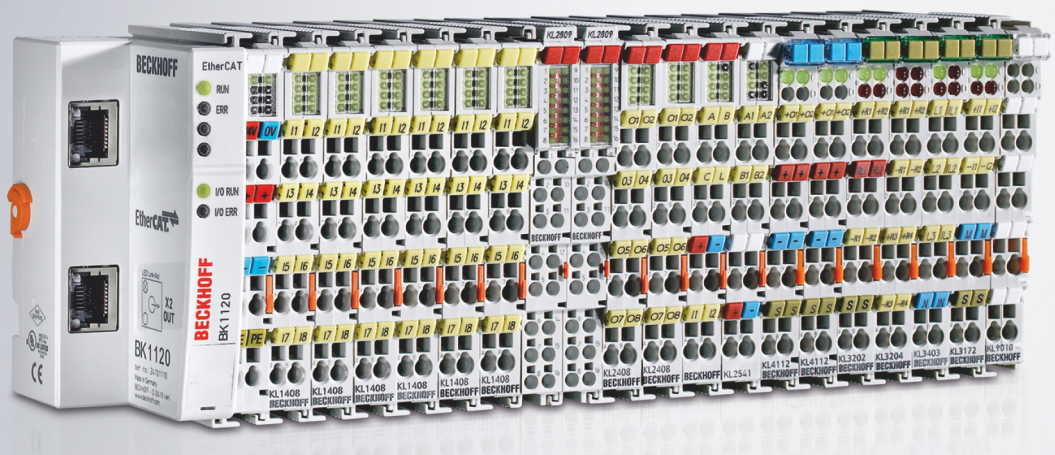
BECKHOFF New Automation Technology

Documentation | EN

KL3222/KS3222

2 Channel Accurate Input Terminals for PT100 (RTD)



2022-05-04 | Version: 2.4.0

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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

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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.

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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 versions

Version	Comment
2.4.0	• Chapter “Technical data” updated • Document structure updated • Chapter “Disposal” added • New title page • Revision status updated
2.3.0	• Update chapter “Instructions for ESD protection” • Chapter “Beckhoff Identification Code (BIC) added
2.2.0	• Update chapter “Introduction” • Update chapter “Technical data” • Update chapter “Register description” • Update structure
2.1.0	• Design of the safety instructions adapted to IEC 82079-1 • Update Technical data • Chapter *Instructions for ESD protection* added • Chapter *ATEX - Special conditions (standard temperature range)* and *ATEX Documentation* added • Example program added to chapter “KS2000 Configuration software“ • Update structure
2.0.0	• Migration
1.1.0	• Register description expanded • Parameterization with KS2000 extended
1.0.0	• First public issue

Firmware and hardware versions

Documentation version	Firmware	Hardware
2.3.0	1C	03
2.2.0	1C	02
2.1.0	1C	02
2.0.0	1C	02
1.1.0	1B	00
1.0.0	1B	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	Example with serial number 20 09 1A 00:
WW - week of production (calendar week) YY - year FF - firmware version HH - hardware version	20 - week of production 20 09 - year of production 2009 1A - firmware version 1A 00 - hardware version 00

2 Product overview

2.1 Introduction

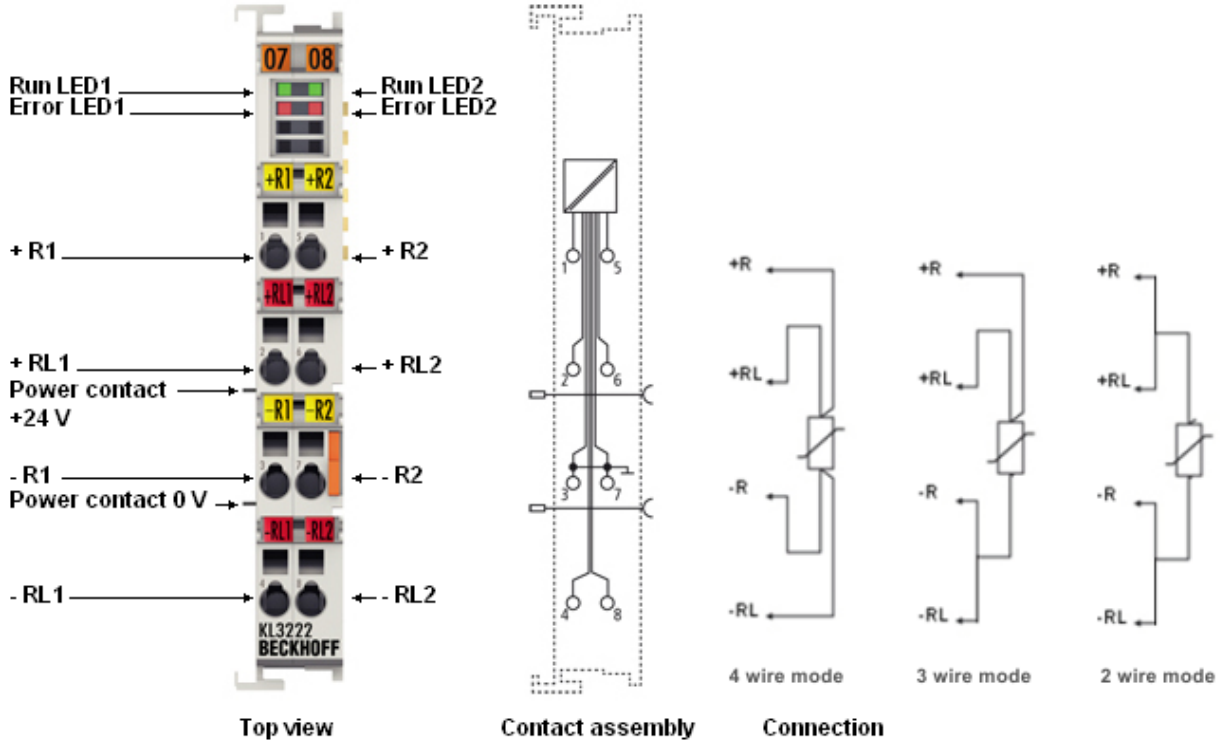


Fig. 1: KL3222

The KL3222 analog input terminal allows the direct connection of resistance sensors in 4-wire connection technology; external jumpers must be used for 2/3-wire connection technology.

Linearization over the full temperature range is realized with the aid of a microprocessor. The temperature range can be selected freely. The Bus Terminal's standard settings are: Resolution 0.01 °C in the temperature range of PT100 sensors in 4-wire connection technology.

The two Run LEDs indicate data exchange with the Bus Coupler, the error LEDs show sensor faults (e.g. broken wire).

2.2 Technical data

Technical data		KL3222, KS3222
Inputs		2
Sensor types		PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000, resistance measurement (e.g. potentiometer connection, 10 Ω...1.2/5 kΩ), KTY
Connection technology		4-wire (2/3-wire possible, see below)
Measuring range	Pt sensors	-200…+850 °C
	Ni sensors	-60…+250 °C
	high-precision	-200…+320 °C
Conversion time		approx. 50 ms
Measuring current		typically 0.5 mA
Resolution		0.01°C per digit
Measuring accuracy		0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors and 50 Hz filter
Bit width in the input process image		2 data words, 2 status bytes (optional)
Bit width in the output process image		2 control bytes (optional)
Power supply for the electronics		via the K-bus
Current consumption from K-bus		typically 60 mA
Electrical isolation		500 V (K-Bus/signal voltage)
Terminal points		Spring-loaded terminals
Pluggable wiring [▶ 16]		for all KSxxxx terminals
Weight		approx. 70 g
Dimensions (W x H x D)		approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Assembly [▶ 12]		on 35 mm mounting rail conforms to EN 60715
Permissible ambient temperature range during operation		0 °C ... + 55 °C
Permissible ambient temperature range during storage		-25 °C ... + 85 °C
Permissible relative air humidity		95 %, no condensation
Enhanced mechanical load capacity		Yes, see Installation instructions [▶ 15] for terminals with enhanced mechanical load capacity
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
Protection class		IP20
Installation position		variable
Approval/Markings*		CE, UKCA, cULus, EAC, ATEX [▶ 20]

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex marking

Standard	Marking
ATEX	II 3 G Ex nA IIC T4 Gc

The KL3222 is designed for 4-wire measurement

The KL3222 is designed for 4-wire measurement. +R/-R are the current-carrying connection cables, +RL/-RL are the currentless sense cables.
If a sensor is to be connected using 2/3 wire connection technology and the KL3202 cannot be used, the following applies

- one or two jumper(s) per channel must be set externally, see wiring diagram
- the setting "four-wire" must be retained in R32, the 2/3-wire measurement is not calibrated by the manufacturer
- the falsifying lead resistance should be entered in R38. The firmware subtracts this lead resistance from the measured resistance in order to determine a corrected temperature. This calculation of R38 is active in all 3 modes 2/3/4-wire of R32.

3 Mounting and wiring

3.1 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 by 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.

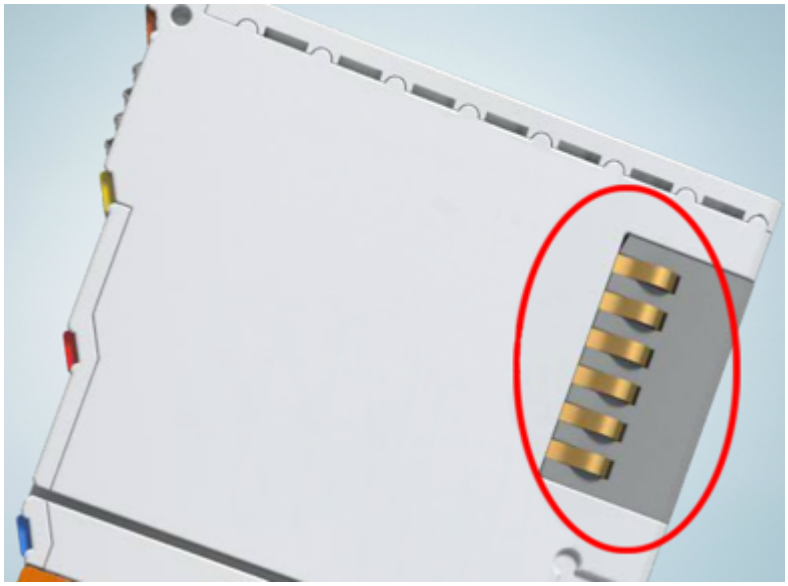


Fig. 2: Spring contacts of the Beckhoff I/O components

3.2 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

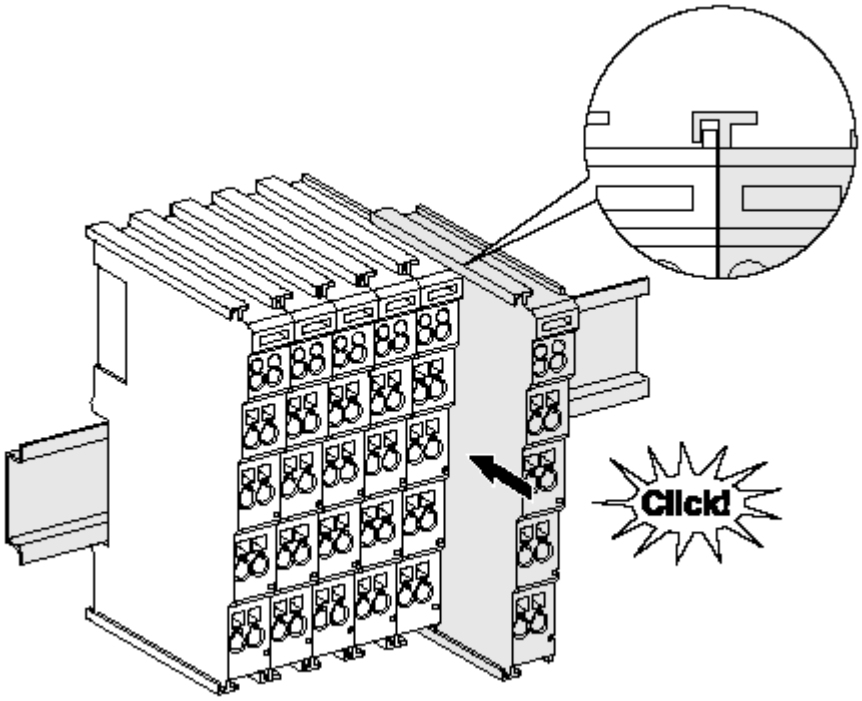


Fig. 3: Attaching on mounting rail

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.

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

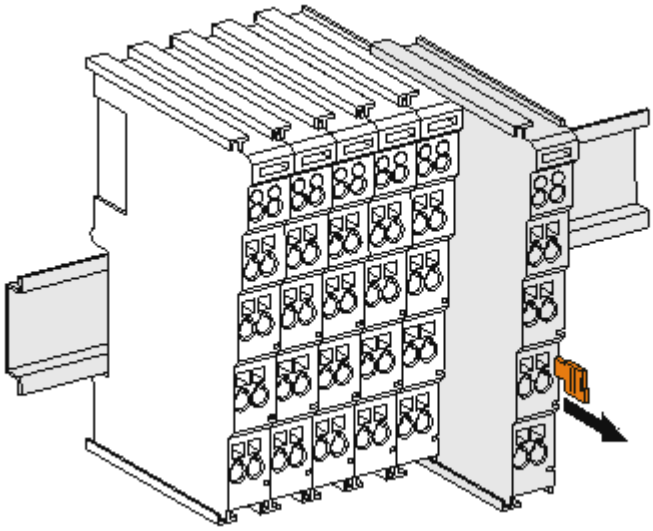


Fig. 4: Disassembling of terminal

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.

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.

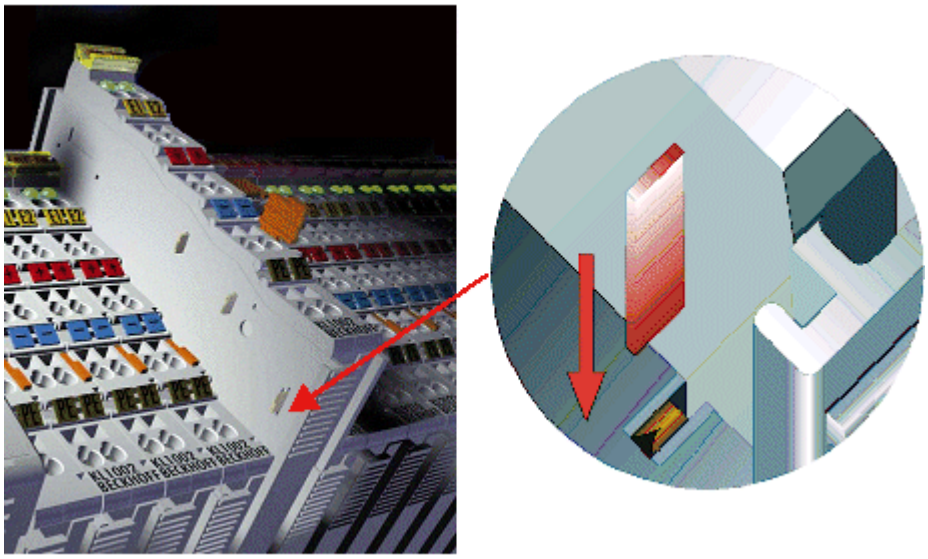


Fig. 5: Power contact on left side

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!

3.3 Installation instructions for enhanced mechanical load capacity

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the Bus Terminal system into a safe, de-energized state before starting mounting, disassembly or wiring of the Bus Terminals!

Additional checks

The terminals have undergone the following additional tests:

Verification	Explanation
Vibration	10 frequency runs in 3 axes
	6 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 *g*, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	25 *g*, 6 ms

Additional installation instructions

For terminals with enhanced mechanical load capacity, the following additional installation instructions apply:

- The enhanced mechanical load capacity is valid for all permissible installation positions
- Use a mounting rail according to EN 60715 TH35-15
- Fix the terminal segment on both sides of the mounting rail with a mechanical fixture, e.g. an earth terminal or reinforced end clamp
- The maximum total extension of the terminal segment (without coupler) is:
  64 terminals (12 mm mounting with) or 32 terminals (24 mm mounting with)
- Avoid deformation, twisting, crushing and bending of the mounting rail during edging and installation of the rail
- The mounting points of the mounting rail must be set at 5 cm intervals
- Use countersunk head screws to fasten the mounting rail
- The free length between the strain relief and the wire connection should be kept as short as possible. A distance of approx. 10 cm should be maintained to the cable duct.

3.4 Disposal

Products marked with a crossed-out wheeled bin shall not be discarded with the normal waste stream. The device is considered as waste electrical and electronic equipment. The national regulations for the disposal of waste electrical and electronic equipment must be observed.

3.5 Connection

3.5.1 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 ELxxxx and KLxxxx series with standard wiring include electronics and connection level in a single enclosure.
- The terminals of ESxxxx and KSxxxx 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 (ELxxxx / KLxxxx)

Fig. 6: Standard wiring

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

Pluggable wiring (ESxxxx / KSxxxx)

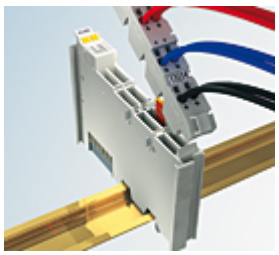


Fig. 7: Pluggable wiring

The terminals of ESxxxx and KSxxxx series feature a pluggable connection level.
The assembly and wiring procedure is the same as for the ELxxxx and KLxxxx series.
The pluggable connection level enables 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 ESxxxx and KSxxxx series has been retained as known from ELxxxx and KLxxxx series.

High Density Terminals (HD Terminals)

Fig. 8: High Density Terminals

The terminals from these series with 16 terminal 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

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

Ultrasonically “bonded” (ultrasonically welded) conductors

Ultrasonically “bonded” conductors

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 [▶ 18]!

3.5.2 Wiring

⚠ 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!

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

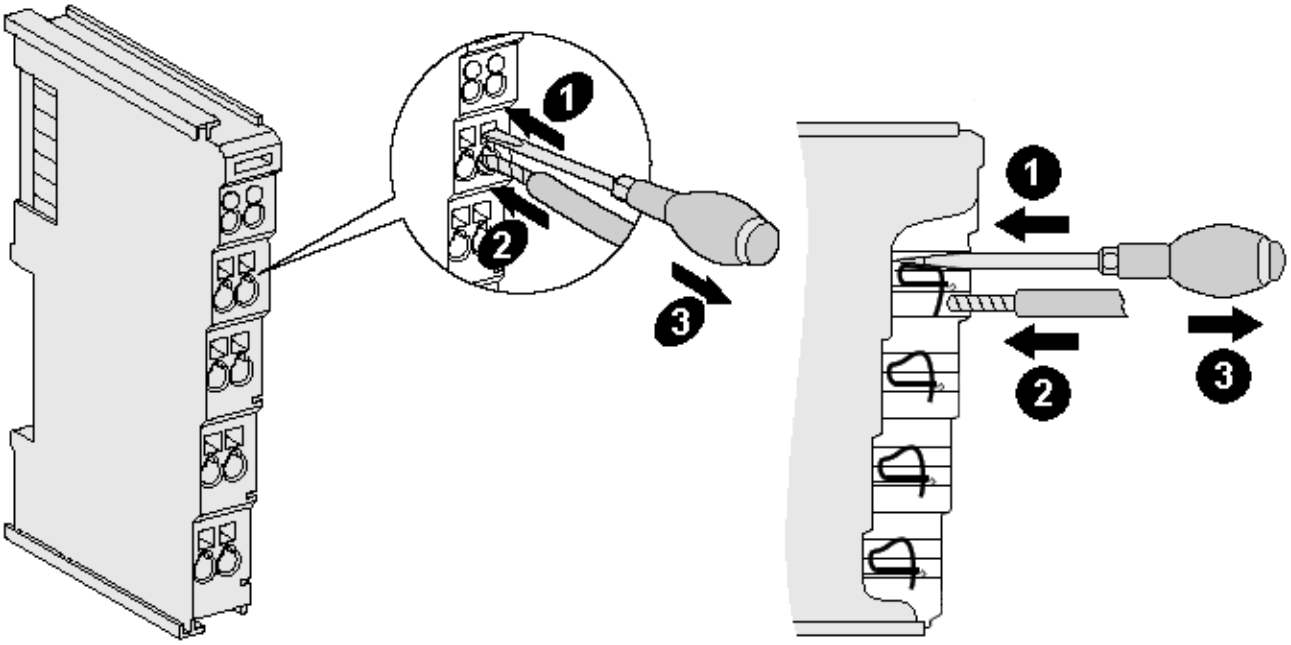


Fig. 9: Connecting a cable on a terminal point

Up to eight terminal points enable the connection of solid or finely stranded cables to the bus terminal. The terminal points are implemented in spring force technology. Connect the cables as follows:

1. Open a terminal point by pushing a screwdriver straight against the stop into the square opening above the terminal point. Do not turn the screwdriver or move it alternately (don't toggle).
2. The wire can now be inserted into the round terminal opening without any force.
3. The terminal point closes automatically when the pressure is released, holding the wire securely and permanently.

See the following table for the suitable wire size width.

Terminal housing	ELxxxx, KLxxxx	ESxxxx, KSxxxx
Wire size width (single core wires)	0.08 ... 2.5 mm²	0.08 ... 2.5 mm²
Wire size width (fine-wire conductors)	0.08 ... 2.5 mm²	0.08 ... 2.5 mm²
Wire size width (conductors with a wire end sleeve)	0.14 ... 1.5 mm²	0.14 ... 1.5 mm²
Wire stripping length	8 ... 9 mm	9 ... 10 mm

High Density Terminals (HD Terminals [▶ 17]) with 16 terminal points

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 terminal 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 (single core wires)	0.08 ... 1.5 mm²
Wire size width (fine-wire conductors)	0.25 ... 1.5 mm²
Wire size width (conductors with a wire end sleeve)	0.14 ... 0.75 mm²
Wire size width (ultrasonically “bonded" conductors)	only 1.5 mm² (see notice [▶ 17])
Wire stripping length	8 ... 9 mm

3.5.3 Shielding

Shielding

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

3.5.4 Contact assignment

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the Bus Terminals system into a safe, de-energized state before starting mounting, disassembly or wiring of the Bus Terminals!

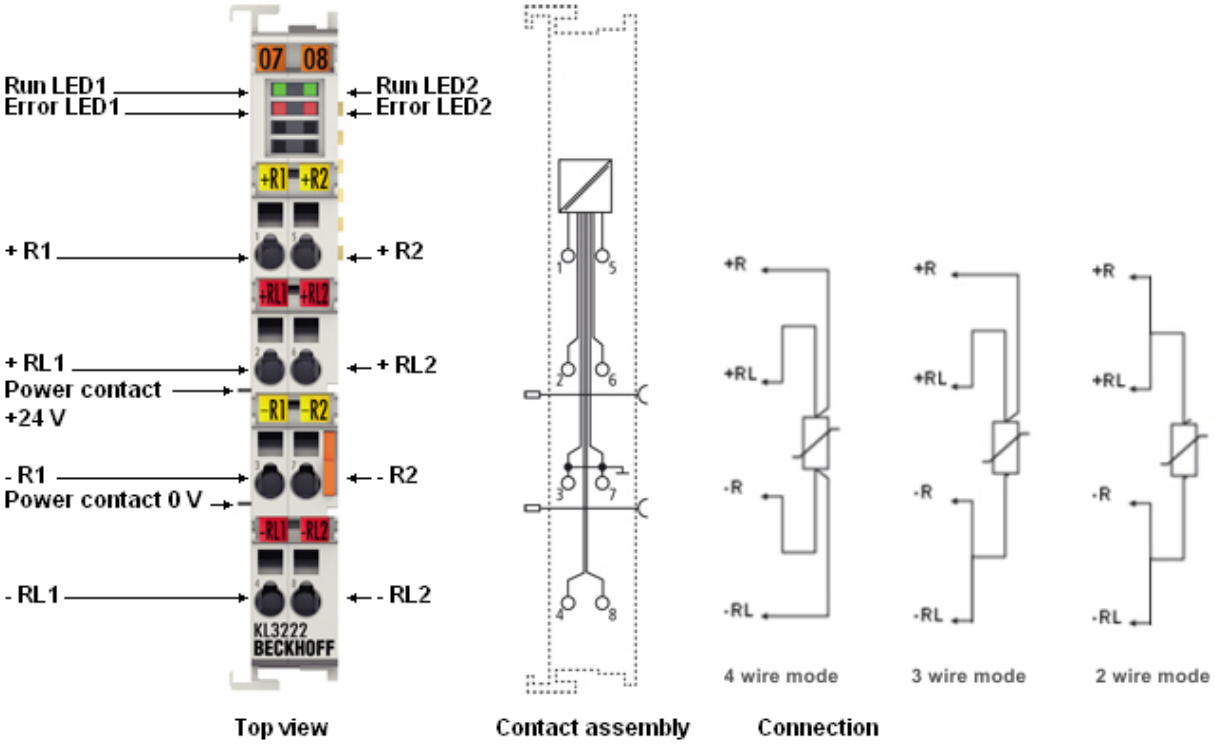


Fig. 10: KL3222 - Contact assignment

KL3222, KS3222

Terminal point	No.	Connection for
+R1	1	Channel 1: +R
+RL1	2	Channel 1: +RL
-R1	3	Channel 1: -R
-RL1	4	Channel 1: -RL
+R1	5	Channel 2: +R
+RL1	6	Channel 2: +RL
-R1	7	Channel 2: -R
-RL1	8	Channel 2: -RL

3.6 ATEX - Special conditions (standard temperature range)

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components with standard temperature range in potentially explosive areas (directive 2014/34/EU)!

- The certified components are to be installed in a suitable housing that guarantees a protection class of at least IP54 in accordance with EN 60079-15! The environmental conditions during use are thereby to be taken into account!
- For dust (only the fieldbus components of certificate no. KEMA 10ATEX0075 X Issue 9): The equipment shall be installed in a suitable enclosure providing a degree of protection of IP54 according to EN 60079-31 for group IIIA or IIIB and IP6X for group IIIC, taking into account the environmental conditions under which the equipment is used!
- If the temperatures during rated operation are higher than 70°C at the feed-in points of cables, lines or pipes, or higher than 80°C at the wire branching points, then cables must be selected whose temperature data correspond to the actual measured temperature values!
- Observe the permissible ambient temperature range of 0 to 55°C for the use of Beckhoff fieldbus components standard temperature range in potentially explosive areas!
- Measures must be taken to protect against the rated operating voltage being exceeded by more than 40% due to short-term interference voltages!
- The individual terminals may only be unplugged or removed from the Bus Terminal system if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The connections of the certified components may only be connected or disconnected if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The fuses of the KL92xx/EL92xx power feed terminals may only be exchanged if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- Address selectors and ID switches may only be adjusted if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!

Standards

The fundamental health and safety requirements are fulfilled by compliance with the following standards:

- EN 60079-0:2012+A11:2013
- EN 60079-15:2010
- EN 60079-31:2013 (only for certificate no. KEMA 10ATEX0075 X Issue 9)

Marking

The Beckhoff fieldbus components with standard temperature range certified according to the ATEX directive for potentially explosive areas bear one of the following markings:

II 3G KEMA 10ATEX0075 X Ex nA IIC T4 Gc Ta: 0 … +55°C

II 3D KEMA 10ATEX0075 X Ex tc IIIC T135°C Dc Ta: 0 ... +55°C
(only for fieldbus components of certificate no. KEMA 10ATEX0075 X Issue 9)

or

II 3G KEMA 10ATEX0075 X Ex nA nC IIC T4 Gc Ta: 0 … +55°C

II 3D KEMA 10ATEX0075 X Ex tc IIIC T135°C Dc Ta: 0 ... +55°C
(only for fieldbus components of certificate no. KEMA 10ATEX0075 X Issue 9)

3.7 Continuative documentation for ATEX and IECEx

NOTE	
	**Continuative documentation about explosion protection according to ATEX and IECEx** Pay also attention to the continuative documentation **Ex. Protection for Terminal Systems** Notes on the use of the Beckhoff terminal systems in hazardous areas according to ATEX and IECEx, that is available for download within the download area of your product on the Beckhoff homepage www.beckhoff.com!

4 Configuration Software KS2000

4.1 KS2000 - Introduction

The KS2000 configuration software permits configuration, commissioning and parameterization of bus couplers, of the affiliated bus terminals and of Fieldbus Box Modules. The connection between bus coupler / Fieldbus Box Module and the PC is established by means of the serial configuration cable or the fieldbus.

Fig. 11: KS2000 configuration software

Configuration

You can configure the Fieldbus stations with the Configuration Software KS2000 offline. That means, setting up a terminal station with all settings on the couplers and terminals resp. the Fieldbus Box Modules can be prepared before the commissioning phase. Later on, this configuration can be transferred to the terminal station in the commissioning phase by means of a download. For documentation purposes, you are provided with the breakdown of the terminal station, a parts list of modules used and a list of the parameters you have modified. After an upload, existing fieldbus stations are at your disposal for further editing.

Parameterization

KS2000 offers simple access to the parameters of a fieldbus station: specific high-level dialogs are available for all bus couplers, all intelligent bus terminals and Fieldbus Box modules with the aid of which settings can be modified easily. Alternatively, you have full access to all internal registers of the bus couplers and intelligent terminals. Refer to the register description for the meanings of the registers.

Commissioning

The KS2000 software facilitates commissioning of machine components or their fieldbus stations: Configured settings can be transferred to the fieldbus modules by means of a download. After a *login* to the terminal station, it is possible to define settings in couplers, terminals and Fieldbus Box modules directly *online*. The same high-level dialogs and register access are available for this purpose as in the configuration phase.

The KS2000 offers access to the process images of the bus couplers and Fieldbus Box modules.

- Thus, the coupler's input and output images can be observed by monitoring.
- Process values can be specified in the output image for commissioning of the output modules.

All possibilities in the *online mode* can be used in parallel with the actual fieldbus mode of the terminal station. The fieldbus protocol always has the higher priority in this case.

4.2 Parameterization with KS2000

Connect the configuration interface of your fieldbus coupler with the serial interface of your PC via the configuration cable and start the *KS2000* Configuration Software.

Click on the *Login* button. The configuration software will now load the information for the connected fieldbus station.
In the example shown, this is:

- an Ethernet Coupler BK9000
- a digital input terminal KL1xx2
- a KL3222
- a KL9010 bus end terminal

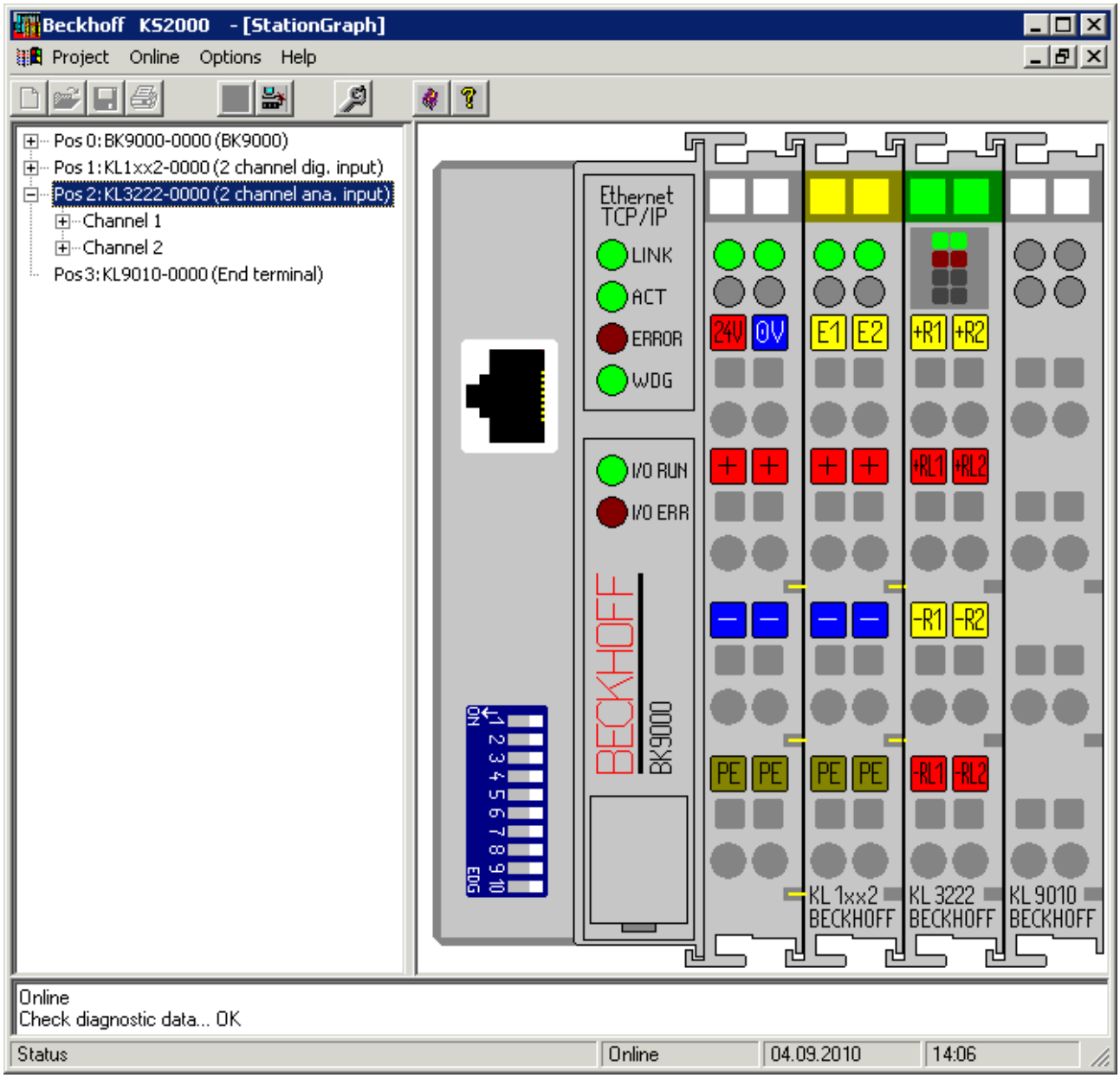


Fig. 12: Display of the fieldbus station in KS2000

The left-hand KS2000 window displays the terminals of the fieldbus station in a tree structure.
The right-hand KS2000 window contains a graphic display of the fieldbus station terminals.

In the tree structure of the left-hand window, click on the plus-sign next to the terminal whose parameters you wish to change (item 2 in the example).

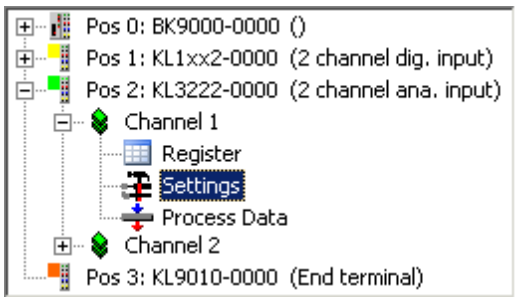


Fig. 13: KS2000 branch for channel 1 of the KL3222

For the KL3222, the branches *Register*, *Settings* and *ProcData* are displayed:

- Register enables direct access to the KL3222 registers.
- The dialog mask for the parameterization of the KL3222 can be found under Settings [▶ 25].
- ProcData displays the KL3222 process data.

4.3 Settings

The dialog mask for parameterization the KL3222/KS3222 can be found under *Settings*.

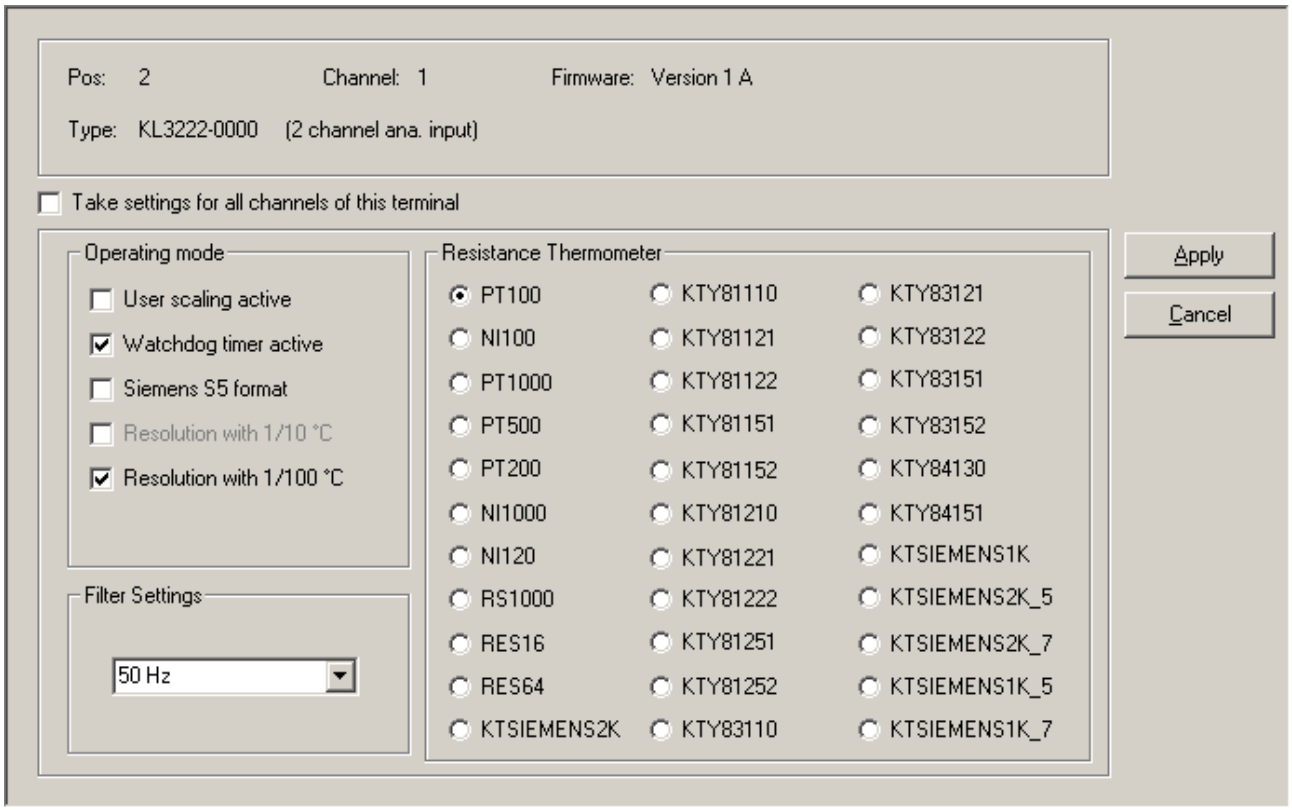


Fig. 14: Settings via KS2000

Operation mode

Here you can

- enable user scaling (R32.0 [▶ 35]), default value: inactive
- disable the watchdog timer (R32.2) [▶ 35], default value: active
- enable the Siemens S5 format (R32.4 [▶ 35]), default value: inactive
- specify the resolution (R32.5 [▶ 35]), default value: 1/100 °C (high-precision)

Filter settings

Here you can set the input filter of the terminal (R37 [▶ 36]).

- 50 Hz (default value)
- 60 Hz
- 100 Hz
- 500 Hz
- 1000 Hz
- 2000 Hz
- 3750 Hz
- 7500 Hz
- 15000 Hz
- 30000 Hz
- 5 Hz
- 10 Hz

Resistance thermometer (sensor type)

Here you can adjust the KL3222 to the connected sensor type (R32.15-R32.08 [▶ 35]):

- PT100
- NI100
- PT1000
- PT500
- PT200
- NI1000
- NI120
- RS1000
- RTD_RES16
- RTD_RES64
- RTD_KTSIEMENS2K
- KTY81110
- KTY81121
- KTY81122
- KTY81151
- KTY81221
- KTY81210
- KTY81221
- KTY81222
- KTY81251
- KTY81252
- KTY83110
- KTY83121
- KTY83122
- KTY83151
- KTY83152
- KTY84130
- KTY84151

- KTSIEMENS1K
- KTSIEMENS2K_5
- KTSIEMENS2K_7
- KTSIEMENS1K_5
- KTSIEMENS1K_7

4.4 Sample program for register communication via EtherCAT on KL3314 exemplary

Using the sample programs

This document contains sample applications of our products for certain areas of application. The application notes provided here are based on typical features of our products and only serve as examples. The notes contained in this document explicitly do not refer to specific applications. The customer is therefore responsible for assessing and deciding whether the product is suitable for a particular application. We accept no responsibility for the completeness and correctness of the source code contained in this document. We reserve the right to modify the content of this document at any time and accept no responsibility for errors and missing information.

Program description / function

This example program (TwinCAT 3) provides change of single register values of the KL3314 as selection of the element type, characteristical settings of the feature register R32 and user scaling offset and gain (R33/R34) similar as per KS2000.

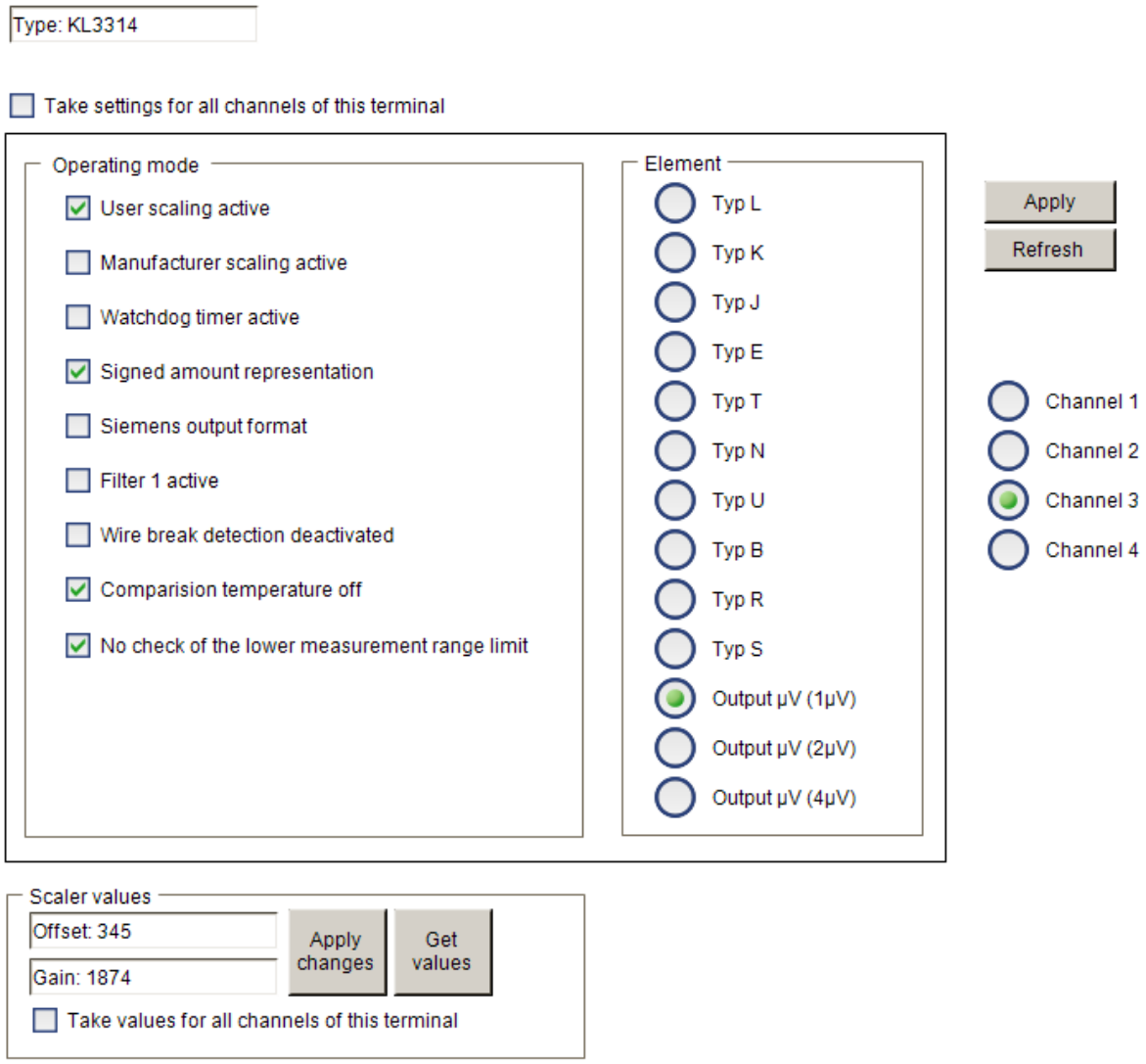


Fig. 15: Settings of KL3314 via visualization of TwinCAT 3

At least following configuration setup shall be present:

[coupler (e.g. BK1120) or embedded PC] + KL3314 + KL9010.

Download:
https://infosys.beckhoff.com/content/1033/kl3222/Resources/zip/5996114571.zip

Preparations for starting the sample programs (tnzip file / TwinCAT 3)

- Click on the download button to save the Zip archive locally on your hard disk, then unzip the *.tnzip archive file in a temporary folder.

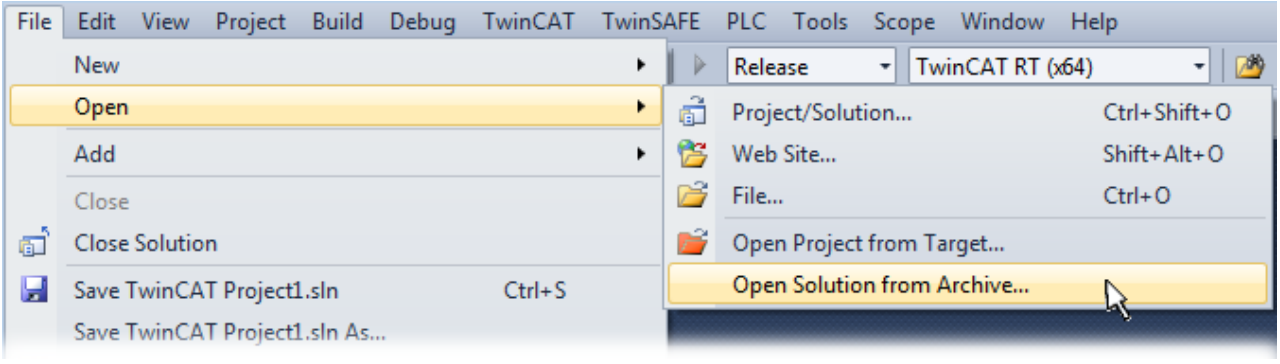


Fig. 16: Opening the *. tnzip archive

- Select the .tnzip file (sample program).
- A further selection window opens. Select the destination directory for storing the project.
- For a description of the general PLC commissioning procedure and starting the program please refer to the terminal documentation or the EtherCAT system documentation.
- The EtherCAT device of the example should usually be declared your present system. After selection of the EtherCAT device in the “Solutionexplorer” select the “Adapter” tab and click on “Search...”:

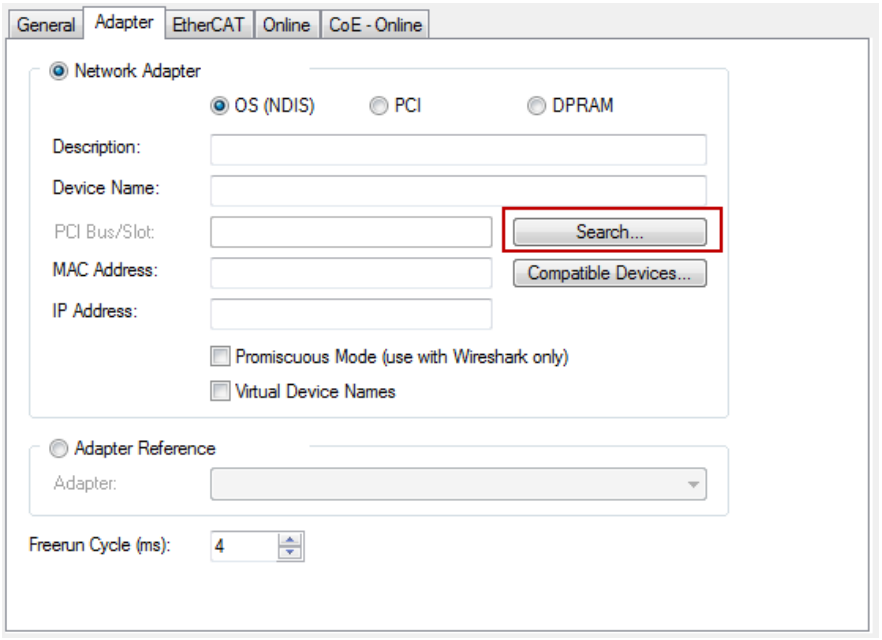
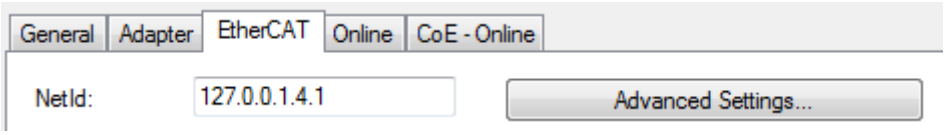


Fig. 17: Search of the existing HW configuration for the EtherCAT configuration of the example

- Checking NetId: the “EtherCAT” tab of the EtherCAT device shows the configured NetId:



The first four numbers must be identical with the project NetId of the target system. The project NetId can be viewed within the TwinCAT environment above, where a pull down menu can be opened to choose a target system (by clicking right in the text field). The number blocks are placed in brackets there next to each computer name of a target system.

- Modify the NetId: By right clicking on “EtherCAT device” within the solution explorer a context menu opens where “Change NetId...” have to be selected. The first four numbers of the NetId of the target computer must be entered; both last values are 4.1 usually.
  Example:
  - NetId of project: myComputer (123.45.67.89.1.1)
  - Entry via „Change NetId...“: 123.45.67.89.4.1

5 Access from the user program

5.1 Process image

Complete process image

The KL3222/KS3222 is represented in the complex process image with 6 bytes of input data and 2 bytes of output data. These are organized as follows:

Byte offset (without word alignment)	Byte offset (with word alignment*)	Format	Input data	Output data
0	0	Byte	SB1 [▶ 31]	CB1 [▶ 31]
1	2	Word	DataIN1	-
3	4	Byte	SB2 [▶ 31]	CB2 [▶ 31]
4	6	Word	DataIN2	-

Compact process image

The KL3222 is represented in the compact process image with 4 bytes input data and without output data. These are organized as follows:

Byte offset (without word alignment)	Byte offset (with word alignment*)	Format	Input data	Output data
0	0	Word	DataIN1	-
1	1	Word	DataIN2	-

*) word alignment: The Bus Coupler sets words to even byte addresses

Key

SB1, SB2: Status bytes of channels 1 and 2
CB1, CB2: Control bytes of channels 1 and 2
DataIN1, DataIN2 input words of channels 1 and 2
DataOUT: not present

5.2 Control and status bytes

Channel 1

The values are explained below using channel 1 as an example.

Channel 2

The control and status bytes of channel 2 (CB2 and SB2) are structured like the control and status byte of channel 1 [▶ 31].

5.2.1 Process data mode

Control byte 1 (for process data mode)

Control byte 1 (CB1) is located in the output image [▶ 30], and is transmitted from the controller to the terminal.

Bit	CB1.7	CB1.6	CB1.5	CB1.4	CB1.3	CB1.2	CB1.1	CB1.0
Name	RegAccess	-	Calli	Gain	Offset	Clock	up	down

Key

Bit	Name	Description		
CB1.7	RegAccess	0_{bin}	Register communication off (process data mode)	
CB1.6	-	0_{bin}	reserved	
CB1.5	Calli	1_{bin}	Terminal compensation function is enabled	A gain and offset calibration of the terminal can be carried out with the control byte in process data mode. The code word must be entered in register R31 so that the calibration can be carried out. The parameter will only be saved permanently once the code word is reset!
CB1.4	Gain	1_{bin}	Gain calibration	
CB1.3	Offset	1_{bin}	Offset calibration	
CB1.2	Clock	0_{bin}	slow clock	
		1_{bin}	fast clock	
CB1.1	up	1_{bin}	up	
CB1.0	down	1_{bin}	down	

Status byte 1 (for process data mode)

The status byte 1 (SB1) is located in the input image [▶ 30] and is transmitted from terminal to the controller.

Bit	SB1.7	SB1.6	SB1.5	SB1.4	SB1.3	SB1.2	SB1.1	SB1.0
Name	RegAccess	Error	-	-	-	-	Overrange	Underrange

Key

Bit	Name	Description	
SB1.7	RegAccess	0_{bin}	Acknowledgment for process data mode
SB1.6	Error	1_{bin}	General error bit
SB1.5 .. . SB1.2	-	0_{bin}	reserved
SB1.1	Overrange	1_{bin}	Process data too large
SB1.0	Underrange	1_{bin}	Process data too small

5.2.2 Register communication

Control byte 1 (in register communication)

Control byte 1 (CB1) is located in the output image, and is transmitted from the controller to the terminal.

Bit	CB1.7	CB1.6	CB1.5	CB1.4	CB1.3	CB1.2	CB1.1	CB1.0
Name	RegAccess	R/W	Reg. no.					

Key

Bit	Name	Description	
CB1.7	RegAccess	1_{bin}	Register communication switched on
CB1.6	R/W	0_{bin}	Read access
		1_{bin}	Write access
CB1.5 to CB1.0	Reg. no.	Register number: Enter the number of the register [▶ 33] that you - want to read with input data word DataIn [▶ 30] or - want to write with output data word DataOut [▶ 30].	

Status byte 1 (in register communication)

The status byte 1 (SB1) is located in the input image and is transmitted from terminal to the controller.

Bit	SB1.7	SB1.6	SB1.5	SB1.4	SB1.3	SB1.2	SB1.1	SB1.0
Name	RegAccess	R/W	Reg. no.					

Key

Bit	Name	Description	
SB1.7	RegAccess	1_{bin}	Acknowledgment for register access
SB1.6	R	0_{bin}	Read access
SB1.5 to SB1.0	Reg. no.	Number of the register that was read or written.	

5.3 Register overview

The registers are used for parameterization of the Bus Terminals and are present once for each channel. They can be read or written by means of register communication.

Register no.	Comment	Default value		R/W	Memory
R0 [▶ 34]	A/D converter, raw value	variable	variable	R	RAM
R1 [▶ 34]	A/D converter, raw value of the line	variable	variable	R	RAM
R2	reserved	0x0000	0_{dec}	R	RAM
...	...	...	...	...	-
R5	reserved	0x0000	0_{dec}	R	RAM
R6 [▶ 34]	Diagnostic register	0x0000	0_{dec}	R	RAM
R7 [▶ 34]	Command register (not used)	0x0000	0_{dec}	R/W	RAM
R8 [▶ 34]	Terminal type	0x0C96	3222_{dec}	R	ROM
R9 [▶ 34]	Firmware version	e.g. 0x3141	e.g. 12609_{dec}	R	ROM
R10	Multiplex shift register	0x0130	304_{dec}	R	ROM
R11	Signal channels	0x0218	536_{dec}	R	ROM
R12	minimum data length of a channel	0x0098	152_{dec}	R	ROM
R13	Data structure	0x0004	4_{dec}	R	ROM
R14	reserved	-	-	-	-
R15	Alignment register	variable	variable	R/W	RAM
R16 [▶ 34]	Hardware version number	e.g. 0x0000	e.g. 0_{dec}	R/W	SEEPROM
R17 [▶ 34]	Vendor calibration: Offset	specific	specific	R/W	SEEPROM
R18 [▶ 34]	Vendor calibration: Gain	specific	specific	R/W	SEEPROM
R19 [▶ 34]	Manufacturer scaling: Offset	0x0000	0_{dec}	R/W	SEEPROM
R20 [▶ 34]	Manufacturer scaling: Gain	0x0100	256_{dec}	R/W	SEEPROM
R21	reserved	0x0000	0_{dec}	R/W	SEEPROM
...	-	...	...	...	...
R30	reserved	0x0000	0_{dec}	R/W	SEEPROM
R31 [▶ 34]	Code word register	0x0000	0dec	R/W	RAM
R32 [▶ 35]	Feature register	0x0000	0dec	R/W	SEEPROM
R33 [▶ 36]	User scaling: Offset	0x0000	0_{dec}	R/W	SEEPROM
R34 [▶ 36]	User scaling: Gain	0x0100	256_{dec}	R/W	SEEPROM
R35	...	...	...	-	-
R36	...	...	...	-	-
R37 [▶ 36]	Filter	0x0000	0_{dec}	R/W	SEEPROM
R38	reserved	0x0000	0_{dec}	R/W	SEEPROM
...	reserved	...	...	...	...
R63	reserved	0x0000	0_{dec}	R/W	SEEPROM

5.4 Register description

The registers are used for parameterization of the Bus Terminals and are present once for each channel. They can be read or written by means of register communication [▶ 36].

- **R0: A/D converter, raw value**
  Register R0 contains the raw value of the analog/digital converter. This is the unchanged analog value prior to any scaling.
- **R1: A/D converter, raw value of the line**
  Register R1 contains the raw value of the line resistance between +R1 – RL1 or between +R2 – RL2.
- **R6: diagnostic register**
  The status byte SBn of Channel n is shown in the low byte of register R6.
- **R7: command register**
  The command register of KL3222 is currently not used.
- **R8: terminal designation**
  Register R8 contains the name of the terminal: KL3222: 0x0C9C (3222_{dec})
- **R9: firmware version**
  Register R9 contains the ASCII coding of the terminal's firmware version, e.g. **0x3141 = '1A'.** The **'0x31'** corresponds here to the ASCII character **'1'**, while the **'0x41'** represents the ASCII character **'A'**. This value cannot be changed.
- **R12: minimum data length of a channel**
  - Bits 0 to 6 of the high-order byte indicate the minimum number of output data in bits: 000.0000_{bin} = 0_{dec} so 0 bytes.
  - Bits 0 to 6 of the low-order byte indicate the minimum number of input data in bits: 001.1000_{bin} = 24_{dec} so 3 bytes.
  - The fact that bit 7 is set indicates that the control and status byte are not mandatory for the terminal function and are not transferred in compact mode.
- **R16: hardware version number**
  Register R16 contains the hardware version of the terminal.
- **R17: manufacturer compensation - offset**
  This register contains the offset of the vendor calibration.
- **R18: manufacturer compensation - gain**
  This register contains the gain of the vendor calibration.
- **R19: manufacturer scaling - offset**
  This register contains the offset of the manufacturer scaling. It can be enabled by R32.1 [▶ 35] in the feature register.
- **R20: manufacturer scaling - gain**
  This register contains the gain of the manufacturer scaling. It can be enabled by R32.1 [▶ 35] in the feature register.
- **R23: reference calibration value: offset**
  This register contains the reference value of the calibration, which is determined during the vendor calibration.
- **R24: reference calibration value: gain**
  This register contains the reference value of the calibration, which is determined during the vendor calibration.
- **R31: code word register**
  - If you write values into the user registers without first entering the user code word (0x1235) into the code word register, the terminal will not accept the supplied data.
  - If you write values into the user registers and have previously entered the user code word (0x1235) in the code word register, these values are stored in the RAM registers and in the SEEPROM registers and are therefore retained if the terminal is restarted.

    The code word is reset if the terminal is restarted.
- **Feature register (R32)**
  The feature register specifies the terminal's operation mode.

Bit	R32.15	R32.14	R32.13	R32.12	R32.11	R32.10	R32.9	R32.8
Name	SensorType							

Bit	R32.7	R32.6	R32.5	R32.4	R32.3	R32.2	R32.1	R32.0
Name	ConnectionTech		Resolution	-	-	Watchdog	enManScal	enUsrScal

Key				
Bit	**Name**	**Description**		**Default**
R32.15 ... R32.08	SensorType	0_{dec}	PT100	0_{bin}
		1_{dec}	NI100	
		2_{dec}	PT1000	
		3_{dec}	PT500	
		4_{dec}	PT200	
		5_{dec}	NI1000	
		6_{dec}	NI120	
		7_{dec}	RS1000	
		14_{dec}	RTD_RES16	
		15_{dec}	RTD_RES64	
		16_{dec}	RTD_KTSIEMENS2K	
		17_{dec}	KTY81110	
		18_{dec}	KTY81121	
		19_{dec}	KTY81122	
		20_{dec}	KTY81151	
		21_{dec}	KTY81221	
		22_{dec}	KTY81210	
		23_{dec}	KTY81221	
		24_{dec}	KTY81222	
		25_{dec}	KTY81251	
		26_{dec}	KTY81252	
		27_{dec}	KTY83110	
		28_{dec}	KTY83121	
		29_{dec}	KTY83122	
		30_{dec}	KTY83151	
		31_{dec}	KTY83152	
		32_{dec}	KTY84130	
		33_{dec}	KTY84151	
		34_{dec}	KTSIEMENS1K	
		35_{dec}	KTSIEMENS2K_5	
		36_{dec}	KTSIEMENS2K_7	
		37_{dec}	KTSIEMENS1K_5	
		38_{dec}	KTSIEMENS1K_7	
		others	reserved	
R32.7...R32.6	ConnectionTech	00_{dec}	Two-conductor (not applicable, see note 2/3 conductor measurement [▶ 9])	10_{bin}
		01_{dec}	Three-conductor (not applicable, see note 2/3 conductor measurement [▶ 9])	
		10_{dec}	Four-wire	
		11_{dec}	not connected	
R32.5	Resolution	0_{bin}	Resolution: 1/10 °C	1_{bin}
		1_{bin}	Resolution: 1/100 °C (high-precision)	
R32.4	enS format	0_{bin}	Siemens format not active	0_{bin}
		1_{bin}	Siemens format active	
R32.3	-	0_{bin}	reserved	0_{bin}
R32.2	Watchdog	0_{bin}	Watchdog not active	1_{bin}
		1_{bin}	Watchdog active	
R32.1	enManScal	0_{bin}	Manufacturer scaling is not active	0_{bin}
		1_{bin}	Manufacturer scaling is active	
R32.0	enUsrScal	0_{bin}	User scaling is not active	0_{bin}
		1_{bin}	User scaling is active	

- **R33: User scaling - offset**
  This register contains the offset of the user scaling. User scaling can be enabled in the feature register via bit R32.0 [▶ 35].
- **R34: user scaling - gain**
  This register contains the gain of the user scaling. User scaling can be enabled in the feature register via bit R32.0 [▶ 35].
- **R37: filter constant of the A/D converter**

Value in R37	Limit frequency	Default
0_{dec}	50 Hz	0_{dec}
1_{dec}	60 Hz	
2_{dec}	100 Hz	
3_{dec}	500 Hz	
4_{dec}	1000 Hz	
5_{dec}	2000 Hz	
6_{dec}	3750 Hz	
7_{dec}	7500 Hz	
8_{dec}	15 kHz	
9_{dec}	30 kHz	
10_{dec}	5 Hz	
11_{dec}	10 Hz	

5.5 Examples of Register Communication

The numbering of the bytes in the examples corresponds to the display without word alignment.

5.5.1 Example 1: reading the firmware version from Register 9

Output Data

Byte 0: Control byte	Byte 1: DataOUT1, high byte	Byte 2: DataOUT1, low byte
0x89 (1000 1001_{bin})	0xXX	0xXX

Explanation:

- Bit 0.7 set means: Register communication switched on.
- Bit 0.6 not set means: reading the register.
- Bits 0.5 to 0.0 specify the register number 9 with 00 1001_{bin}.
- The output data word (byte 1 and byte 2) has no meaning during read access. To change a register, write the required value into the output word.

Input Data (answer of the Bus Terminal)

Byte 0: Status byte	Byte 1: DataIN1, high byte	Byte 2: DataIN1, low byte
0x89	0x33	0x41

Explanation:

- The terminal returns the value of the control byte as a receipt in the status byte.
- The terminal returns the firmware version 0x3341 in the input data word (byte 1 and byte 2). This is to be interpreted as an ASCII code:
  - ASCII code 0x33 represents the digit 3

◦ ASCII code 0x41 represents the letter A
The firmware version is thus 3A.

5.5.2 Example 2: Writing to an user register

Code word

In normal mode all user registers are read-only with the exception of Register 31. In order to deactivate this write protection you must write the code word (0x1235) into Register 31. If a value other than 0x1235 is written into Register 31, write protection is reactivated. Please note that changes to a register only become effective after restarting the terminal (power-off/power-on).

I. Write the code word (0x1235) into Register 31.

Output Data

Byte 0: Control byte	Byte 1: DataOUT1, high byte	Byte 2: DataOUT1, low byte
0xDF (1101 1111_{bin})	0x12	0x35

Explanation:

- Bit 0.7 set means: Register communication switched on.
- Bit 0.6 set means: writing to the register.
- Bits 0.5 to 0.0 specify the register number 31 with 01 1111_{bin}.
- The output data word (byte 1 and byte 2) contains the code word (0x1235) for deactivating write protection.

Input Data (answer of the Bus Terminal)

Byte 0: Status byte	Byte 1: DataIN1, high byte	Byte 2: DataIN1, low byte
0x9F (1001 1111_{bin})	0xXX	0xXX

Explanation:

- The terminal returns a value as a receipt in the status byte that differs only in bit 0.6 from the value of the control byte.
- The input data word (byte 1 and byte 2) is of no importance after the write access. Any values still displayed are invalid!

II. Read Register 31 (check the set code word)

Output Data

Byte 0: Control byte	Byte 1: DataOUT1, high byte	Byte 2: DataOUT1, low byte
0x9F (1001 1111_{bin})	0xXX	0xXX

Explanation:

- Bit 0.7 set means: Register communication switched on.
- Bit 0.6 not set means: reading the register.
- Bits 0.5 to 0.0 specify the register number 31 with 01 1111_{bin}.
- The output data word (byte 1 and byte 2) has no meaning during read access.

Input Data (answer of the Bus Terminal)

Byte 0: Status byte	Byte 1: DataIN1, high byte	Byte 2: DataIN1, low byte
0x9F (1001 1111_{bin})	0x12	0x35

Explanation:

- The terminal returns the value of the control byte as a receipt in the status byte.
- The terminal returns the current value of the code word register in the input data word (byte 1 and byte 2).

III. Write to Register 32 (change contents of the feature register)

Output data

Byte 0: Control byte	Byte 1: DataIN1, high byte	Byte 2: DataIN1, low byte
0xE0 (1110 0000_{bin})	0x00	0x02

Explanation:

- Bit 0.7 set means: Register communication switched on.
- Bit 0.6 set means: writing to the register.
- Bits 0.5 to 0.0 indicate register number 32 with 10 0000_{bin}.
- The output data word (byte 1 and byte 2) contains the new value for the feature register.

⚠ CAUTION

Observe the register description!

The value of 0x0002 given here is just an example!
The bits of the feature register change the properties of the terminal and have a different meaning, depending on the type of terminal. Refer to the description of the feature register of your terminal (chapter *Register description*) regarding the meaning of the individual bits before changing the values.

Input data (response from the Bus Terminal)

Byte 0: Status byte	Byte 1: DataIN1, high byte	Byte 2: DataIN1, low byte
0xA0 (1010 0000_{bin})	0xXX	0xXX

Explanation:

- The terminal returns a value as a receipt in the status byte that differs only in bit 0.6 from the value of the control byte.
- The input data word (byte 1 and byte 2) is of no importance after the write access. Any values still displayed are invalid!

IV. Read Register 32 (check changed feature register)

Output Data

Byte 0: Control byte	Byte 1: DataOUT1, high byte	Byte 2: DataOUT1, low byte
0xA0 (1010 0000_{bin})	0xXX	0xXX

Explanation:

- Bit 0.7 set means: Register communication switched on.
- Bit 0.6 not set means: reading the register.
- Bits 0.5 to 0.0 indicate register number 32 with 10 0000_{bin}.
- The output data word (byte 1 and byte 2) has no meaning during read access.

Input Data (answer of the Bus Terminal)

Byte 0: Status byte	Byte 1: DataIN1, high byte	Byte 2: DataIN1, low byte
0xA0 (1010 0000_{bin})	0x00	0x02

Explanation:

- The terminal returns the value of the control byte as a receipt in the status byte.
- The terminal returns the current value of the feature register in the input data word (byte 1 and byte 2).

V. Write Register 31 (reset code word)

Output Data

Byte 0: Control byte	Byte 1: DataOUT1, high byte	Byte 2: DataOUT1, low byte
0xDF (1101 1111_{bin})	0x00	0x00

Explanation:

- Bit 0.7 set means: Register communication switched on.
- Bit 0.6 set means: writing to the register.
- Bits 0.5 to 0.0 specify the register number 31 with 01 1111_{bin}.
- The output data word (byte 1 and byte 2) contains 0x0000 for reactivating write protection.

Input Data (answer of the Bus Terminal)

Byte 0: Status byte	Byte 1: DataIN1, high byte	Byte 2: DataIN1, low byte
0x9F (1001 1111_{bin})	0xXX	0xXX

Explanation:

- The terminal returns a value as a receipt in the status byte that differs only in bit 0.6 from the value of the control byte.
- The input data word (byte 1 and byte 2) is of no importance after the write access. Any values still displayed are invalid!

6 Appendix

6.1 Beckhoff Identification Code (BIC)

The Beckhoff Identification Code (BIC) is increasingly being applied to Beckhoff products to uniquely identify the product. The BIC is represented as a Data Matrix Code (DMC, code scheme ECC200), the content is based on the ANSI standard MH10.8.2-2016.

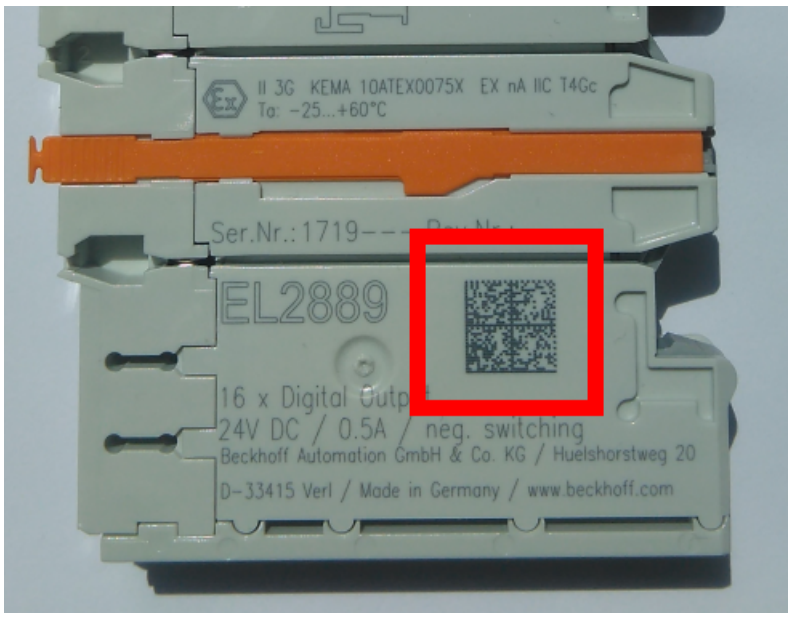


Fig. 18: BIC as data matrix code (DMC, code scheme ECC200)

The BIC will be introduced step by step across all product groups.

Depending on the product, it can be found in the following places:

- on the packaging unit
- directly on the product (if space suffices)
- on the packaging unit and the product

The BIC is machine-readable and contains information that can also be used by the customer for handling and product management.

Each piece of information can be uniquely identified using the so-called data identifier (ANSI MH10.8.2-2016). The data identifier is followed by a character string. Both together have a maximum length according to the table below. If the information is shorter, spaces are added to it.

Following information is possible, positions 1 to 4 are always present, the other according to need of production:

Position	Type of information	Explanation	Data identifier	Number of digits incl. data identifier	Example
1	Beckhoff order number	**Beckhoff order number**	1P	8	1P072222
2	Beckhoff Traceability Number (BTN)	**Unique serial number, see note below**	SBTN	12	SBTNk4p562d7
3	Article description	**Beckhoff article description, e.g. EL1008**	1K	32	1KEL1809
4	Quantity	**Quantity in packaging unit, e.g. 1, 10, etc.**	Q	6	Q1
5	Batch number	Optional: Year and week of production	2P	14	2P401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products	51S	12	51S678294
7	Variant number	Optional: Product variant number on the basis of standard products	30P	32	30PF971, 2*K183
...					

Further types of information and data identifiers are used by Beckhoff and serve internal processes.

Structure of the BIC

Example of composite information from positions 1 to 4 and with the above given example value on position 6. The data identifiers are highlighted in bold font:

1P072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

Accordingly as DMC:

Fig. 19: Example DMC **1P**072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

BTN

An important component of the BIC is the Beckhoff Traceability Number (BTN, position 2). The BTN is a unique serial number consisting of eight characters that will replace all other serial number systems at Beckhoff in the long term (e.g. batch designations on IO components, previous serial number range for safety products, etc.). The BTN will also be introduced step by step, so it may happen that the BTN is not yet coded in the BIC.

NOTE

This information has been carefully prepared. However, the procedure described is constantly being further developed. We reserve the right to revise and change procedures and documentation at any time and without prior notice. No claims for changes can be made from the information, illustrations and descriptions in this information.

6.2 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!

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