

Documentation | EN

KL6831, KL6841

Master Terminals for SMI Bus

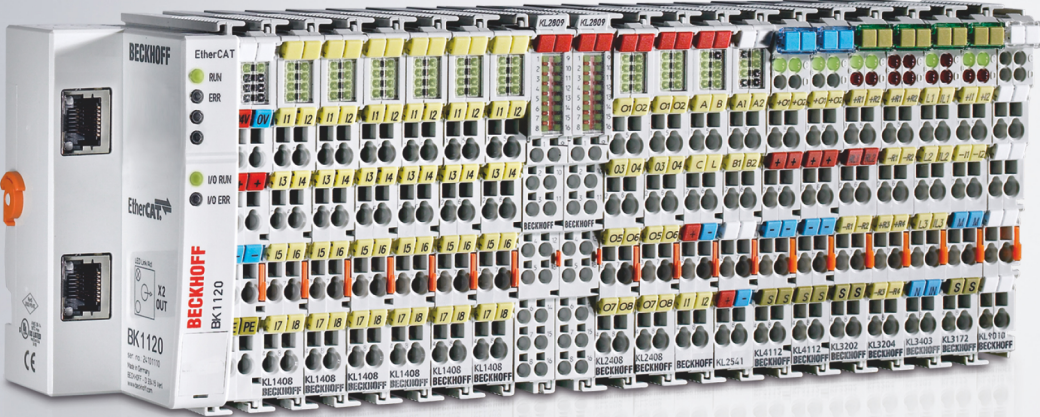


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1 Foreword

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

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



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1.2 Safety instructions

Safety regulations

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

Exclusion of liability

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

Personnel qualification

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

Description of instructions

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

DANGER

Serious risk of injury!

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

WARNING

Risk of injury!

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

CAUTION

Personal injuries!

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

NOTE

Damage to environment/equipment or data loss

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



Tip or pointer

This symbol indicates information that contributes to better understanding.

1.3 Documentation issue status

Version	Comment
2.0.0	<ul style="list-style-type: none"> • Migration • Structure update • Chapter <i>Product overview</i> updated, <ul style="list-style-type: none"> ◦ <i>SMI Power LED</i> added ◦ Links to the TwinCAT libraries updated ◦ Corrections in chapter <i>Technical Data</i> • Chapter <i>Notes on ESD protection</i> added • Update chapter <i>Connection system</i> -> <i>Connection</i> • Chapter <i>Notes on commissioning with DI1 and DI2</i> updated • Chapter <i>KS200 configuration software</i> added • Chapter <i>Access from the user program</i> added
1.1.0	<ul style="list-style-type: none"> • Chapter <i>Register description</i> updated • Chapter <i>Principle of operation</i> corrected
1.0.0	First release
0.0.x	Internal versions for product management and development

Firmware and hardware versions

Documentation Version	KL6831		KL6841	
	Firmware	Hardware	Firmware	Hardware
2.0.0	1D	02	1D	02
1.1.0	1C	00	1C	00
1.0.0	1C	00	1C	00

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

Syntax of the serial number

Structure of the serial number: WW YY FF HH

WW - week of production (calendar week)

YY - year

FF - firmware version

HH - hardware version

Example with ser. no.: 44 13 B1 00:

44 - week of production 44

13 - year of production 2013

1C – firmware version 1C

00 - hardware version 00

2 Product overview

2.1 KL6831, KL6841 - Introduction

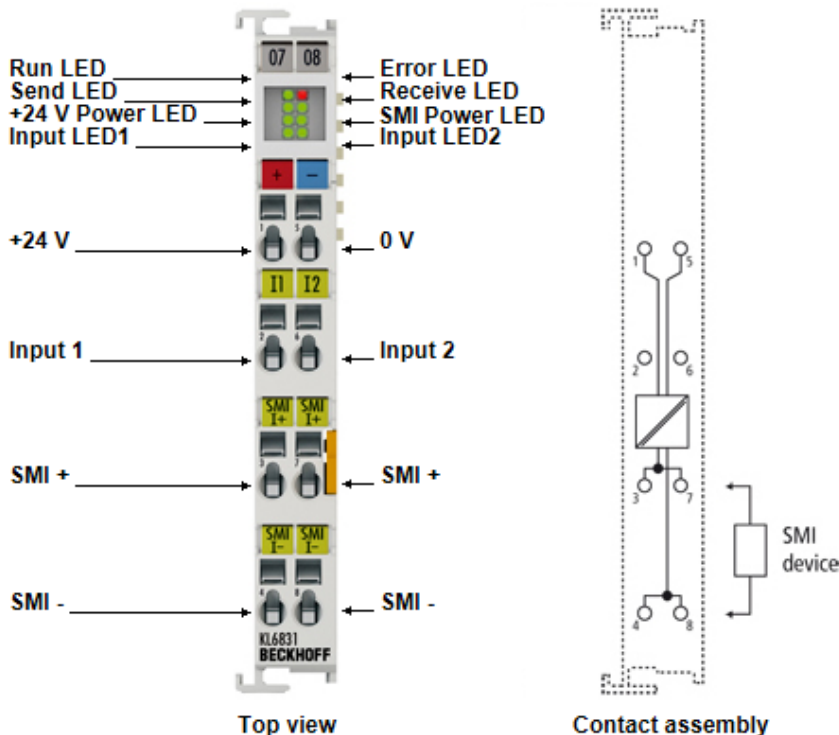


Fig. 1: KL6831

The SMI master terminals KL6831 and KL6841 enable direct connection to the SMI bus system.

The automation of roller shutters and sun blinds in building automation is simplified with the SMI-Bus system (Standard Motor Interface). With SMI drives roller shutters can drive to precise positions and blind drives can drive to angular positions with an accuracy of a degree. The SMI drives can return actual positions, error messages and service information to the SMI master terminal.

The KL6831 is designed for installations with 24 V LoVo SMI drives, the KL6841 for installations with 230 V_{AC} SMI drives.

NOTE

Application of the KL6831 and KL6841

The KL6831 and KL6841 may only be operated at the designated SMI drives. Interchanging of 24 V LoVo SMI drives and 230 V_{AC} SMI drives or mixed operation is not permitted, since it may lead to malfunctions and destruction of modules.

The wiring effort is reduced compared with standard drives, since each SMI master terminal can control up to 16 SMI drives.

Further information on the SMI bus and SMI drives are provided by the SMI Group under <http://standard-motor-interface.com>.

The KL6831 and KL6841 contain an integrated power supply unit for the electrically isolated SMI power supply. No further components are required for the operation of SMI drives. The KL6831 and KL6841 operate fieldbus-independent.

The TwinCAT PLC Lib SMI library, which is available free of charge (see TwinCAT Information System), is used to control the SMI master terminals directly from the PLC program. In addition, high-performance PLC function blocks for room automation according to VDI 3813 are available in the TwinCAT library TS8040 (TwinCAT 2) / TF8040 (TwinCAT 3).

Support for KL6831 and KL6841



The KL6831 and KL6841 are only supported in conjunction with the TwinCAT library for the SMI master terminal!

If the KL6831 or KL6841 are used under another control system than TwinCAT, Bus Couplers (BK) are not supported.

In this case a Bus Terminal controller (BC or BX) would be required!

Without TwinCAT PLC, the KL6831 or KL6841 are not supported at an Embedded PC (CX).

2.2 KL6831, KL6841 - Diagnostic LEDs

The LEDs indicate the operating state of the KL6831 and KL6841.

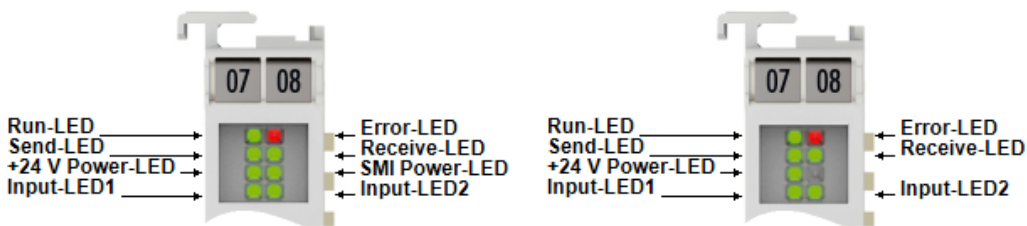


Fig. 2: LEDs, from hardware 03 with additional SMI Power LED (left), up to hardware 02 (right)

Meaning of the LED displays

LED	Color	State and significance		
		On	Off	Flashes
Run-LED	green	K-bus communication is OK	No K-bus communication	K-bus communication
Send LED	green	SMI telegrams are sent	No sending	Sending active
+ 24 V Power LED	green	Power supply OK	No 24 V power supply	-
Input LED1	green	DI 1 is switched on or was active and has not yet been acknowledged.	DI 1 is switched off	-
Error LED	red	Hardware error	No error	-
Receive LED	green	SMI telegrams are received	No reception	Reception active
SMI Power LED (from hardware 03)	green	SMI power supply OK	SMI power supply missing	-
Input LED2	green	DI 2 is switched on or was active and has not yet been acknowledged.	DI 2 is switched off	-

2.3 Technical data

Technical data	KL6831	KL6841
Number of channels	1	
Number of SMI slaves	16 max.	
Electrical isolation (K-bus / SMI bus)	1500 V	
Bit width in the K-bus I/O	2 x 22 bytes input and output data, 1 x 16 bit control/status word	
Bit width in the input process image	22 bytes of input data, 16 bits each for control word and status word	
Bit width in the output process image	22 bytes of output data, 16 bits each for control word and status word	
Configuration	Via function blocks of the TwinCAT automation software	
Special features	2 digital inputs for simplified commissioning, TwinCAT library available, can only be used with Beckhoff controller	
Power supply for the electronics	via the K-bus	
Current consumption from K-bus	typically 55 mA	
Short-circuit strength	yes, automatic re-starting	
Input voltage	24 V _{DC} (-15%/+ 20%)	
Isolation voltage	SMI bus / K-bus: permanent 1500 V _{AC} SMI bus / 24 V _{DC} power supply: permanent 1500 V _{AC} K-bus / 24 V _{DC} power supply: permanent 500 V _{AC}	
SMI	standard-compliant, open circuit voltage approx. 18 V _{DC}	
Data transfer rates	2400 baud	
SMI system	LoVo	230 V _{AC}
Resistance to overvoltage (effective)	permanent 275 V _{AC}	
Weight	approx. 80 g	
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm	
Mounting [▶ 11]	on 35 mm mounting rail conforms to EN 60715	
Power dissipation	0.5 W + power dissipation caused by the connected SMI slaves	
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, see also Installation instructions for enhanced mechanical load capacity [▶ 15]	
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4	
Protection class	IP20	
Installation position	variable	
Approval	CE	

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 be grounded probably, when handling with the devices.
- Each assembly must be terminated at the right hand end with an [EL9011](#) or [EL9012](#) bus end cap, to ensure the protection class and ESD protection.

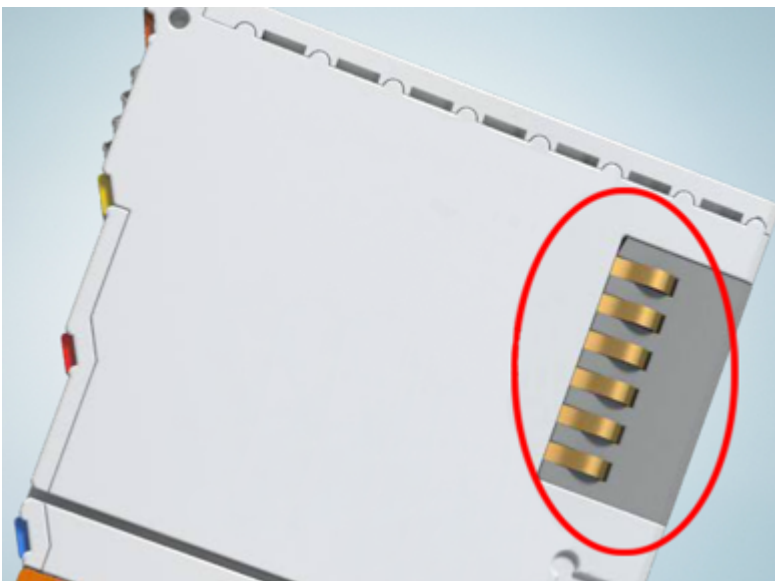


Fig. 3: Spring contacts of the Beckhoff I/O components

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

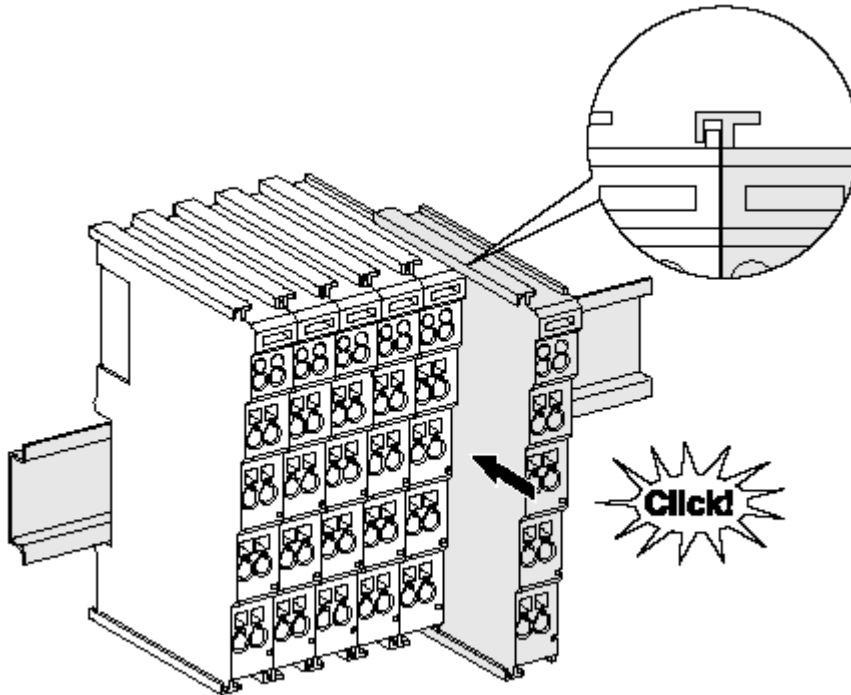


Fig. 4: Attaching on mounting rail

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

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

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

i Fixing of mounting rails

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

Disassembly



Fig. 5: Disassembling of terminal

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

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

Connections within a bus terminal block

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

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

i Power Contacts

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

PE power contact

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

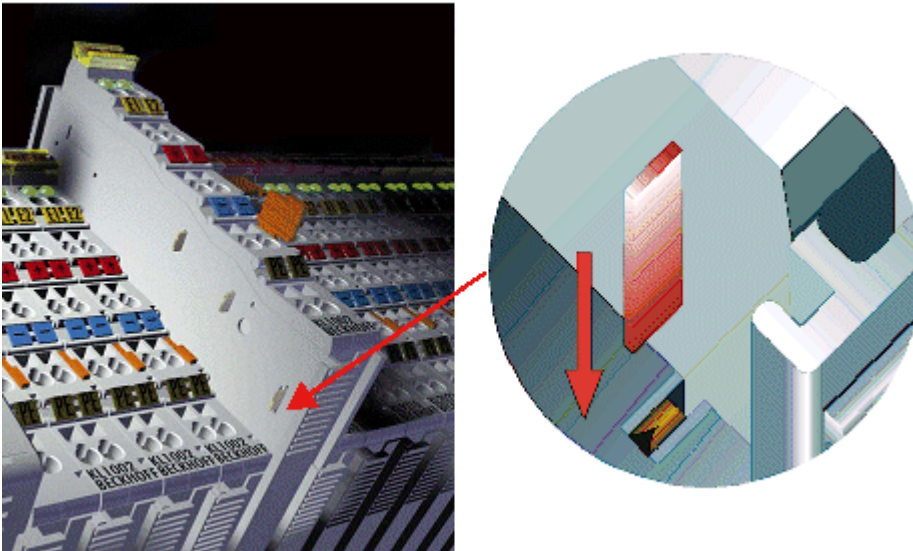


Fig. 6: Power contact on left side

NOTE**Possible damage of the device**

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

⚠ WARNING**Risk of electric shock!**

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

3.3 Installation instructions for enhanced mechanical load capacity

⚠ WARNING

Risk of injury through electric shock and damage to the device!
 Bring the Bus Terminal system into a safe, de-energized state before starting mounting, disassembly or wiring of the Bus Terminals!

Additional checks

The terminals have undergone the following additional tests:

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

Additional installation instructions

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

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

3.4 Connection

3.4.1 Connection system

⚠ WARNING

Risk of electric shock and damage of device!
 Bring the bus terminal system into a safe, powered down state before starting installation, disassembly or wiring of the bus terminals!

Overview

The bus terminal system offers different connection options for optimum adaptation to the respective application:

- The terminals of ELxxxx and KLxxxx series with standard wiring include electronics and connection level in a single enclosure.

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

Standard wiring (ELxxxx / KLxxxx)



Fig. 7: Standard wiring

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

Pluggable wiring (ESxxxx / KSxxxx)



Fig. 8: Pluggable wiring

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

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

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

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

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

High Density Terminals (HD Terminals)



Fig. 9: High Density Terminals

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

● **Wiring HD Terminals**

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

Ultrasonically “bonded” (ultrasonically welded) conductors

● **Ultrasonically “bonded” conductors**

i It is also possible to connect the Standard and High Density Terminals with ultrasonically “bonded” (ultrasonically welded) conductors. In this case, please note the tables concerning the wire-size width!

3.4.2 Wiring

⚠ WARNING

Risk of electric shock and damage of device!

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

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

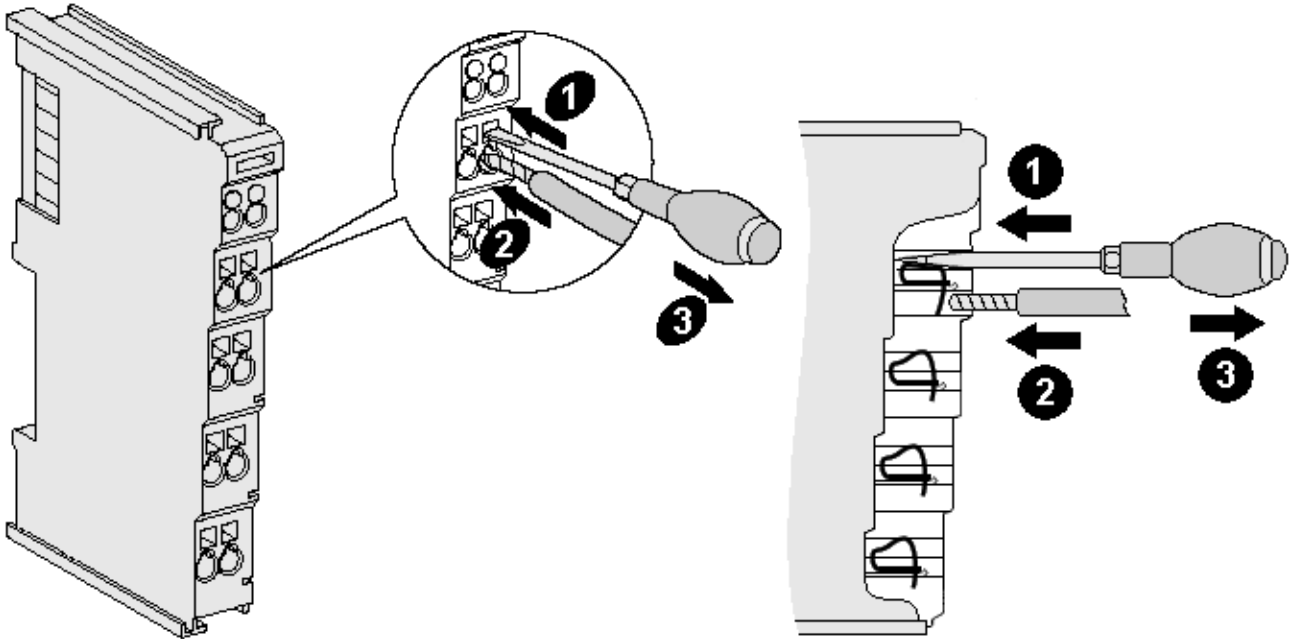


Fig. 10: Connecting a cable on a terminal point

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

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

See the following table for the suitable wire size width.

Terminal housing	ELxxxx, KLxxxx	ESxxxx, KSxxxx
Wire size width (single core wires)	0.08 ... 2.5 mm ²	0.08 ... 2.5 mm ²
Wire size width (fine-wire conductors)	0.08 ... 2.5 mm ²	0,08 ... 2.5 mm ²
Wire size width (conductors with a wire end sleeve)	0.14 ... 1.5 mm ²	0.14 ... 1.5 mm ²
Wire stripping length	8 ... 9 mm	9 ... 10 mm

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

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

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

3.4.3 Shielding



Shielding

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

3.5 KL6831, KL6841 - Connection

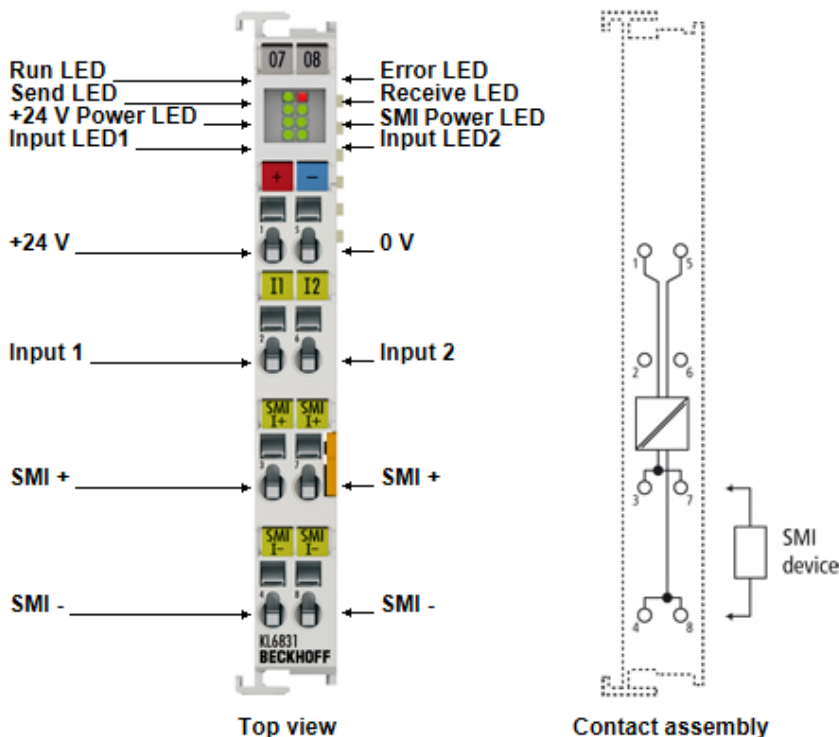


Fig. 11: KL6831

Terminal point	No.	Connection for
+ 24 V _{DC}	1	24 V supply voltage
Input 1	2	24 V digital input for executing freely definable SMI commands, default: Rising edge: all SMI drives are started up Falling edge: all SMI drives are stopped
SMI+	3	SMI bus line I+
SMI-	4	SMI bus line I-
0 V	5	Ground
Input 2	6	24 V digital input for executing freely definable SMI commands, default: Rising edge: all SMI drives are shut down Falling edge: all SMI drives are stopped
SMI+	7	SMI bus line I+
SMI-	8	SMI bus line I-

● **Input 1 and input 2**

i The digital inputs Input 1 and Input 2 (terminal points 2 and 6) only work if the 24 V supply voltage is connected and the K-bus voltage supplied is switched on.

● **Input 1 and input 2, effect on automatic mode**

i The digital inputs Input 1 and Input 2 (terminal points 2 and 6) have priority over automatic control through the PLC program. If the digital inputs are operated, other PLC-controlled SMI commands are blocked. To enable them a rising edge is required at the bResetInactiveProcessImage input of FB_KL6831KL6841Communication. See documentation [TwinCAT PLC Lib:SMI](#).

4 SMI

4.1 SMI - Overview

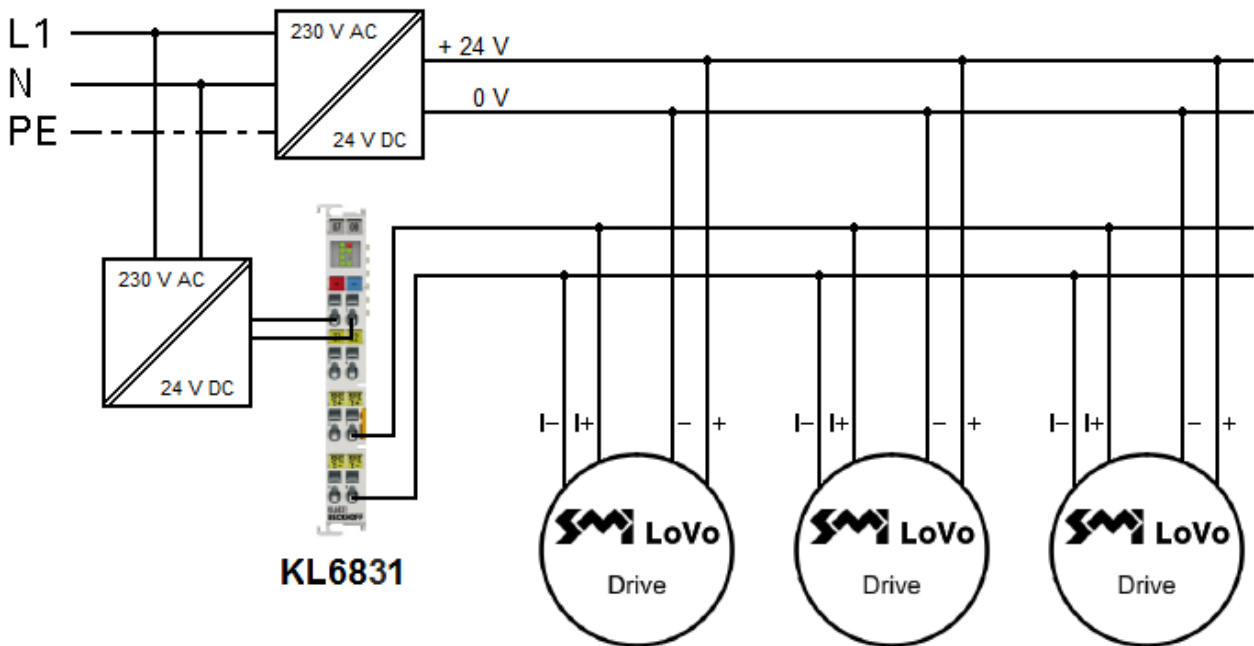


Fig. 12: KL6831 connection example

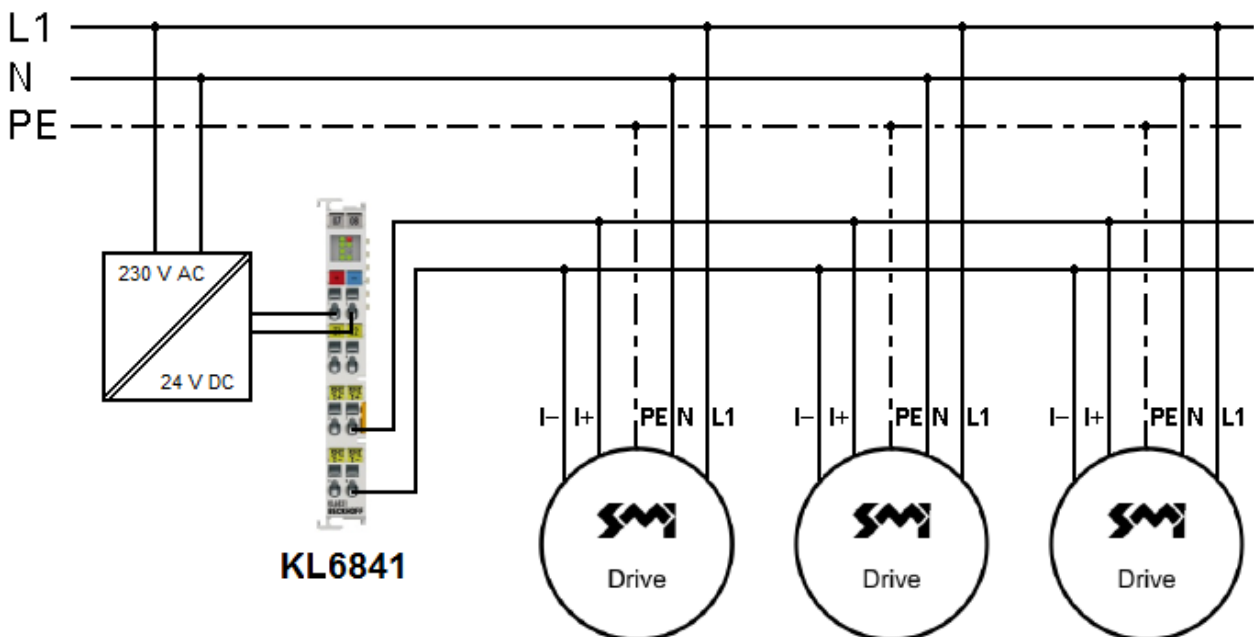


Fig. 13: KL6841 connection example

4.2 Introduction to SMI

The automation of roller shutters and sun blinds in building automation is simplified with the **SMI-Bus** system (**Standard Motor Interface**). With SMI drives roller shutters can drive to precise positions and blind drives can drive to angular positions with an accuracy of a degree. The SMI drives can return actual positions, error messages and service information to the SMI master terminal.

Major European manufacturers have formed the *SMI Standard Motor Interface e.V.* and developed the digital interface. Drives are controlled by means of telegrams via this uniform interface. Using standard commands, functions can be implemented that are not so easy to realize with conventional drives. Examples are the precise movement to positions, the feedback of the current position and diagnosis. For the adjustment of louvers in shading systems, for example, angular resolutions of 2° can be achieved. Adjustment of the louvers in relation to the position of the sun is thus possible for constant light control.

For mains-voltage drives, the drive and controller are connected via a five-core cable for power supply and data transmission. Distances of up to 350 m between controller and drive are possible. The connecting cables are reverse-polarity protected to prevent damage to the drive in case of incorrect connection. Up to 16 drives can be connected in parallel and addressed individually. SMI drives are available for mains voltage ($230 V_{AC}$) and for low voltage ($24 V_{DC}$).

In order to ensure the compatibility of the SMI products with one another, all products that are to be marked with the SMI logo must be certified. A positive certification can be read on the SMI Group's homepage (www.standard-motor-interface.com). Further information on the SMI-Bus and SMI drives can also be found there.

4.3 Principle of operation

The two SMI master terminals KL6831 and KL6841 enable the operation of 16 SMI drives (blinds/roller shutters) per terminal and support the complete SMI functionality. Ready-made function blocks are used to realize up, down and stop commands, travel to any position, adjustment of the slat angle and feedback on the current position of the motor/blind in the PLC user program. The SMI master terminals implement the process data (movement commands in the PLC program) in the SMI protocol, including level conversion. The terminals require an external $24 V_{DC}$ supply. The K-bus, the $24 V$ supply and the SMI connections are electrically isolated from each other.

Addressing of the SMI drives and programming of the SMI master terminal

Addressing of the SMI drives and programming of the SMI master terminal is described in the software documentation in the Beckhoff Information System:

TwinCAT 2: [TwinCAT PLC Lib: SMI](#)

TwinCAT 3: [TwinCAT 3 PLC Lib: Tc2_SMI](#)

4.4 Notes for commissioning with DI1 and DI2

The behavior of the digital inputs DI1 and DI2 can be modified via the library blocks. To support commissioning the following default behavior is assigned.

Digital input	SMI command
Rising edge at DI1	All SMI drives travel UP on rising edge at DI1 (factory setting)
Falling edge at DI1	All SMI drives stop on falling edge at DI1 (factory setting)
Rising edge at DI2	All SMI drives travel DOWN on rising edge at DI2 (factory setting)
Falling edge at DI2	All SMI drives stop on falling edge at DI2 (factory setting)

● Input 1 and input 2, effect on automatic mode

I The digital inputs Input 1 and Input 2 (terminal points 2 and 6) have priority over automatic control through the PLC program. If the digital inputs are operated, other PLC-controlled SMI commands are blocked. To enable them a rising edge is required at the `bResetInactiveProcessImage` input of `FB_KL6831KL6841Communication`. See documentation [TwinCAT PLC Lib:SMI](#).

Addressing and behavior of DI1 and DI2 with KS2000

The inputs DI1 and DI can be addressed and configured with the KS2000 software via the Device Settings and Options dialogs (see [Settings](#) [▶ 28]).

5 KS2000 Configuration software

5.1 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. 14: 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.

5.2 Parameterization of the KL6831, KL6841 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.

It is also possible to configure the terminal via the PLC with the function block *FB_KL6831KL6841Config*.



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 BK1120 Bus Coupler for Ethernet
- a KL1xx2 digital input terminal
- a KL6831 SMI master terminal
- a KL6841 SMI master terminal
- a KL9010 Bus End Terminal

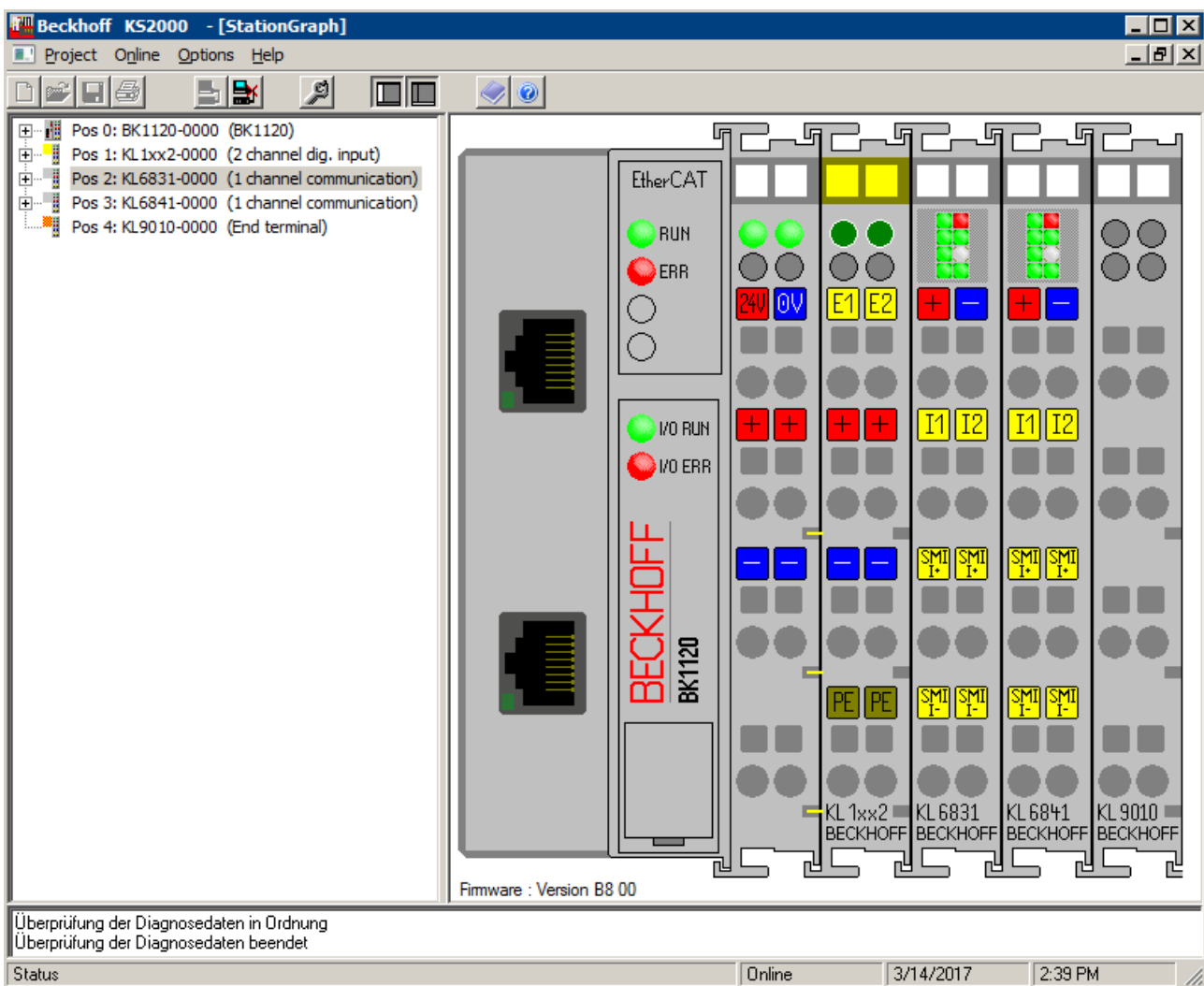


Fig. 15: Display of the fieldbus station in KS2000

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 and 3 in the example).

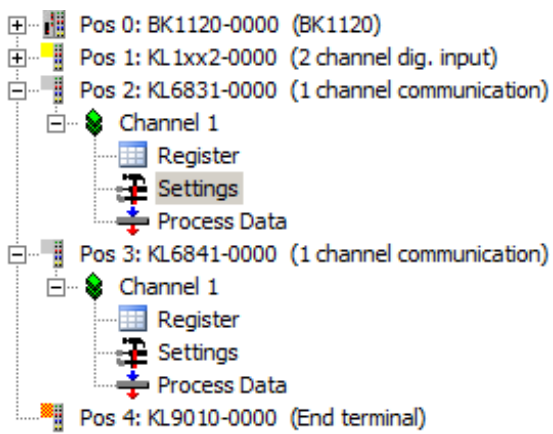


Fig. 16: KS2000 branches for channel 1 of the KL6831 and KL6841

The branches *Register*, *Settings* and *ProcData* are displayed for the KL6831 and KL6841:

- [Register](#) [► 27] enables direct access to the KL6831/KL6841 registers.
- Dialog masks for the parameterization of the KL6831/KL6841 can be found under [Settings](#) [► 28].
- [ProcData](#) [► 33] shows the process data for the KL6831/KL6841.

5.3 Register

Under *Register* you can directly access the registers of the dimmer terminal. The meaning of the register is explained in the [register overview](#) [▶ 35].

The following image shows the registers of the KL6831.

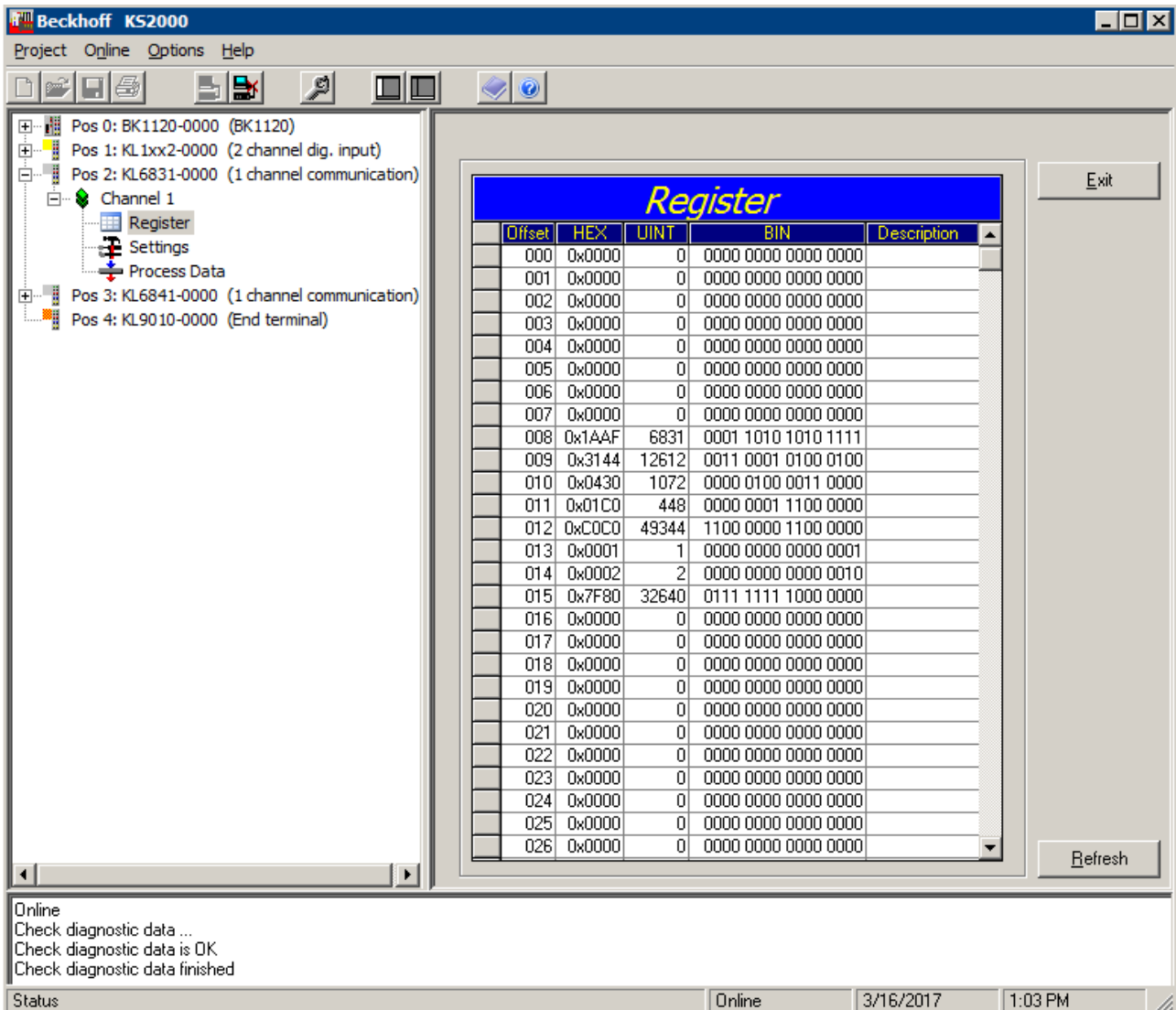


Fig. 17: Register view example: KL6831 in KS2000

5.4 Settings

Two dialog masks for parameterization of the KL6831/KL6841 are available under *Settings*:

1. [Device settings \[▶ 29\]](#)
 - Different address types can be selected to search for SMI devices.
 - The main SMI commands are available for manual control

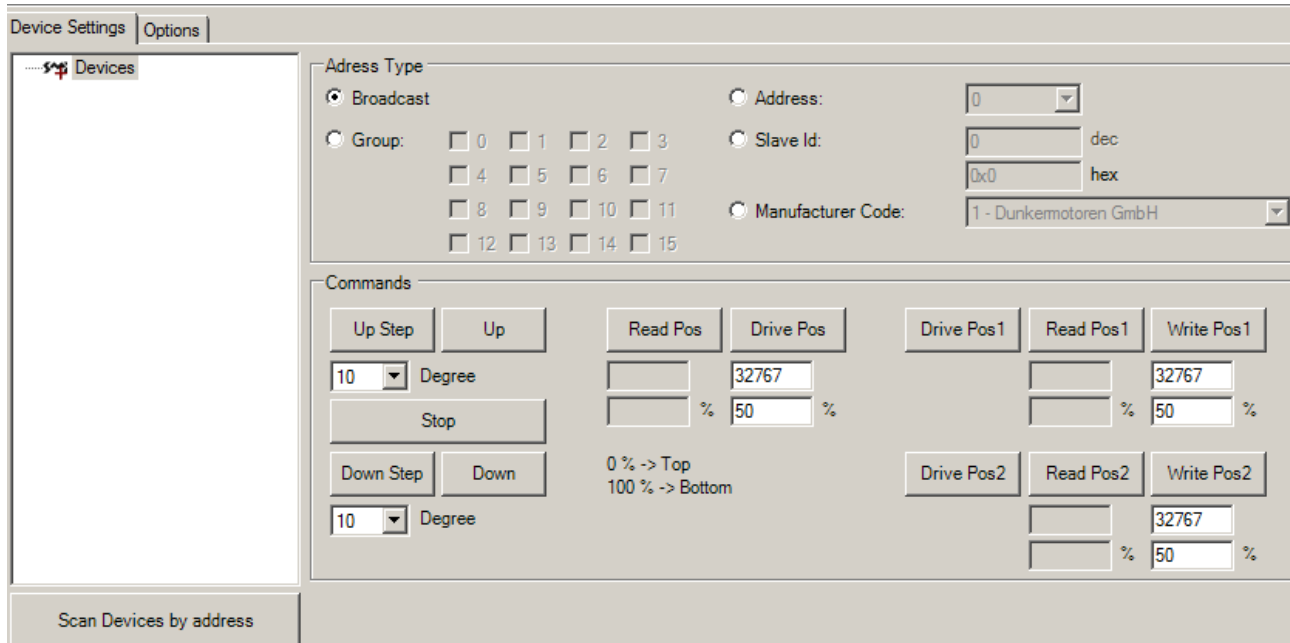


Fig. 18: KL6831/KL6841 - device settings via KS2000

2. [Options \[▶ 32\]](#)
 - For setting the behavior of the digital inputs DI1 and DI2.

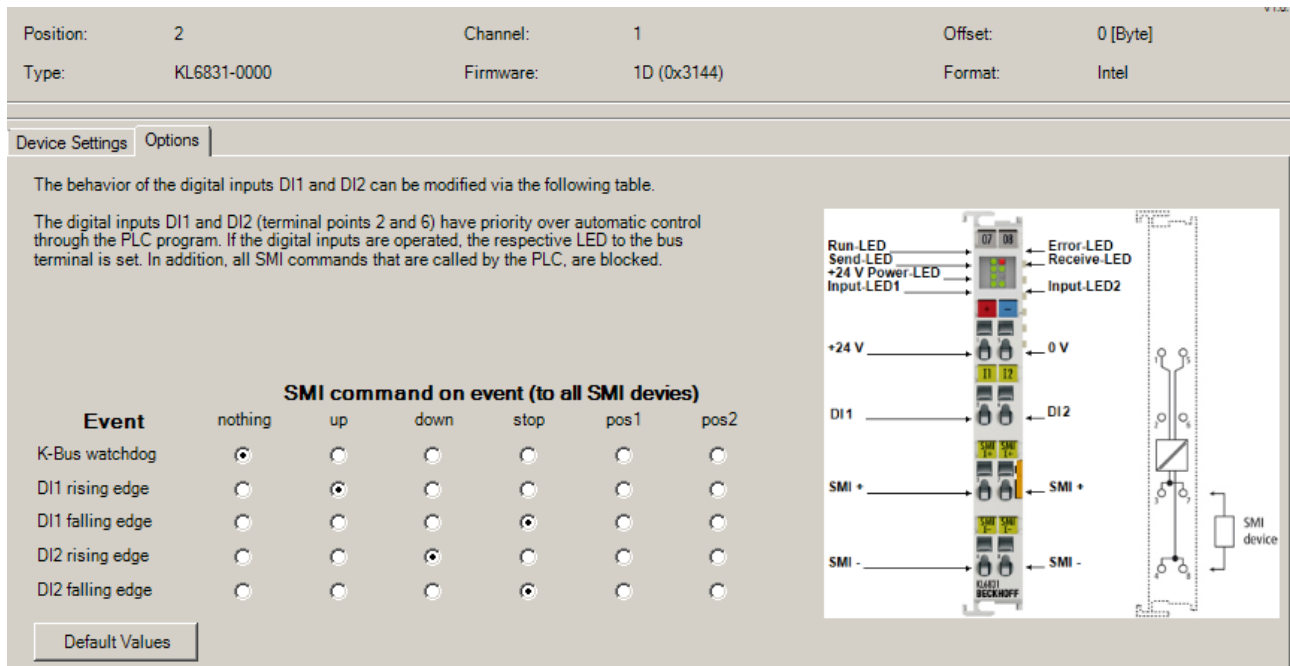


Fig. 19: KL6831/KL6841 - setting the behavior of the digital inputs for event

5.4.1 Device settings

Searching for devices by address

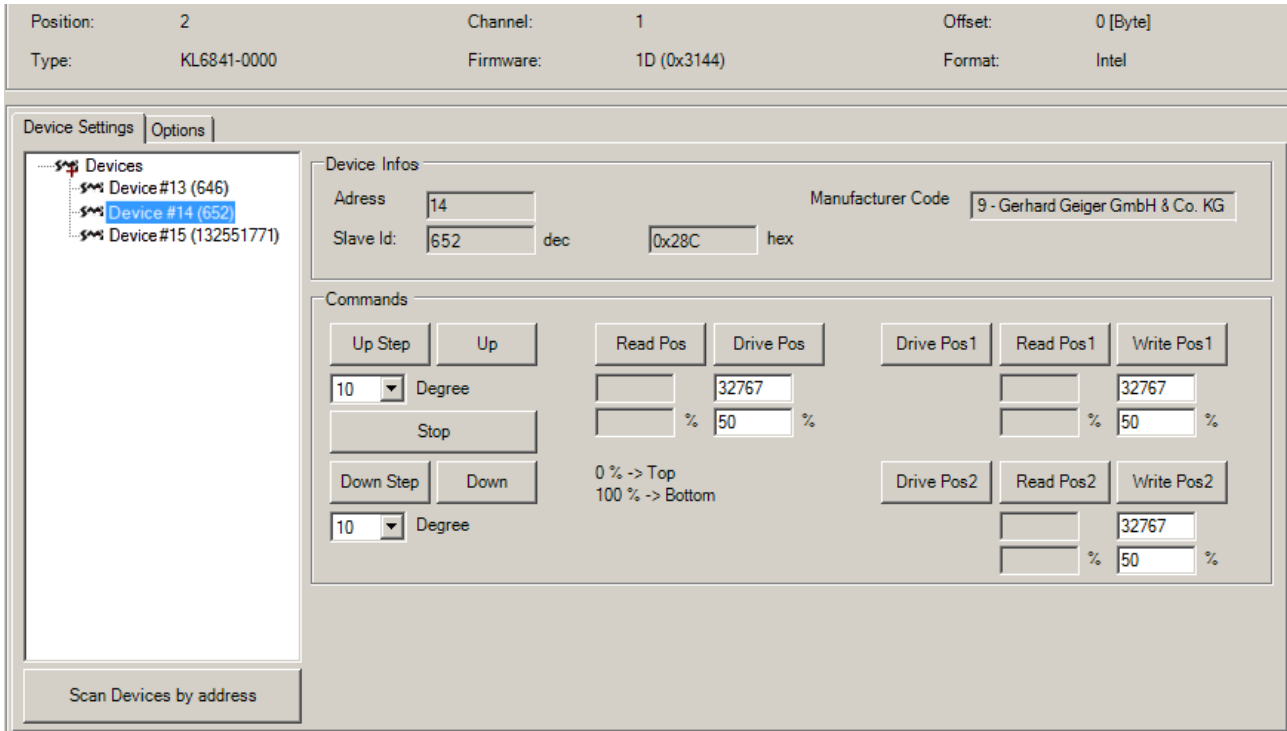


Fig. 20: KL6831/KL6841 - Searching for devices by address

Clicking the *Searching for devices by address* button triggers a search for devices with a short address (0... 15). The results are shown in the dialog box (see image above). Devices without an address are not displayed.

The *Device information* field shows the address, the slave ID and the manufacturer code for the selected device.

Address type

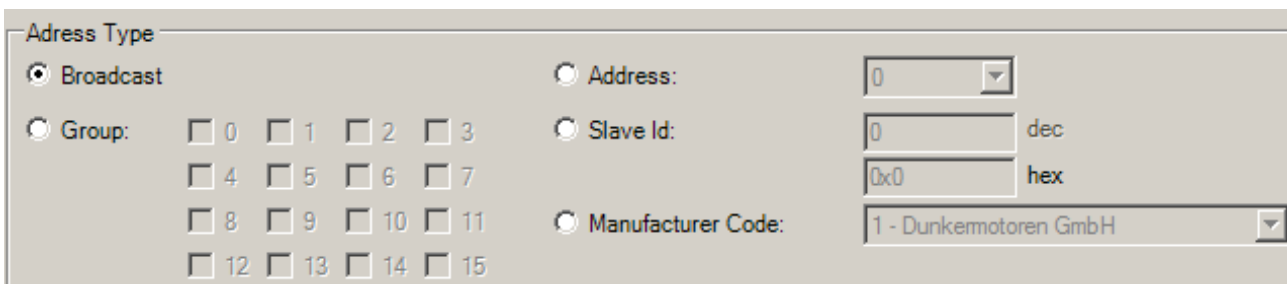


Fig. 21: KL6831, KL6841 - selecting the address type with KS2000

The individual modes of addressing are described below. Note that not every command supports all addressing modes.

The following types of device addressing are available:

- **Broadcast**
A broadcast always addresses all devices, irrespective of the address set at the device.
- **Group addressing**
Each device that is to be controlled via group addressing must have an address from 0 to 15. Use the checkboxes to select the addresses of the devices to be accessed.

Example: The drives with addresses 1, 4, 7 and 12 are to be accessed

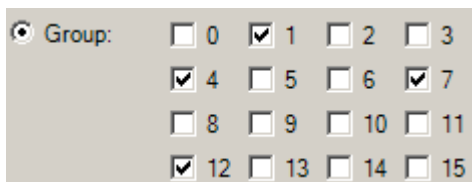


Fig. 22: Example for group addressing with KS2000

• **Individual addressing**

◦ **by address**

Each SMI device can be assigned an address from 0 to 15. Since each address should only be assigned once, each SMI device can be addressed individually.

The address is stored in the SMI device and must be correctly set again when exchanging the drive.

This address is also occasionally called the slave address. The slave address must not be confused with the slave ID (see below).

◦ **via slave ID**

The device manufacturers store a unique 32-bit number in each SMI device. The slave ID, also referred to as key ID, can be used for addressing a device.

With some SMI devices the slave ID is printed on the name plate or is made visible by a label on the cable.

Most read commands do not support addressing by Slave ID.

• **Addressing by manufacturer code**

All devices from a manufacturer are always addressed by this addressing.

SMI defines a manufacturer code for each manufacturer. The manufacturer code is permanently stored in the SMI device and cannot be changed. Often abbreviated as M-ID.

With some SMI devices the manufacturer code is printed on the name plate or is made visible by a label on the cable.

Commands

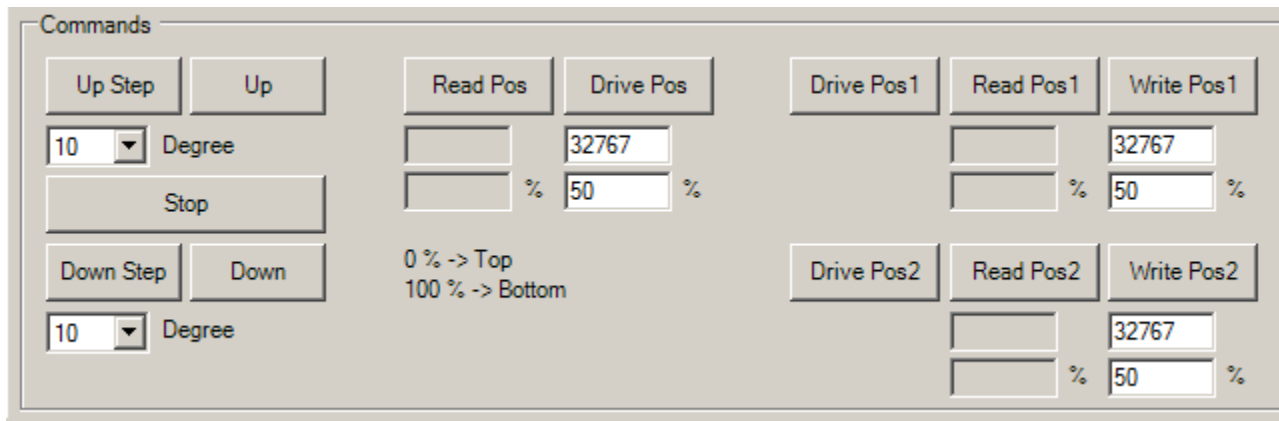


Fig. 23: KL6831, KL6841 - entering commands via KS2000 (default settings)

• **Up Step / Down Step**

Enables motor travel up / down by a specified angle.

In the listbox below, angles between 2 and 510 degrees can be specified (default: 10). Since the SMI standard reduces the accuracy to a resolution of 2 degrees, the angles are specified in 2-degree steps.

• **Up / Down**

enables motor movement to the upper / lower end position.

• **Stop**

stops the motor operation.

• **Read Pos**

Reads the current position from the drive. The position value is shown below the button as an absolute value and in percent.

- The value = 0 (0 %) corresponds to the upper end position

- The value = 65535 (100 %) corresponds to the lower end position.
- **Drive Pos**
The drive travels to a specified position value. The position value is specified via the input fields, either as an absolute value or in percent.
- **Drive Pos1 / Drive Pos2**
The drive travels to the fixed position *Pos1* / *Pos2* that is configured on the motor side.
- **Read Pos1 / Read Pos2**
Reads the fixed position *Pos1* / *Pos2* that is configured on the motor side and shows it as an absolute value and in percent.
 - The value = 0 (0 %) corresponds to the upper end position
 - The value = 65535 (100 %) corresponds to the lower end position.
- **Write Pos1 / Write Pos2**
The position value for the fixed position *Pos1* / *Pos2* is specified via the input fields, either as an absolute value or in percent.

5.4.2 Options

Use the *Options* dialog to specify commands that are executed for all SMI devices when the corresponding event occurs.

● Input 1 and input 2, effect on automatic mode

i The digital inputs Input 1 and Input 2 (terminal points 2 and 6) have priority over automatic control through the PLC program. If the digital inputs are operated, other PLC-controlled SMI commands are blocked. To enable them a rising edge is required at the bResetInactiveProcessImage input of FB_KL6831KL6841Communication. See documentation [TwinCAT PLC Lib:SMI](#).

The behavior of the digital inputs DI1 and DI2 can be modified via the following table.

The digital inputs DI1 and DI2 (terminal points 2 and 6) have priority over automatic control through the PLC program. If the digital inputs are operated, the respective LED to the bus terminal is set. In addition, all SMI commands that are called by the PLC, are blocked.

Event	SMI command on event (to all SMI devies)					
	nothing	up	down	stop	pos1	pos2
K-Bus watchdog	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DI1 rising edge	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DI1 falling edge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
DI2 rising edge	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DI2 falling edge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

Default Values

Fig. 24: KL6831/KL6841 - Setting options with KS2000 (default settings)

Event	Description
K-bus watchdog	The terminal is no longer addressed by the K-bus.
DI1 rising edge	A rising edge is present at input DI1.
DI1 falling edge	A falling edge is present at input DI1.
DI2 rising edge	A rising edge is present at input DI2.
DI2 falling edge	A falling edge is present at input DI2.

SMI commands	Description
none	No command is executed.
Up	All drives drive travel to the upper end position.
Down	All drives drive travel to the lower end position.
Stop	The motor operation is stopped.
To Pos1	The drive travels to the fixed position Pos1 that is configured on the motor side.
To Pos2	The drive travels to the fixed position Pos2 that is configured on the motor side.

Default values

Use the *Defaults* button to restore the default settings (see image above).

5.5 Process data

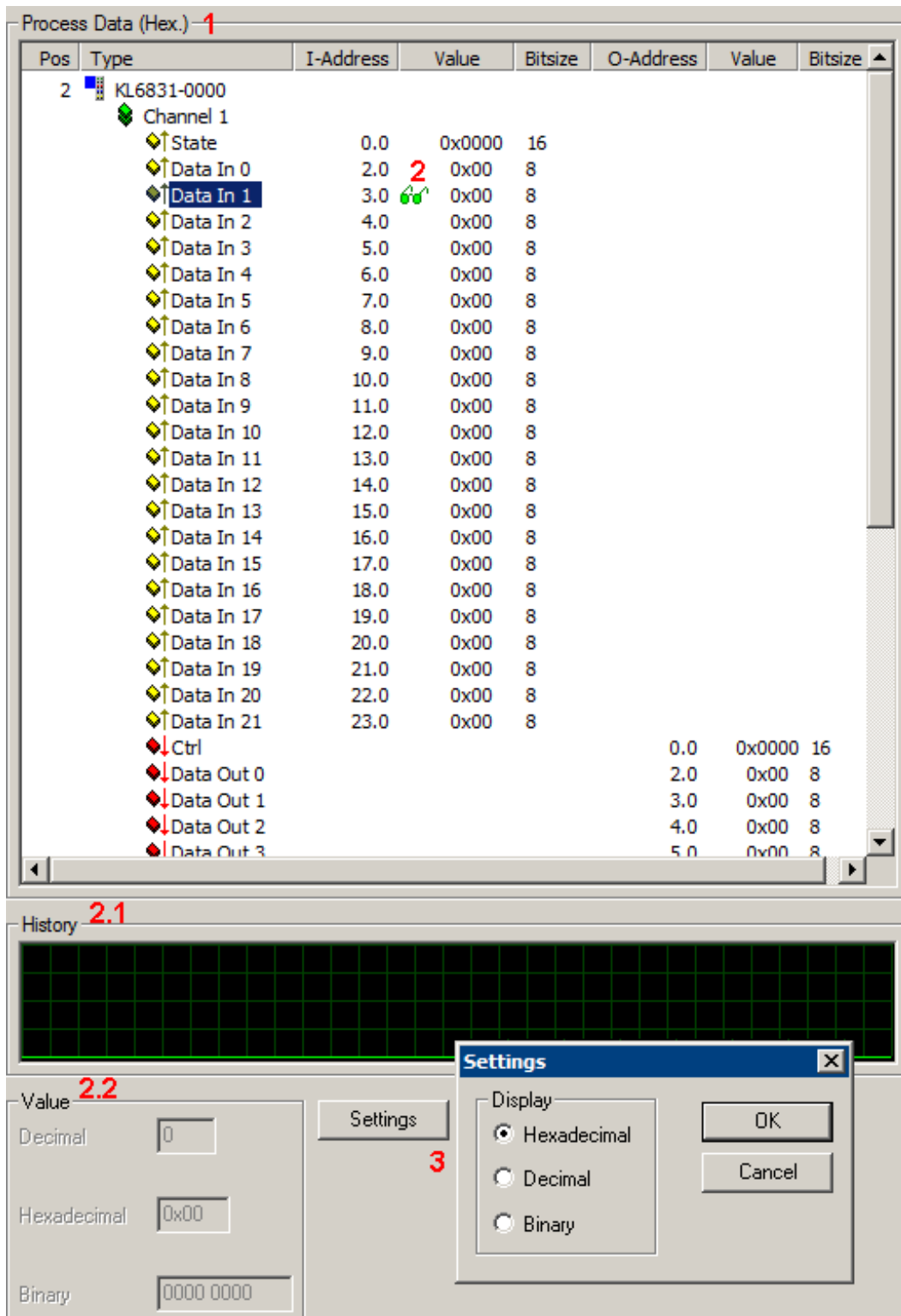


Fig. 25: KL6831/KL6841 - displaying the process data (Data In) with KS2000

1. The field Process Data (hex.) shows the status byte (Status), the control byte (Ctrl) and the process data (Data) in a tree structure.
2. The spectacles indicate the data currently
 - graphically displayed in the *History* field.
 - The current input value for the selected data is displayed numerically in the *Value* field.
3. Click the *Settings* set the numerical display format in the *Process Data* field to hexadecimal, decimal or binary for all values.

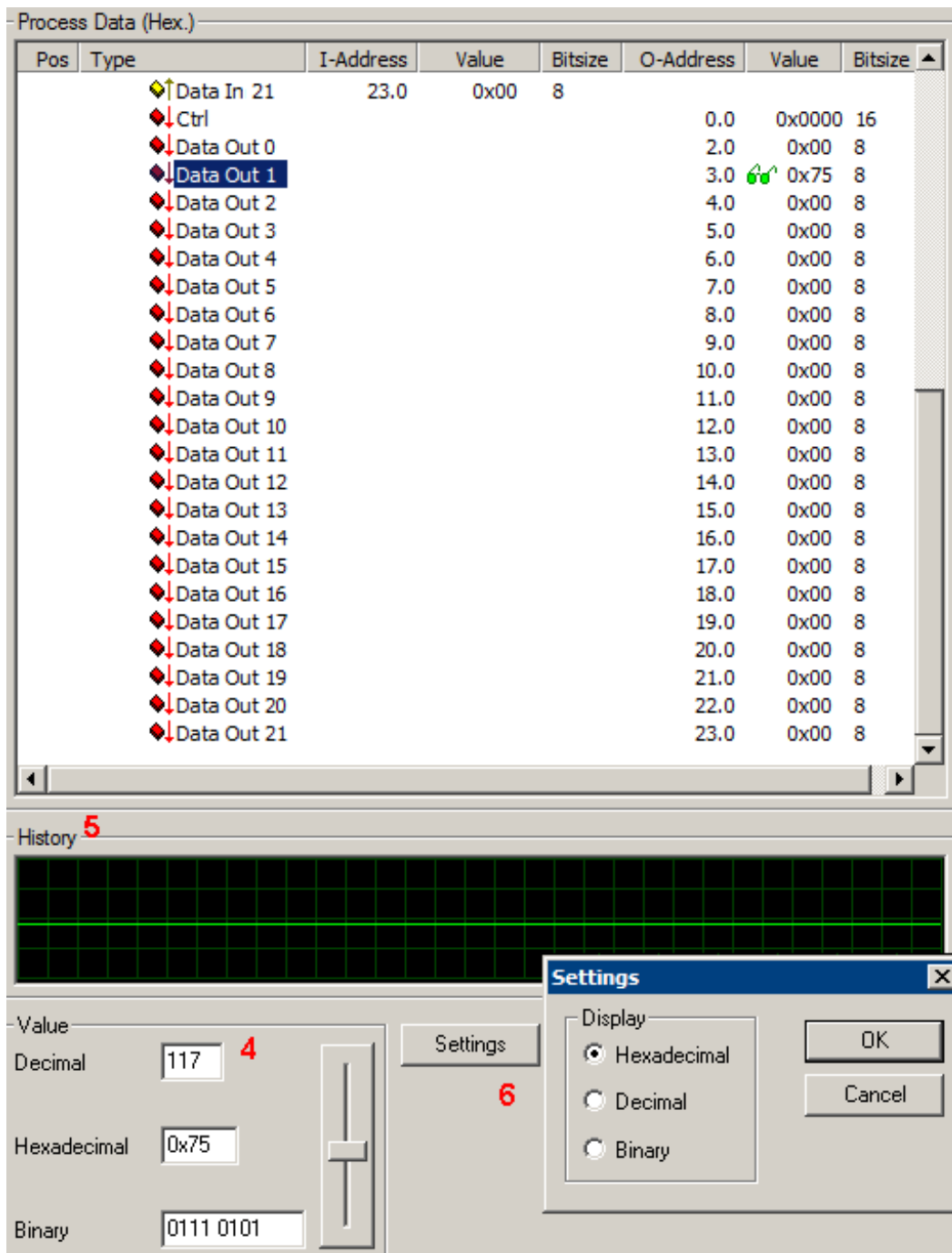


Fig. 26: KL6831/KL6841 - displaying the process data (Data Out) with KS2000

4. in the Value field you can change the output values indicated by the spectacles via the fader. The current value is shown in decimal, hexadecimal and binary format.
5. The History field shows the history of the output value.
6. Click the Settings set the numerical display format in the Process Data field to hexadecimal, decimal or binary for all values.

⚠ CAUTION

Danger for persons, the environment or devices!

Note that changing initial values (forcing them) can have a direct effect on your automation application. Only modify these output values if you are certain that the state of your equipment permits it, and that there will be no risk to people or to the machine!

6 Access from the user program

6.1 Register overview

The registers are used for the parameterization of the interface terminals. They can be read or written by means of register communication.

Register no.	Comment	Default value		R/W	Memory	
R0	reserved	0x0000	0 _{dec}	-	-	
...	
R5	reserved	0x0000	0 _{dec}	-	-	
R6 [▶ 36]	Diagnostic register	variable	variable	R	RAM	
R7 [▶ 36]	Command register	0x0000	0 _{dec}	R/W	RAM	
R8 [▶ 36]	Terminal type	KL6831	0x1AAF	6831 _{dec}	R	ROM
		KL6841	0x1AB9	6841 _{dec}	R	ROM
R9 [▶ 36]	Firmware version	variable	variable	R	ROM	
R10	reserved	0x0000	0 _{dec}	-	-	
...	
R15	reserved	0x0000	0 _{dec}	-	-	
R16	Hardware version	e.g. 0x0000	e.g. 0 _{dec}	...	EEPROM	
R17	reserved	0x0000	0 _{dec}	-	-	
...	
R28	reserved	0x0000	0 _{dec}	-	-	
R29	Terminal type - special identification	0x0000	0 _{dec}	R	EEPROM	
R30	reserved	0x0000	-	-	-	
R31 [▶ 36]	Code word register	0x0000	0 _{dec}	R/W	RAM	
R32	Feature register	0x0000	0 _{dec}	R/W	EEPROM	
R33 [▶ 37]	Watchdog register	variable	variable	R/W	RAM	
R34 [▶ 37]	Watchdog register	variable	variable	R/W	RAM	
R35 [▶ 36]	Watchdog register	variable	variable	R/W	RAM	
R36 [▶ 37]	DI register	variable	variable	R/W	RAM	
...	
R47 [▶ 37]	DI register	variable	variable	R/W	RAM	
...	
R63	reserved	0x0000	0 _{dec}	-	-	

6.2 Register description

All registers can be read or written via register communication. They are used for parameterizing the terminals.

The behavior in conjunction with a K-bus watchdog (R33 ... R35) and the behavior of the inputs DI1 and DI2 (R36 ... R47) can be modified via [library blocks](#) [▶ 38].

R6: diagnostic register

Bit	Description	default
R6.5-15	- reserved	-
R6.4	1 _{bin} Buffer is full	0 _{bin}
R6.3	1 _{bin} An overrun error has occurred	0 _{bin}
R6.2	1 _{bin} A framing error has occurred	0 _{bin}
R6.1	1 _{bin} A parity error has occurred	0 _{bin}
R6.0	1 _{bin} The receive buffer has overflowed, incoming data is lost	0 _{bin}

R7: command register



User code word

For the following commands to be executed, it is first necessary for the user code word, 0x1235, to be entered into [register R31](#) [▶ 36].

Command 0x7000: Restore Factory Settings

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

[R33, 34 and 35](#) [▶ 37]: No SMI command with K-bus watchdog

[R36, 37 and 38](#) [▶ 37]: All SMI drives travel UP on rising edge at DI1

[R39, 40 and 41](#): [▶ 37] All SMI drives stop on falling edge at DI1

[R42, 43 and 44](#) [▶ 37]: All SMI drives travel DOWN on rising edge at DI2

[R45, 46 and 47](#) [▶ 37]: All SMI drives stop on falling edge at DI2

R8: terminal type

The terminal name is contained in register R8:

KL6831: 0x1AAF (6831_{dec})

KL6841: 0x1AB9 (6841_{dec})

R9: firmware version

Register R9 contains the ASCII coding of the terminal's firmware version, e.g. **0x3143 = '1C'**. The **'0x31'** corresponds here to the ASCII character **'1'**, while the **'0x43'** represents the ASCII character **'C'**. This value cannot be changed.

R16: hardware version number

Register R16 contains the hardware version of the terminal.

R31-R47: user registers

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 if the terminal is restarted.

R32: feature register

The feature register R32 is not occupied.

R33, R34 and R35: watchdog

The R33, 34 and 35 determine the behavior of the terminal in the event of a K-bus watchdog.

The factory setting is: No SMI command if the K-bus watchdog is triggered.

The behavior can be changed via the library blocks.

R36 to R47: Behavior of DI1 and DI2

The behavior of the digital inputs DI1 and DI2 can be modified via the library function blocks.

Digital input	SMI command
Rising edge at DI1	All SMI drives travel UP on rising edge at DI1 (factory setting)
Falling edge at DI1	All SMI drives stop on falling edge at DI1 (factory setting)
Rising edge at DI2	All SMI drives travel DOWN on rising edge at DI2 (factory setting)
Falling edge at DI2	All SMI drives stop on falling edge at DI2 (factory setting)

7 Programming

7.1 TwinCAT libraries

Software documentation in the Beckhoff Information System:

TwinCAT 2: [TwinCAT 2 PLC Lib: SMI](#)

TwinCAT 3: [TwinCAT 3 PLC Lib: Tc2_SMI](#)

8 Appendix

8.1 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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