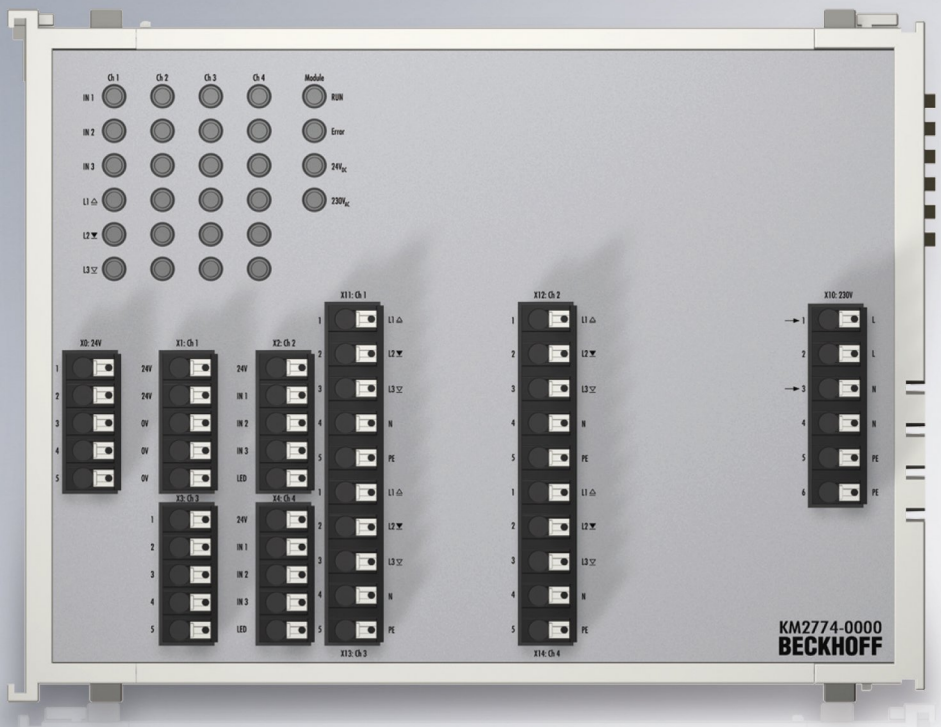
BECKHOFF New Automation Technology

Documentation | EN

KM2774-0000

Terminal module for jalousie motors



2024-02-27 | Version: 2.1.0

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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.
The qualified personnel is obliged to always use the currently valid documentation.

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.

Signal words

The signal words used in the documentation are classified below. In order to prevent injury and damage to persons and property, read and follow the safety and warning notices.

Personal injury warnings

⚠ DANGER
Hazard with high risk of death or serious injury.

⚠ WARNING
Hazard with medium risk of death or serious injury.

⚠ CAUTION
There is a low-risk hazard that could result in medium or minor injury.

Warning of damage to property or environment

NOTICE
The environment, equipment, or data may be damaged.

Information on handling the product

This information includes, for example:
recommendations for action, assistance or further information on the product.

1.3 Documentation issue status

Version	Comment
2.1.0	• Chapter technical data updated • Chapter *Instructions for ESD protection* added • Chapter *Recommended mounting rails* updated • Chapter *Disposal* added
2.0.0	• Migration • Document structure updated
1.0.0	• First release

Firmware and hardware versions

Documentation Version	Firmware version	Hardware version
2.1.0	1E	08
2.0.0	1E	07
1.0.0	1E	04

The firmware and hardware version can be found in the serial number on the label at the bottom of the terminal module.

Syntax of the serial number

Structure of the serial number: WW YY FF HH	Example with serial number 12 10 1E 04:
WW - week of production (calendar week)	12 - week of production 12
YY - year of production	10 - year of production 2010
FF - firmware version	1E - firmware version 1E
HH - hardware version	04 - hardware version 04

2 Product overview

2.1 Introduction

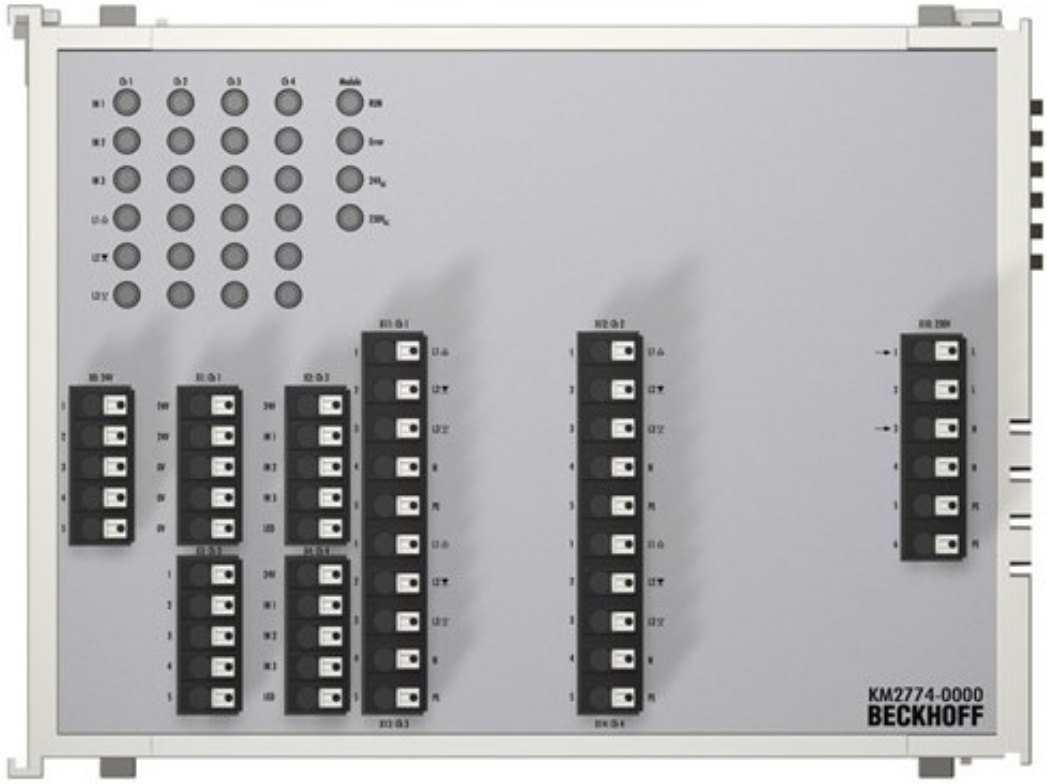


Fig. 1: KM2774 - Triac outputs for four blind motors

The KM2774-0000 terminal module is used for controlling up to four motors for blinds and for connecting the associated push buttons.

Three interlocked triac outputs (230 V, 1.5 A), three digital inputs (24 V) and one ground switching output (24 V, 20 mA), e.g. for connecting a button LED, are available for each motor. The outputs are protected against overload. An adjustable overcurrent limit protects the motor from damage.

LEDs indicate the status of the inputs and outputs. In addition, there are LEDs for data traffic on the K-bus (RUN), the presence of the supply voltages (24 V_{DC}, 230 V_{AC}) and for the indication of overtemperature (Error) in the terminal module.

The triac outputs, the LED outputs and the status LEDs are not controlled if the power supply voltage (230 V) is not present, or if the temperature is too high.

2.2 Technical data

Technical data	KM2774-0000
Number of power outputs	4 x 3 make contacts
Rated voltage of the power outputs	80 ... 230 V_{AC}
Overvoltage protection at the power outputs	> 275 V
Output current from the power outputs	1.5 A (0.6 mA no-load current)
Surge current	40 A (16 ms), 3 A (30 s)
Overcurrent limitation	Ajustable
Switch-on time	0.1 ... 10 ms, zero crossing
Switch-off time	T/2
Residual voltage	maximum 1.5 V (60 mA ... 1 A), 150 Ω (< 60 mA)
Number of digital outputs	4 (1 per channel), ground switching
Nominal voltage	24 V_{DC}
Output current	maximum 20 mA, short-circuit proof
Signal voltage "0"	-3 V ... 5 V
Signal voltage "1"	-15 V ... 30 V
Number of digital inputs	12 (4 x 3)
Nominal voltage	24 V_{DC} (-15 %/+20 %)
Signal voltage "0"	-3 V ... 5 V (IEC 61132-2, type 1)
Signal voltage "1"	-15 V ... 30 V (IEC 61132-2, type 1)
Input filter	3.0 ms
Input current	typically 3 mA (IEC 61132-2, type 1)
Power supply for the electronics	via the K-bus
Current consumption via K-bus	typically 30 mA
Electrical isolation	500 V (K-bus/field voltage), 3750 V_{AC} (1 minute)
Bit width in the input process image	24 bit
Dimensions with terminals (W x H x D)	approx. 135 mm x 100 mm x 40 mm (width aligned: 132 mm), see dimensional drawing [▶ 16]
Weight	approx. 270 g
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
Permissible degree of pollution	1
Mounting [▶ 11]	on a 35 mm mounting rail (e.g. DIN rail TH 35-7.5 conforming to EN 60715)
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
Approvals / markings	CE

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

3 Mounting and wiring

3.1 Instructions for ESD protection

NOTICE

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 spring contacts (see fig.) 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.

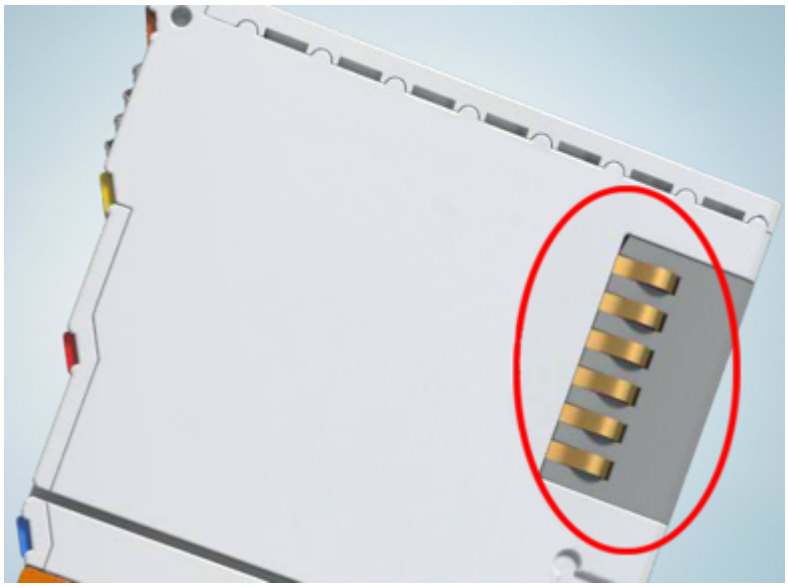


Fig. 2: Spring contacts of the Beckhoff I/O components

3.2 Recommended mounting rails

Terminal Modules and EtherCAT Modules of KMxxxx and EMxxxx series, same as the terminals of the EL66xx and EL67xx series can be snapped onto the following recommended mounting rails:

- mounting rail TH 35-7.5 with 1 mm material thickness (according to EN 60715)
- mounting rail TH 35-15 with 1.5 mm material thickness
- mounting rail TH 35-15 with 2.2 to 2.5 mm material thickness (according to EN 60715)

For older modules pay attention to the material thickness of the mounting rail

Modules of KM10x4, KM10x8, KM2004, KM2008, KM26x4 and KM2774 series, do not fit to the mounting rail TH 35-15 with 2.2 to 2.5 mm material thickness (according to EN 60715)!

3.3 Mounting and demounting - traction lever unlocking

The terminal modules are fastened to the assembly surface with the aid of a 35 mm mounting rail (e. g. mounting rail TH 35-15).

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 recommended mounting rails under the terminals and couplers, you should use flat mounting connections (e.g. countersunk screws or blind rivets).

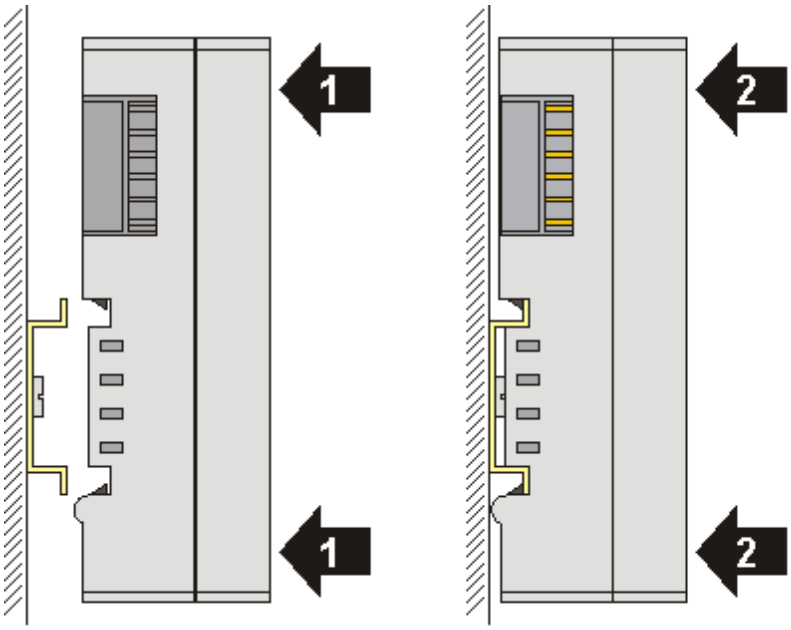
⚠ WARNING

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!

Mounting

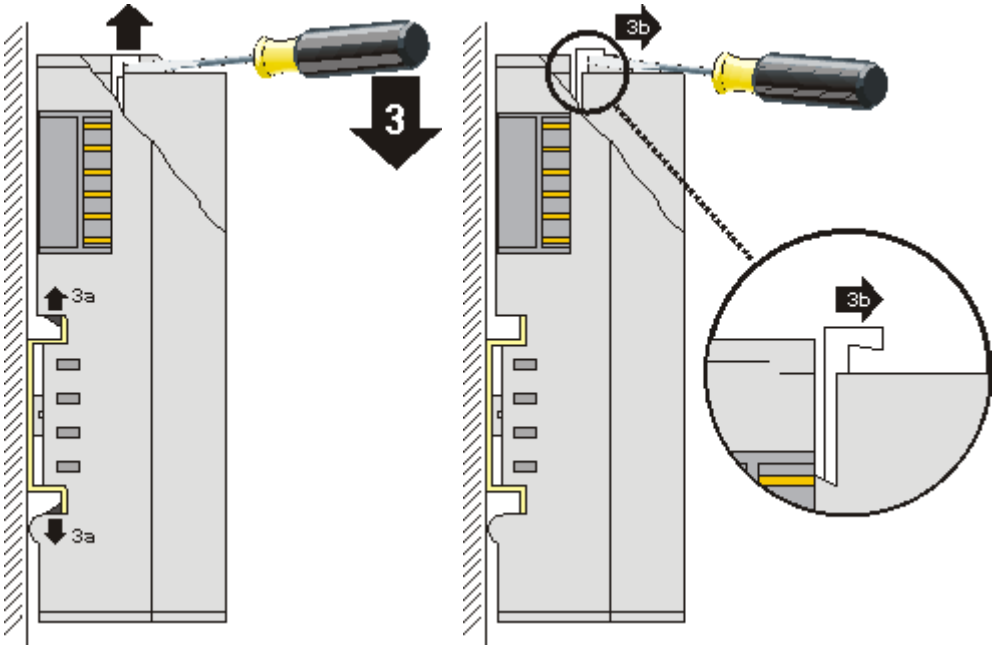
- Fit the mounting rail to the planned assembly location.



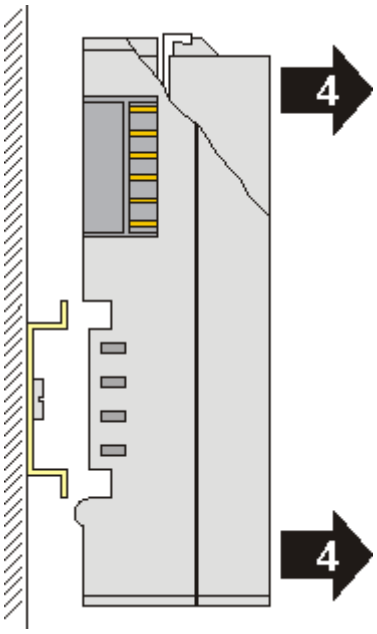
  and press (1) the terminal module against the mounting rail until it latches in place on the mounting rail (2).
- Attach the cables.

Demounting

- Remove all the cables. Thanks to the KM/EM connector, it is not necessary to remove all the cables separately for this, but for each KM/EM connector simply undo 2 screws so that you can pull them off (fixed wiring)!
- Lever the unlatching hook on the left-hand side of the terminal module upwards with a screwdriver (3). As you do this
  - an internal mechanism pulls the two latching lugs (3a) from the top hat rail back into the terminal module,
  - the unlatching hook moves forwards (3b) and engages



- In the case 32 and 64 channel terminal modules (KMxxx4 and KMxxx8 or EMxxx4 and EMxxx8) you now lever the second unlatching hook on the right-hand side of the terminal module upwards in the same way.
- Pull (4) the terminal module away from the mounting surface.



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 Wiring

⚠ 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!

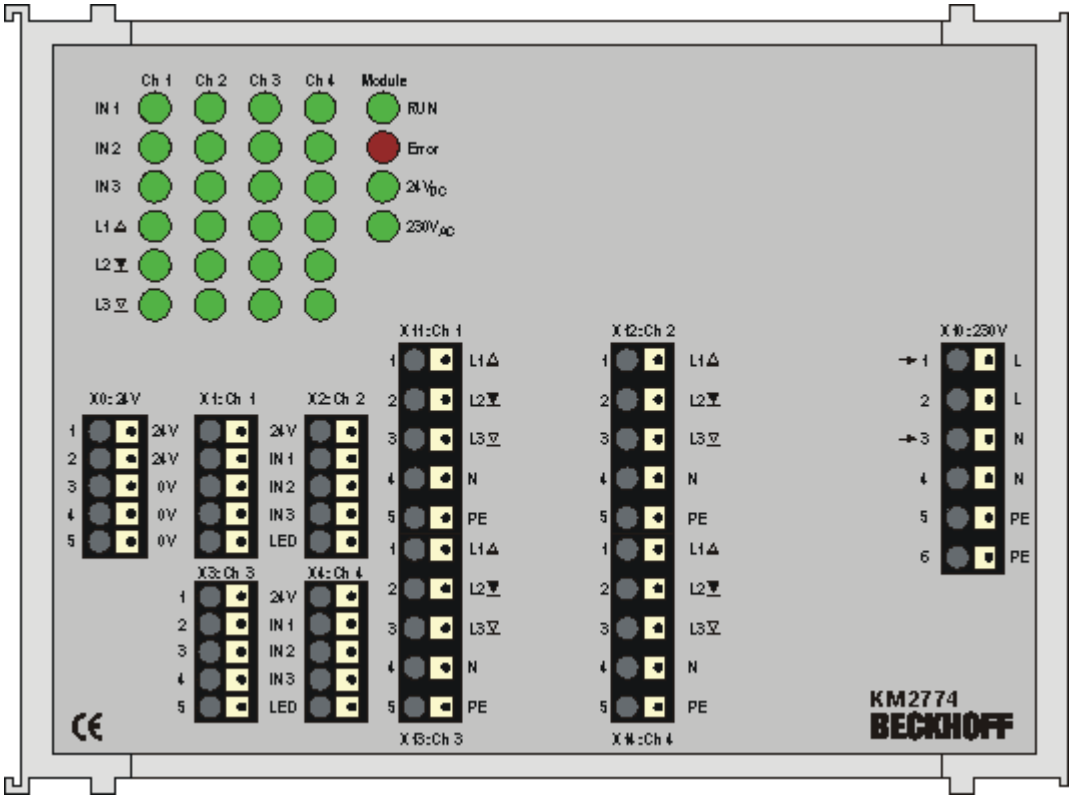


Fig. 3: KM2774 - Wiring

Connection for supply voltage (24 V)

⚠ CAUTION

Ground the 0 V potentials of the 24 V supply voltage.

Connect

- the 0 V potential of the supply voltage (Us) of the Bus Coupler that controls the KM2774-1001 and
- the 0 V potential of the KM2774-1001 supply voltage (X0, terminal point 3, 4 or 5) with the protective earth.

Terminal strip	Terminal point	Name	Function
X0: 24 V	0	24 V	24 V supply for module electronics
	1	24 V	24 V supply for module electronics
	2	0 V	0 V supply for module electronics
	3	0 V	0 V supply for module electronics
	4	0 V	0 V supply for module electronics

Connection of the push buttons for channels 1 to 4

Terminal strip	Terminal point	Name	Function
X1: Ch1	0	24 V	Channel 1: 24 V for push button
	1	IN1	Channel 1: Input for button 1
	2	IN2	Channel 1: Input for button 2
	3	IN3	Channel 1: Input for button 3
	4	LED	Channel 1: Switched ground for button LED
X2: Ch2	0	24 V	Channel 2: 24 V for push button
	1	IN1	Channel 2: Input for button 1
	2	IN2	Channel 2: Input for button 2
	3	IN3	Channel 2: Input for button 3
	4	LED	Channel 2: Switched ground for button LED
X3: Ch3	0	24 V	Channel 3: 24 V for push button
	1	IN1	Channel 3: Input for button 1
	2	IN2	Channel 3: Input for button 2
	3	IN3	Channel 3: Input for button 3
	4	LED	Channel 3: Switched ground for button LED
X4: Ch4	0	24 V	Channel 4: 24 V for push button
	1	IN1	Channel 4: Input for button 1
	2	IN2	Channel 4: Input for button 2
	3	IN3	Channel 4: Input for button 3
	4	LED	Channel 4: Switched ground for LED

Connection of the motors for channels 1 to 4

Terminal strip	Terminal point	Name	Function
X11: Ch1	0	L1	Channel 1: Phase L1 for motor 1
	1	L2	Channel 1: Phase L2 for motor 1
	2	L3	Channel 1: Phase L3 for motor 1
	3	N	Channel 1: Neutral conductor for motor 1 (internally connected to the neutral conductor terminal points of the other channels)
	4	PE	Channel 1: Protective earth for motor 1
X12: Ch2	0	L1	Channel 2: Phase L1 for motor 2
	1	L2	Channel 2: Phase L2 for motor 2
	2	L3	Channel 2: Phase L3 for motor 2
	3	N	Channel 2: Neutral conductor for motor 2 (internally connected to the neutral conductor terminal points of the other channels)
	4	PE	Channel 2: Protective earth for motor 2
X13: Ch3	0	L1	Channel 3: Phase L1 for motor 3
	1	L2	Channel 3: Phase L2 for motor 3
	2	L3	Channel 3: Phase L3 for motor 3
	3	N	Channel 3: Neutral conductor for motor 3 (internally connected to the neutral conductor terminal points of the other channels)
	4	PE	Channel 3: Protective earth for motor 3
X14: Ch4	0	L1	Channel 4: Phase L1 for motor 4
	1	L2	Channel 4: Phase L2 for motor 4
	2	L3	Channel 4: Phase L3 for motor 4
	3	N	Channel 4: Neutral conductor for motor 4 (internally connected to the neutral conductor terminal points of the other channels)
	4	PE	Channel 4: Protective earth for motor 4

Connection for supply voltage (230 V)

Terminal strip	Terminal point	Name	Function
X10: 230 V	0	L	Load voltage supply (230 V)
	1	L	Continuation of load voltage (230 V)
	2	N	Load voltage supply (0 V)
	3	N	Continuation of load voltage (0 V)
	4	PE	Protective earth
	4	PE	Protective earth

3.6 Dimensions

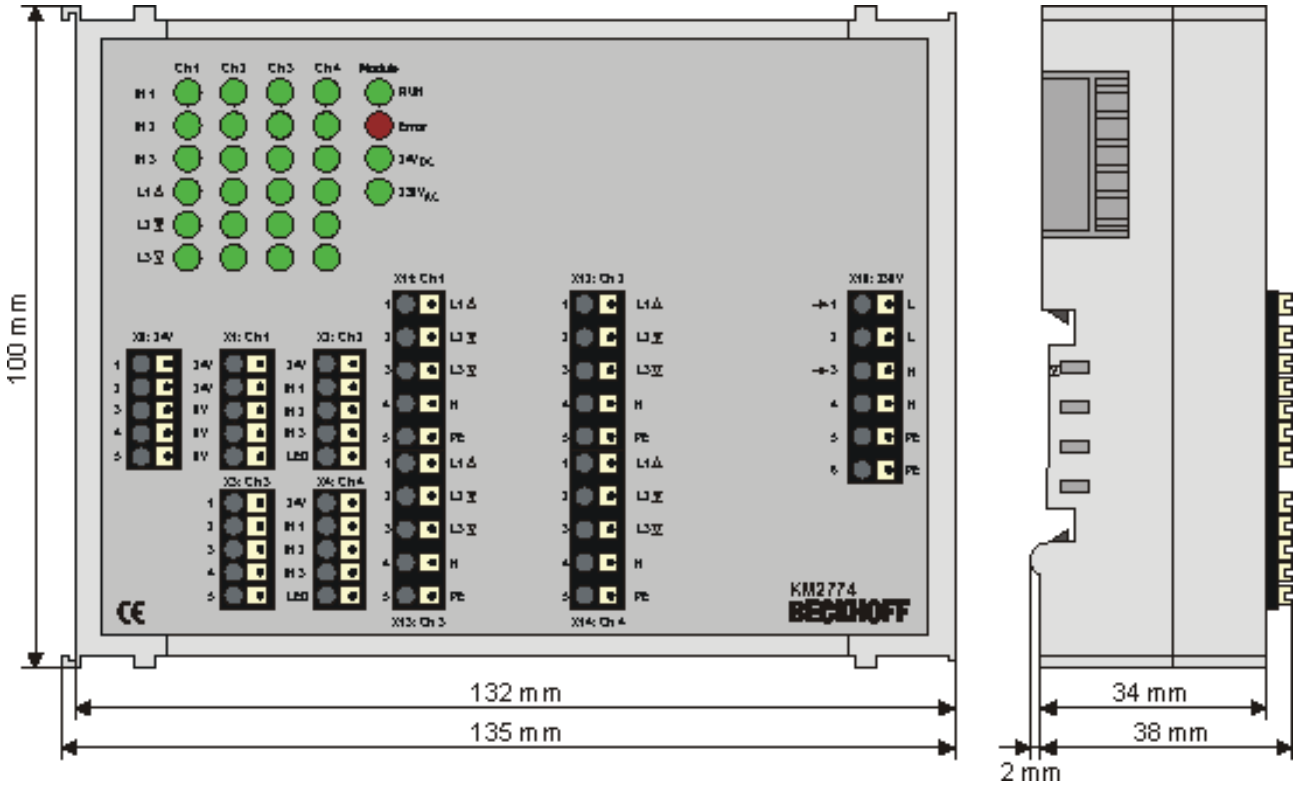


Fig. 4: KM2774 - Dimensions

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. 5: 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 terminal module for blind motors KM2774-0000
- a KL9010 Bus End Terminal

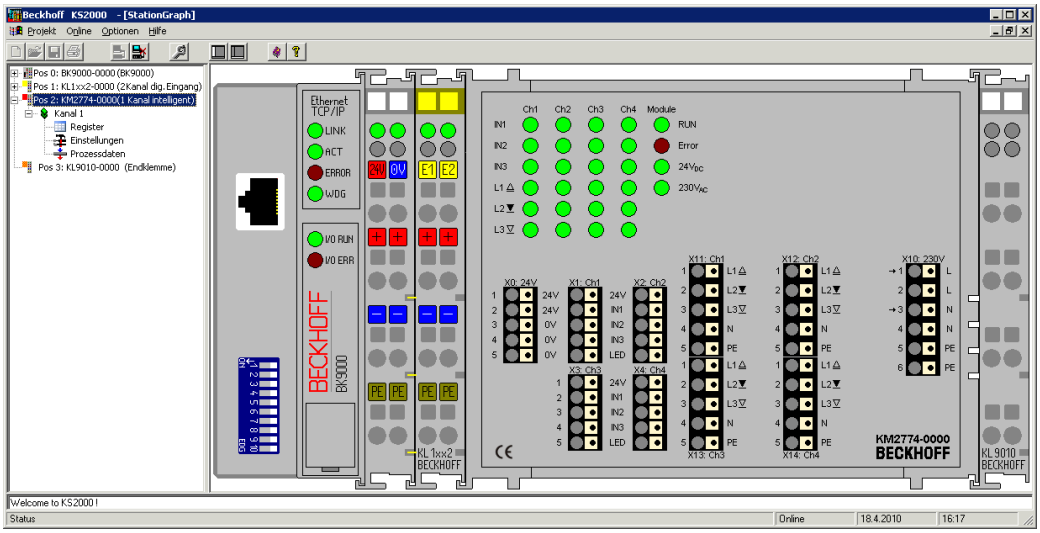


Fig. 6: Display of the fieldbus station in KS2000

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 module whose parameters you wish to change (pos. 2 in the example).

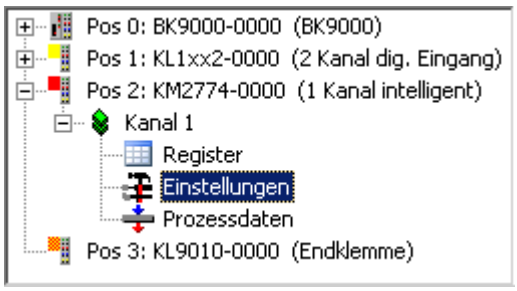


Fig. 7: KS2000 branch for channel 1 of the KM2774

For the KM2774-0000, the branches *Register*, *Settings* and *ProcData* are displayed:

- Register enables direct access to the register of the KM2774-0000.
- The dialog screen for parameterizing the KM2774-0000 can be found under Settings [▶ 19].
- ProcData shows the process data of the KM2774-0000.

4.3 Settings

Settings for parameterizing the KM2774-0000.

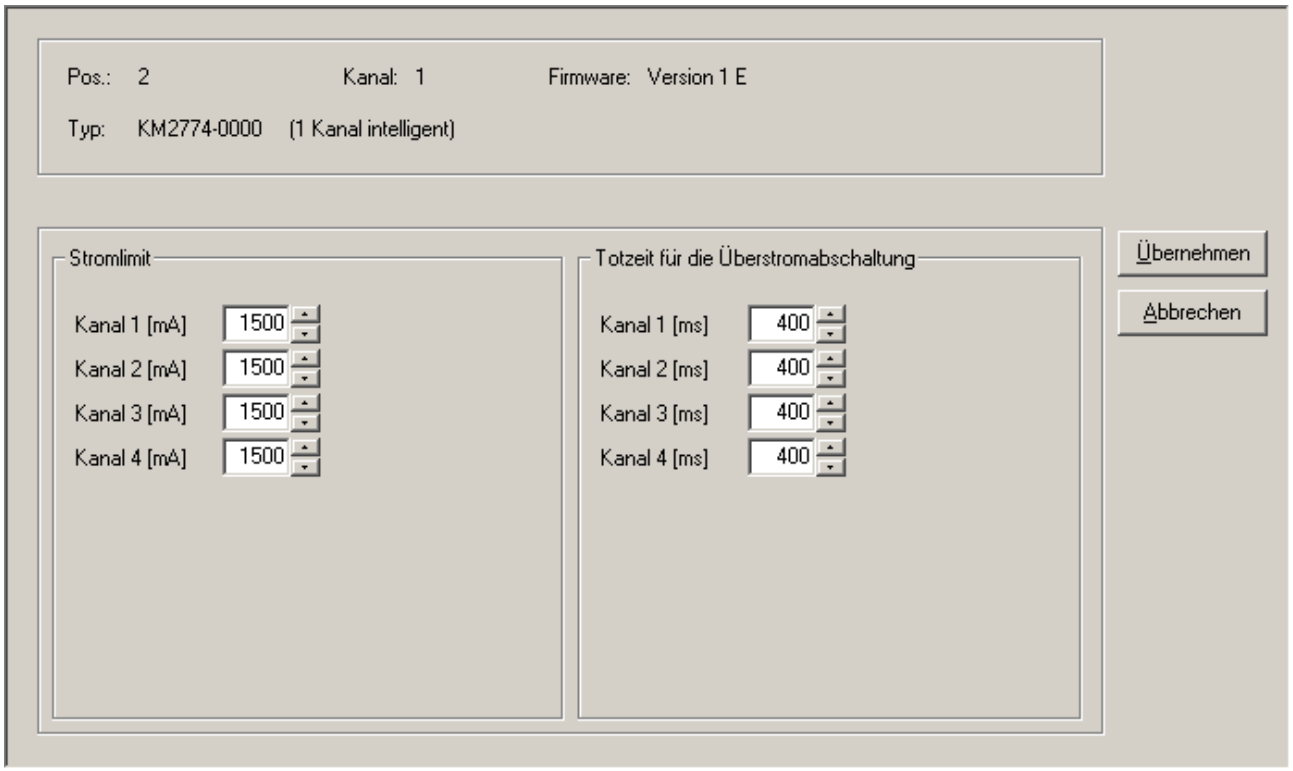


Fig. 8: Dialog screen for parameterizing the KM2774

Current limit

Channel 1 (R34)

R34 [▶ 29]

Here you can set the current limit for channel 1 (default: 1500 mA).
Permissible value range: 50 to 1500 mA.

Channel 2 (R35)

R35 [▶ 30]

Here you can set the current limit for channel 1 (default: 1500 mA).
Permissible value range: 50 to 1500 mA.

Channel 3 (R36)

R36 [▶ 30]

Here you can set the current limit for channel 1 (default: 1500 mA).
Permissible value range: 50 to 1500 mA.

Channel 4 (R37)

R37 [▶ 30]

Here you can set the current limit for channel 1 (default: 1500 mA).
Permissible value range: 50 to 1500 mA.

Dead time

Dead time for channel 1 (R38)

R38 [▶ 30]

Here you can define the dead time until overcurrent shutdown for channel 1 (default: 400 ms).
Permissible value range: 100 to 2560 ms in steps of 10 ms.
If you enter 0 ms, the dead time is disabled. The output switches off immediately when the current limit is exceeded.

Dead time for channel 2 (R39)

R39 [▶ 30]

Here you can define the dead time until overcurrent shutdown for channel 2 (default: 400 ms).
Permissible value range: 100 to 2560 ms in steps of 10 ms.
If you enter 0 ms, the dead time is disabled. The output switches off immediately when the current limit is exceeded.

Dead time for channel 3 (R40)

R40 [▶ 30]

Here you can define the dead time until overcurrent shutdown for channel 3 (default: 400 ms).
Permissible value range: 100 to 2560 ms in steps of 10 ms.
If you enter 0 ms, the dead time is disabled. The output switches off immediately when the current limit is exceeded.

Dead time for channel 4 (R41)

R41 [▶ 30]

Here you can define the dead time until overcurrent shutdown for channel 4 (default: 400 ms).
Permissible value range: 100 to 2560 ms in steps of 10 ms.
If you enter 0 ms, the dead time is disabled. The output switches off immediately when the current limit is exceeded.

5 Access from the user program

5.1 Process image

The KM2774 terminal module presents itself in the process image with 2 or 3 bytes of input data and 2 or 3 bytes of output data. These are organized as follows:

Format	Input data	Output data
Byte	SB [▶ 24]	CB [▶ 24]
Word	DataIN [▶ 26]	DataOUT [▶ 27]

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

Key

SB: Status byte (not applicable for compact evaluation)
CB: Control byte (not applicable for compact evaluation)

DataIN: Process input data
DataOUT: Process output data

- Please refer to the Mapping [▶ 22] page for the assignment of the bytes and words to the addresses of the controller.
- The meaning of the control and status bytes is explained on the Control and Status bytes [▶ 24] page.
- For a description of the process data words please refer to the pages on Process input data (DataIN) [▶ 26] and Process output data (DataOUT) [▶ 27].

5.2 Mapping

The KM2774 terminal module occupies input and output addresses in the controller's process image. The assignment of process data (input and output data) and parameterization data (control and status bytes) to the control addresses is called mapping. The type of mapping depends on:

- the fieldbus system used
- the terminal type
- the parameterization of the Bus Coupler (conditions) such as
  - compact or complex evaluation
  - Intel or Motorola format
  - word alignment switched on or off

The Bus Couplers (BKxxxx, LCxxxx) and Bus Terminal Controllers (BCxxxx, BXxxxx) are supplied with certain default settings. The default setting can be changed with the KS2000 configuration software or with a master configuration software (e.g. TwinCAT System Manager or ComProfibus).

The following tables show the mapping depending on different conditions. For information about the contents of the individual bytes please refer to the pages *Process image* and *Control and status byte*.

Compact evaluation

Under compact evaluation, the KM2774 occupies addresses in the input and output process image. Control and status bytes cannot be accessed.

Compact evaluation in Intel format

Default mapping for CANopen, CANCAL, DeviceNet, ControlNet, Modbus, RS232 and RS485 coupler

	Address	Input data		Output data	
Conditions	**Word offset**	**High byte**	**Low byte**	**High byte**	**Low byte**
Complex evaluation: no Motorola format: no Word alignment: any	0	D1	D0	D1	D0

Compact evaluation in Motorola format

Default mapping for PROFIBUS and Interbus coupler

	Address	Input data		Output data	
Conditions	**Word offset**	**High byte**	**Low byte**	**High byte**	**Low byte**
Complex evaluation: no Motorola format: yes Word alignment: any	0	D0	D1	D0	D1

Complex evaluation

Under compact evaluation, the KM2774 occupies addresses in the input and output process image. Control and status bytes can be accessed.

Complex evaluation in Intel format

	Address	Input data		Output data	
Conditions	**Word offset**	**High byte**	**Low byte**	**High byte**	**Low byte**
Complex evaluation: yes Motorola format: no Word alignment: no	0	D0	SB	D0	CB
	1	-	D1	-	D1

Complex evaluation in Motorola format

	Address	Input data		Output data	
Conditions	**Word offset**	**High byte**	**Low byte**	**High byte**	**Low byte**
Complex evaluation: yes Motorola format: yes Word alignment: no	0	D1	SB	D1	CB
	1	-	D0	-	D0

Complex evaluation in Intel format with word alignment

Default mapping for Lightbus, Ethernet and EtherCAT couplers (BK1120) and for Bus Terminal Controllers (BCxxxx, BXxxxx)

	Address	Input data		Output data	
Conditions	**Word offset**	**High byte**	**Low byte**	**High byte**	**Low byte**
Complex evaluation: yes Motorola format: no Word alignment: yes	0	reserved	SB	reserved	CB
	1	D1	D0	D1	D0

Complex evaluation in Motorola format with word alignment

	Address	Input data		Output data	
Conditions	**Word offset**	**High byte**	**Low byte**	**High byte**	**Low byte**
Complex evaluation: yes Motorola format: yes Word alignment: yes	0	reserved	SB	reserved	CB
	1	D0	D1	D0	D1

Key

Complex evaluation: In addition to the process data, the control and status bytes are also mapped into the address space.
Motorola format: Motorola or Intel format can be set.
Word alignment: In order for the channel address range to commence at a word boundary, empty bytes are inserted into the process image as appropriate.

SB status byte (appears in the input process image)
CB: Control byte (appears in the output process image)

D0: low-order byte of the data word
D1: high-order byte of the data word

reserved: This byte is assigned to the process data memory, although it has no function.
"-": This byte is not assigned or used by the module.

5.3 Control and status byte

5.3.1 Process data mode

Control byte (for process data mode)

The control byte (CB) is located in the output image [▶ 21], and is transmitted from the controller to the terminal.

Bit	CB.7	CB.6	CB.5	CB.4	CB.3	CB.2	CB.1	CB.0
Name	RegAccess	Reset	-	-	-	-	-	-

Key

Bit	Name	Description	
CB.7	RegAccess	0_{bin}	Register communication off (process data mode)
CB.6	Reset	1_{bin}	all errors that may have occurred are reset by setting this bit (rising edge)
CB.5 to CB.3	-	0_{bin}	reserved
CB.2 to CB.0	-	0_{bin}	reserved

Status byte (for process data mode)

The status byte (SB) is located in the input image [▶ 21], and is transmitted from the terminal to the controller.

Bit	SB.7	SB.6	SB.5	SB.4	SB.3	SB.2	SB.1	SB.0
Name	RegAccess	Error	-	-	-	OverTemp	Err230V	Err24V

Key

Bit	Name	Description	
SB.7	RegAccess	0_{bin}	Acknowledgment for process data mode
SB.6	Error	0_{bin}	No error
		1_{bin}	An error has occurred
SB.5 to SB.3	-	0_{bin}	reserved
SB.2	OverTemp	1_{bin}	The internal temperature of the terminal is above 80°C
SB.1	Err230V	1_{bin}	The 230 V power supply voltage is not present
SB.0	Err24V	1_{bin}	The 24 V power supply voltage is not present

5.3.2 Register communication

Control byte (for register communication)

The control byte (CB) is located in the output image [▶ 21], and is transmitted from the controller to the terminal.

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

Key

Bit	Name	Description	
CB.7	RegAccess	1_{bin}	Register communication switched on
CB.6	R/W	0_{bin}	Read access
		1_{bin}	Write access
CB.5 to CB.0	Reg. no.	Register number: Enter the number of the register that you - want to read with input data word DataIn [▶ 21] or - want to write with output data word DataOut [▶ 21].	

Status byte (for register communication)

The status byte (SB) is located in the input image [▶ 21], and is transmitted from the terminal to the controller.

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

Key

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

5.4 Process input data (DataIN)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Channel	Ch4				Ch3				Ch2				Ch1			
Name	curr	IN3	IN2	IN1	curr	IN3	IN2	IN1	curr	IN3	IN2	IN1	curr	IN3	IN2	IN1

Key

Bit	Channel/Name	Description	
15	Ch4 curr	0_{bin}	Current is lower than the switching threshold specified for channel 4
		1_{bin}	Current is higher than the switching threshold specified for channel 4
14	Ch4 IN3	Channel 4, input 3	
13	Ch4 IN2	Channel 4, input 2	
12	Ch4 IN1	Channel 4, input 1	
11	Ch3 curr	0_{bin}	Current is lower than the switching threshold specified for channel 3
		1_{bin}	Current is higher than the switching threshold specified for channel 3
10	Ch3 IN3	Channel 3, input 3	
9	Ch3 IN2	Channel 3, input 2	
8	Ch3 IN1	Channel 3, input 1	
7	Ch2 curr	0_{bin}	Current is lower than the switching threshold specified for channel 2
		1_{bin}	Current is higher than the switching threshold specified for channel 2
6	Ch2 IN3	Channel 2, input 3	
5	Ch2 IN2	Channel 2, input 2	
4	Ch2 IN1	Channel 2, input 1	
3	Ch1 curr	0_{bin}	Current is lower than the switching threshold specified for channel 1
		1_{bin}	Current is higher than the switching threshold specified for channel 1
2	Ch1 IN3	Channel 1, input 3	
1	Ch1 IN2	Channel 1, input 2	
0	Ch1 IN1	Channel 1, input 1	

5.5 Process output data (DataOUT)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Channel	Ch4				Ch3				Ch2				Ch1			
Name	LED	L3	L2	L1	LED	L3	L2	L1	LED	L3	L2	L1	LED	L3	L2	L1

Key

Bit	Channel/Name	Description	
15	Ch4 LED	0_{bin}	Ground for button LED is not connected
		1_{bin}	Ground for button LED is connected
14	Ch4 L3	Channel 4, output L3	
13	Ch4 L2	Channel 4, output L2	
12	Ch4 L1	Channel 4, output L1	
11	Ch3 LED	0_{bin}	Ground for button LED is not connected
		1_{bin}	Ground for button LED is connected
10	Ch3 L3	Channel 3, output L3	
9	Ch3 L2	Channel 3, output L2	
8	Ch3 L1	Channel 3, output L1	
7	Ch2 LED	0_{bin}	Ground for button LED is not connected
		1_{bin}	Ground for button LED is connected
6	Ch2 L3	Channel 2, output L3	
5	Ch2 L2	Channel 2, output L2	
4	Ch2 L1	Channel 2, output L1	
3	Ch1 LED	0_{bin}	Ground for button LED is not connected
		1_{bin}	Ground for button LED is connected
2	Ch1 L3	Channel 1, output L3	
1	Ch1 L2	Channel 1, output L2	
0	Ch1 L1	Channel 1, output L1	

5.6 Register overview

These registers are used to parameterize the terminal module. They can be read or written by means of the register communication [▶ 31].

Register no.	Comment	Default value		R/W	Memory
R0 [▶ 29]	Analog value channel 1	-	-	R	RAM
R1 [▶ 29]	Analog value channel 2	-	-	R	RAM
R2 [▶ 29]	Analog value channel 3	-	-	R	RAM
R3 [▶ 29]	Analog value channel 4	-	-	R	RAM
R4	reserved	0x001A	26_{dec}	R	RAM
R5	reserved	0x0000	0_{dec}	R/W	RAM
R6	reserved	0x0000	0_{dec}	R/W	RAM
R7 [▶ 29]	Command register (no function)	0x0000	0_{dec}	R/W	RAM
R8 [▶ 29]	Terminal type	0x0AD6	2774_{dec}	R	ROM
R9 [▶ 29]	Firmware version	e.g. 0x3144	e.g. $1D_{ASCII}$	R	ROM
R10	Multiplex shift register	0x0118	280_{dec}	R	ROM
R11	Signal channels	0x0118	280_{dec}	R	ROM
R12	Minimum data length	0x9898	39064_{dec}	R	ROM
R13	Data structure	0x0004	4_{dec}	R	ROM
R14	reserved	-	-	-	-
R15	Alignment register	0x7F80	32640	R/W	RAM
R16 [▶ 29]	Hardware version number	e.g. 0x0000	e.g. 0_{dec}	R/W	EEPROM
R17	reserved	-	-	-	-
...	...	...	...	...	...
R28	reserved	-	-	-	-
R29 [▶ 29]	Terminal type - special identification	0x0000	0000	R	EEPROM
R30	reserved	-	-	-	-
R31 [▶ 29]	Code word register	0x0000	0_{dec}	R/W	RAM
R32	reserved	0x0000	0_{dec}	R/W	RAM
R33	Minimum current limit	0x0005	5_{dec}	R/W	EEPROM
R34 [▶ 29]	Current limit, channel 1	0x0096	150_{dec}	R/W	EEPROM
R35 [▶ 30]	Current limit, channel 2	0x0096	150_{dec}	R/W	EEPROM
R36 [▶ 30]	Current limit, channel 3	0x0096	150_{dec}	R/W	EEPROM
R37 [▶ 30]	Current limit, channel 4	0x0096	150_{dec}	R/W	EEPROM
R38 [▶ 30]	Dead time for overcurrent shutdown, channel 1	0x0004	4_{dec}	R/W	EEPROM
R39 [▶ 30]	Dead time for overcurrent shutdown, channel 2	0x0004	4_{dec}	R/W	EEPROM
R40 [▶ 30]	Dead time for overcurrent shutdown, channel 3	0x0004	4_{dec}	R/W	EEPROM
R41 [▶ 30]	Dead time for overcurrent shutdown, channel 4	0x0004	4_{dec}	R/W	EEPROM
R42	reserved	0x0000	0_{dec}	R/W	RAM
...	...	...	...	...	...
R63	reserved	0x0000	0_{dec}	R/W	RAM

5.7 Register description

These registers are used to parameterize the terminal module. They can be read or written by means of the register communication [▶ 31].

R0: Analog value of Channel 1

Contains the current analog value for Channel 1.

R1: Analog value of Channel 2

Contains the current analog value for Channel 2.

R2: Analog value of Channel 3

Contains the current analog value for Channel 3.

R3: Analog value of Channel 4

Contains the current analog value for Channel 4.

R7: Command register

The command register in the KM2774-0000 has no function.

R8: Terminal type

The terminal name is contained in register R8: 0x0AD6 (2774_{dez})

R9: Firmware version

Register R9 contains the ASCII coding of the terminal's firmware version, e.g. **0x3141 = '1A'**. **'0x31'** corresponds to the ASCII character **'1'**, **'0x41'** corresponds to the ASCII character **'A'**.
This value cannot be changed.

R16: Hardware version number

Register R16 contains the hardware version of the terminal.

R29: Terminal type - special identification

The terminal special identification is contained in register R29: 0x0000 (0_{dec})

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 written into the RAM registers and in the EEPROM registers and are therefore retained if the terminal is restarted.

The code word is reset when the terminal is restarted.

R34: Current limit, channel 1

Here you can set the current limit for channel 1 (default: 150_{dec}).
Scaling: 150_{dec} corresponds to 1500 mA.
Permissible value range: 5 to 150_{dec}

R35: Current limit, channel 2

Here you can set the current limit for channel 2 (default: 150_{dec}).
Scaling: 150_{dec} corresponds to 1500 mA.
Permissible value range: 5 to 150_{dec}

R36: Current limit, channel 3

Here you can set the current limit for channel 3 (default: 150_{dec}).
Scaling: 150_{dec} corresponds to 1500 mA.
Permissible value range: 5 to 150_{dec}

R37: Current limit, channel 4

Here you can set the current limit for channel 4 (default: 150_{dec}).
Scaling: 150_{dec} corresponds to 1500 mA.
Permissible value range: 5 to 150_{dec}

R38: Dead time for overcurrent shutdown, channel 1

Here you can define the dead time until overcurrent shutdown for channel 1 (default: 40_{dec}).
Scaling: 40_{dec} corresponds to 400 ms.
Permissible value range: 10 to 256_{dec}
If you enter 0, the dead time is disabled. The output switches off immediately when the current limit is exceeded.

R39: Dead time for overcurrent shutdown, channel 2

Here you can define the dead time until overcurrent shutdown for channel 2 (default: 40_{dec}).
Scaling: 40_{dec} corresponds to 400 ms.
Permissible value range: 10 to 256_{dec}
If you enter 0, the dead time is disabled. The output switches off immediately when the current limit is exceeded.

R40: Dead time for overcurrent shutdown, channel 3

Here you can define the dead time until overcurrent shutdown for channel 3 (default: 40_{dec}).
Scaling: 40_{dec} corresponds to 400 ms.
Permissible value range: 10 to 256_{dec}
If you enter 0, the dead time is disabled. The output switches off immediately when the current limit is exceeded.

R41: Dead time for overcurrent shutdown, channel 4

Here you can define the dead time until overcurrent shutdown for channel 4 (default: 40_{dec}).
Scaling: 40_{dec} corresponds to 400 ms.
Permissible value range: 10 to 256_{dec}
If you enter 0, the dead time is disabled. The output switches off immediately when the current limit is exceeded.

5.8 Examples of Register Communication

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

5.8.1 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.

5.8.2 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 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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e-mail:	service@beckhoff.com
web:	www.beckhoff.com/service

Headquarters Germany

Beckhoff Automation GmbH & Co. KG

Hülshorstweg 20
33415 Verl
Germany

Phone:	+49 5246 963 0
e-mail:	info@beckhoff.com
web:	www.beckhoff.com

Table of figures

More Information:
www.beckhoff.com/KM2774

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