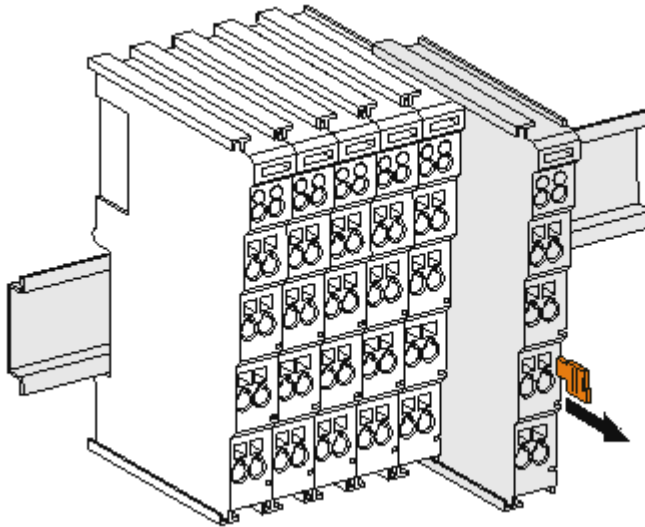


Fig. 5: Disassembling of terminal

Each terminal is secured by a lock on the mounting rail, which must be released for disassembly:

1. Pull the terminal by its orange-colored lugs approximately 1 cm away from the mounting rail. In doing so for this terminal the mounting rail lock is released automatically and you can pull the terminal out of the bus terminal block easily without excessive force.
2. Grasp the released terminal with thumb and index finger simultaneous at the upper and lower grooved housing surfaces and pull the terminal out of the bus terminal block.

Connections within a bus terminal block

The electric connections between the Bus Coupler and the Bus Terminals are automatically realized by joining the components:

- The six spring contacts of the K-Bus/E-Bus deal with the transfer of the data and the supply of the Bus Terminal electronics.
- The power contacts deal with the supply for the field electronics and thus represent a supply rail within the bus terminal block. The power contacts are supplied via terminals on the Bus Coupler (up to 24 V) or for higher voltages via power feed terminals.

i Power Contacts

During the design of a bus terminal block, the pin assignment of the individual Bus Terminals must be taken account of, since some types (e.g. analog Bus Terminals or digital 4-channel Bus Terminals) do not or not fully loop through the power contacts. Power Feed Terminals (KL91xx, KL92xx or EL91xx, EL92xx) interrupt the power contacts and thus represent the start of a new supply rail.

PE power contact

The power contact labeled PE can be used as a protective earth. For safety reasons this contact mates first when plugging together, and can ground short-circuit currents of up to 125 A.

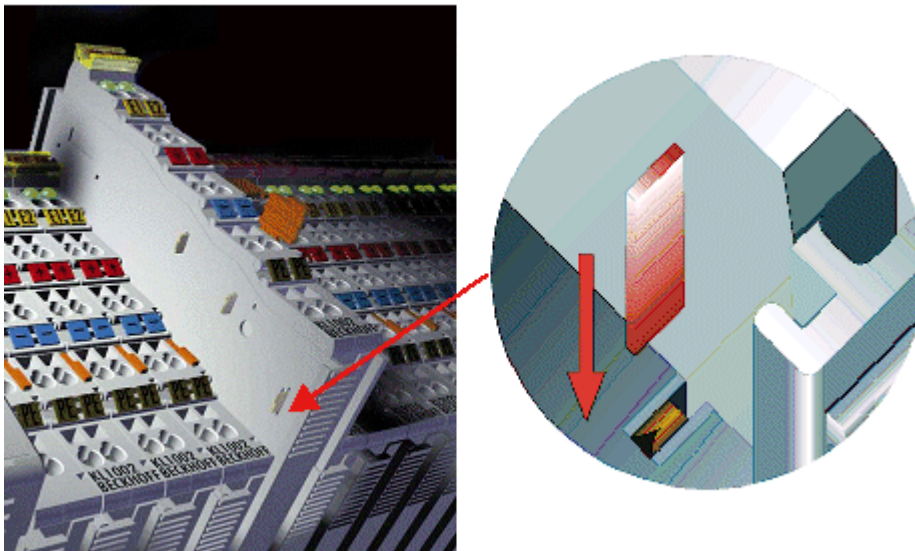


Fig. 6: Power contact on left side

NOTE**Possible damage of the device**

Note that, for reasons of electromagnetic compatibility, the PE contacts are capacitatively coupled to the mounting rail. This may lead to incorrect results during insulation testing or to damage on the terminal (e.g. disruptive discharge to the PE line during insulation testing of a consumer with a nominal voltage of 230 V). For insulation testing, disconnect the PE supply line at the Bus Coupler or the Power Feed Terminal! In order to decouple further feed points for testing, these Power Feed Terminals can be released and pulled at least 10 mm from the group of terminals.

⚠ WARNING**Risk of electric shock!**

The PE power contact must not be used for other potentials!

4.3 Connection system

⚠ WARNING**Risk of electric shock and damage of device!**

Bring the bus terminal system into a safe, powered down state before starting installation, disassembly or wiring of the Bus Terminals!

Overview

The Bus Terminal system offers different connection options for optimum adaptation to the respective application:

- The terminals of KLxxxx and ELxxxx series with standard wiring include electronics and connection level in a single enclosure.
- The terminals of KSxxxx and ESxxxx series feature a pluggable connection level and enable steady wiring while replacing.
- The High Density Terminals (HD Terminals) include electronics and connection level in a single enclosure and have advanced packaging density.

Standard wiring



Fig. 7: Standard wiring

The terminals of KLxxxx and ELxxxx series have been tried and tested for years. They feature integrated screwless spring force technology for fast and simple assembly.

Pluggable wiring

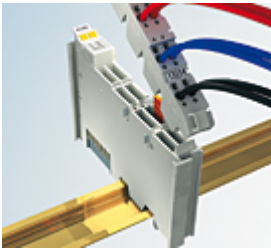


Fig. 8: Pluggable wiring

The terminals of KSxxxx and ESxxxx series feature a pluggable connection level. The assembly and wiring procedure for the KS series is the same as for the KLxxxx and ELxxxx series. The KS/ES series terminals enable the complete wiring to be removed as a plug connector from the top of the housing for servicing. The lower section can be removed from the terminal block by pulling the unlocking tab. Insert the new component and plug in the connector with the wiring. This reduces the installation time and eliminates the risk of wires being mixed up.

The familiar dimensions of the terminal only had to be changed slightly. The new connector adds about 3 mm. The maximum height of the terminal remains unchanged.

A tab for strain relief of the cable simplifies assembly in many applications and prevents tangling of individual connection wires when the connector is removed.

Conductor cross sections between 0.08 mm² and 2.5 mm² can continue to be used with the proven spring force technology.

The overview and nomenclature of the product names for KSxxxx and ESxxxx series has been retained as known from KLxxxx and ELxxxx series.

High Density Terminals (HD Terminals)



Fig. 9: High Density Terminals

The Bus Terminals from these series with 16 connection points are distinguished by a particularly compact design, as the packaging density is twice as large as that of the standard 12 mm Bus Terminals. Massive conductors and conductors with a wire end sleeve can be inserted directly into the spring loaded terminal point without tools.

● Wiring HD Terminals

i The High Density Terminals of the KLx8xx and ELx8xx series doesn't support steady wiring.

Ultrasonically "bonded" (ultrasonically welded) conductors

● Ultrasonically "bonded" conductors

i It is also possible to connect the Standard and High Density terminals with ultrasonically "bonded" (ultrasonically welded) conductors. In this case, please note the tables concerning the wire-size width [► 16] below!

Wiring

Terminals for standard wiring ELxxxx/KLxxxx and for pluggable wiring ESxxxx/KSxxxx

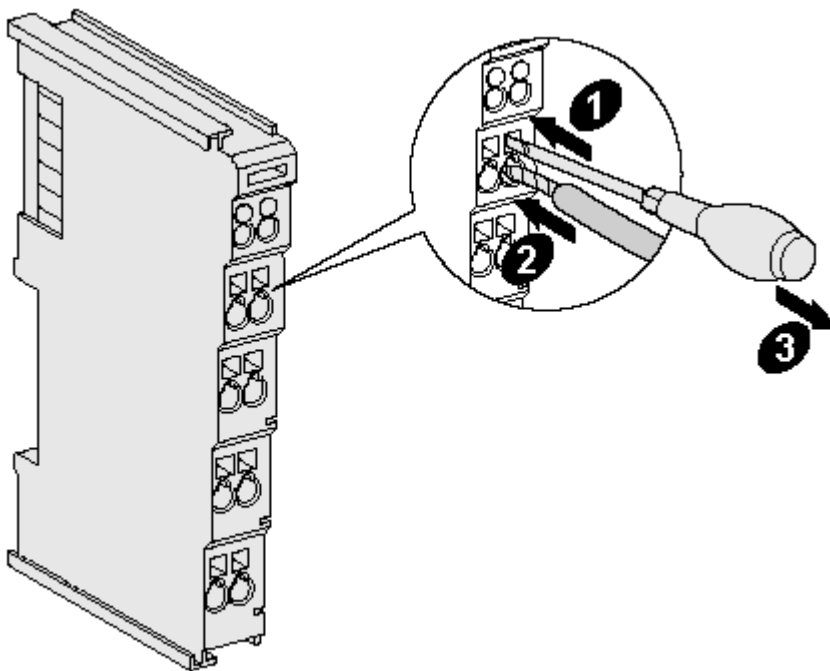


Fig. 10: Mounting a cable on a terminal connection

Up to eight connections enable the connection of solid or finely stranded cables to the Bus Terminals. The terminals are implemented in spring force technology. Connect the cables as follows:

1. Open a spring-loaded terminal by slightly pushing with a screwdriver or a rod into the square opening above the terminal.
2. The wire can now be inserted into the round terminal opening without any force.
3. The terminal closes automatically when the pressure is released, holding the wire securely and permanently.

Terminal housing	ELxxxx, KLxxxx	ESxxxx, KSxxxx
Wire size width	0.08 ... 2,5 mm ²	0.08 ... 2.5 mm ²
Wire stripping length	8 ... 9 mm	9 ... 10 mm

High Density Terminals ELx8xx, KLx8xx (HD)

The conductors of the HD Terminals are connected without tools for single-wire conductors using the direct plug-in technique, i.e. after stripping the wire is simply plugged into the contact point. The cables are released, as usual, using the contact release with the aid of a screwdriver. See the following table for the suitable wire size width.

Terminal housing	High Density Housing
Wire size width (conductors with a wire end sleeve)	0.14 ... 0.75 mm ²
Wire size width (single core wires)	0.08 ... 1.5 mm ²
Wire size width (fine-wire conductors)	0.25 ... 1.5 mm ²
Wire size width (ultrasonically "bonded" conductors)	only 1.5 mm ² (see notice [▶_16]!)
Wire stripping length	8 ... 9 mm

Shielding



Shielding

Analog sensors and actors should always be connected with shielded, twisted paired wires.

4.4 Connection and LED displays

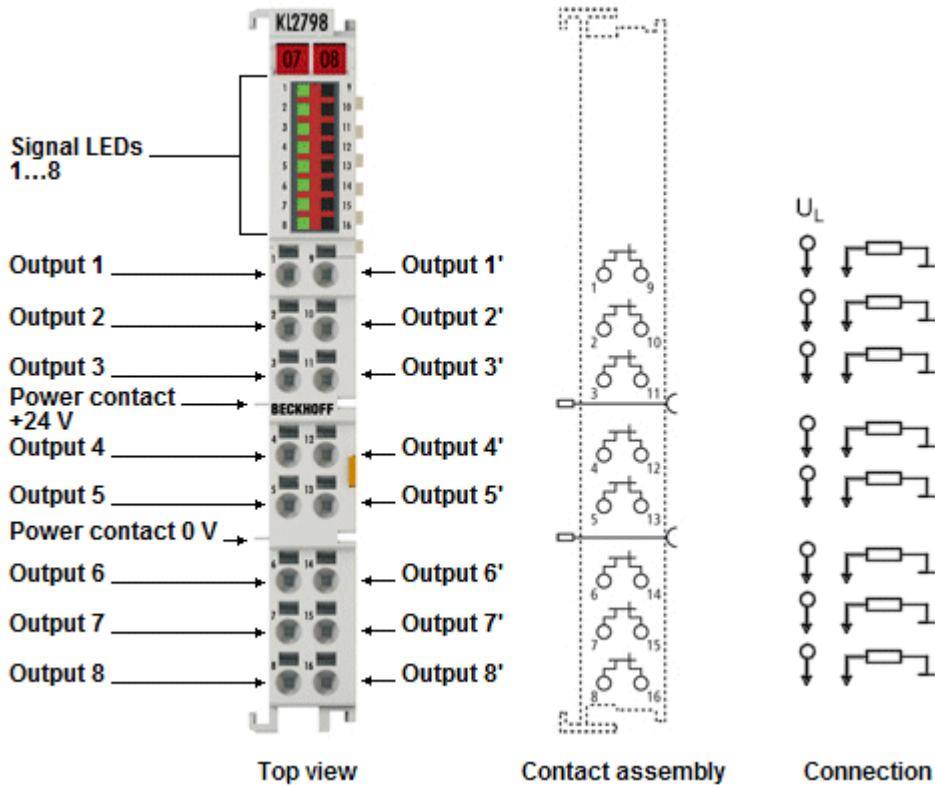


Fig. 11: KL2798 - terminal points and LEDs

Terminal point		Description
Name	No.	
Output 1	1	Output 1
Output 2	2	Output 2
Output 3	3	Output 3
Output 4	4	Output 4
Output 5	5	Output 5
Output 6	6	Output 6
Output 7	7	Output 7
Output 8	8	Output 8
Output 1'	9	Output 1'
Output 2'	10	Output 2'
Output 3'	11	Output 3'
Output 4'	12	Output 4'
Output 5'	13	Output 5'
Output 6'	14	Output 6'
Output 7'	15	Output 7'
Output 8'	16	Output 8'

LEDs

LED	Color	Meaning	
Signal LED 1 - 8	green	off	No signal voltage at the respective output
		on	Signal voltage at the respective output

5 Appendix

5.1 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff's branch offices and representatives

Please contact your Beckhoff branch office or representative for local support and service on Beckhoff products!

The addresses of Beckhoff's branch offices and representatives round the world can be found on her internet pages: <https://www.beckhoff.com>

You will also find further documentation for Beckhoff components there.

Beckhoff Support

Support offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with other, wide-ranging services:

- support
- design, programming and commissioning of complex automation systems
- and extensive training program for Beckhoff system components

Hotline: +49 5246 963 157
Fax: +49 5246 963 9157
e-mail: support@beckhoff.com

Beckhoff Service

The Beckhoff Service Center supports you in all matters of after-sales service:

- on-site service
- repair service
- spare parts service
- hotline service

Hotline: +49 5246 963 460
Fax: +49 5246 963 479
e-mail: service@beckhoff.com

Beckhoff Headquarters

Beckhoff Automation GmbH & Co. KG

Huelshorstweg 20
33415 Verl
Germany

Phone: +49 5246 963 0
Fax: +49 5246 963 198
e-mail: info@beckhoff.com
web: <https://www.beckhoff.com>

Table of figures

Fig. 1	KL2798 - Bus terminal, 8-channel solid state output, 30 V AC, 48 V DC, 2 A, potential-free.....	8
Fig. 2	KL2798 within TwinCAT 2.11	10
Fig. 3	Spring contacts of the Beckhoff I/O components.....	11
Fig. 4	Attaching on mounting rail	12
Fig. 5	Disassembling of terminal.....	13
Fig. 6	Power contact on left side.....	14
Fig. 7	Standard wiring.....	15
Fig. 8	Pluggable wiring	15
Fig. 9	High Density Terminals.....	15
Fig. 10	Mounting a cable on a terminal connection	16
Fig. 11	KL2798 - terminal points and LEDs	18

More Information:
www.beckhoff.com/KL2798

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl
Germany
Phone: +49 5246 9630
info@beckhoff.com
www.beckhoff.com

