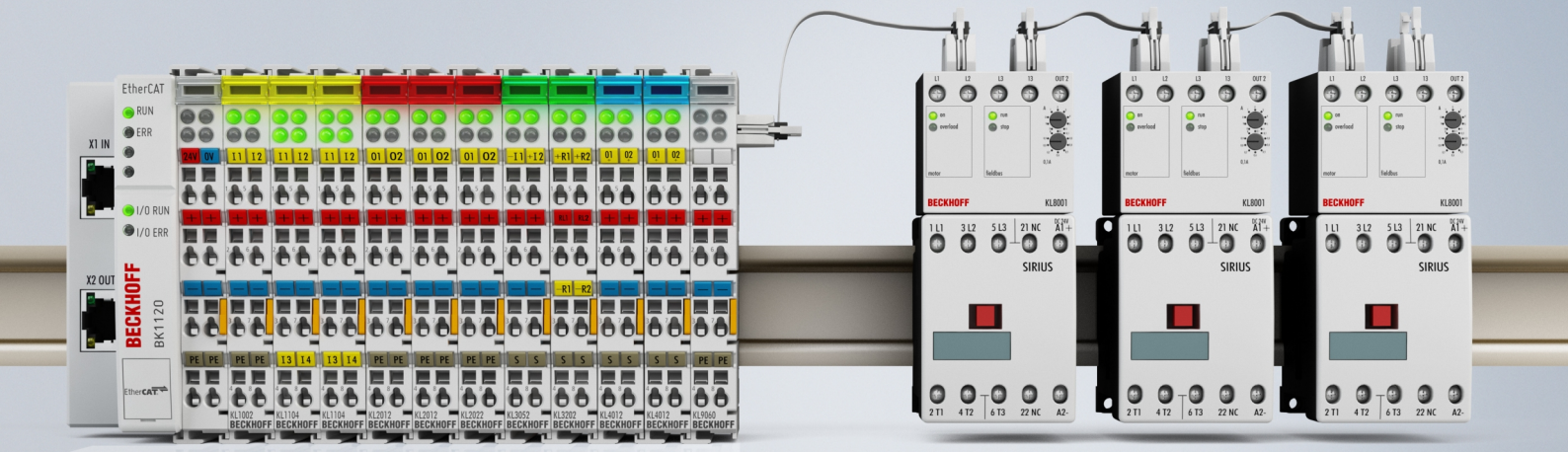
BECKHOFF New Automation Technology

Documentation | EN

KL8001 and KL9060

Power and adapter terminal for Siemens contactors of the Sirius 3RT10 series



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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.

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Patent Pending

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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 status

Version	Comment
2.1.0	• Chapter “Technical data” updated • Document structure updated • Chapter “Disposal” added • Chapter “Instructions for ESD protection” updated • Chapter “Beckhoff Identification Code (BIC)” added • New title page • Revision status updated
2.0.0	• Migration • Chapter *Mounting rail installation* revised • Structural update
1.2.0	• Introduction and annex updated • Ordering information updated • Technical data updated • Description of feature register updated • Description of command register added • Parameter registers PR33, PR40, PR46: resolution corrected • Description of the Data registers corrected
1.1	• Technical data updated • Description of the parameter registers extended
1.0	• Description of the parameter registers updated • English version available
0.3	• Product overview revised • Description of control and status byte revised • Register description revised • Ordering information extended
0.2	• Functional description revised • Technical data updated • Information about mounting and wiring added • Application examples added • Description of parameterization with KS2000 software added • Description of the process image revised • Register description amended • Ordering information added
0.1	• First preliminary version

Firmware and hardware versions

Documentation Version	KL8001				KL9060	
	Measuring PCB		K-bus PCB		Firmware	Hardware
	Firmware	Hardware	Firmware	Hardware		
2.1.0	5	5	7	4	00	03
2.0.0	5 (=3C)	5	7 (=3D)	4	00	02
1.2.0	5 (=3C)	4	6 (=3C)	1	00	01
1.1	2 (=2A)	3	3 (=1C)	0	00	00
1.0	1 (=1B)	1	1 (=1B)	0	00	00
0.3					00	00
0.2					00	00
0.1					00	00

- The firmware and hardware versions (delivery state) of the KL9060 can be found in the serial number printed at the side of the terminal.
- The firmware version of the measuring PCB of the KL8001 can be read from data register DR37 [▶ 42].

- The firmware version of the K-bus PCB of the KL8001 is shown in the header of the KS2000 Settings [▶ 26] dialog for KL8001
- The hardware version of the measuring and K-bus PCB of the KL8001 is coded in the serial number of the KL8001.

Syntax of the serial number for KL9060

Structure of the serial number: WW YY FF HH

WW - week of production (CW, calendar week)
YY - year of production
FF - firmware version
HH - hardware version

Example with serial number 02 06 00 01:

02 - week of production 02
06 - year of production 2006
00 - firmware version 00
01 - hardware version 01

Syntax of the serial number for KL8001

Structure of the serial number: WW YY FH fh

WW - week of production (CW, calendar week)
YY - year of production
FH - firmware version (F) and hardware version (H) of the measuring PCB (coded)
f h - firmware version (f) and hardware version (h) of the K-bus PCB (coded)

Example with serial number 02 06 54 61:

02 - week of production 02
06 - year of production 2006
54 - measuring PCB: firmware version 5 (=3C), hardware version 4
61 - K-bus PCB: firmware version 6 (=3C), hardware version 1

2 Product Overview

2.1 KL8001 Power terminal - Introduction

The KL8001 power terminal is specially constructed for Siemens contactors [▶ 46] from the Sirius 3RT10 series, size S00. It is fitted to the contactor in the same way as a standard motor protection relay. The power terminal switches the installed contactor and takes over all the functions of the motor protection relay. Apart from its purely protective function of switching off the motor when overloaded, the power terminal can carry out numerous diagnostic functions on the motor and make the diagnostic data available to the controller via the fieldbus.

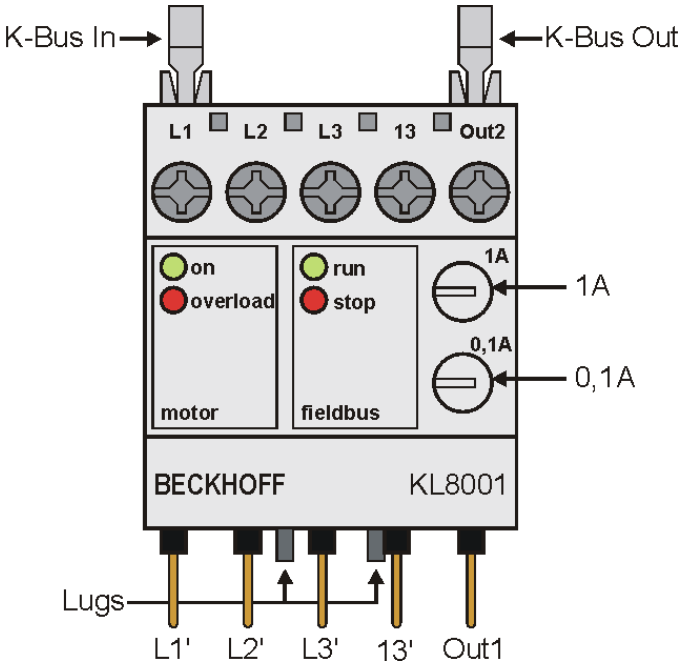


Fig. 1: KL8001

Name	Description
K-Bus In	Pin contact strip for the incoming K-bus.
K-Bus Out	Pin contact strip for the outgoing K-bus. Insert the bus end plug [▶ 20] here, included with the KL9060, in the last power terminal of your bus terminal block.
L1, L2, L3	Connection terminals for the load circuit from the mains.
L1', L2', L3'	Connection pins for the load circuit to the contactor.
13, 13'	Connections for feeding through the auxiliary contact.
Out1	Connection pin for the contactor's operating coil (right motion in reversing contactor connection)
Out2	Connection terminal for the contactor's operating coil (left motion in reversing contactor connection)
1A	Rotary switch for manual adjustment of the rated current (resolution 1 A)
0.1A	Rotary switch for manual adjustment of the rated current (resolution 0.1 A)
on (motor)	LED for motor diagnostics: indicates whether the motor is switched on
overload (motor)	LED for motor diagnostics: indicates motor overload
run (fieldbus)	LED for K-bus diagnostics: indicates that data is being transferred on the K-bus
stop (fieldbus)	LED for K-bus diagnostics: indicates that data transmission on the K-bus has been interrupted
Lugs	Lugs for mounting the KL8001 on Siemens contactors

2.2 KL8001 Power terminal - Functional description

Rotary switches for adjusting the rated current

You can set the motor's rated current manually using the two rotary switches on the power terminal. The upper rotary switch operates in 1 A steps, while the lower switch provides 0.1 A steps. You can thus set values between 0.9 A and 9.9 A. The value set then applies to all three phases.

If you set the two rotary switches to zero, you must specify the rated motor current using the three parameter registers PR33 [▶ 35], PR39 [▶ 35] and PR45 [▶ 35]. You can then:

- set the rated current separately for each phase, if three different single-phase motors are connected, for example.
- use the extended setting range of 10.0 A to 15.0 A, which cannot be set via the rotary switches.

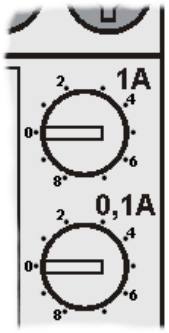


Fig. 2: KL8001 - rotary switch for setting the rated current

LEDs

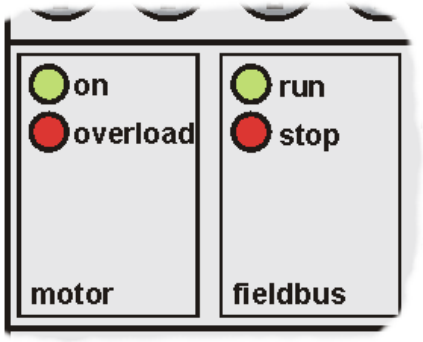


Fig. 3: KL8001 - LEDs

The power terminal has 4 LEDs for status display to enable rapid diagnosis. The possible states are listed in the following table.

LED	State	Description
on (motor)	on	Motor is running, either to the right or left
	off	Motor is switched off, or overload protection has triggered
overload (motor)	on	Motor has been switched off due to overload
	flashes (2 Hz)	Power has fallen below minimum load threshold
	flashes (5 Hz)	Overload threshold has been exceeded
	off	Nominal operation (load neither below minimum and or above maximum), or motor is switched off
run (fieldbus)	on	Communication with the terminal bus is taking place without errors
	off	No communication with the terminal bus (watchdog timer has triggered after 100 ms)
stop (fieldbus)	on	No communication with the terminal bus
	flashes	Error code and error argument are indicated as flashing code
	off	Communication with the terminal bus is taking place without errors

Flashing Code

If there is a fieldbus error, the *stop* LED indicates a flashing code that describes the fault more accurately:

The LED flickers for about 2 seconds before starting the error output. After a clearly visible pause, the error code is indicated through slow flashing, and the error argument is then indicated after a further pause. The following table allows you to determine the error more precisely with the aid of these two items of information.

Code	Argument	Description	Solution
1	0	No rated current set: both the two rotary switches and • the register PR33 are zero (single-phase analysis [▶ 27] not active) or • at least one of registers PR33, PR39 or PR45 is zero (single-phase analysis is active)	• Use the rotary switches [▶ 10] to set a rated current, or • enter values for the rated current in registers PR33 [▶ 35], PR39 [▶ 35] and PR45 [▶ 35].
2	n	Communication with the nth ADC is faulty	Contact your supplier.
3	n	Communication with the n^{th} Hall sensor is faulty	

Changing the terminal registers

✓ To ensure that the new values are applied to the measuring unit after the terminal registers have been changed, you have to perform:

a) a power-off reset (switch the terminal off and back on again) or

b) a software reset [▶ 34] (via the command register)!

2.3 KL8001 Power terminal - Technical data

KL8001	Power Terminal	
Number of power terminals per Bus Coupler	10 max.	If you operate two contactors with each power terminal (reversing contactor connection) then you may only use 5 power terminals with each Bus Coupler. Observe also the maximum current [▶ 14] that your Bus Coupler can supply to the K-bus!
Number of contactors per Bus Coupler	10 max.	
Type of fastening and mechanical connection	Suitable for Siemens contactors of the Sirius 3RT10 series, size S00	
Type of connection power path	Screw terminals for core cross-sections up to 2 x 2.5 mm^2	
Power path current loading (back-up fuse)	25 A max.	
Power path short-circuit strength	up to 5000 A	
Power path internal resistance	< 1 mΩ	
Setting range of rated current	via rotary switch [▶ 10]: 0.9 A to 9.9 A	
	via KS2000 [▶ 28] or parameter registers [▶ 35]: 0.9 A to 15.0 A	
Selectable tripping classes	CLASS 5, 10, 15, 20, 25, 30 selectable	
Measured values	Current, voltage, effective power, cos **j**, energy consumption, switching cycles, operating hours	
Measuring accuracy (at balanced load)	0.15 A_{rms}; 2 V_{rms}; 5 W; 1 kWh	
Crosstalk between the channels at unbalanced load	up to 3% from the difference	
Measuring voltage	500 V	
Type of K-bus connection	2 x flat plug socket, 10 pin	
K-bus current consumption (5 V_{DC})	typically 150 mA Observe the maximum current [▶ 14] that your Bus Coupler can supply to the K-bus!	
Contactor control voltage current consumption (24 V_{DC})	When contactor switched off: typically 7 mA	
	When contactor switched on: typically 7 mA + current in the contactor coil	
Dielectric strength	500 V (power contact/K-bus), 6000 V (mains supply/K-bus)	
Behavior under short-circuit conditions	conforms to EN 60947-4-1 (assignment type 2)/VDE 102	
Triggering tolerance	conforms to IEC 947, as well as UL and CSA	
Configuration options	Automatic over the fieldbus using the KS2000 configuration software, manual (rated current)	
Width in the process image	96 bits I/O (see description of the process image [▶ 29])	
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	
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	
Weight	approx. 90 g	
Dimensions (W x H x D)	approx. 45 mm x 69 mm x 74 mm	
Mounting	With lugs and connecting pins to Siemens contactors of the 3RT1016 series	
Installation position	variable (although you must observe the permitted installation positions of the contactors)	
Protection class	IP20	
Approvals/Markings*	CE, UKCA, EAC	

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

2.4 KL9060 Adapter terminal - Introduction

The KL9060 Adapter Terminal is used to connect power terminals to the K-bus of the Beckhoff bus terminal system.

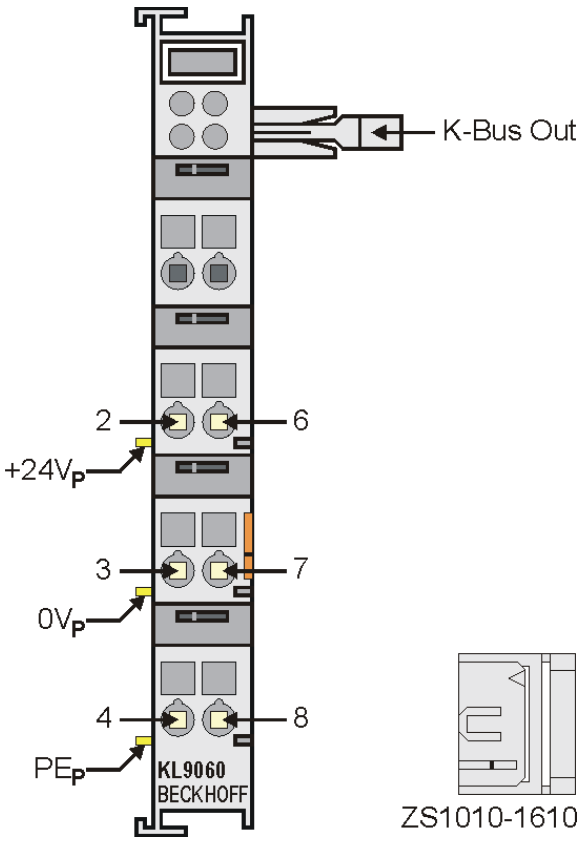


Fig. 4: KL9060

Name	Description
K-bus Out	Pin contact strip for the outgoing K-bus. Plug the long ribbon cable (approx. 10 cm) in here to the first power terminal.
ZS1010-1610	Insert the *ZS1010-1610* bus end plug into the *K-bus Out* pin contact strip on the last power terminal [▶ 20].
2 and 6	Terminals for the connection of the power contact's +24 V
3 and 7	Terminals for the connection of the power contact's 0 V
4 and 8	Terminals for the connection to the power contact's PE
+24 V_P	Power contact for +24 V
0 V_P	Power contact for 0 V
PE_P	Power contact for PE

2.5 Adapter terminal KL9060 - Technical data

KL9060	Adapter terminal	
Power contacts voltage (ribbon cable)	24 V_{DC} (-15%, +20%)	
Power contacts current loading (ribbon cable)	maximum 1400 mA (short-circuit proof). Observe the current consumption of the power terminals and the contactor coils!	
Voltage of the K-bus power supply (ribbon cable)	5 V_{DC}	
Current consumption of the K-bus power supply (ribbon cable)	maximum 2000 mA Observe the maximum current that your Bus Coupler can supply to the K-bus! Examples: • Low Cost Coupler: 500 mA • Economy Coupler: 500 mA • Economy Plus Coupler: 1750 mA • Standard Coupler: 1750 mA • KL9400 Power Supply Terminal: 2000 mA Use the KL9400 Power Supply Terminal if the current consumption of your terminals exceeds the maximum current that your Bus Coupler can feed to the K-bus supply.	
Number of power terminals per KL9060	10 max.	If you operate two contactors with each power terminal (reversing contactor connection) then you may only use 5 power terminals with each KL9060. Observe also the maximum current [▶ 14]that your Bus Coupler can supply to the K-bus!
Number of contactors per KL9060	10 max.	
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	
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	
Weight	approx. 50 g	
Dimensions (W x H x D)	approx. 33 mm x 100 mm x 70 mm	
Mounting	on 35 mm mounting rail conforms to EN 60715	
Installation position	variable	
Protection class	IP20	
Approvals/markings*	CE, UKCA, EAC	

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

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.

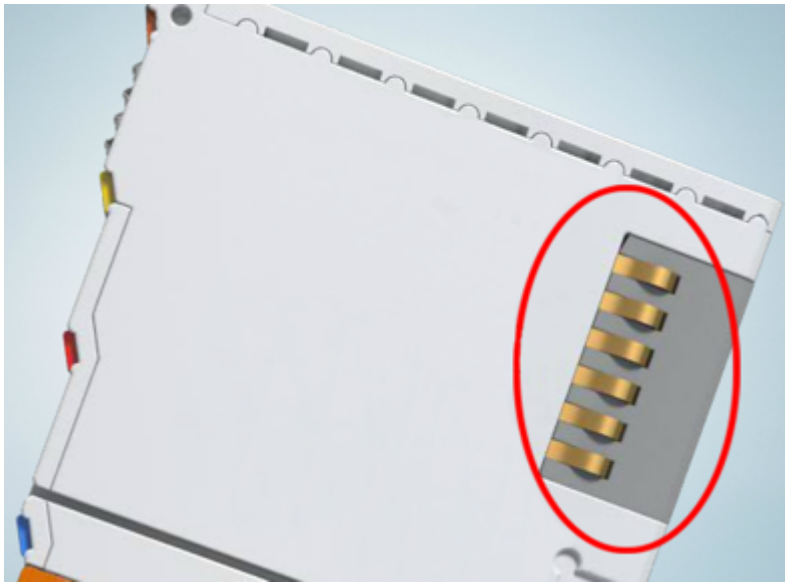


Fig. 5: Spring contacts of the Beckhoff I/O components

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

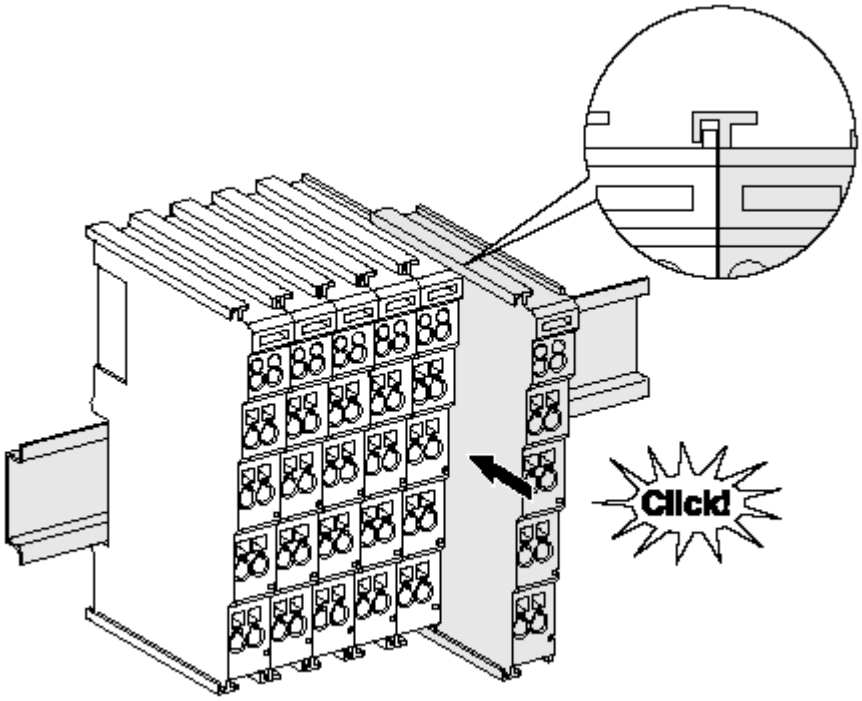


Fig. 6: Attaching on mounting rail

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

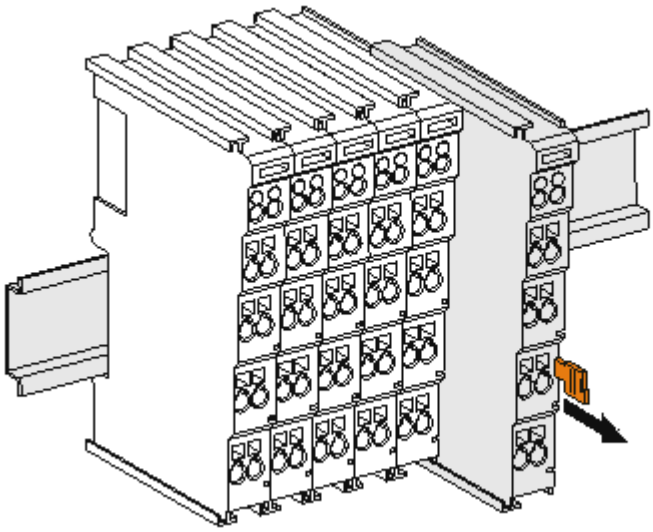


Fig. 7: Disassembling of terminal

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.

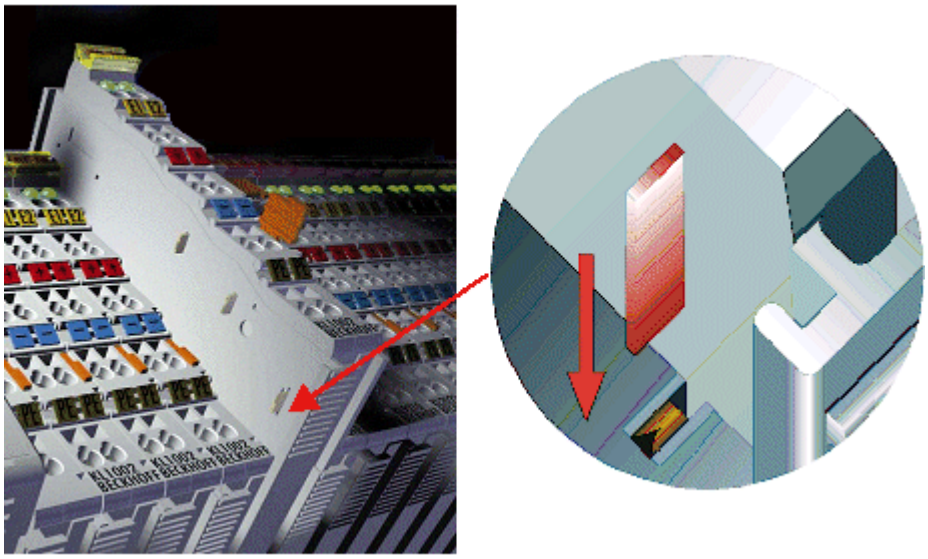


Fig. 8: Power contact on left side

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 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.

3.4 Mounting the KL8001

Preparation for mounting

1. Undo all 5 screw terminals (1L1, 3L2, 5L3, 13NO, A1+) on the mains connection side of the Siemens contactor.
2. Suspend the power terminal by inserting the two lugs into the two rectangular openings at the foot of the Siemens contactor.
3. Push the power terminal's 5 contact pins into the 5 opened screw terminals on the mains connection side of the Siemens contactor until the power terminal is located flush with the Siemens contactor. The power terminal's two lugs must not be allowed to slip out of the rectangular holes at the foot of the Siemens contactor!
4. Firmly tighten all 5 screw terminals on the mains side of the Siemens contactor. The power terminal must sit tightly, flush with the Siemens contactor!

NOTE

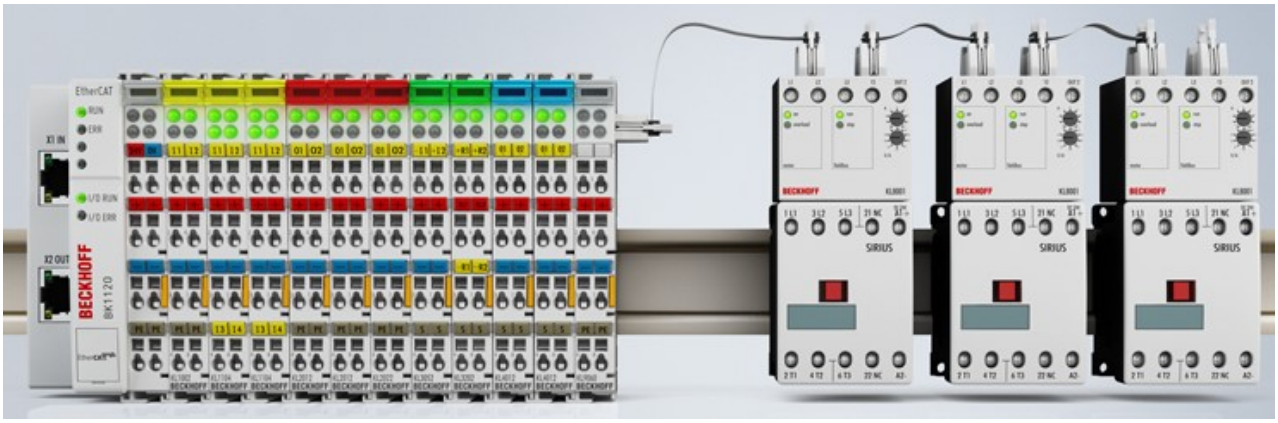
Intended use

Only use the KL8001 Power Terminal in combination with Siemens contactors of the SIRIUS 3RT10 series, size S00, as listed in the ordering information [▶ 46]!

Installing a Bus Terminal block with power terminals

When mounting, observe the information in the chapter entitled Mounting rail installation [▶ 16].

1. Ensure that the system is powered down and in a safe state.
2. Install the Bus Terminal block, consisting of the fieldbus coupler and any Bus Terminals that may be desired, on a mounting rail.
   Fit a KL9060 Adapter Terminal as the last Bus Terminal at the end of the Bus Terminal block instead of a standard end terminal (KL9010).
3. Clip the Siemens contactor, with the power terminal mounted on it, about 3 cm away on the mounting rail next to the KL9060 Adapter Terminal.
4. Use the ribbon cable, about 10 cm long, included with the KL9060 Adapter Terminal, to join the power terminal to the KL9060.
5. Connect the power terminal to the next power terminal, using the ribbon cable (approx. 3 cm long) supplied with the power terminal.
   or
   connect the terminal connector supplied with the KL9060 Adapter Terminal to the continuation plug connector of the last power terminal.
   Up to 10 type KL8001 Power Terminals can be operated from one Bus Terminal block.



3.5 Connection

⚠ 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!

The first power terminal is connected to the end of the Bus Terminal block with the KL9060 [▶ 13] Adapter Terminal. The K-bus, and the contactor control voltage (24 V) are brought from the KL9060 to the first power terminal via a ribbon cable about 10 cm in length. Other power terminals are connected using a ribbon cable about 3 cm. Insert the ZS1010-1610 bus end plug included with the KL9060 into the last power terminal!

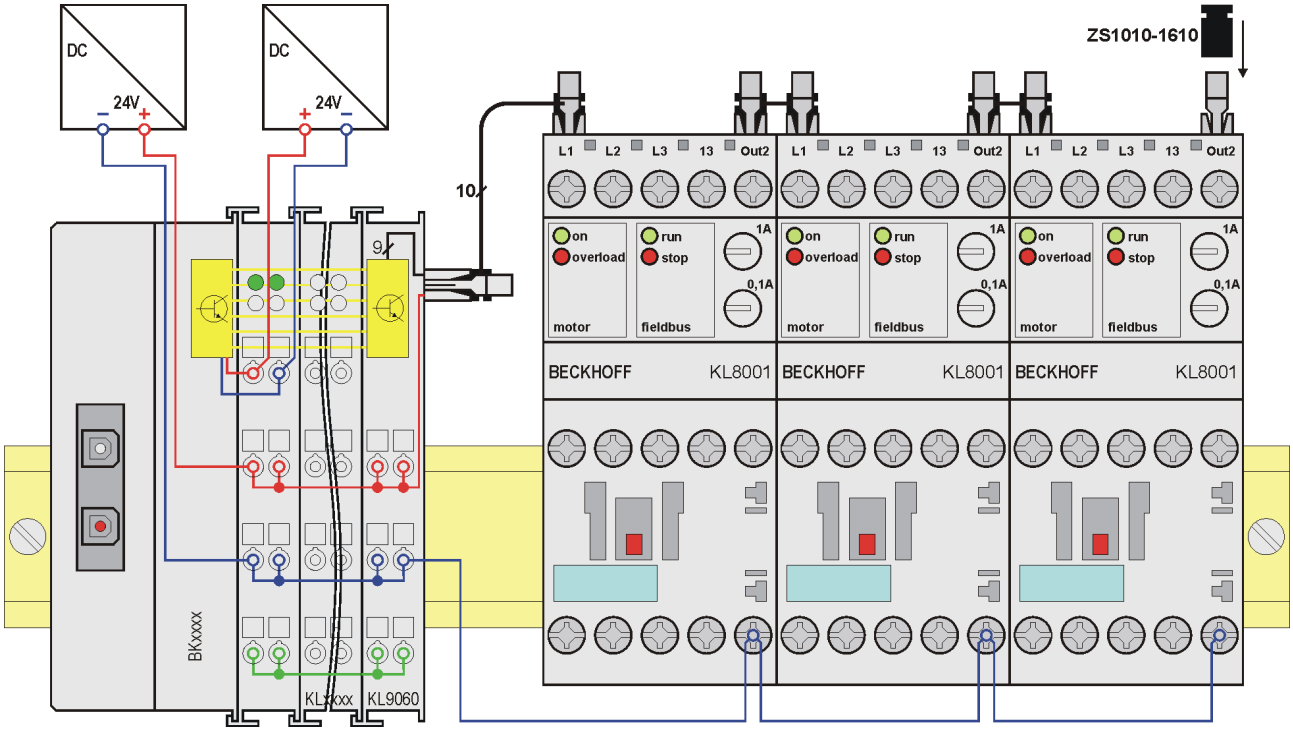


Fig. 9: KL8001, KL9060 - Connection

Power is supplied to the KL8001 electronics via the K-bus (through the ribbon cable).

The (24 V) contactor control voltage that is to be switched by the power terminals is also passed along the ribbon cable, but is electrically isolated from the K-bus. You may simply join the ground connection for the contactor coils (A2-) with the free ground terminals (0 V, contacts 3 and 7) on the KL9060 [▶ 13] Adapter Terminal.

NOTE

Rated current inadmissibly exceeded

The KL9060 Adapter Terminal can supply up to 1.4 A rated current to power the contactor coils (24 V_{DC}). Make sure that this rated current is not exceeded.

3.6 Application examples

⚠ WARNING

Protection of the load circuit

Ensure that the load circuit can be fused with up to a maximum of 25 A per phase.

Motor control

The following figure illustrates control of a three-phase AC motor utilizing a KL8001 and a Siemens contactor. The power terminal's Out1 output controls the Siemens contactor.

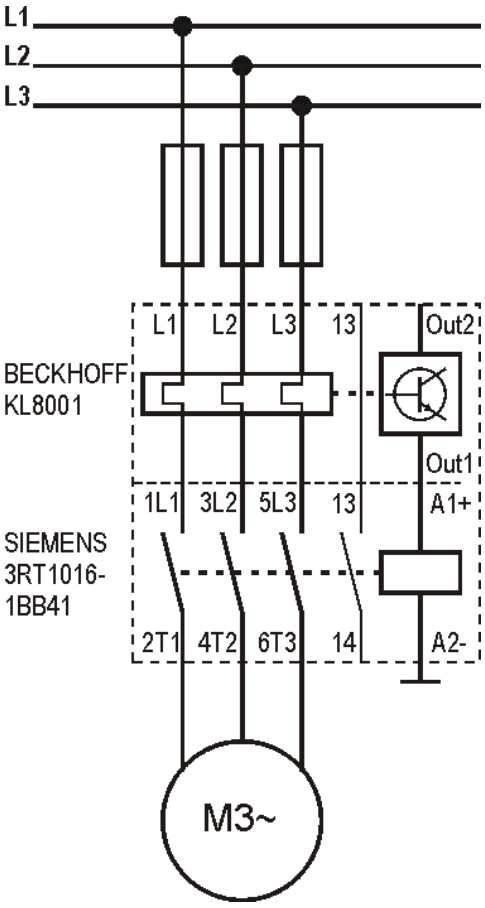


Fig. 10: Application example: Motor control

Reversing contactor connection

The following figure illustrates a reversing contactor connection utilizing a KL8001 and two Siemens contactors. The power terminal's Out1 and Out2 outputs alternately control the two Siemens contactors.

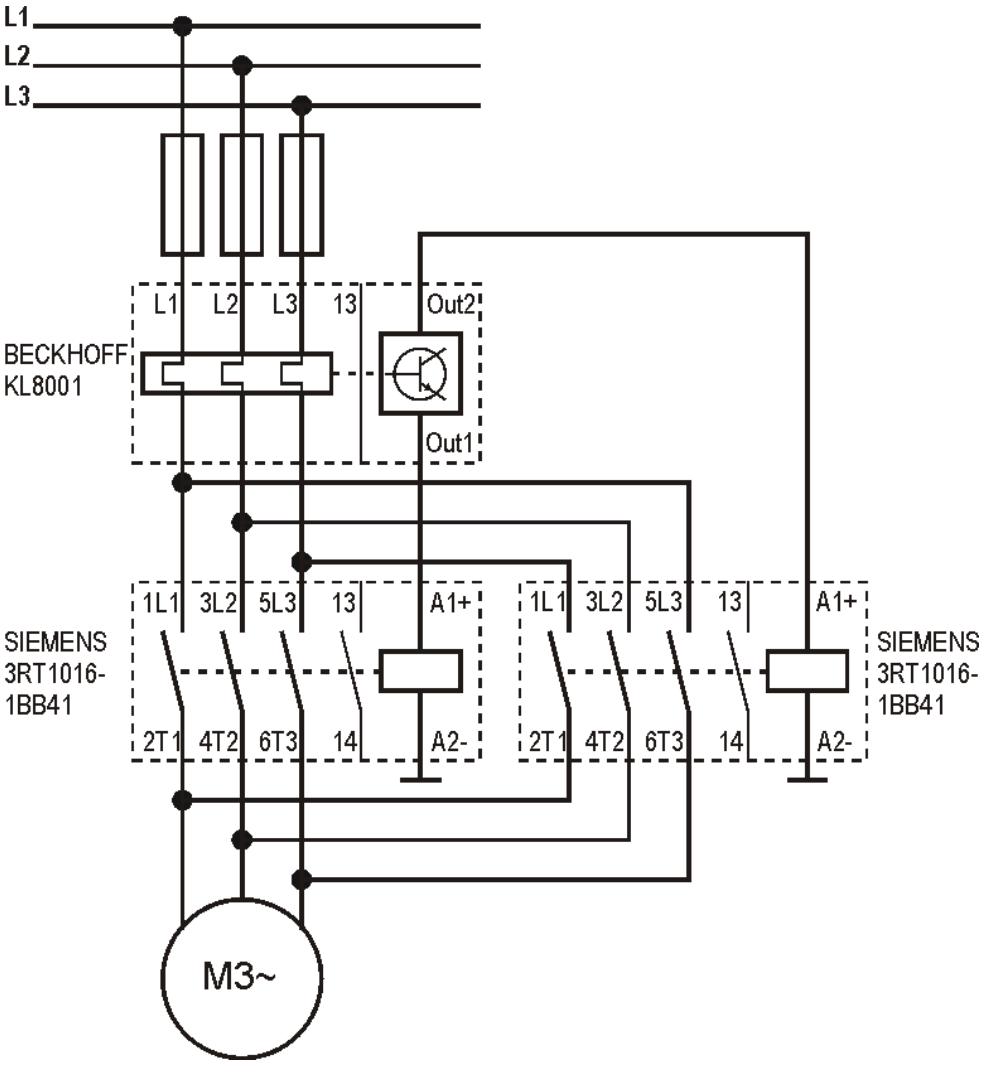


Fig. 11: Application example: Reversing contactor connection

Installation notes for reversing contactor connection

- Use the Siemens kit for reversing combinations [▶ 46] to facilitate installation of the power terminal in the reversing contactor connection directly at the contactor (see diagram below).

  ⇨ To do this, remove the connections for the auxiliary contacts and for A1 at the mains-side bridge of the Siemens kit by breaking these connections at the locations provided for the purpose (red line).

  ⇨ The connections for the auxiliary contact and for A1 are not required for a reversing contactor connection controlled by a KL8001, because the KL8001 interlocks the two contactors.

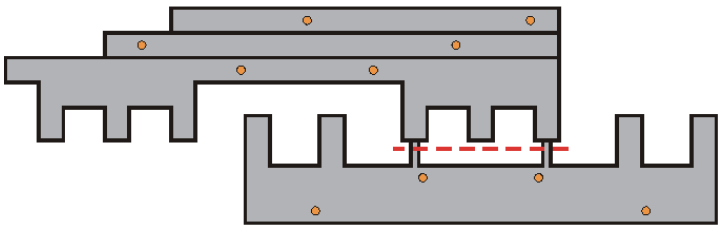


Fig. 12: Siemens kit for reversing combination

4 KS2000 Configuration Software

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. 13: 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

- a BK9000 Bus Coupler for Ethernet
- a KL1xx2 digital input terminal
- a KL9060 Adapter Terminal for connecting power terminals (which is not yet displayed by some versions of KS2000)
- a KL8001 Power Terminal for connecting Siemens contactors of the Sirius R3 series
- a ZS1010-1610 [▶ 46] bus end plug (some versions of KS2000 still show the bus end plug as the KL9010 End Terminal)

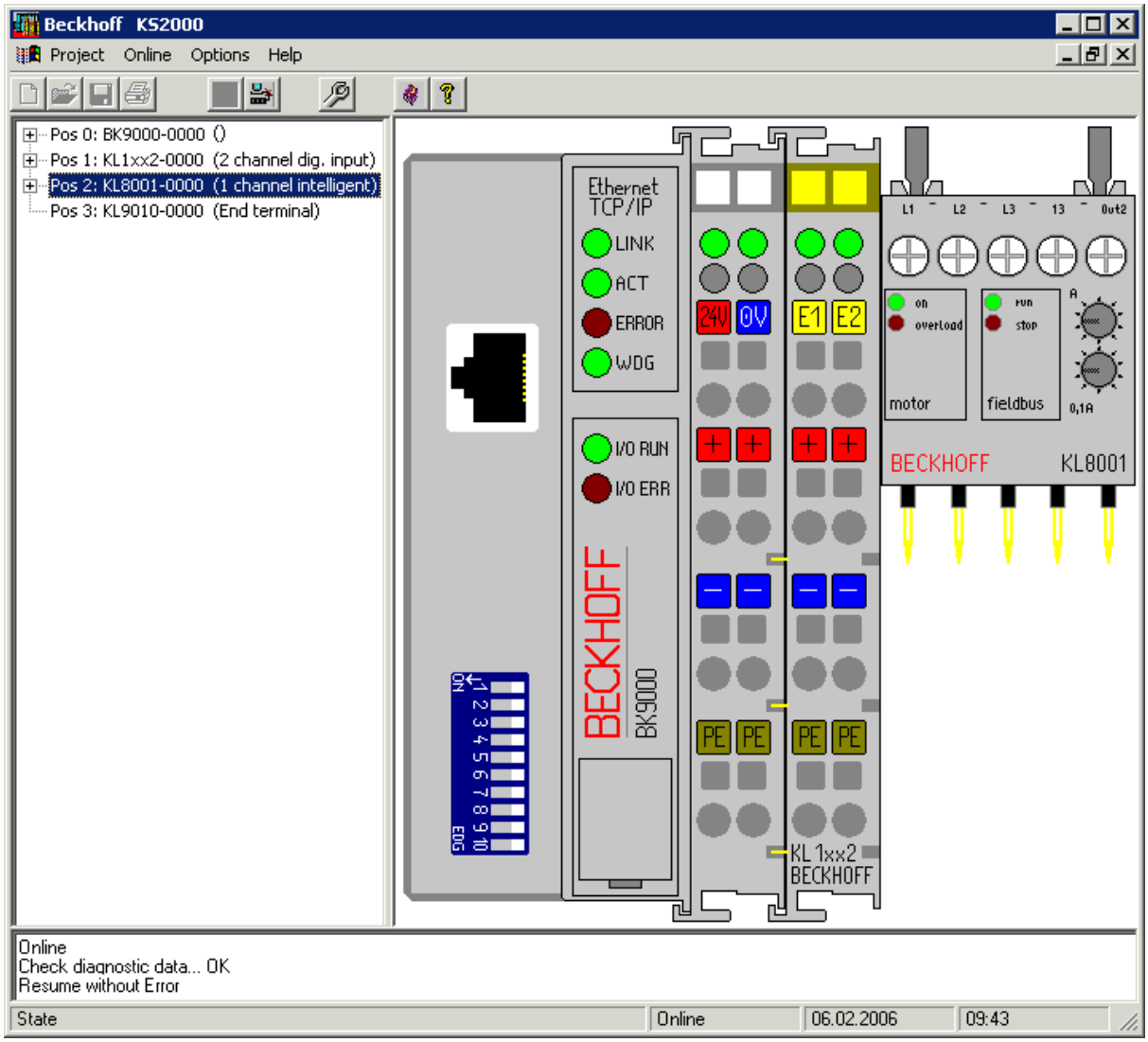


Fig. 14: Display of the fieldbus station in KS2000

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).

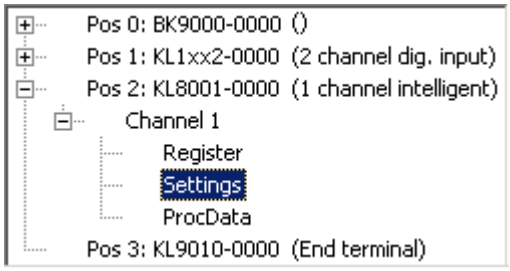


Fig. 15: KS2000 branches for channel 1 of the KL8001

Click on *Settings*. You can modify the power terminal settings in the configuration mask [▶ 26] which is then displayed.

- Operation mode [▶ 27]
- Fast shut off [▶ 27]
- Register values [▶ 28]

4.3 Settings

Header

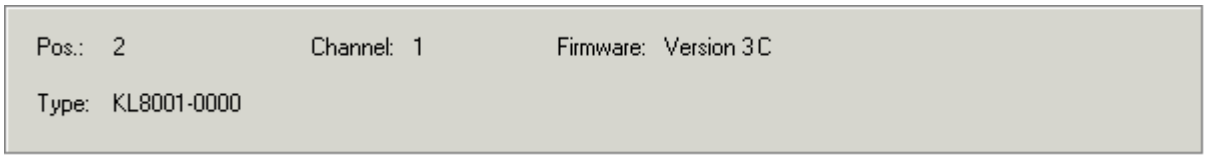


Fig. 16: Settings via KS2000 - Header

Pos.	Position of the terminal in the terminal block
Type	Terminal type
Channel	Channel whose parameters are displayed in the configuration screen
Firmware	Firmware version of the K-bus PCB

Configuration screen

In the *Settings* screen you can set of the behavior of the KL8001 Power Terminal.

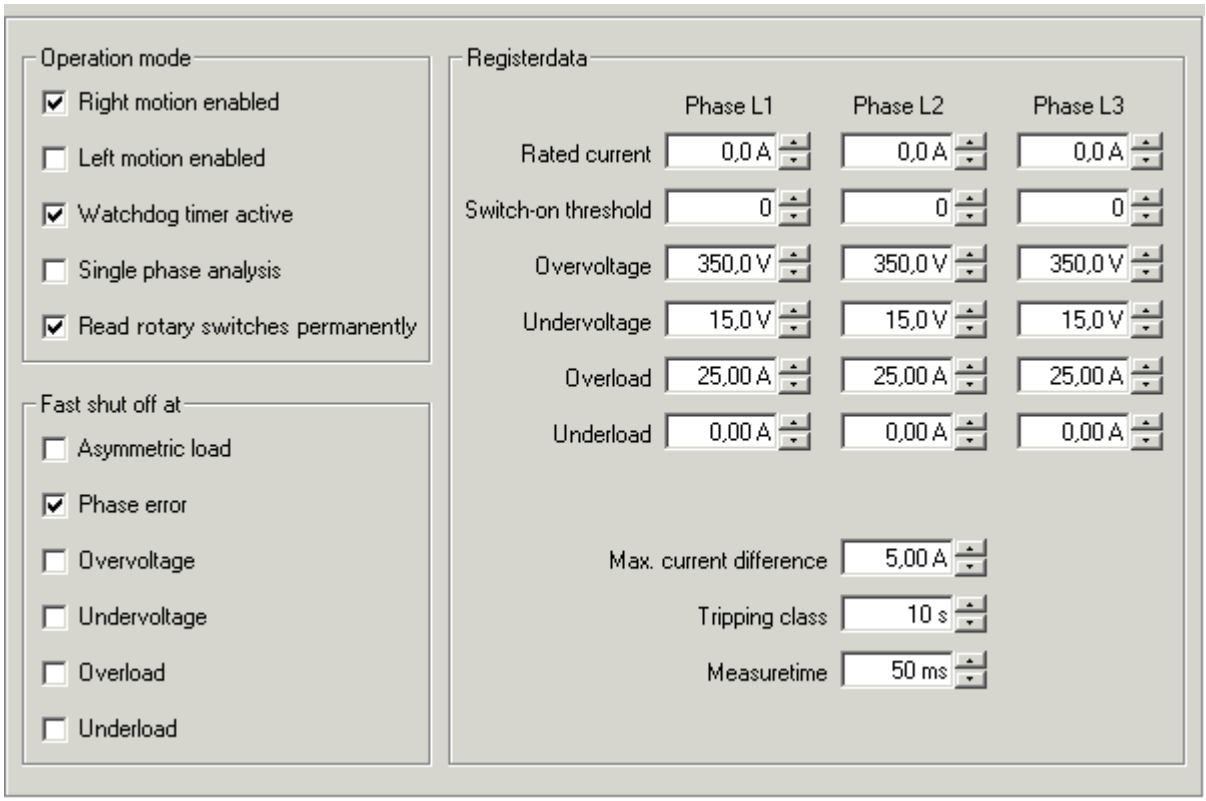


Fig. 17: Settings via KS2000 - Configuration screen

Operation mode

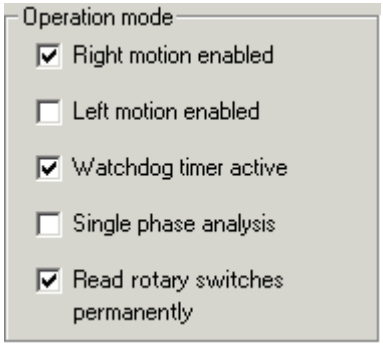


Fig. 18: Setting the operation mode via KS2000

Select from the various operation modes here.

Right motion enabled (PR32.0 [▶ 35]) Default: enabled	Enable for motor rotation to the right. Allows the motor to start rotating to the right using bit 5 in the extended control byte [▶ 31].
Left motion enabled (PR32.1 [▶ 35]) Default: not enabled	Enable for motor rotation to the left. Allows the motor to start rotating to the left using bit 6 in the extended control byte [▶ 31].
Watchdog timer active (PR32.2 [▶ 35]) Default: active	Activates the watchdog. If the power terminal does not receive any data from the fieldbus for 100 ms, the watchdog switches the motor off and stops data transmission.
Single phase analysis (PR32.3 [▶ 35]) Default: not active	Activates analysis of the single phases. The phases are each compared with their associated register values [▶ 32], and analyzed individually. If you switch single phase analysis off, then the values entered for phase L1 applies to all three phases.
Read rotary switches permanently (PR32.5 [▶ 35]) Default: active	In normal operation, the rotary switches [▶ 10] for setting the rated current are read continuously. The transfer of modified values does not require a reset.

Fast shut off

Select here the motor states for which fast shut off should be triggered after 500 ms.

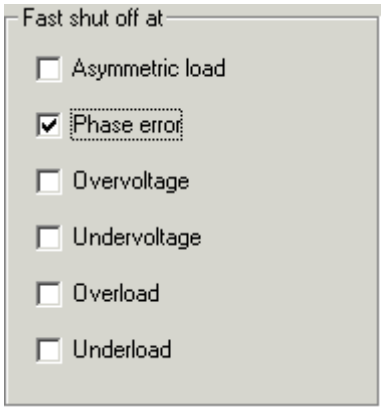


Fig. 19: Selecting the condition for fast shut off

Asymmetric load (PR32.8 [▶ 35]) Default: not active	Activates fast shut off if the difference between the currents in L1, L2 or L3 exceeds the maximum permissible current difference [▶ 28].
Phase error (PR32.9 [▶ 35]) Default: active	Activates fast shut off if a phase fails.
Overvoltage* (PR32.10 [▶ 35]) Default: not active	Activates fast shut off in the presence of overvoltage.
Undervoltage* (PR32.11 [▶ 35]) Default: not active	Activates fast shut off in the presence of undervoltage.
Overload (PR32.12 [▶ 35]) Default: not active	Activates fast shut off in the presence of overload.
Underload (PR32.13 [▶ 35]) Default: not active	Activates fast shut off in the presence of underload.

*) The voltages of the three phases are measured with reference to an artificial star point.

Registerdata

Enter the various threshold values here. The range of values for some of the input fields is restricted (e.g. the rated current must be between 0.0 and 25.0 A), and is automatically limited during input.

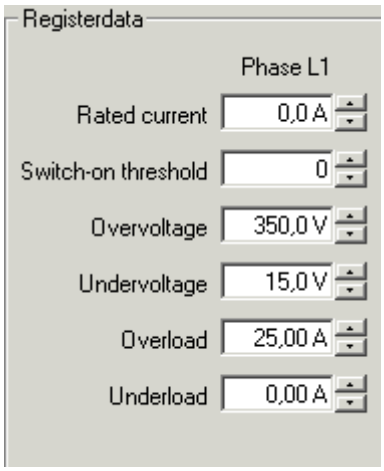


Fig. 20: Setting the register values; example: phase L1

Rated current
(PR33 [▶ 35], PR39 [▶ 35], PR45 [▶ 35])
Default: 0 A
permitted setting range:
0.9 A to 15.0 A

Specification of the rated current for the L1, L2 and L3 phases.
These values are only used when both the rotary switches [▶ 10]on the front of the KL8001 for setting the rated current are set to zero. Otherwise the value set with the rotary switches applies to all three phases.

Switch-on threshold
(PR34 [▶ 36], PR40 [▶ 36], PR46 [▶ 36])
Default: 0

Specification of the switch-on threshold for the L1, L2 and L3 phases.

Overvoltage*
(PR35 [▶ 36], PR41 [▶ 36], PR47 [▶ 37])
Default: 350 V

Specifying the threshold value for overvoltage for phases L1, L2 and L3.

*) The voltages of the three phases are measured with reference to an artificial star point.

Undervoltage*
(PR36 [▶ 36], PR42 [▶ 37], PR48 [▶ 37])
Default: 150 V

Specifying the threshold value for undervoltage for phases L1, L2 and L3.

Overload
(PR37 [▶ 36], PR43 [▶ 37], PR49 [▶ 37])
Default: 25 A

Specification of the overload thresholds for the L1, L2 and L3 phases.

Underload
(PR38 [▶ 36], PR44 [▶ 37], PR50 [▶ 37])
Default: 0 A

Specification of the underload thresholds for the L1, L2 and L3 phases.

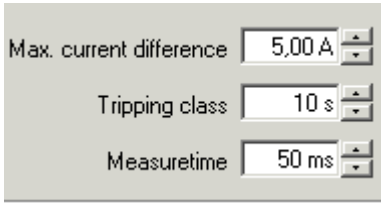


Fig. 21: Setting the register values: max. current difference, tripping class, measuring cycle time

Max. current difference (PR51 [▶ 37])
Default 5 A

Specification of the maximum permitted current difference between the L1, L2 and L3 phases.

Tripping class (PR52 [▶ 38])
Default: 10 s

Specification of the tripping class.

Measuretime (PR53 [▶ 38])
Default: 50 ms

Specification of the measuring cycle time.

5 Access from the user program

5.1 Process image

The power terminal is represented in the process image with 12 bytes of input and output data each. These are organized as follows:

Byte-Offset without Word-Alignment*	Byte-Offset with Word-Alignment*	Format	Input data	Output data
0	0	Byte	Status-Byte 0 (SB0 [▶ 29])	Control-Byte 0 (CB0 [▶ 29])
1	2	Word	DataIN0	DataOUT0
3	4	Byte	Status-Byte 1 (SB1 [▶ 29])	Control-Byte 1 (CB1 [▶ 29])
4	6	Word	DataIN1	DataOUT1
6	8	Byte	Status-Byte 2 (SB2 [▶ 29])	Control-Byte 2 (CB2 [▶ 29])
7	10	Word	DataIN2	DataOUT2
9	12	Byte	Extended Status-Byte (ESB [▶ 32])	Extended Control-Byte (ECB [▶ 31])
10	14	Word	not used**	not used**

*) Word-Alignment: The Bus Coupler places values on even byte addresses

**) The process image is extended by an unused word in the input and output range, so that the power terminal appears like a four-channel analog terminal.

5.1.1 Control and Status Bytes

The control bytes 0 (CB0), 1 (CB1) and 2 (CB2) are in the output image [▶ 29] and are transferred from the controller to the power terminal. Pay attention to the assignment [▶ 42] of the control bytes to the process input data words in process data mode.

The status bytes 0 (SB0), 1 (SB1) and 2 (SB2) are in the input image [▶ 29] and are transferred from the power terminal to the controller.

Since the structure and application of the control and status bytes are identical, they are described below using control byte 0 (CB0) and status byte 0 (SB0) as examples.

5.1.1.1 Control and status byte 0 in process data mode

Control byte 0 in process data mode

Control byte 0 (CB0) is in the output image [▶ 29] and is transferred from the controller to the power terminal.

Bit	CB0.7	CB0.6	CB0.5	CB0.4	CB0.3	CB0.2	CB0.1	CB0.0
Name	RegAccess	R/W	DR no.					

Key

Bit	Name	Description	
CB0.7	RegAccess	0_{bin}	Register communication off (process data mode)
CB0.6	R/W	0_{bin}	Read access
		(1_{bin})	Because the KL8001 data registers can only be read, write access is not useful.
CB0.5 to CB0.0	DR no.	Data register number: Enter the number of the data register [▶ 42] that you want to read with input data word 0 here.	

Status byte 0 in process data mode

Status byte 0 (SB0) is located in the power terminal's input image [▶ 29], and is transmitted from the power terminal to the controller.

Bit	SB0.7	SB0.6	SB0.5	SB0.4	SB0.3	SB0.2	SB0.1	SB0.0
Name	RegAccess	ES Error Info	DR no.					

Key

Bit	Name	Description	
SB0.7	RegAccess	0_{bin}	Acknowledgement for process data access
SB0.6	ES Error Info	1_{bin}	The lowest nibble (ES.3 to ES.0) in the extended status byte [▶ 32] contains error information. Evaluate the extended status byte!
SB0.5 to SB0.0	DR no.	The number of the data register [▶ 42] that is to be read.	

5.1.1.2 Control and status byte 0 for register communication

Control byte 0 in register communication

Control byte 0 (CB0) is in the output image [▶ 29] and is transferred from the controller to the power terminal.

Bit	CB0.7	CB0.6	CB0.5	CB0.4	CB0.3	CB0.2	CB0.1	CB0.0
Name	RegAccess	R/W	PR no.					

Key

Bit	Name	Description	
CB0.7	RegAccess	1_{bin}	Register communication switched on
CB0.6	R/W	0_{bin}	Read access
		1_{bin}	Write access
CB0.5 to CB0.0	PR no.	Parameter register number: Enter the number of the parameter register [▶ 34] that you want to • to read with input data word 0 or • write to with output data word 0.	

⚠ WARNING

Invalid process data during register communication!

It is not possible to access the data registers during register communication! Process data that may still be displayed is not valid!

Status byte 0 in register communication

Status byte 0 (SB0) is in the input image [▶ 29] and is transferred from the power terminal to the controller.

Bit	SB0.7	SB0.6	SB0.5	SB0.4	SB0.3	SB0.2	SB0.1	SB0.0
Name	RegAccess	R	PR no.					

Key

Bit	Name	Description	
SB0.7	RegAccess	1_{bin}	Acknowledgment for register access
SB0.6	R	0_{bin}	Read access
SB0.5 to SB0.0	PR no.	The number of the parameter register that is to be read or written.	

5.1.2 Extended Control-Byte

The extended control byte (ECB) is transmitted in process data mode [▶ 29] from the controller to the terminal, and controls a variety of functions within the power terminal.

Extended Control-Byte

Bit	ECB.7	ECB.6	ECB.5	ECB.4	ECB.3	ECB.2	ECB.1	ECB.0
Name	-	Motor left motion	Motor right motion	-	-	-	-	Clear I_{max}

Key

Bit	Name	Value	Description
ECB.7	-	0_{bin}	reserved
ECB.6	Motor left motion*	1_{bin}	Switches the motor into rotation to left: The power terminal's output *Out2* is set, in order so switch on the contactor connected through the Siemens kit for reversing combinations [▶ 22]
ECB.5	Motor right motion*	1_{bin}	Switches the motor into rotation to right: The power terminal's output *Out1* is set, in order to switch on the contactor mounted directly on the power terminal.
ECB.4 to ECB.1	-	0_{bin}	reserved
ECB.0	Clear I_{max}	1_{bin}	The DR2 [▶ 42] data registers are set to zero in all three register sets (they contain the peak values of the currents). Because locked-rotor currents of motors are much larger than the rated currents, the DR2 [▶ 42] data registers indicate a high current each time a motor has started. In order to be able to detect any peak currents that might occur during nominal operation, you can set the DR2 [▶ 42] data registers to zero at any time with this bit.

*) Notes:

- Rotation to the right or left must be enabled (with bits 0 and 1 respectively) in the feature register [▶ 35] if it is to be possible to switch the motor to right-handed (bit 5) or left-handed (bit 6) rotation with the extended control byte.
- If the motor is running to the right (output *Out1* is set), you must first switch this off (by resetting bit 5) before you can switch it to left-handed rotation with bit 6. If you set bit 6 while the motor is running to the right, the power terminal will switch the motor off.
- If the motor is running to the left (output *Out2* is set), you must first switch this off (by resetting bit 6) before you can switch it to right-handed rotation with bit 5. If you set bit 5 while the motor is running to the left, the power terminal will switch the motor off.
- If you set bits 5 and 6 at the same time, the motor remains switched off.

5.1.3 Extended Status-Byte

The extended status byte (ESB) contains information on the state of the KL8001, and is transmitted from the terminal to the controller in process data mode [▶ 29].

Extended Status-Byte

Bit	ESB.7	ESB.6	ESB.5	ESB.4	ESB.3	ESB.2	ESB.1	ESB.0
Name	Rated operation	Motor Rotation to the left	Motor Rotation to the right	-	SW Error Info	Overload motor STOP	Underload	Overload

Key

Bit	Name	Value	Description
ESB.7	Rated operation	0_{bin}	An overload or underload has occurred, or the motor has been switched off because of overloading.
		1_{bin}	The power terminal is in nominal operation.
ESB.6	Motor left motion	1_{bin}	The power terminal's *Out2* output is set.
ESB.5	Motor right motion	1_{bin}	The power terminal's *Out1* output is set.
ESB.4	-	0_{bin}	reserved
ESB.3	SW error information	1_{bin}	The status word [▶ 43] contains error information. Evaluate the status word!
ESB.2	Overload motor STOP	1_{bin}	The power terminal has switched off the motor, because the current integral (data register DR7 [▶ 42]) has reached the maximum value. This bit will only be reset when the switch-on protection phase has elapsed, and the bits for motor control (ECB.5 and ECB.6) have been reset in the extended control byte [▶ 31].
ESB.1	Underload	1_{bin}	The current in at least one of the phases has fallen below the specified underload threshold (parameter registers PR38 [▶ 36], PR44 [▶ 37], PR50 [▶ 37]).
ESB.0	Overload	1_{bin}	The current in at least one of the phases has exceeded the specified overload threshold (parameter registers PR37 [▶ 36], PR43 [▶ 37], PR49 [▶ 37]).

5.2 Parameter registers (overview)

These registers are used to parameterize the power terminal. They can be read or written by means of register communication.

Transferring new values after a power-off reset

Carry out a power-off reset (switching the terminal off and then on again) each time the terminal registers are changed so that the new values are also adopted by the measurement unit!

PR no.	Comment	Default value		R/W	Memory
PR0	reserved	-	-	-	-
...	...	...	...	...	...
PR5	reserved	-	-	-	-
PR6	Diagnostic register	-	-	R	RAM
PR7 [▶ 34]	Command register	0x0000	0_{dec}	-	-
PR8 [▶ 34]	Terminal type	0x1F41	8001_{dec}	R	ROM
PR9 [▶ 34]	Firmware version	e.g. 0x3141	12609_{dec}	R	ROM
PR10	Multiplex shift register	0x0230 / 0x0418	560_{dec} / 1048_{dec}	R	ROM
PR11	Signal channels	0x0160	352_{dec}	R	ROM
PR12	Minimum data length	0x6060	24672_{dec}	R	ROM
PR13	Data structure	0x0007	7_{dec}	R	ROM
PR14	reserved	-	-	-	-
PR1	Alignment register	-	-	R/W	RAM
PR16	Hardware Version	e.g. 0x0000	e.g. 0_{dec}	R/W	Flash
PR17 [▶ 34]	L1 voltage gain compensation	e.g. 0x0B00	e.g. 2816_{dec}	R/W	Flash
PR18 [▶ 34]	L2 voltage gain compensation	e.g. 0x0B00	e.g. 2816_{dec}	R/W	Flash
PR19 [▶ 34]	L3 voltage gain compensation	e.g. 0x0B00	e.g. 2816_{dec}	R/W	Flash
PR20 [▶ 34]	L1 current gain compensation	e.g. 0x3000	e.g. 12288_{dec}	R/W	Flash
PR21 [▶ 34]	L2 compensation gain current	e.g. 0x3000	e.g. 12288_{dec}	R/W	Flash
PR22 [▶ 34]	L3 compensation gain current	e.g. 0x3000	e.g. 12288_{dec}	R/W	Flash
PR23 [▶ 34]	Hall Sensor Sensitivity	0x1FE3	8163_{dec}	R/W	Flash
PR24	reserved	-	-	-	-
...	...	...	...	...	...
PR30	reserved	-	-	-	-
PR31 [▶ 35]	Code word register	-	-	R/W	RAM
PR32 [▶ 35]	Feature-Register	0x0221	545_{dec}	R/W	Flash
PR33 [▶ 35]	Rated current L1	0x0000	0_{dec}	R/W	Flash
PR34 [▶ 36]	Switch-on threshold L1	0x0000	0_{dec}	R/W	Flash
PR35 [▶ 36]	Overvoltage threshold L1	0x0DAC	3500_{dec}	R/W	Flash
PR36 [▶ 36]	Undervoltage threshold L1	0x0096	150_{dec}	R/W	Flash
PR37 [▶ 36]	Overload threshold L1	0x09C4	2500_{dec}	R/W	Flash
PR38 [▶ 36]	Underload threshold L1	0x0000	0_{dec}	R/W	Flash
PR39 [▶ 35]	Rated current L2	0x0000	0_{dec}	R/W	Flash
PR40 [▶ 36]	Switch-on threshold L2	0x0000	0_{dec}	R/W	Flash
PR41 [▶ 36]	Overvoltage threshold L2	0x0DAC	3500_{dec}	R/W	Flash
PR42 [▶ 37]	Undervoltage threshold L2	0x0096	150_{dec}	R/W	Flash
PR43 [▶ 37]	Overload threshold L2	0x09C4	2500_{dec}	R/W	Flash
PR44 [▶ 37]	Underload threshold L2	0x0000	0_{dec}	R/W	Flash
PR45 [▶ 35]	Rated current L3	0x0000	0_{dec}	R/W	Flash
PR46 [▶ 36]	Switch-on threshold L3	0x0000	0_{dec}	R/W	Flash
PR47 [▶ 37]	Overvoltage threshold L3	0x0DAC	3500_{dec}	R/W	Flash
PR48 [▶ 37]	Undervoltage threshold L3	0x0096	150_{dec}	R/W	Flash
PR49 [▶ 37]	Overload threshold L3	0x09C4	2500_{dec}	R/W	Flash
PR50 [▶ 37]	Underload threshold L3	0x0000	0_{dec}	R/W	Flash
PR51 [▶ 37]	Maximum current difference	0x01F4	500_{dec}	R/W	Flash
PR52 [▶ 38]	Tripping class	0x000A	10_{dec}	R/W	Flash
PR53 [▶ 38]	Measuring cycle time	0x0032	50_{dec}	R/W	Flash
PR54	reserved	-	-	-	-
...	...	...	...	...	...
PR63	reserved	-	-	-	-

5.2.1 Parameter registers (description)

These registers are used to parameterize the power terminal. They can be read or written by means of register communication [▶ 38].

PR7: Command register

In order to be able to call a command, you first have to enter the user codeword 0x1235 in register R31 [▶ 35].

Command 0x7000: Restore Factory Settings

Entering 0x7000 in register R7 restores the delivery state for the following registers:

PR32 [▶ 35]: 545 (0x0221)
PR33 [▶ 35]: 0
PR34 [▶ 36]: 0
PR35 [▶ 36]: 3500
PR36 [▶ 36]: 150
PR37 [▶ 36]: 2500
PR38 [▶ 36]: 0
PR39 [▶ 35]: 0
PR40 [▶ 36]: 0
PR41 [▶ 36]: 3500
PR42 [▶ 37]: 150
PR43 [▶ 37]: 2500
PR44 [▶ 37]: 0
PR45 [▶ 35]: 0
PR46 [▶ 36]: 0
PR47 [▶ 37]: 3500
PR48 [▶ 37]: 150
PR49 [▶ 37]: 2500
PR50 [▶ 37]: 0
PR51 [▶ 37]: 500
PR52 [▶ 38]: 10
PR53 [▶ 38]: 50

Command 0x8000: Software reset

Entry 0x8000 in register R7 triggers a full software reset of the power terminal. All internal variables are cleared. The internal circuits (output driver) are reinitialized with a software reset.

⚠ WARNING

Risk of injury

During a software reset, the contactor connected to the power terminal is released. Ensure that your system state permits this and that hazards for persons or machinery have been ruled out!

PR8: Terminal description

Register PR8 contains the terminal identifier in hexadecimal coding: KL8001: 0x1F41 (8001_{dec})

PR9: Firmware version

Register PR9 contains the firmware version of the terminal in hexadecimal coding, e. g. 0x3141 (12609_{dec}).

PR17, PR18, PR19: Voltage gain compensation

These registers contain the compensation values determined at production, and cannot be changed.

PR20, PR21, PR22: Current gain compensation

These registers contain the compensation values determined at production, and cannot be changed.

PR23: Hall-Sensor sensitivity

The sensitivity of the Hall sensor is adjusted during production, and has a direct effect on the compensation values; it cannot be changed.

PR31: Code word register

- If you write values into the user registers without previously having entered the user code word (0x1235) in the code word register, these values are only stored in the RAM registers, but not in the EPROM registers and are therefore lost if the terminal is restarted.
- 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 EPROM registers and are therefore retained if the terminal is restarted.

The code word is reset if the terminal is restarted.

PR32: Feature-Register

A variety of KL8001 functions can be activated or enabled by means of the feature register.

Single phase analysis makes it possible to connect three single-phase motors to the power terminal. In this case, the current values for the detection of an overload are evaluated separately. This means that if an error state occurs in one of the three phases L1, L2, or L3, then the corresponding contactor is switched off.

Fast shut off is triggered after about 500 ms if one of the fast shut off functions has been activated and the corresponding error state occurs.

Bit	Name	Value	Description	Default
PR32.15	-	0_{bin}	reserved	0_{bin}
PR32.14	-	0_{bin}	reserved	0_{bin}
PR32.13	enFsoUnderload	1_{bin}	Fast shut off in the event of underload is active	0_{bin}
PR32.12	enFsoOverload	1_{bin}	Fast shut off in the event of overload is active	0_{bin}
PR32.11	enFsoUndervoltage*	1_{bin}	Fast shut off in the event of undervoltage is active	0_{bin}
PR32.10	enFsoOvervoltage*	1_{bin}	Fast shut off in the event of overvoltage is active	0_{bin}
PR32.9	enFsoPhaseError	1_{bin}	Fast shut off in the event of a phase error is active	1_{bin}
PR32.8	enFsoAsymmetricLoad	1_{bin}	Fast shut off if the load is asymmetric is active	0_{bin}
PR32.7	-	0_{bin}	reserved	0_{bin}
PR32.6	-	0_{bin}	reserved	0_{bin}
PR32.5	enPermanent RotarySwitchEvaluation	0_{bin}	The rotary switches for the rated current are only read during a power reset.	1_{bin}
		1_{bin}	The rotary switches for the rated current are continuously read during normal operation.	
PR32.4	enDcCurrentMeasurement	1_{bin}	DC current measurement is active: the upstream high-pass filter is switched off.	0_{bin}
PR32.3	enSinglePhaseAnalysis	0_{bin}	Single-phase analysis is disabled: the values entered for the L1 phase applies to all three phases.	0_{bin}
		1_{bin}	Single-phase analysis is active: the phases are each compared with their associated register values [▶ 32], and analyzed individually.	
PR32.2	disWatchdog	0_{bin}	Watchdog is active: If the power terminal does not receive any data from the fieldbus for 100 ms, the watchdog switches the motor off and stops data transmission.	0_{bin}
PR32.1	enLeftMotion	1_{bin}	Allows the motor to start rotating to the left using bit 6 in the extended control byte [▶ 31].	0_{bin}
PR32.0	enRightMotion	1_{bin}	Allows the motor to start rotating to the right using bit 5 in the extended control byte [▶ 31].	1_{bin}

*) The voltages of the three phases are measured with reference to an artificial star point.

PR33, PR39, PR45: Rated current

If you set both rotary switches for setting the rated current at the front of the KL8001 to zero, the values stored in registers PR33, PR39 and PR45 are used for overload control (resolution: 0.01 A, permitted setting range: 0.9 A to 15.0 A). This is useful when:

- different rated currents are required for single-phase evaluation, for example if three different single-phase motors are connected.
- you want to use the extended setting range of 10.0 A to 15.0 A, which cannot be set via the rotary switches.

PR34, PR40, PR46: Switch-on threshold

A switch-on protection phase is maintained before switching on again after the power terminal has switched off the motor because of overload. This time corresponds to the tripping class [▶ 38]. In other words, with a tripping class of 50 the motor can only be switched on again after a period of 50 seconds. This time can be shortened by means of this register, which can be useful under some circumstances with large tripping classes.

The value to be entered is calculated in accordance with the following formula:

$$\text{Switch on threshold} = \left(1 - \frac{\text{make time [s]}}{\text{tripping class [s]}}\right) \cdot 65535$$

Example:

Switch-on time = 10 seconds, tripping class = 50 seconds

(1 - 10 sec / 50 sec) x 65535 = 52428

The switch-on threshold to be entered then is 0xCCCC (52428_{dec}).

PR35: L1 overvoltage threshold*

If the mains voltage at L1 exceeds the overvoltage threshold stored (with a resolution of 0.1 V) in register PR35, bit *SW.7* will be set in the status word [▶ 43].
*) The voltages of the three phases are measured with reference to an artificial star point.

PR36: L1 undervoltage threshold*

If the mains voltage at L1 falls below the undervoltage threshold stored (with a resolution of 0.1 V) in register PR36, bit *SW.4* will be set in the status word [▶ 43].
*) The voltages of the three phases are measured with reference to an artificial star point.

PR37: Overload threshold L1

If the current in phase L1 exceeds the overload threshold stored in register PR37 (with a resolution of 0.01 A), the *ESB.0* bit will be set in the extended status byte [▶ 32] while the *Overload* LED will flash at about 5 Hz. If you set the overload threshold in register PR37 below the rated current, the motor can be switched off early in the event of excessive rated load, in order to prevent damage.

PR38: Underload threshold L1

If the current in phase L1 falls below the underload threshold stored in register PR38 (with a resolution of 0.01 A), the *ESB.1* bit will be set in the extended status byte [▶ 32] while the *Overload* LED will flash at about 2 Hz. If you set the value in register PR38 below the rated load that has been set, then the motor can be switched off in the event of, for instance, a broken shaft, in order to avoid more serious damage.

PR39

See PR33 [▶ 35].

PR40

See PR34 [▶ 36].

PR41: L2 overvoltage threshold*

If the mains voltage at L2 exceeds the overvoltage threshold stored (with a resolution of 0.1 V) in register PR41, bit *SW.8* will be set in the status word [▶ 43].
*) The voltages of the three phases are measured with reference to an artificial star point.

PR42: L2 undervoltage threshold*

If the mains voltage at L2 falls below the undervoltage threshold stored (with a resolution of 0.1 V) in register PR42, bit *SW.5* will be set in the status word [▶ 43].
*) The voltages of the three phases are measured with reference to an artificial star point.

PR43: Overload threshold L2

If the current in phase L2 exceeds the overload threshold stored in register PR43 (with a resolution of 0.01 A), the *ESB.0* bit will be set in the extended status byte [▶ 32] while the *Overload* LED will flash at about 5 Hz. If you set the overload threshold in register PR43 below the rated current, the motor can be switched off early in the event of excessive rated load, in order to prevent damage.

PR44: Underload threshold L2

If the current in phase L2 falls below the underload threshold stored in register PR44 (with a resolution of 0.01 A), the *ESB.1* bit will be set in the extended status byte [▶ 32] while the *Overload* LED will flash at about 2 Hz. If you set the value in register PR44 below the rated load that has been set, then the motor can be switched off in the event of, for instance, a broken shaft, in order to avoid more serious damage.

PR45

See PR33 [▶ 35].

PR46

See PR34 [▶ 36].

PR47: L3 overvoltage threshold*

If the mains voltage at L3 exceeds the overvoltage threshold stored (with a resolution of 0.1 V) in register PR47, bit *SW.9* will be set in the status word [▶ 43].
*) The voltages of the three phases are measured with reference to an artificial star point.

PR48: L3 undervoltage threshold*

If the mains voltage at L3 falls below the undervoltage threshold stored (with a resolution of 0.1 V) in register PR48, bit *SW.6* will be set in the status word [▶ 43].
*) The voltages of the three phases are measured with reference to an artificial star point.

PR49: Overload threshold L3

If the current in phase L3 exceeds the overload threshold stored in register PR49 (with a resolution of 0.01 A), the *ESB.0* bit will be set in the extended status byte [▶ 32] while the *Overload* LED will flash at about 5 Hz. If you set the overload threshold in register PR49 below the rated current, the motor can be switched off early in the event of excessive rated load, in order to prevent damage.

PR50: Underload threshold L3

If the current in phase L3 falls below the underload threshold stored in register PR50 (with a resolution of 0.01 A), the *ESB.1* bit will be set in the extended status byte [▶ 32] while the *Overload* LED will flash at about 2 Hz. If you set the value in register PR50 below the rated load that has been set, then the motor can be switched off in the event of, for instance, a broken shaft, in order to avoid more serious damage.

PR51: Maximum permissible current difference

If the current difference between two phases exceeds the value stored in register PR51 (with a resolution of 0.01 A) then bit *SW.0* is set in the status word [▶ 43].

PR52: Tripping class

The delay in the event of overload is set via the tripping class (resolution: 1 s). The value set corresponds to the release time in seconds (for an overcurrent that is precisely 7.2 times greater than the set rated current). If the overcurrent is more than 7.2 times the rated current, the release time becomes correspondingly shorter, and is extended if the current is below this value.

Example:

Tripping class = 10 s, rated current = 4.0 A
An overcurrent of 28.8 A (4.0 A x 7.2) results in a release time of 10 s.

PR53: Measuring cycle time

The conversion time of the A/D converter is set through this register directly (with a resolution of 1 ms).

Accuracy of the measurement results

To obtain correct measurement results, a value of less than 30 ms must not be set!

5.2.2 Examples of Register Communication

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

5.2.2.1 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.

5.2.2.2 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!

5.3 Data registers

These registers are used to store the measured values. They can be read in process data mode [▶ 30], but not written.

The three sets of registers are loosely assigned to the mains phases, but to some extent also contain general measured values.

KL8001 data registers

DR no.	Register set 0 (access via DataIN0 [▶ 42])		Register set 1 (access via DataIN1 [▶ 42])		Register set 2 (access via DataIN2 [▶ 42])	
	Contents	Unit	Contents	Unit	Contents	Unit
DR0	Status word [▶ 43] (1)	-	Status word [▶ 43] (1)	-	Status word [▶ 43] (1)	-
DR1	Current (rms value) (average value of L1, L2 and L3)	0.01 A	Voltage (rms value) (average value of L1, L2 and L3)	0.1 V	Active power (sum of L1, L2 and L3)	1 W
DR2	Peak value(2) of current in L1 (since the KL8001 was switched on)	0.01 A	Peak value(2) of current in L2 (since the KL8001 was switched on)	0.01 A	Peak value(2) of current in L3 (since the KL8001 was switched on)	0.01 A
DR3	RMS value current L1	0.01 A	RMS value current L2	0.01 A	RMS value current L3	0.01 A
DR4	RMS value voltage L1	0.1 V	RMS value voltage L2	0.1 V	RMS value voltage L3	0.1 V
DR5	Active power L1	1 W	Active power L2	1 W	Active power L3	1 W
DR6	Cosine **j** L1	0.01	Cosine **j** L2	0.01	Cosine **j** L3	0.01
DR7	Motor loading L1 (L1-L2-L3)	1 A^2sec	Motor loading L2	1 A^2 sec	Load motor L3	1 A^2 sec
DR8	Energy consumption(3) L1	1 kWh	Energy consumption(3) L2	1 kWh	Energy consumption(3) L3	1 kWh
DR9	Energy consumption (sum of 3 phases)	1 kWh	Maximum current difference between L1, L2 and L3	0.01 A	Cos phi (mean value of L1, L2 and L3)	0.01
DR10	Rated current set at the rotary switches	0.01 A	Switching cycle counter	1	Motor operating hours counter(4)	0.5 h
DR11-DR17	reserved	-	reserved	-	reserved	-
DR18-DR36	Internal register	-	Internal register	-	Internal register	-
DR37	Software version of the measuring unit in ASCII code (e.g.: 0x3343 = 5167_{dec} =$3C_{ASCII}$)	-	Software version of the measuring unit in ASCII code (e.g.: 0x3343 = 5167_{dec} =$3C_{ASCII}$)	-	Software version of the measuring unit in ASCII code (e.g.: 0x3343 = 5167_{dec} =$3C_{ASCII}$)	
DR38-DR63	Internal register	-	Internal register	-	Internal register	-

(1) The status word [▶ 43] can be read from any of the three sets of registers. It contains the status information for all three channels.
(2) The stored peak current values can be reset to zero at any time using bit 0 of the extended control byte [▶ 31].
(3) The energy consumption is stored in the registers every half-hour, and is retained even when the KL8001 is switched off.
(4) The operating hours are stored every 30 minutes in the register and are retained even if the KL8001 is switched off.

Reading a data register

If the register number of a data register is entered during process data mode in the associated control byte, then its contents will be returned in the corresponding process data word.

Data register assignments

Register set	corresponding control byte	Associated process data word
0	Control byte 0 [▶ 29]	DataIN0 [▶ 29]
1	Control byte 1 [▶ 29]	DataIN1 [▶ 29]
2	Control byte 2 [▶ 29]	DataIN2 [▶ 29]

Examples

Read the active power of phase L1:

- Enter data register number 5 into control byte 0 [▶ 29].
- The content of register DR5 in register set 1 is returned in process data word DataIN0 [▶ 29].

Read the energy consumption of phase L2:

- Enter data register number 8 into control byte 1 [▶ 29].
- The content of register DR8 in register set 2 is returned in process data word DataIN1 [▶ 29].

Read cos phi for phase L3:

- Enter data register number 6 into control byte 2 [▶ 29].
- The content of register DR6 in register set 3 is returned in process data word DataIN2 [▶ 29].

5.3.1 Status word

The status word contains further information about the state of the KL8001. Under process data mode [▶ 30], it can be transmitted from the terminal to the controller using any of the DataIN0 [▶ 29], DataIN1 [▶ 29] or DataIN2 [▶ 29] input words.

Status word

Bit	SW.15	SW.14	SW.13	SW.12	SW.11	SW.10	SW.9	SW.8	SW.7	SW.6	SW.5	SW.4	SW.3	SW.2	SW.1	SW.0

Key

Bit	Name	Value	Description
SW.15	Other errors	1_{bin}	another error has occurred
SW.14	No rated current set	1_{bin}	Both the two rotary switches and • register PR33 [▶ 35] is zero (single-phase analysis [▶ 27] not active) or • at least one of registers PR33 [▶ 35], PR39 [▶ 35] or PR45 [▶ 35] is zero (single-phase analysis is active)
SW.13	Contactor fault	1_{bin}	Current flow detected with contactor switched off
SW.12	reserved	-	-
SW.11	reserved	-	-
SW.10	reserved	-	-
SW.9	Overvoltage L3	1_{bin}	Voltage > configured overvoltage limit (PR47 [▶ 37])
SW.8	Overvoltage L2	1_{bin}	Voltage > configured overvoltage limit (PR41 [▶ 36])
SW.7	Overvoltage L1	1_{bin}	Voltage > configured overvoltage limit (PR35 [▶ 36])
SW.6	Undervoltage L3	1_{bin}	Voltage < configured undervoltage limit (PR48 [▶ 37])
SW.5	Undervoltage L2	1_{bin}	Voltage < configured undervoltage limit (PR42 [▶ 37])
SW.4	Undervoltage L1	1_{bin}	Voltage < configured undervoltage limit (PR36 [▶ 36])
SW.3	Phase failure in L3	1_{bin}	Failure of phase L3
SW.2	Phase failure L2	1_{bin}	Outage of phase L2
SW.1	Phase failure L1	1_{bin}	Outage of phase L1
SW.0	Asymmetric load	1_{bin}	Current difference > configured current difference (PR51 [▶ 37])

6 TwinCAT

1. Start the TwinCAT System Manager.
2. Using the right mouse button, start searching for new devices under the branch *I/O Configuration \ I/O devices*.
   or add the fieldbus card (device) and the Bus Coupler (box) manually.
3. Click with the right mouse button on the Bus Coupler in the tree structure and add the desired Bus Terminal with the *Add terminal* menu item.

Insert a power terminal

The KL8001 is found in the *Power Terminals (KL800x)* group. You can insert up to 10 power terminals at the end of the terminal block with the KL9060 Adapter Terminal.

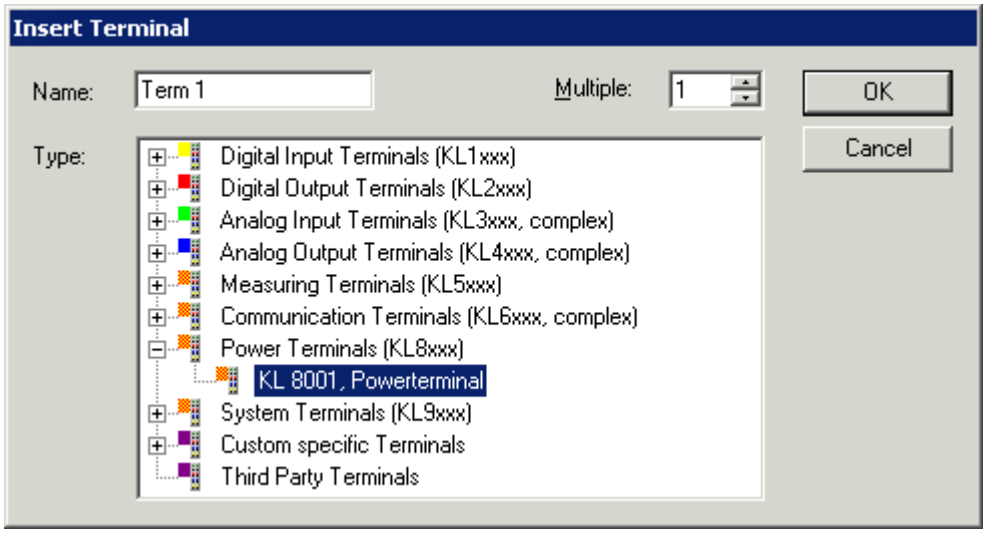


Fig. 22: Adding a Bus Terminal in the TwinCAT System Manager

The KL8001 in the tree structure

The KL8001 is represented with 10 bytes of input data and 10 bytes of output data in the System Manager. The empty word (see process image [▶ 29]) is present in the Bus Coupler mapping, but is not, however, displayed by the System Manager.

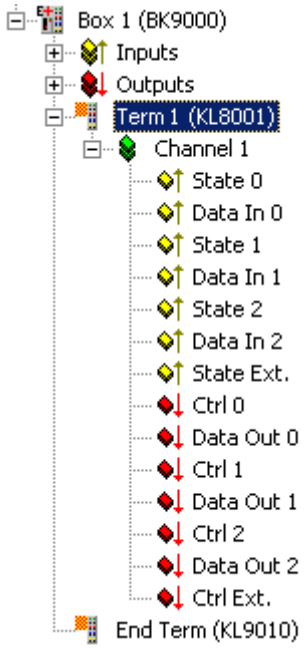


Fig. 23: Tree structure of the KL8001 in the TwinCAT System Manager

Beckhoff Information System

For further information on configuration with the TwinCAT System Manager and programming with TwinCAT PLC Control please refer to the Beckhoff Information System. The Beckhoff Information System is a continuously growing reference system for TwinCAT products. It contains technical information, manuals, sample code, the Beckhoff Knowledge Base and much more.

The setup for installing the Beckhoff Information System is available for download from our website under https://www.beckhoff.com. In addition, the online version of the Beckhoff Information System can be found at https://infosys.beckhoff.com.

7 Appendix

7.1 Ordering information

Beckhoff

Power Terminal	
Order identifier	**Scope of supply**
KL8001	• 1 x power terminal for controlling Siemens contactors of the Sirius 3RT10 series of size S00 • 1 x short (approx. 3 cm) ribbon cable for the bus connection between two power terminals

Accessories for the power terminal	
Order identifier	**Scope of supply**
KL9060	• 1 x adapter terminal for connecting power terminals to a Beckhoff Bus Terminal block • 1 x long (approx. 10 cm) ribbon cable for the bus connection between the adapter terminal and the first power terminal • 1 x bus end plug for the last power terminal
ZS1010-1610	• 1 x bus end plug [▶ 20]
ZK1010-8080-3003	• 1 x short (approx. 3 cm) ribbon cable for the bus connection between two power terminals
ZK1010-8080-3005	• 1 x medium-sized (approx. 5 cm) ribbon cable for the bus connection between two power terminals with a reversing contactor connection
ZK1010-8080-3010	• 1 x long (approx. 10 cm) ribbon cable for the bus connection between the adapter terminal and the first power terminal or
KS2000	• 1 x configuration software • 1 x serial configuration cable for the Beckhoff Bus Coupler

Siemens

Siemens contactors of the Sirius 3RT10 series					
Order number	**Product**	**Power section**	**Auxiliary contact**	**Size**	**Connection technology**
3RT1015-1BB41	Contactor, AC-3	3 kW, 400 V, 3-pin	1 NO contact, 24 V_{DC}	S00	Screw connection
3RT1016-1BB41	Contactor, AC-3	4 kW, 400 V, 3-pin	1 NO contact, 24 V_{DC}	S00	Screw connection
3RT1017-1BB41	Contactor, AC-3	5.5 kW, 400 V, 3-pin	1 NO contact, 24 V_{DC}	S00	Screw connection
3RT1015-1BB42	Contactor, AC-3	3 kW, 400 V, 3-pin	1 NC contact, 24V_{DC}	S00	Screw connection
3RT1016-1BB42	Contactor, AC-3	4 kW, 400 V, 3-pin	1 NC contact, 24V_{DC}	S00	Screw connection
3RT1017-1BB42	Contactor, AC-3	5.5 kW, 400 V, 3-pin	1 NC contact, 24V_{DC}	S00	Screw connection

Siemens accessories for contactors of the Sirius 3RT10 series	
Order number	**Description**
3RA1913-2A	Kit for reversing combination

7.2 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.

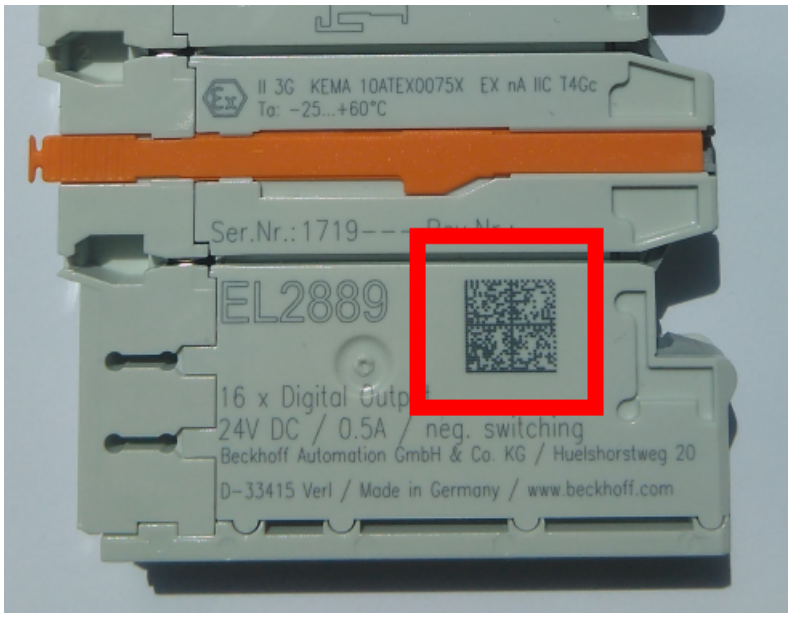


Fig. 24: BIC as data matrix code (DMC, code scheme ECC200)

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. 25: 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.

7.3 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:

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

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e-mail:	support@beckhoff.com

Beckhoff Service

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

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- repair service
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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

More Information:
www.beckhoff.com/KL8001

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