

Beckhoff **Минск** т.80447584780 Viber email [minsk17@tut.by](mailto:minsk17@tut.by)  
[www.fotorele.net](http://www.fotorele.net) [www.tiristor.by](http://www.tiristor.by) радиодетали, электронные компоненты  
tel.+375 29 758 47 80 МТС

[каталог](#), [описание](#), [технические](#), [характеристики](#), [datasheet](#), [параметры](#), [маркировка](#), [габариты](#), [фото](#), [даташит](#), Beckhoff

### **где и как купить в Минске?**

Сделать заявку или запрос можно по телефону факсу или по электронной почте

Просим Вас указывать в заявке:

- название предприятия, факс, контактный телефон, контактное лицо;
- полное наименование и количество товара;
- возможность замены или аналоги;

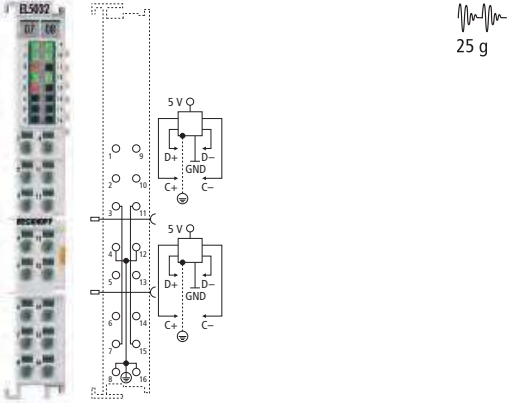
## Каталог Beckhoff

Автоматизация

# Position measurement | EnDat 2.2 interface

The EL5032 EnDat 2.2 EtherCAT Terminal is used for direct connection of two encoders with EnDat 2.2 interface. The EL5032 enables reading of position values, diagnosis encoder data, internal and external temperature values and the electronic identification plate. With the electronic identification plate all measuring device-specific information is directly available. In addition, user-defined data can be stored in the encoder. This enables cost-effective and quicker commissioning. The position value is output with up to 48 bits, depending on the resolution of the connected measuring device. In addition to the position value, further information such as status information, addresses and data can be transferred. A list of additional information supported by the encoder is stored in the parameters. The EL5032 features distributed clocks, which means that the position value can be read in exact synchrony with the system. If the distributed clock function is deactivated, the EL5032 cycles synchronous with the EtherCAT cycle.

2-channel EnDat 2.2 interface

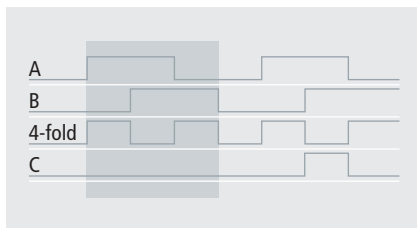
Technical data	EL5032
Technology	EnDat 2.2 interface
Number of channels	2
	
Nominal voltage	24 V at power contact, built in encoder supply, max. 0.5 A
Encoder supply	optionally 5 V DC or 9 V DC
Current consumption power contacts	typ. 150 mA
Current consumption E-bus	typ. 120 mA
Commands	reading position values including additional information available for selection via MRS code (Memory Range Select), reading and writing parameters, reset functions
Distributed clocks	yes
Encoder connection	D+, D-, C+, C-
Resolution	max. 48 bit for position
Special features	saving the zero offset shift, electronic type plate, diagnostics, warning, including cable length compensation up to 100 m, reading the encoder temperature values
Operating temperature	0...+55 °C
Approvals	CE
Weight	approx. 50 g
Further information	<a href="http://www.beckhoff.com/EL5032">www.beckhoff.com/EL5032</a>

# Position measurement | Incremental/SinCos encoder interfaces

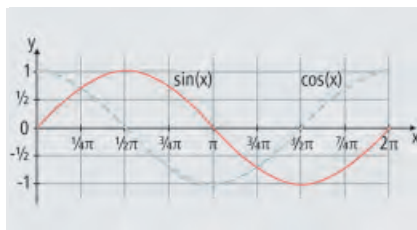
As opposed to absolute value encoders, incremental encoders do not provide a direct position, but rather two changing/pulsed signals that are phase-shifted by  $90^\circ$ , which can be used to calculate back to a position. To this end, digital position encoders subdivide a  $360^\circ$  rotation of the encoder axis into individual steps (increments). For position encoders with analog sin/cos interface it is subdivided into periods, with a period corresponding to a full revolution of the sine/cosine signal. A full revolution of the encoder axis is indicated by a special marker/zero pulse. The number of increments determines both the resolution of an encoder and the accuracy of the position.

The EL51xx terminals support micro-increment mode: By interpolating the signal voltages, the resolution is increased 256-fold and can be used for refining the positioning.

Using the EL5021, an n-times more precise position determination is achieved within one period through interpolation of the two  $90^\circ$  phase-shifted sine signals. Depending on the setting (8 to 13 bit), a micro-resolution of the period of 256 to 8,192 times can be achieved.



The quadruple evaluation of the signals A and B (quadrature encoder) produces a fine positional resolution and enables detection of the direction.

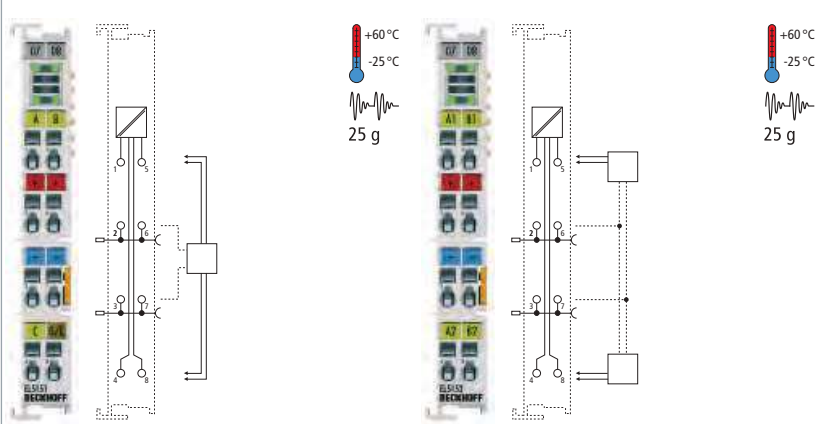
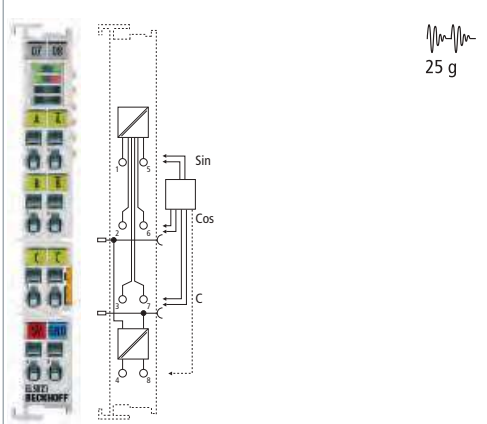


SinCos signal depending on the encoder position

1-channel incremental encoder interface, differential input (RS485)

Technical data	EL5101   ES5101		
Technology	incremental encoder interface RS485		
Number of channels	1		
	<p>The EL5101 is an interface for the direct connection of incremental encoders with differential (RS485) or single-ended inputs. It supplies 5 V for the encoder supply.</p>		
Nominal voltage	24 V DC at power contact		
Current consum. pow. cont.	typ. 100 mA + load		
Current consumption E-bus	typ. 130 mA		
Distributed clocks	yes		
Input signal	difference signal (RS485), single-ended possible		
Encoder connection	A, A (inv), B, B (inv), C, C (inv), differential inputs (RS485); status input 5 V DC; gate/latch input 24 V DC		
Encoder operating voltage	5 V DC/max. 0.5 A		
Input frequency	max. 4 million increments/s (with 4-fold evaluation)		
Resolution	1/256 bit microincrements		
Counter	1 x 16/32 bit switchable		
Special features	wire breakage detection, latch and gate function, period duration and frequency measurement, microincrements, time-stamping of edges, filters		
Operating temperature	-25...+60 °C		
Approvals	CE, UL, Ex		
Weight	approx. 100 g		
Further information	www.beckhoff.com/EL5101		
Special terminals	EL5101-0010	EL5101-0090	
Distinguishing features	20 million increments/s (with 4-fold evaluation), no single-ended operation	TwinSAFE SC	324

**i** For availability status see Beckhoff website at: [www.beckhoff.com](http://www.beckhoff.com)

1-channel incremental encoder interface, single-ended, 24 V DC	2-channel incremental encoder interface, single-ended, 24 V DC	1-channel SinCos encoder interface, 1 V <sub>PP</sub>
EL5151   ES5151	EL5152   ES5152	EL5021   ES5021
incremental encoder interface 24 V DC, EN 61131-2, type 1, "0": < 5 V DC, "1": > 15 V DC, typ. 5 mA		SinCos encoder interface for differential 1 V <sub>PP</sub> signal
2		1
 <p>The diagrams show the terminal blocks for EL5151 and EL5152. EL5151 has terminals for A, B, C, and a gate/latch input. EL5152 has terminals for A1, B1, A2, and B2. Both diagrams include a temperature range of +60 °C to -25 °C and a vibration level of 25 g.</p>		 <p>The diagram shows the terminal block for EL5021 with terminals for Sin, Cos, and C. It includes a vibration level of 25 g.</p>
<p>The EL5151 and EL5152 are interfaces with 24 V inputs for the direct connection of incremental encoders. For each channel a 32-bit counter with quadrature decoder can be read and set. In addition, the EL5151 offers a 32-bit latch for the zero pulse. Alternatively, both terminals can be used as forward/backward counters. Due to their support of distributed clocks, the EL515x terminals can detect the axis positions together with other slaves synchronously and with high temporal accuracy.</p>		<p>The EL5021 is an interface for the direct connection of a measuring sensor with sinusoidal voltage output 1 V<sub>PP</sub>. The measuring signal is provided as a 32 bit value. The maximum resolution of the counter value is 24 bit, the maximum resolution of the signal period is 13 bit. The reference mark is stored in a 32 bit value.</p>
24 V DC at power contact typ. 100 mA + load		24 V DC at power contact typ. 50 mA + load
typ. 130 mA		typ. 120 mA
yes		yes
24 V DC		1 V <sub>PP</sub>
A, B, C, gate/latch input 24 V DC, 24 V/0 V	A1, B1, A2, B2, 24 V/0 V	A, A (inv), B, B (inv), C, C (inv)
24 V DC max. 400,000 increments/s (with 4-fold evaluation)		5 V DC/max. 0.5 A 250 kHz @ 10 bit (sampling frequency 70 MHz)
1/256 bit microincrements		max. 13 bit, 8,192 steps per period
1 x 16/32 bit switchable	2 x 32 bit	max. 24 bit
gate or latch function, microincrements, time stamping of edges, period duration and frequency measurement, up/down counters	microincrements, period duration and frequency measurement, up/down counters	latch, reset, amplitude and frequency error recognition, frequency-dependent period resolution, frequency counter max. 24 bit
-25...+60 °C		0...+55 °C
CE, UL, Ex		CE, Ex
approx. 50 g		approx. 55 g
www.beckhoff.com/EL5151	www.beckhoff.com/EL5152	www.beckhoff.com/EL5021
<b>i</b> EL5151-0021		<b>i</b> EL5021-0090
with parameterisable 24 V DC output and workpiece measurement		TwinSAFE SC <span style="float: right;">324</span>

# Communication | Serial interfaces RS232/RS485

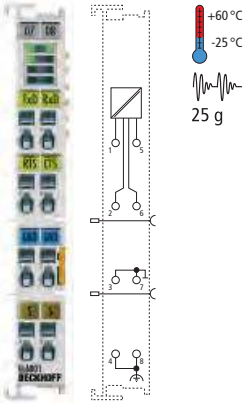

The EL60xx serial interfaces enable the connection of devices with RS232 or RS422/RS485 interfaces to the control level. The devices connected to the EtherCAT Terminal communicate via the EtherCAT network with the automation device. The active communication channel works independently of the cycle of the higher-level EtherCAT system in full duplex mode at up to 115.2 kbaud. This way, any desired number of serial interfaces can be used in the application without having to consider structural restrictions in the control device. The serial interface can be positioned close to the place of use, this way reducing the necessary cable lengths.

The RS232 interface allows for high immunity to interference through electrically isolated signals. In the EL6021 this is additionally supported by differential signal transmission according to RS422. The EL6022 can make 2 x 5 V/20 mA from the E-bus supply available for powering external devices.

The EL60xx can be used as a normal Windows COM interface in conjunction with the TwinCAT Virtual Serial COM Driver (see page 963).

1 x serial interface  
RS232/RS422/RS485

2 x serial interface  
RS232/RS422/RS485

Technical data	EL6001   ES6001		EL6021   ES6021	
	<b>Data transfer rates</b>	2,400...115,200 baud; default: 9,600 baud, 8 data bits, no parity and one stop bit		300...115,200 baud; default: 9,600 baud, 8 data bits, no parity and one stop bit
<b>Interfaces</b>	1 x RS232	1 x RS422/ RS485	2 x RS232	2 x RS422/ RS485
<b>Technology</b>	terminal contact		D-sub, 9-pin	
				
<b>Data buffer</b>	864 bytes receive buffer, 128 bytes transmit buffer		864 bytes receive buffer, 128 bytes transmit buffer	
<b>Current consumption power contacts</b>	–		–	
<b>Current consumption E-bus</b>	typ. 120 mA	typ. 170 mA	typ. 170 mA	typ. 270 mA
<b>Distributed clocks</b>	–		–	
<b>Cable length</b>	max. 15 m	approx. 1,000 m twisted pair	max. 15 m	approx. 1,000 m twisted pair
<b>Line impedance</b>	–	120 Ω	–	120 Ω
<b>Special features</b>	–		2 x 5 V/20 mA for external supply (EL6022)	
<b>Operating temperature</b>	-25...+60 °C		-25...+60 °C	
<b>Approvals</b>	CE, UL, Ex		CE, UL, Ex	
<b>Weight</b>	approx. 55 g		approx. 55 g	
<b>Further information</b>	www.beckhoff.com/EL6001		www.beckhoff.com/EL6002	

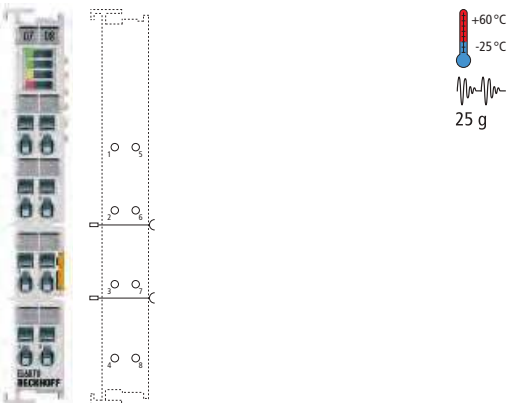
# Communication | License key terminal for TwinCAT 3.1

TwinCAT 3.1 enables management of TwinCAT licenses via the EL6070 EtherCAT Terminal. The EL6070 is used as a hardware license key in the modular EtherCAT I/O system. Via an interface, the terminal can also be used for secure data encryption. Data transfer takes place via EtherCAT.

For even more convenient handling of the TwinCAT 3.1 licensing, from hardware version 02 the EL6070 license key terminal is equipped with a local data memory. The data memory is used for storing the TwinCAT 3.1 license files. It is not freely accessible and is managed by TwinCAT 3.1.

The functionally equivalent C9900-L100 license key USB stick also features this data memory.

License key terminal  
for TwinCAT 3.1

<b>Technical data</b>	EL6070
<b>Technology</b>	EtherCAT license key terminal
	
<b>Current consumption power contacts</b>	–
<b>Current consumption E-bus</b>	typ. 130 mA
<b>Distributed clocks</b>	–
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	CE
<b>Weight</b>	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL6070">www.beckhoff.com/EL6070</a>



C9900-L100 | License key USB stick  
for TwinCAT 3.1

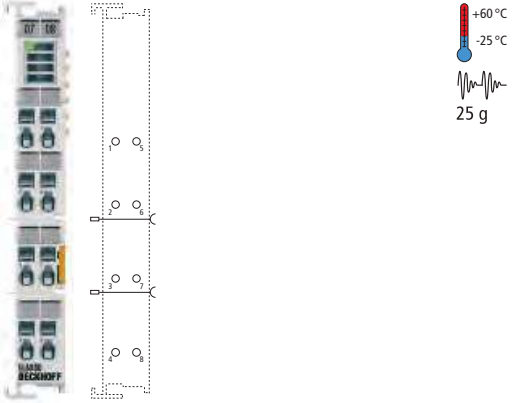
# Communication | EtherCAT memory terminal 128 kbyte

The EL6080 EtherCAT memory terminal has 128 KB of non-volatile memory (NOVRAM). The terminal can be used to store and read out parameters and recipes. Part of the memory can also be used for the cyclic storage of machine data such as operating hour meters or production numbers. The EtherCAT Terminal is used, for example, for storing module-related data in the machine module in modular machine concepts with a central controller.

Data is only stored in the RAM in the live terminal and is therefore not stored permanently. However, this allows unlimited access for reading and writing. In the event of a power failure, an internal buffer supplies the NOVRAM block until the entire contents of the RAM have been stored in a non-volatile memory.

The EL6080 supports memory access with cyclic process data or via acyclic SDO/CoE. The access time depends in both cases on the size of the data. For cyclic access, the user must create a set of process data with an arbitrary structure, which is then written to or read from the terminal in its entirety. This process takes several task cycles, depending upon the size of the data and the cycle time, and is controlled by a handshake.

EtherCAT memory terminal  
128 kbyte, NOVRAM

Technical data	EL6080
Technology	EtherCAT memory terminal
Memory	128 kbyte NOVRAM
	
Number of write/read	arbitrary
Current consumption power contacts	–
Current consumption E-bus	typ. 130 mA
Distributed clocks	–
Operating temperature	-25...+60 °C
Approvals	CE, UL, Ex
Weight	approx. 50 g
Further information	<a href="http://www.beckhoff.com/EL6080">www.beckhoff.com/EL6080</a>


# Communication | Display terminal – operating hours counter

The display terminal has an illuminated, low-reflection LC display with two lines of 16 characters. It can be used, for example, for displaying status messages or diagnostic information. A non-resettable operating hours counter is integrated and can be displayed and also read out via the controller.

Via the user program dynamic and static application-specific texts can be displayed, e.g. "Production counter: (count value)". If the output text is longer than 16 characters, the terminal automatically switches to scrolling text mode. Two special characters can be defined via a 5 x 8 pixel matrix.

The statuses of the navigation switch – up, down, left, right and enter – are transmitted to the controller as binary variables and can be used, for example, to control the display.

Display terminal with navigation switch and operating hours counter

<b>Technical data</b>	EL6090
<b>Technology</b>	EtherCAT display terminal
<b>Switch inputs</b>	navigation switch: up, down, left, right, enter
	
<b>Display</b>	LC display, 2 x 16 characters (> 16 characters = scrolling text mode), switchable backlight
<b>Special characters</b>	2 characters (5 x 8 pixel matrix)
<b>Operating hours counter</b>	32 bit overflow after 136 years (no reset possible), secure data storage > 100 years (@15 minutes writing interval), accuracy: ±50 ppm
<b>Time measuring</b>	4 x 32 bit second counter (reset possible)
<b>Counter</b>	4 x 32 bit counter (reset possible)
<b>Storage interval</b>	manual/automatic every 15 minutes
<b>Current consumption power contacts</b>	–
<b>Current consumption E-bus</b>	typ. 80 mA
<b>Distributed clocks</b>	–
<b>Operating temperature</b>	0...+55 °C
<b>Approvals</b>	CE
<b>Weight</b>	approx. 70 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL6090">www.beckhoff.com/EL6090</a>



# Communication | Ethernet switch port terminals



The EL6601 and EL6614 Ethernet switch-port terminals serve the local connection of arbitrary Ethernet devices to the EtherCAT system. The EtherCAT system relays the Ethernet communication of the connected devices fully transparent and collision-free.

The EL6614 Ethernet switchport terminal has an integrated 5-port switch. It manages the data from the EtherCAT system and the four RJ 45 ports. In full-duplex mode, the terminal enables the collision-free communication of the connected devices with one another.

The EL6601 and EL6614 are suitable for transmitting and receiving "normal" non-real-time-critical Ethernet frames, e.g. with TCP/IP contents. The throughput specified in the documentation must be observed. TwinCAT, as a "virtual switch", manages these frames at the IPC Ethernet port, which is configured as an EtherCAT device.

In addition, the EL6601 and EL6614 can appear as a publisher/subscriber like a real-time Ethernet device and can be configured as such in TwinCAT. Real-time data are preferred by the terminal and processed synchronously with the EtherCAT cycle. In this way, several hundred bytes of process data can be transmitted and received cyclically, up to < 1 ms.

## Ethernet

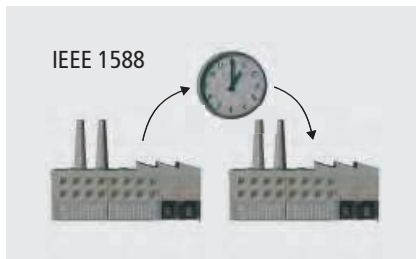
	Ethernet switch port terminal, 1 port	Ethernet switch port terminal, 4 ports, internal switch
Technical data	EL6601	EL6614
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 1 x RJ45	10BASE-T/100BASE-TX Ethernet with 4 x RJ45
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings	
Cable length	up to 100 m twisted pair	up to 100 m twisted pair
		
Protocol	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode
Current consumption power contacts	–	–
Current consumption E-bus	typ. 310 mA	typ. 450 mA
Distributed clocks	–	–
Special features	support of RT Ethernet, publisher/subscriber, DHCP/BootP address allocation (1 device)	support of RT Ethernet, publisher/subscriber, DHCP/BootP address allocation (1 device)
Operating temperature	-25...+60 °C	-25...+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 75 g	approx. 95 g
Further information	<a href="http://www.beckhoff.com/EL6601">www.beckhoff.com/EL6601</a>	<a href="http://www.beckhoff.com/EL6614">www.beckhoff.com/EL6614</a>

# Communication | IEEE 1588 external synchronisation

The Precision Time Protocol can be used in order to generate an identical time base within an application, i.e. over several networks. PTP is a protocol that secures the synchronicity of the time settings of several devices in a network and which is defined in IEEE 1588 standard as the protocol standard for the synchronisation of distributed clocks in networks. As opposed to the NTP (Network Time Protocol), the emphasis in PTP is on higher accuracy. The applicational synchronisation can be implemented using TwinCAT and the EL6688 IEEE 1588 External Synchronisation Interface.

If the PTP Ethernet frames are routed by switches in a larger network, then PTP-compatible switches should be used in order to attain the highest possible synchronisation accuracy. These enter the self-caused data delays into the correction values provided in the PTP data. In this way, the accuracy of the synchronisation of the master to the slave is not affected negatively by the transmission delays.

The EL6688 is the simplest way to synchronise an EtherCAT system with appropriate interface devices to the global world time via GPS or radio transmitters such as DFC77. If more than two EtherCAT systems are to be synchronised with one another, the EtherCAT Terminal is likewise the means of choice.



Applicational synchronicity in the network thanks to distributed clocks according to IEEE 1588

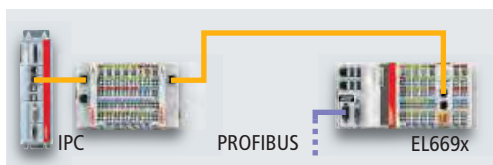
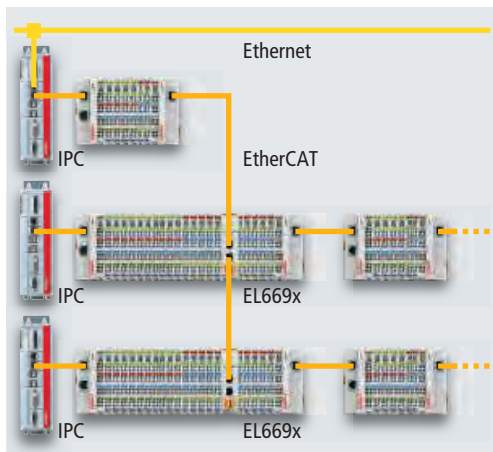
IEEE 1588 external synchronisation interface

Technical data	EL6688
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 1 x RJ45
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings
Cable length	up to 100 m twisted pair
	<p>The EL6688 EtherCAT Terminal is a device in the IEEE 1588 synchronisation system that supports the Ethernet-based precision time protocols PTPv1 (IEEE 1588-2002) and PTPv2 (IEEE 1588-2008). On the one hand, the EL6688 is an IEEE 1588 clock (master or slave), which is synchronised within the scope of the protocol accuracy. On the other hand, it is synchronised by the EtherCAT master as an EtherCAT Terminal in the distributed clocks system, or it provides the reference clock for the EtherCAT system. To do this, it only needs to be selected as the "reference clock" in the TwinCAT System Manager. This way, a consistent timebase can be created across applications for any number of spatially separated TwinCAT EtherCAT systems and machine sections, e.g. for applications with axes or measurement technology. The compact EtherCAT Terminal enables flexible deployment depending on the application requirements.</p>
Protocol	PTPv1 (IEEE 1588-2002), PTPv2 (IEEE 1588-2008)
Current consumption power contacts	–
Current consumption E-bus	typ. 310 mA
Distributed clocks	yes
Cable length	up to 100 m twisted pair
Special features	usable in TwinCAT as a reference clock
Operating temperature	0...+55 °C
Approvals	CE, UL, Ex
Weight	approx. 75 g
Further information	<a href="http://www.beckhoff.com/EL6688">www.beckhoff.com/EL6688</a>

# Communication | EtherCAT bridge terminals

The slaves within an EtherCAT system are synchronised by the distributed clocks system. In each slave capable of doing so, a local clock triggers the reading in of inputs and the output of outputs synchronously with all other slaves. A slave represents the reference clock, according to which the EtherCAT master/TwinCAT synchronises all other slaves. For event logging and axis synchronisation, the synchronous operation of several EtherCAT systems is useful. The EL669x, which serves as a crossover point between two EtherCAT systems, can be used for interconnection: it is an EtherCAT Terminal on the so-called primary side and an EtherCAT slave with an RJ45 connection on the so-called secondary side. The direction of the time synchronisation is selectable. TwinCAT can use this terminal as the reference clock in the synchronised system; this way, the entire lower-level system is operated synchronously with the primary system. With the same cycle times, both real-time tasks then work synchronously in TwinCAT.

The power supply for the secondary side (RJ45) of the EL6695 is via an external connection, the primary side is supplied via the E-bus. The bridge terminal can also be used for integrating a subordinate PC system as an EtherCAT slave.



Example topologies EL669x

	EtherCAT bridge terminal	EtherCAT bridge terminal
	EL6692	EL6695
<b>Technical data</b>	EL6692	EL6695
<b>Technology</b>	primary side: E-bus (terminal strand), secondary side: 2 x 100 Mbit/s Ethernet, RJ45, In/Out	
<b>Function</b>	EtherCAT distributed clock synchronisation, data exchange	
	<p>The EL6692 and EL6695 are EtherCAT bridge terminals with different performance levels for the synchronous and asynchronous data transmission between two EtherCAT systems. The EL6695 differs from the EL6692 in a flexible CoE configuration, the possibility for device emulation and significantly higher data throughput rates. Apart from that, a reconfigurable partial transmission of the PDO can be offered through selective PDO mapping. Especially with modular or changing machine concepts this is a helpful function.</p>	
<b>Nominal voltage</b>	24 V DC (secondary side)	24 V DC (secondary side)
<b>Current consumption power contacts</b>	–	–
<b>Current consumption E-bus</b>	E-bus: 120 mA, external: 60 mA/24 V typ.	E-bus: typ. 400 mA, external: 80 mA/24 V typ.
<b>Distributed clocks</b>	yes	yes
<b>Power supply</b>	primary: via the E-bus, secondary: via connector	primary: via the E-bus, secondary: via connector, 24 V
<b>Cyclic process data per direction</b>	max. 480 byte	max. 1400 byte
<b>Special features</b>	usable in TwinCAT as a reference clock, supports ADS over EtherCAT (AoE)	usable in TwinCAT as a reference clock, synchronous data exchange, flexible PDO mapping, supports AoE, EoE, FoE, VoE
<b>Operating temperature</b>	-25...+60 °C	0...+55 °C
<b>Approvals</b>	CE, Ex	CE
<b>Weight</b>	approx. 85 g	approx. 85 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL6692">www.beckhoff.com/EL6692</a>	<a href="http://www.beckhoff.com/EL6695">www.beckhoff.com/EL6695</a>

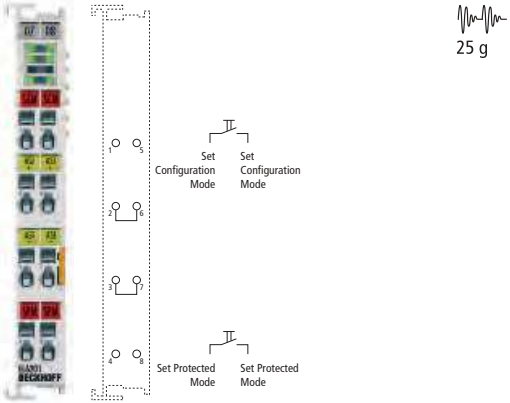
# Communication | AS-Interface master terminal

The AS-Interface (AS-i = Actuator Sensor interface) is a fieldbus communication method for actuators and sensors. The master cyclically transmits telegrams to the individual slaves via a 2-core yellow ribbon cable, which serves at the same time for the 24 V power supply. Up to 62 slaves with a total of 496 inputs and 496 outputs are supported, depending on the protocol.

AS-Interface potential feed terminal  
EL9520 see page [440](#)



AS-Interface master terminal

Technical data	EL6201   ES6201
Technology	AS-Interface master terminal (M3)
Specification version	AS-Interface V 2.0, V 2.11, V 3.0 (Rev. 4)
AS-Interface slaves	31 for V 2.0, 62 for V 2.1
Number of channels	1 (AS-Interface channel)
	 <p>The EL6201 AS-Interface master terminal enables the direct connection of AS-Interface slaves. The AS-Interface compliant interface supports digital and analog slaves, versions 3.0 (master profile M3). The connected devices are supplied via the EL9520 AS-Interface potential feed terminal with integrated filter.</p>
Cycle time	max. 5 ms (at 31 or 62 slaves)
Current consumption power contacts	–
Current consumption	120 mA (E-Bus), typ. 40 mA/max. 60 mA (AS-Interface)
Distributed clocks	–
AS-Interface diagnostics	power failure, slave failure, parameterisation error
Operating temperature	0...+55 °C
Approvals	CE
Weight	approx. 55 g
Further information	<a href="http://www.beckhoff.com/EL6201">www.beckhoff.com/EL6201</a>

# Communication | IO-Link terminal

The EL6224 IO-Link terminal enables connection of up to four IO-Link devices, e.g. actuators, sensors or combinations of both. A point-to-point connection is used between the terminal and the device. The terminal is parameterised via the EtherCAT master. IO-Link is designed as an intelligent link between the fieldbus level and the sensor, allowing parameterisation information to be exchanged bidirectionally via the IO-Link connection. The parameterisation of the IO-Link devices with service data can be done from TwinCAT via ADS.

In the standard setting, the EL6224 functions as a 4-channel input terminal, 24 V DC, which communicates with connected IO-Link devices, parameterises them and, if necessary, changes their operating mode.

Integration into the HD housing with 16 connection points enables each IO-Link device to be operated in 3-wire connection mode.

Additional 24 V and 0 V connection points can be realised via the EL918x potential distributor terminal.



4-channel input/output,  
IO-Link master terminal

Technical data	EL6224
Technology	IO-Link input/output
Specification version	IO-Link V1.1
Data transfer rates	4.8 kbaud, 38.4 kbaud and 230.4 kbaud
Number of channels	4 IO-Link interfaces
Supply current for devices	500 mA per device
Current consumption power contacts	typ. 20 mA + load
Current consumption E-bus	typ. 120 mA
Distributed clocks	–
Cable length	max. 20 m
Special features	each channel parameterisable in TwinCAT
Operating temperature	0...+55 °C
Approvals	CE, UL, Ex
Weight	approx. 60 g
Further information	<a href="http://www.beckhoff.com/EL6224">www.beckhoff.com/EL6224</a>
Special terminals	EL6624-0090
Distinguishing features	TwinSAFE SC <span style="float: right;">324</span>



For availability status see Beckhoff website at: [www.beckhoff.com/EL6624-0090](http://www.beckhoff.com/EL6624-0090)

# Communication | PROFINET controller/device

The EL6631 PROFINET RT controller (master) terminal supports the complete real-time function (RT) as well as extensive diagnostic possibilities. All services according to conformance class B are supported. Up to 15 PROFINET RT devices can be projected on the EL6631.



The EL6631-0010 PROFINET RT device (slave) terminal enables the simple exchange of data between EtherCAT and the PROFINET RT controllers. Within the EtherCAT strand it represents a slave that can consist of up to 65,535 devices. The EL6631-0010 contains a 3-port switch; two of these ports are fed externally to RJ45 sockets. This allows the construction of the I/O stations as a line topology, thus reducing wiring. The maximum distance between two devices is 100 m.

Protocols such as LLDP or SNMP can be used for network diagnostics.

The EL6632 PROFINET IRT Controller Terminal supports the complete RT (real-time) or IRT (isochronous real-time) function as well as providing extensive diagnostic options.

All services in accordance with Conformance Class C are supported. Depending on the cycle time, up to five PROFINET IRT or up to 15 PROFINET RT devices can be operated at the EL6632 in a line topology. The maximum distance between two devices is 100 m. Protocols such as LLDP or SNMP can be used for network diagnostics.



	PROFINET RT controller/ device terminal	PROFINET IRT controller
<b>Technical data</b>	EL6631	<b>i</b> EL6632
<b>Technology</b>	PROFINET RT	PROFINET IRT
<b>Ethernet interface</b>	100BASE-TX Ethernet with 2 x RJ45	
<b>Number of channels</b>	2 (switched)	2 (switched)
		
<b>Protocol</b>	RT	RT or IRT
<b>Current consumption power contacts</b>	–	–
<b>Current consumption E-bus</b>	typ. 400 mA	typ. 400 mA
<b>Distributed clocks</b>	–	–
<b>Cable length</b>	up to 100 m twisted pair	up to 100 m twisted pair
<b>Special features</b>	LLDP, SNMP, Conformance Class B, max. 15 RT devices, min. 1 ms RT cycle	Conformance Class C, max. 5 IRT devices, max. 15 RT devices, min. 500 µs IRT cycle, min. 1 ms RT cycle
<b>Operating temperature</b>	0...+55 °C (see documentation)	0...+55 °C (see documentation)
<b>Approvals</b>	CE, UL, Ex	CE
<b>Weight</b>	approx. 75 g	approx. 75 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL6631">www.beckhoff.com/EL6631</a>	<a href="http://www.beckhoff.com/EL6632">www.beckhoff.com/EL6632</a>
<b>Special terminals</b>	EL6631-0010	
<b>Distinguishing features</b>	PROFINET RT device	

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL6632](http://www.beckhoff.com/EL6632)


# Communication | EtherNet/IP master/slave terminal

The EL6652 EtherNet/IP master terminal and the EL6652-0010 EtherNet/IP slave terminal have a switched 2-port Ethernet connection and can thus be operated in a line with further Ethernet/IP nodes. The process data are configured by an EtherCAT master, allowing different process data and different sizes.

The EL6652 and EL6652-0010 support both multicast and unicast connections. With the EL6652, up to 16 simple EtherNet/IP slave devices can be connected via one generic node. The EL6652-0010 is optionally available for connecting EtherCAT with an EtherNet/IP master.

## EtherNet/IP™

EtherNet/IP master/slave terminal

Technical data	EL6652	EL6652-0010
Technology	EtherNet/IP master terminal	EtherNet/IP slave terminal
Ethernet interface	100BASE-TX Ethernet with 2 x RJ45	
Number of channels	2 (switched)	
		
Protocol	EtherNet/IP	EtherNet/IP slave
Number of possible slave devices	max. 16 slave nodes	–
Current consumption power contacts	–	
Current consumption E-bus	typ. 400 mA	
Distributed clocks	–	
Cable length	up to 100 m twisted pair	
Special features	multicast/unicast connection	
Operating temperature	0...+55 °C (see documentation)	
Approvals	CE	
Weight	approx. 75 g	
Further information	<a href="http://www.beckhoff.com/EL6652">www.beckhoff.com/EL6652</a>	

# Communication | PROFIBUS master/slave terminal

The EL6731 PROFIBUS master terminal corresponds to the FC3101 PROFIBUS PCI card. Connection via EtherCAT allows PCI slots in the PC to be dispensed with; instead, any desired number of PROFIBUS master terminals (EL6731) or slave terminals (EL6731-0010) can be used in the field. This reduces cabling and facilitates the connection of existing fieldbus installations to the high-performance EtherCAT fieldbus.


The terminal can handle the PROFIBUS protocol with all features and enables the integration of arbitrary PROFIBUS devices in the EtherCAT Terminal network. The terminal has a PROFIBUS chip with the latest PROFIBUS technology – including a high-precision isochronous mode for axis control and advanced diagnostic options.

The EL6731 allows the operation of PROFIBUS slaves with different polling rates and is distinguished by the following characteristics:

- Cycle times from 200 µs are possible.
- PROFIBUS DP, PROFIBUS DP-V1, PROFIBUS DP-V2
- master and slave monitor up to 12 Mbit/s
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.
- It is possible to read the bus configuration and automatically assign the "GSD" files.



PROFIBUS master/slave terminal

Technical data	EL6731	EL6731-0010
Technology	PROFIBUS master terminal	PROFIBUS slave terminal
Data transfer rates	9.6 kbaud...12 Mbaud	
Interfaces	1 x D-sub socket, 9-pin, galvanically decoupled	
Number of channels	1	
		
Fieldbus	PROFIBUS DP (standard), PROFIBUS DP-V1 (Cl. 1+2: acyclic services, alarms), DP-V2, PROFIBUS MC (equidistant)	
Cycle time	differing DP cycle times per slave are possible using the CDL concept	
Current consumption power contacts	–	
Current consumption E-bus	typ. 350 mA	
Distributed clocks	yes	–
Bus device	max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave	
Special features	status LEDs, total max. 7 kbyte input and output data	
Operating temperature	-25...+60 °C	
Approvals	CE, UL, Ex	
Weight	approx. 70 g	
Further information	<a href="http://www.beckhoff.com/EL6731">www.beckhoff.com/EL6731</a>	




# Communication | CANopen master/slave terminal

The EL6751 CANopen master terminal corresponds to the FC5101 CANopen PCI card. Connection via EtherCAT allows PCI slots in the PC to be dispensed with; instead, any desired number of CANopen master or slave terminals can be used in the field. The EL6751 enables the integration of arbitrary CANopen devices in the EtherCAT Terminal network. It is alternatively available as a master (EL6751) or slave (EL6751-0010). In addition, general CAN messages can be sent or received – without having to bother with CAN frames in the applications program. The terminal has a powerful protocol implementation with many features:

- support for all CANopen PDO communication modes: event-controlled, time-controlled (event timer), synchronous, polling
- synchronisation with the task cycle of the PC controller
- SYNC cycle with quartz precision for drive synchronisation, zero cumulative jitter
- parameter communication (SDO) at start-up and when running
- emergency message handling, guarding and heartbeat
- powerful parameter and diagnostics interfaces
- online bus load display

## CANopen

CANopen master/slave terminal

Technical data	EL6751	EL6751-0010
Technology	CANopen master terminal	CANopen slave terminal
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1,000 kbaud	
Interfaces	D-sub connector, 9-pin according to CANopen specification, galvanically decoupled	
Number of channels	1	
		
Fieldbus	CANopen	
Current consumption power contacts	–	
Current consumption E-bus	typ. 300 mA	
Distributed clocks	–	
Bus device	max. 127 slaves	–
Special features	status LEDs, CANopen network master, CANopen Manager, supports RAW-CAN	status LEDs, CANopen slave
Operating temperature	-25...+60 °C	
Approvals	CE, UL, Ex	
Weight	approx. 70 g	
Further information	<a href="http://www.beckhoff.com/EL6751">www.beckhoff.com/EL6751</a>	


# Communication | DeviceNet master/slave terminal

The EL6752 DeviceNet master terminal corresponds to the FC5201 DeviceNet PCI card. Connection via EtherCAT allows PCI slots in the PC to be dispensed with; instead, any desired number of DeviceNet master or slave terminals can be used in the field. The EL6752 allows the integration of arbitrary DeviceNet devices in the EtherCAT Terminal network. It is alternatively available as a master (EL6752) or slave (EL6752-0010). The DeviceNet terminal has a powerful protocol implementation with many features:

- support of all DeviceNet I/O modes: polling, change of state, cyclic, strobed
- Unconnected Message Manager (UCMM)
- offline connection set, Device Heartbeat Messages, Device Shutdown Messages
- Auto Device Replacement (ADR)
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.

## DeviceNet

DeviceNet master/slave terminal

Technical data	EL6752	EL6752-0010
Technology	DeviceNet master terminal	DeviceNet slave terminal
Data transfer rates	125, 250, 500 kbaud	
Interfaces	open style connector, 5-pin, according to DeviceNet specification, galvanically decoupled (Connector is supplied.)	
Number of channels	1	
		
Fieldbus	DeviceNet	
Current consumption power contacts	–	
Current consumption E-bus	typ. 260 mA	
Distributed clocks	–	
Bus device	max. 63 slaves	
Special features	DeviceNet scanner	
Operating temperature	-25...+60 °C	
Approvals	CE, UL, Ex	
Weight	approx. 70 g	
Further information	<a href="http://www.beckhoff.com/EL6752">www.beckhoff.com/EL6752</a>	



# Communication | Lightbus master/Interbus slave terminal

## Lightbus

The EL6720 Lightbus master terminal enables the connection to Lightbus devices just as the Beckhoff FC2001 Lightbus PCI card.

Due to the connection via EtherCAT, no PCI slots are required in the PC. The terminal controls the Lightbus protocol with all its features. Within an EtherCAT Terminal network, the EL6720 enables the integration of any Lightbus slaves. The terminal has a powerful protocol implementation with many features:

- Cycle times up to 100 µs are possible.
- Process data communication can either be free running or synchronised.
- powerful parameter and diagnostics interfaces (ADS)

Lightbus accessories see page [688](#)



## Interbus

Interbus is a ring system, i.e. all devices are actively integrated into a closed transmission path. Each device regenerates the incoming signal and passes it on. In the Interbus system, both the data line and the return line are fed through all devices inside one cable. This results in the physical appearance of a line or tree structure. The master-slave system allows the connection of a maximum of 512 devices, which form the structure of a spatially distributed shift register. Each device, with its registers of different lengths, is part of the shift register ring. The master pushes data through the ring serially. Due to the point-to-point connection method, termination resistors do not have to be installed.

The EL6740-0010 Interbus slave terminal enables data exchange between EtherCAT and Interbus. For both bus systems the terminal "mirrors" up to 32 word input and 32 word output to the respective other system. The outputs are written to the inputs of the other bus with minimum delay. The terminal can use the Interbus protocol up to a baud rate of 2 Mbits. Due to the connection via EtherCAT, no PCI slots are required in the PC.

## LIGHTBUS



	Lightbus master terminal	Interbus slave terminal
<b>Technical data</b>	<b>EL6720</b>	<b>EL6740-0010</b>
<b>Technology</b>	Lightbus master terminal	Interbus slave terminal
<b>Data transfer rates</b>	2.5 Mbaud	500 kbits, 2 Mbits (default)
<b>Interfaces</b>	2 x fibre optic standard connector Z1000 (plastic fibre), Z1010 (HCS fibre)	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock
<b>Number of channels</b>	1	1
		
<b>Fieldbus</b>	Lightbus	Interbus, max. 400 m between 2 stations at 500 kbit/s
<b>Type of connection</b>	fibre optic standard connector	only remote bus
<b>Current consumption power contacts</b>	–	–
<b>Current consumption E-bus</b>	typ. 240 mA	typ. 450 mA
<b>Distributed clocks</b>	–	–
<b>Bus device</b>	max. 254 nodes with a max. of 65,280 I/O points per fieldbus connection	–
<b>Special features</b>	3 priority-controlled logical communication channels	status LEDs
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex
<b>Weight</b>	approx. 70 g	approx. 80 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL6720">www.beckhoff.com/EL6720</a>	<a href="http://www.beckhoff.com/EL6740">www.beckhoff.com/EL6740</a>

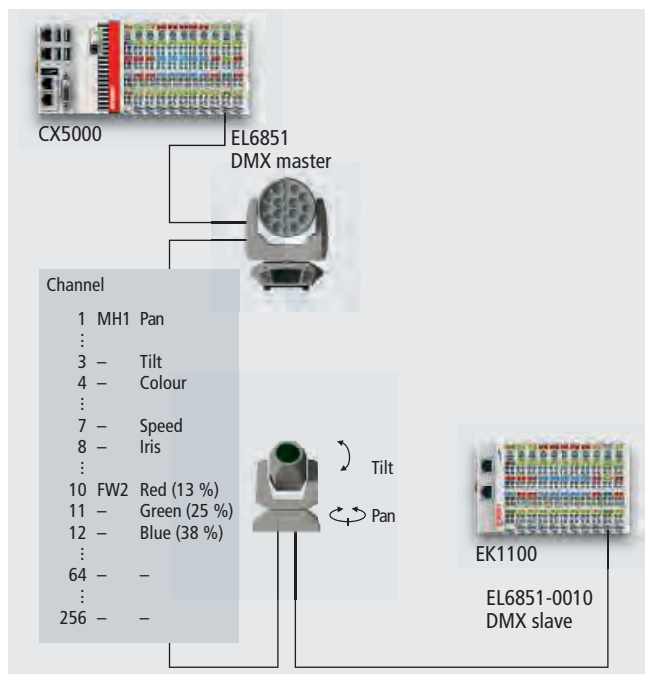
# Communication | DMX master/slave terminal

DMX is the standard protocol for controlling professional stage and effect lighting equipment, which is used, for example, for the dynamic lighting of showrooms and salesrooms as well as for exclusive displays of light and colour in high-profile buildings, such as hotels and event centres. For static DMX light sources (e.g. spotlights), colour mixing and brightness values are transmitted, while moving DMX light sources (e.g. moving heads and scanners) receive additional spatial coordinates. The high data transfer rate of EtherCAT permits higher update rates of light settings, resulting in more harmonious changes of light and colour as perceived by the human eye.

The EL6851 DMX master terminal allows the direct connection of up to 32 DMX devices and supports the transmission of the full DMX protocol width

of 512 bytes in just one control cycle using EtherCAT. This way, random devices, such as scanners, moving heads or spotlights can be controlled (see illustration below).

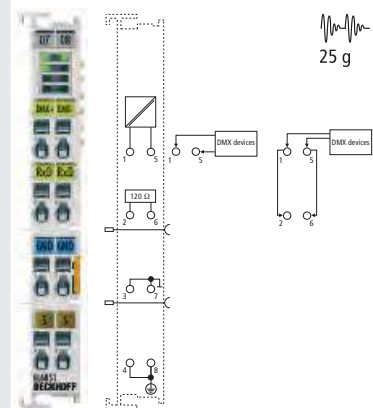
The EL6851-0010 DMX slave terminal acts as a link to the DMX world and enables professional stage and effect lighting to be implemented in conjunction with standard hardware. It takes on the information from the DMX master for the assigned automation equipment. This way, theatre and show stages can be constructed with standard hardware at reduced cost, but with full flexibility. The data from the DMX telegram are output on simple digital outputs, stepper motors or dimmer terminals. Furthermore, it is possible to transmit the DMX data to a DALI network and in this way to indirectly operate DALI ballasts with DMX.



## DMX

DMX master/slave terminal

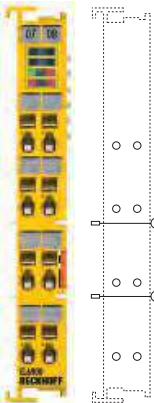
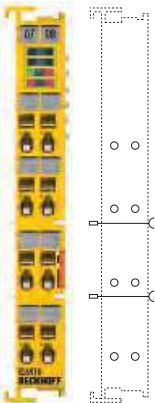
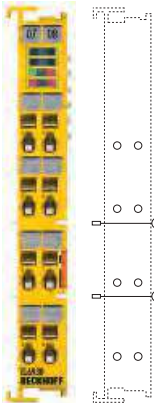
Technical data	EL6851	EL6851-0010
Technology	DMX master terminal	DMX slave terminal
Data transfer rates	250 kbit, one start bit, two stop bits	
Interfaces	RS485, termination resistor can be switched, half duplex	
Number of channels	1	



The EL6851 EtherCAT Terminal is a DMX master terminal and enables connection of up to 32 devices without repeater. The DMX master terminal can send up to 512 bytes of data. At 250 kbit/s a maximum data rate of 44 kHz is thus possible.

Data length	max. 512 bytes	
Protocol	DMX512	
Current consumption power contacts	-	
Current consumption E-bus	typ. 130 mA	
Distributed clocks	-	
Bus device	max. 32 without repeater	-
Line impedance	120 Ω	
Special features	supports RDM protocol, library available; electrically isolated	start address and data length can be set
Operating temperature	0...+55 °C	
Approvals	CE, UL, Ex	
Weight	approx. 55 g	
Further information	www.beckhoff.com/EL6851	

# Communication | TwinSAFE, PROFIsafe

	TwinSAFE Logic	TwinSAFE Logic	TwinSAFE/PROFIsafe logic and gateway terminal
Technical data	EL6900	<b>i</b> EL6910	EL6930
Technology	TwinSAFE Logic		TwinSAFE/PROFIsafe logic and gateway terminal
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)		
Protocol	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT, PROFIsafe
	 <p>The TwinSAFE Logic can establish 128 connections to other TwinSAFE devices.</p>	 <p>The TwinSAFE Logic can establish 128 connections to other TwinSAFE devices.</p>	 <p>The EL6930 logic terminal can establish 127 connections to other TwinSAFE/Safety over EtherCAT devices and one PROFIsafe slave connection to a PROFIsafe master.</p>
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consum. pow. cont.	–	–	–
Current consumption E-bus	approx. 188 mA	approx. 188 mA	approx. 188 mA
Cycle time	500 µs...~25 ms	500 µs...~10 ms	500 µs...~25 ms
Fault response time	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
Permitted degree of contamination	2	2	2
Climate class EN 60721-3-3	3K3	3K3	3K3
Installation position	horizontal	horizontal	horizontal
Special features	backup restore	backup restore	1 PROFIsafe slave connection
Operating/storage temperature	-25...+55 °C/-40...+70 °C	-25...+55 °C/-40...+70 °C	-25...+55 °C/-40...+70 °C
EMC immunity/emission	conforms to EN 61000-6-2/ EN 61000-6-4	conforms to EN 61000-6-2/ EN 61000-6-4	conforms to EN 61000-6-2/ EN 61000-6-4
Vibration/shock resistance	conforms to EN 60068-2-6/ EN 60068-2-27	conforms to EN 60068-2-6/ EN 60068-2-27	conforms to EN 60068-2-6/ EN 60068-2-27
Approvals	CE, UL, Ex, TÜV SÜD	in preparation (CE, UL, Ex, TÜV SÜD)	CE, TÜV SÜD
Weight	approx. 50 g	approx. 50 g	approx. 50 g
Further information	<a href="http://www.beckhoff.com/EL6900">www.beckhoff.com/EL6900</a>	<a href="http://www.beckhoff.com/EL6910">www.beckhoff.com/EL6910</a>	<a href="http://www.beckhoff.com/EL6930">www.beckhoff.com/EL6930</a>

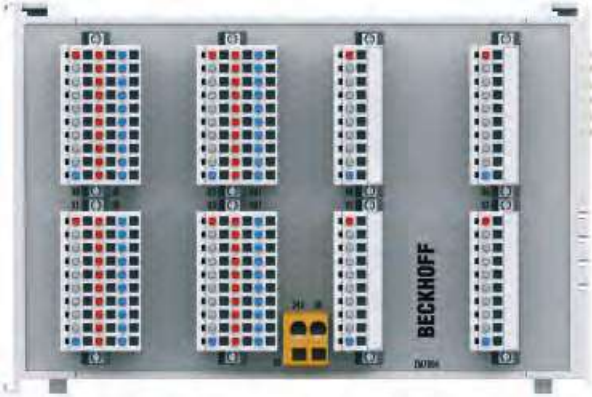
For TwinSAFE products and further information on the TwinSAFE technology see page **966**

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EL6910](http://www.beckhoff.com/EL6910)

# Motion | 4-axis interface

The EM7004 interface module is designed for direct connection of servo drives with  $\pm 10$  V DC interface and incremental encoder output for position feedback and represents a cost-effective solution for drives in the lower and medium speed range. The individual servo interfaces are electrically isolated from each other. The analog I/Os and the incremental encoder connections have a common reference potential. Further digital inputs and outputs turn the compact module into a complete – and sole – link between the control and application level. Internal preprocessing of the signals enables users to modify outputs with short reaction times, depending on the position.

4-axis interface

Technical data	EM7004						
Technology	4-axis interface						
Number of channels	4 encoder inputs, 4 analog outputs, 16 digital inputs and 16 digital outputs						
Cycle time	min. 1 ms						
							
<p>The EM7004 module is available with different connectors:</p> <table border="0"> <tr> <td>EM7004-0000</td> <td>without connectors</td> </tr> <tr> <td>EM7004-0002</td> <td>4 x ZS2001-0002 (1-wire, LED), 4 x ZS2001-0005 (1-wire, LED)</td> </tr> <tr> <td>EM7004-0004</td> <td>4 x ZS2001-0005 (1-wire), 4 x ZS2001-0004 (3-wire, LED)</td> </tr> </table> <p>Plug X8 is included in the scope of supply.</p>		EM7004-0000	without connectors	EM7004-0002	4 x ZS2001-0002 (1-wire, LED), 4 x ZS2001-0005 (1-wire, LED)	EM7004-0004	4 x ZS2001-0005 (1-wire), 4 x ZS2001-0004 (3-wire, LED)
EM7004-0000	without connectors						
EM7004-0002	4 x ZS2001-0002 (1-wire, LED), 4 x ZS2001-0005 (1-wire, LED)						
EM7004-0004	4 x ZS2001-0005 (1-wire), 4 x ZS2001-0004 (3-wire, LED)						
Nominal voltage	24 V DC (-15 %/+20 %)						
Current consumption power contacts	– (no power contacts)						
Current consumption E-bus	typ. 280 mA						
Distributed clocks	–						
Digital inputs	16 x 24 V DC						
Digital outputs	16 (8 x 0.5 A, 8 x 1.5 A), 24 V DC						
Analog outputs	4 x $\pm 10$ V (2 mA)						
Encoder inputs	4 x (A, /A, B, /B, gate, latch, ground); A B – isolated RS485 inputs (RS422); 4 x 16 bit quadrature encoder; < 400 kHz						
Special features	outputs switchable in relation to counter states, user scaling parameterisable, watchdog parameterisable						
Operating temperature	0...+55 °C						
Approvals	CE						
Weight	approx. 260 g						
Further information	<a href="http://www.beckhoff.com/EM7004">www.beckhoff.com/EM7004</a>						

# Motion | Stepper motor terminals

Stepper motors are often used in positioning drives. They allow, by the combination of single steps, a positioning process without feedback of the rotor positions. This "open control chain" mode of operation and the longevity of a stepper motor are particularly interesting for price-sensitive fields of application.

In contrast with a DC motor the control of a stepper motor is carried out by the different energisation of the individual motor windings following a defined pattern of pulses. The electromagnetic field of the stator is switched intermittently so that the shaft turns through the step angle  $\alpha$ . The motor follows the impulse pattern of the control unit, until the coupled momentum exceeds its holding momentum or the impulse demand is too dynamic, which leads to standstill of the motor. The EL703x and EL704x EtherCAT stepper motor terminals, which are suitable for highly dynamic movement, solve this problem also in areas of higher speeds of rotation.

The EL703x and EL704x stepper motor terminals are designed for direct connection of medium capacity stepper motors. A high frequency clocked PWM output stage regulates the currents through the motor coils.

The stepper motor terminals are synchronised with the motor by parameterising. Unipolar as well as bipolar stepper motors can be driven. Additional inputs support functions like homing and final position monitoring. 64-fold micro stepping ensures particularly quiet and precise motor opera-

tion even with standard technology. Together with a stepper motor, the stepper motor terminals represent an inexpensive small servo axis. The EL7037 and EL704x also include an incremental encoder interface to read position data.

The stepper motor terminals can be controlled like a servo drive by a speed interface from a Motion Control software such as TwinCAT for example. In applications with a less complex and less powerful CPU the control is also possible via a position interface (travel distance control). The stepper motor terminals move the motor themselves to a desired position. Ramp steepness and maximum speed can be entered as parameters.

Irregular operation at certain speed ranges with standard technology, particularly without coupled load, indicates that the stepper motor is being run at its resonance frequency. Under certain circumstances the motor may even stop. Resonances in the lower frequency range essentially result from the mechanical motor parameters. Apart from their impact on smooth running, such resonances can lead to significant loss of torque, or even loss of step of the motor, and are therefore particularly undesirable. The EL7041-1000 special version with field-oriented control is particularly well suited for such low-mass and therefore resonance-critical applications.

In combination with the AS10xx series stepper motors, the EL7037 and EL7047 EtherCAT Terminals optionally support field-

oriented control. The advantages of this operating mode are:

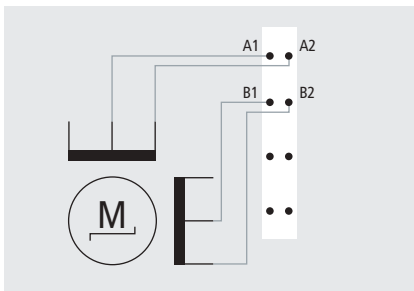
- low power consumption (almost entirely load-dependent)
- high efficiency
- consistent dynamics compared with standard mode
- Step losses are inherently eliminated.

The EL703x stepper motor terminal is designed exclusively for 24 V supply voltage. The motor current can reach up to 1.5 A. The EL704x covers a supply voltage range from 8 V DC to 50 V DC and also needs a 24 V supply from the power contacts. The motor current can be set from 1 to 5 A. The EL7041-1000 special version is compatible to the KL2541.

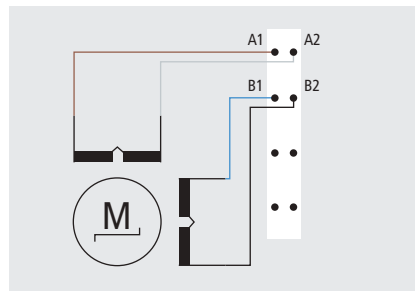
The peak current may briefly significantly exceed the rated current and in this way makes the whole drive system very dynamic. In such dynamic applications, negative acceleration causes the feedback of energy, which leads to voltage peaks at the power supply unit. An EL9576 brake chopper terminal protects from the effects of overvoltage, in that it absorbs some of the energy. For voltage values exceeding the capacity of the terminal, an external resistor has to be connected to eliminate surplus energy.

AS10xx | Stepper motors see page **868**

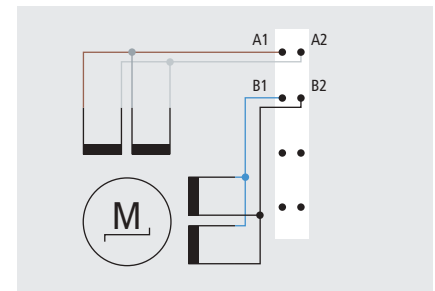
EL9576 | Brake chopper terminal see page **443**



Connection of a unipolar stepper motor



Connection of a bipolar AS10xx stepper motor, serial



Connection of a bipolar AS10xx stepper motor, parallel

	Stepper motor terminal 24 V DC, 1.5 A	Stepper motor terminal 24 V DC, 1.5 A, with incremental encoder, vector control	Stepper motor terminal 50 V DC, 5 A, with incremental encoder	Stepper motor terminal 50 V DC, 5 A, with incremental encoder, vector control
<b>Technical data</b>	<b>EL7031   ES7031</b>	<b>EL7037</b>	<b>EL7041   ES7041</b>	<b>EL7047</b>
<b>Technology</b>	direct motor connection			
<b>Load type</b>	uni- or bipolar stepper motors			
<b>Max. output current</b>	1.5 A (overload- and short-circuit-proof)		5 A (overload- and short-circuit-proof)	
<b>Number of channels</b>	1 stepper motor, 2 digital inputs	1 stepper motor, encoder input, 2 digital inputs	1 stepper motor, encoder input, 2 digital inputs	
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)		8...50 V DC	
<b>Current consumption power contacts</b>	typ. 30 mA + motor current	typ. 50 mA	typ. 50 mA	
<b>Current consumption E-bus</b>	typ. 120 mA	typ. 100 mA	typ. 140 mA	typ. 100 mA
<b>Distributed clocks</b>	yes		yes	
<b>Maximum step frequency</b>	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)	1,000, 2,000, 4,000, 8,000 or 16,000 full steps/s (configurable)	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)	1,000, 2,000, 4,000, 8,000 or 16,000 full steps/s (configurable)
<b>Step pattern</b>	64-fold micro stepping		64-fold micro stepping	
<b>Current controller frequency</b>	approx. 25 kHz	approx. 30 kHz	approx. 30 kHz	
<b>Control resolution</b>	approx. 5,000 positions in typ. applications (per revolution)		approx. 5,000 positions in typ. applications (per revolution)	
<b>Encoder signal</b>	–	5...24 V DC, 5 mA, single-ended	5...24 V DC, 5 mA, single-ended	
<b>Pulse frequency</b>	–	max. 400,000 increments/s (with 4-fold evaluation)	max. 400,000 increments/s (with 4-fold evaluation)	
<b>Special features</b>	travel distance control	travel distance control, encoder input, vector control	travel distance control, encoder input	travel distance control, encoder input, vector control
<b>Weight</b>	approx. 50 g		approx. 90 g	
<b>Operating temperature</b>	0...+55 °C		0...+55 °C	
<b>Approvals</b>	CE		CE	
<b>Further information</b>	<a href="http://www.beckhoff.com/EL7031">www.beckhoff.com/EL7031</a>	<a href="http://www.beckhoff.com/EL7037">www.beckhoff.com/EL7037</a>	<a href="http://www.beckhoff.com/EL7041">www.beckhoff.com/EL7041</a>	<a href="http://www.beckhoff.com/EL7047">www.beckhoff.com/EL7047</a>
<b>Special terminals</b>			<b>EL7041-1000</b>	
<b>Distinguishing features</b>			for resonance-critical applications	



## Motion | Servomotor terminals

Servomotors demonstrate their advantages in highly dynamic and precise positioning applications:

- very high positioning accuracy in applications where maximum precision is required through integrated position feedback
- high efficiency and high acceleration capacity
- Servomotors are overload-proof and therefore have far greater dynamics than stepper motors, for example.
- The high torque is load-independent up to the upper speed ranges.
- The use of servomotors reduces maintenance to a minimum.

These advantages increase the performance and efficiency of an application: the high dynamics with fast start-stop changes and the precise positioning capability thanks to the integrated positional feedback enable the coordination of several servomotors with one another for the synchronisation of several axes.

The EL72x1 and EL72x1-0010 servomotor terminals are a fully functional servo drive in a standard HD (High Density) terminal housing with a width of 12 mm or 24 mm for the direct driving of servomotors. They offer terminal points for a servomotor as well as for a motor brake and a feedback system. The fast

control technology, based on field-oriented current and PI speed control, supports highly dynamic and frequently changing positioning tasks. The monitoring of important load criteria such as overvoltage and undervoltage, overcurrent, terminal temperature and motor load, which are derived from the calculation of an I<sup>2</sup>T model, guarantees the user maximum operational reliability.

While the EL72x1 supports a resolver as feedback system, the EL72x1-0010 offers the user the option to use an absolute feedback system. With the One Cable Technology (OCT) the encoder cable is omitted by transmitting the encoder signal digitally via the existing motor cable. The EL7211 and EL2711-00010 are characterised by their increased performance of 4.5 A<sub>RMS</sub>.

Since the EL72x1 and the EL72x1-0010 servomotor terminals are completely integrated into the EtherCAT Terminal network, it is not necessary to wire up the controller; the space requirement is significantly reduced. The E-bus connection provides the user with all well-known EtherCAT features: in particular short cycle times, low jitter and simple diagnostics. EtherCAT offers precisely the performance that imposes no limits on the dynamics of a servomotor. Modern power semiconductors guarantee minimum power losses and also enable energy recovery in

the intermediate circuit in braking mode. For highly dynamic applications and for supplying several servomotors from one power supply unit, the additional use of the EL9576 brake chopper terminal is recommended. It protects from the effects of overvoltage, in that it absorbs some of the energy. If the voltage exceeds the capacity of the terminal, it gets rid of the excess energy via an external resistance.

The EL72x1 and EL72x1-0010 are tested and pre-configured for the synchronous servo motors from the AM31xx and AM81xx series. In conjunction with the AM31xx and AM81xx they enable very dynamic, precise and compact applications.

AM81xx | Servomotors with OCT  
see page [862](#)

AM31xx | Servomotors  
see page [862](#)

EL9576 | Brake chopper terminal  
see page [443](#)

ZB85xx | Shielding connection system  
see page [448](#)



EL7201 | Servomotor terminal:  
Motor cables and further cables  
see page [864](#)



EL7201-0010 | Servomotor terminal with OCT:  
Reduced commissioning costs due to omission of the encoder cable

	Servomotor terminal 50 V DC, 2.8 A <sub>RMS</sub>	Servomotor terminal 50 V DC, 4.5 A <sub>RMS</sub>	Servomotor terminal with OCT, 50 V DC, 2.8 A <sub>RMS</sub>	Servomotor terminal with OCT, 50 V DC, 4.5 A <sub>RMS</sub>
<b>Technical data</b>	<b>EL7201</b>	<b>EL7211</b>	<b>EL7201-0010</b>	<b>EL7211-0010</b>
<b>Connection method</b>	direct motor connection			
<b>Load type</b>	permanent-magnet synchronous motors			
<b>Number of channels</b>	1 servomotor, resolver, motor brake		1 servomotor, absolute feedback, motor brake, 2 digital inputs	
<b>Nominal voltage</b>	8...50 V DC		8...50 V DC	
<b>Current consumption power contacts</b>	typ. 50 mA + holding current motor brake		typ. 50 mA + holding current motor brake	
<b>Current consumption E-bus</b>	typ. 120 mA		120 mA	
<b>Current controller frequency</b>	double PWM clock frequency		double PWM clock frequency	
<b>Output current I<sub>N</sub></b>	2.8 A (rms)	4.5 A (rms)	2.8 A (rms)	4.5 A (rms)
<b>Peak current I<sub>N</sub></b>	5.7 A (rms) for 1 s	9.0 A (rms) for 1 s	5.7 A (rms) for 1 s	9.0 A (rms) for 1 s
<b>Frequency range</b>	0...599 Hz		0...599 Hz	
<b>PWM clock frequency</b>	16 kHz		16 kHz	
<b>Rated speed controller frequency</b>	16 kHz		16 kHz	
<b>Output voltage motor brake</b>	24 V DC (+6 %/-10 %)		24 V DC (+6 %/-10 %)	
<b>Output current motor brake</b>	max. 0.5 A		max. 0.5 A	
<b>Special features</b>	compact (only 12 mm wide), system-integrated	compact and system-integrated	compact (only 12 mm wide), system-integrated, absolute feedback, One Cable Technology (OCT), plug-and-play	compact and system-integrated, absolute feedback, One Cable Technology (OCT), plug-and-play
<b>Weight</b>	approx. 60 g	approx. 95 g	approx. 60 g	approx. 95 g
<b>Operating temperature</b>	0...+55 °C		0...+55 °C	
<b>Approvals</b>	CE		CE	
<b>Further information</b>	<a href="http://www.beckhoff.com/EL7201">www.beckhoff.com/EL7201</a>	<a href="http://www.beckhoff.com/EL7211">www.beckhoff.com/EL7211</a>	<a href="http://www.beckhoff.com/EL7201-0010">www.beckhoff.com/EL7201-0010</a>	<a href="http://www.beckhoff.com/EL7211-0010">www.beckhoff.com/EL7211-0010</a>

## Motion | 2-channel DC motor output stages

DC motors can replace the servomotors in many applications if they are operated with an intelligent controller. A DC motor can be integrated very simply into the control system using the EL7332 and EL7342 EtherCAT Terminals. All parameters are adjustable via the fieldbus. The small, compact design and DIN rail mounting make the EtherCAT DC motor output stages suitable for a wide range of applications. The output stages are protected against overload and short circuit and offer an integrated feedback system for incremental encoders on a case-by-case basis. Two DC motors can be controlled by one terminal.

Two areas of application are particularly well supported by the output stages:

- Simple controller for low demands on the cycle time at inexpensive processor power: by the use of the integrated travel distance control, the EL73x2 EtherCAT Terminal can perform positioning travels independently without the use of NC. Nothing further is required apart from a DC motor and a terminal.
- High-end positioning by means of integration in TwinCAT NC: in conjunction with the EtherCAT DC motor output stage, the DC motor is used with TwinCAT for the application without further changes – analogous to a servo-axis.

The control of a DC motor is simple to implement in comparison with other motors, since the speed of rotation is proportional to the voltage. It can be adjusted directly via the process data with the EL7332 and EL7342 EtherCAT Terminals. The integrated compensation of the internal resistance keeps the motor at the desired speed for load changes. Thus a simple drive task can be solved using a simple controller.

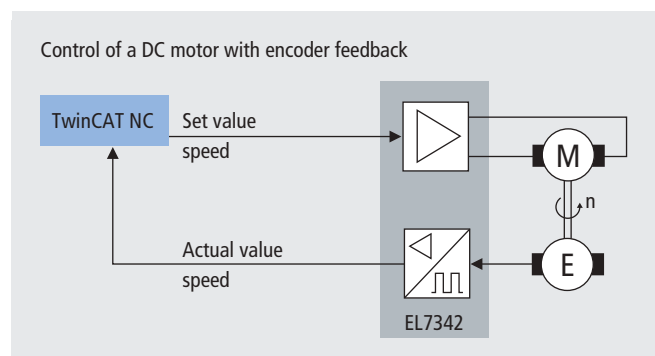
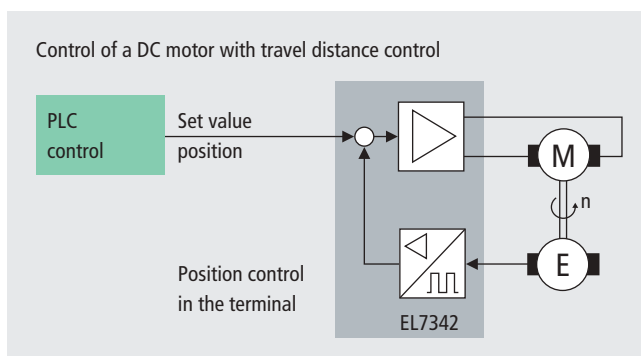
The EL7332 EtherCAT Terminal enables direct operation of two DC motors. It is electrically isolated from the E-bus. The speed is preset by a 16 bit value from the automation unit. The EtherCAT Terminal contains two channels whose signal state is indicated by LEDs. The LEDs enable quick local diagnosis.

For demanding positioning tasks a closed speed control loop with a feedback system is needed. Apart from the operation of two DC motors, the EL7342 EtherCAT Terminal enables the connection of an incremental encoder. The control loop can be closed either by the EtherCAT Terminal itself or by higher-level controller (see illustration).

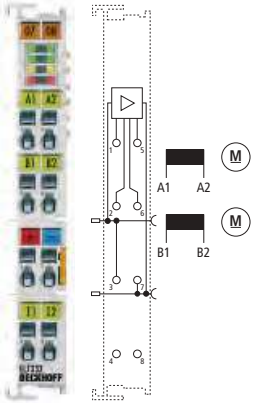
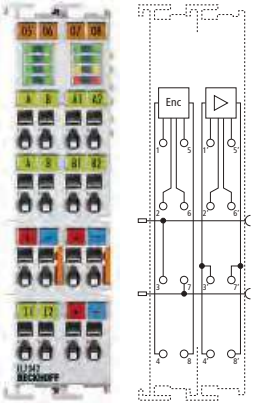
The peak current may briefly significantly exceed the rated current and in this way makes the whole drive system very dynamic. In such dynamic applications, negative accel-

eration causes the feedback of energy, which leads to voltage peaks at the power supply unit. The EL9576 brake chopper terminal protects from the effects of overvoltage, in that it absorbs some of the energy. If the voltage exceeds the capacity of the terminal, it gets rid of the excess energy via an external resistance.

EL9576 | Brake chopper terminal  
see page [443](#)



Realisation possibilities for position control loops

	2-channel DC motor output stage 24 V DC, 1.5 A	2-channel DC motor output stage 50 V DC, 3.5 A
<b>Technical data</b>	EL7332   ES7332	EL7342   ES7342
<b>Technology</b>	direct motor connection	
<b>Load type</b>	DC brush motors, inductive	
<b>Max. output current</b>	2 x 1 A	2 x 3.5 A
<b>Number of channels</b>	2 DC motors, 2 digital inputs	2 DC motors, 2 digital inputs, encoder input
		
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	8...50 V DC
<b>Current consumption power contacts</b>	typ. 40 mA + motor current	typ. 70 mA
<b>Current consumption E-bus</b>	typ. 140 mA	typ. 140 mA
<b>Distributed clocks</b>	yes	yes
<b>PWM clock frequency</b>	32 kHz with 180° phase shift each	32 kHz with 180° phase shift each
<b>Duty factor</b>	0...100 % (voltage-controlled)	0...100 % (voltage-controlled)
<b>Control resolution</b>	max. 10 bits current, 16 bits speed	max. 10 bits current, 16 bits speed
<b>Encoder signal</b>	–	5...24 V, 5 mA, single-ended
<b>Pulse frequency</b>	–	max. 400,000 increments/s (with 4-fold evaluation)
<b>Current consumption sensor supply</b>	–	typ. 20 mA
<b>Special features</b>	travel distance control	travel distance control, encoder input
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE
<b>Weight</b>	approx. 50 g	approx. 90 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL7332">www.beckhoff.com/EL7332</a>	<a href="http://www.beckhoff.com/EL7342">www.beckhoff.com/EL7342</a>

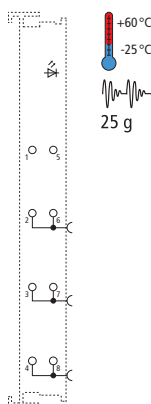
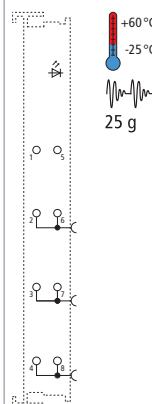
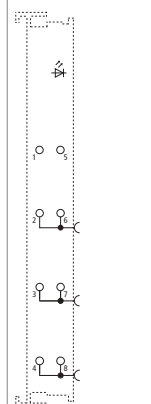
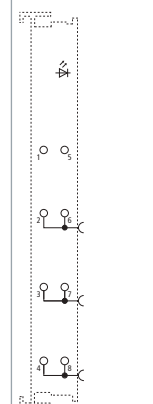
# System terminals | Function terminals

The power feed terminals make it possible to set up various potential groups with any desired voltages (EL9190) or with the standard voltages of 24 V DC or 230 V AC (120 V AC). They are available with or without fine-wire fuse. In order to monitor the supply voltage, the terminals with diagnostics function report the status of the power feed terminal to the EtherCAT Coupler through two input bits. It is thus possible for the controller to check the distributed peripheral voltage over the fieldbus. The operating point performance conforms to the input terminals EL1002 (24 V) and EL1702 (230 V).

The EL9180, EL9185 and EL9195 EtherCAT Terminals allow the supply voltage to be accessed a number of times via spring force terminals. They make it unnecessary to use additional terminal blocks on the terminal strip.

The EL9195 or EL9070 EtherCAT Terminal can be used for the connection of screens. It connects the spring force contacts directly to the DIN rail and can optimally ground incoming electromagnetic radiation. The two power contacts are looped through by the EL9195, allowing two wires to be connected to each.

The EL9080 is used to identify potential groups (e.g. 230 V AC/24 V DC). It is inserted between two potential groups, and indicates the separation through an orange coloured cover.

	Potential supply terminal, 24 V DC	Potential supply terminal, 24 V DC, with diagnostics	Potential supply terminal, 120...230 V AC	Potential supply terminal, 120...230 V AC, with diagnostics
<b>Technical data</b>	<b>EL9100   ES9100</b>	<b>EL9110   ES9110</b>	<b>EL9150   ES9150</b>	<b>i EL9160   ES9160</b>
<b>Technology</b>	potential supply terminal	potential supply terminal with diagnostics	potential supply terminal	potential supply terminal with diagnostics
<b>Diagnostics in the process image</b>	–	yes	–	yes
				
<b>Nominal voltage</b>	24 V DC	24 V DC	120 V AC/ 230 V AC	120 V AC/ 230 V AC
<b>Integrated fine-wire fuse</b>	–	–	–	–
<b>Current load</b>	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A
<b>Power LED</b>	green	green	green	green
<b>Defect LED</b>	–	–	–	–
<b>PE contact</b>	yes	yes	yes	yes
<b>Shield connection</b>	–	–	–	–
<b>Current consumption E-bus</b>	–	typ. 90 mA	–	typ. 90 mA
<b>Connection to DIN rail</b>	–	–	–	–
<b>Electrical isolation</b>	yes	yes	yes	yes
<b>Special features</b>	–	–	–	–
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex	CE, UL	CE, UL
<b>Weight</b>	approx. 50 g	approx. 50 g	approx. 50 g	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL9100">www.beckhoff.com/EL9100</a>	<a href="http://www.beckhoff.com/EL9110">www.beckhoff.com/EL9110</a>	<a href="http://www.beckhoff.com/EL9150">www.beckhoff.com/EL9150</a>	<a href="http://www.beckhoff.com/EL9160">www.beckhoff.com/EL9160</a>



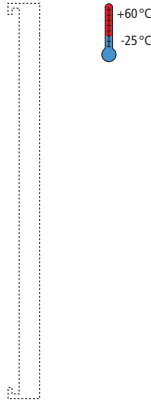
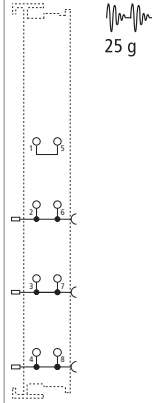
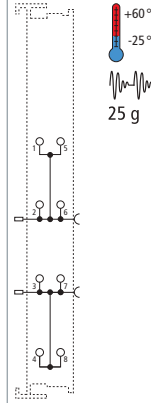
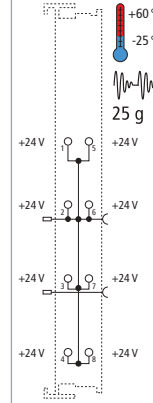
For availability status see Beckhoff website at: [www.beckhoff.com](http://www.beckhoff.com)

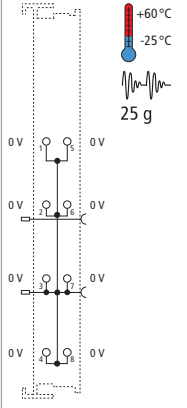
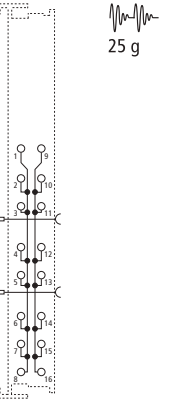
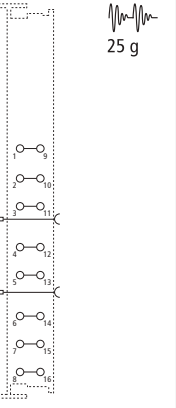
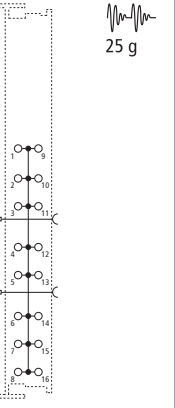
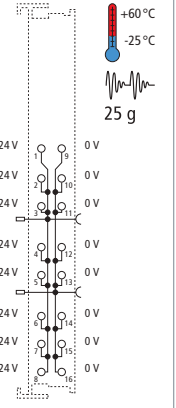
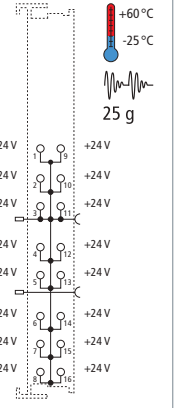
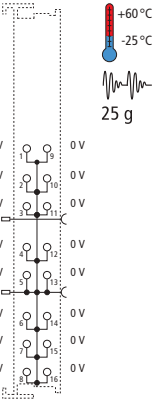
Potential supply terminal, any voltage up to 230 V AC	Potential supply terminal, 24 V DC, with fuse	Potential supply terminal, 24 V DC, with diagnostics and fuse	Potential supply terminal, 120...230 V AC, with fuse	Potential supply terminal, 120...230 V AC, with diagnostics and fuse	Potential supply terminal, arbitrary, with fuse	Shield terminal	Shield terminal	Separation terminal
EL9190   ES9190	EL9200	EL9210	i EL9250	i EL9260	i EL9290	EL9070	EL9195   ES9195	EL9080
potential supply terminal	potential supply terminal with fuse	potential supply terminal with diagnostics and fuse	potential supply terminal with fuse	potential supply terminal with diagnostics and fuse	potential supply terminal with fuse	shield terminal		separation terminal
–		yes	–	yes	–			
arbitrary up to 230 V AC/DC	24 V DC	24 V DC	120 V AC/230 V AC	120 V AC/230 V AC	arbitrary up to 230 V AC/DC	arbitrary up to 230 V AC	arbitrary up to 230 V AC/DC	separation terminal
–	...6.3 A	...6.3 A	...6.3 A	...6.3 A	...6.3 A	–	–	–
≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A
–	green	green	green	green	–	–	–	–
–	red	red	red	red	–	–	–	–
yes	yes	yes	yes	yes	yes	–	–	–
–	–	–	–	–	–	8 x	2 x	–
–	–	typ. 90 mA	–	typ. 90 mA	–	–	–	–
–	–	–	–	–	–	yes	yes	–
yes	yes	yes	yes	yes	yes	–	–	yes
–	–	–	–	–	–	dissipation of EMC interference via large copper surfaces on the DIN rail	dissipation of EMC interference	placeholder terminal with E-bus transmission
0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	-25...+60 °C
CE, UL	CE, UL, Ex	CE, UL, Ex	CE	CE	CE	CE	CE, UL, Ex	CE, UL, Ex
approx. 50 g	approx. 50 g	approx. 55 g	approx. 55 g	approx. 55 g	approx. 50 g	approx. 50 g	approx. 50 g	approx. 50 g
www.beckhoff.com/EL9190	www.beckhoff.com/EL9200	www.beckhoff.com/EL9210	www.beckhoff.com/EL9250	www.beckhoff.com/EL9260	www.beckhoff.com/EL9290	www.beckhoff.com/EL9070	www.beckhoff.com/EL9195	www.beckhoff.com/EL9080

# System terminals | Function terminals

The EL918x potential distribution terminals enable – depending upon the type – the distribution of ground or supply potentials to external devices. Wiring work and separate potential distributors are saved. Eight ground points are required for the ground connection of 8-channel output terminals in 2-wire operating mode, e.g. EL2008, for which the EL9187 can be used. The EL9184 and EL9188 HD EtherCAT Terminals (High Density) even make 16 connection points available in a compact housing.

Each assembly must be terminated at the right hand end with an EL9011 bus end cap.

	End cap	Potential distribution terminal, 2 terminal points per power contact	Potential distribution terminal, 4 terminal points at 2 power contacts	Potential distribution terminal, 8 x 24 V
<b>Technical data</b>	<b>EL9011</b>	<b>EL9180   ES9180</b>	<b>EL9185   ES9185</b>	<b>EL9186   ES9186</b>
<b>Technology</b>	end cap	potential distribution terminal		
<b>Diagnostics in the process image</b>	–	–		
				
<b>Nominal voltage</b>	end cap	arbitrary up to 230 V AC/DC	arbitrary up to 230 V AC/DC	≤ 60 V
<b>Integrated fine-wire fuse</b>	–	–	–	–
<b>Current load</b>	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A
<b>Power LED</b>	–	–	–	–
<b>Defect LED</b>	–	–	–	–
<b>PE contact</b>	–	yes	–	–
<b>Shield connection</b>	–	–	–	–
<b>Current consumption E-bus</b>	–	–	–	–
<b>Electrical connection to DIN rail</b>	–	–	–	–
<b>Electrical isolation</b>	yes	–	–	–
<b>Special features</b>	cover for the E-bus contacts	–	–	–
<b>Operating temperature</b>	-25...+60 °C	0...+55 °C	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
<b>Weight</b>	approx. 10 g	approx. 50 g	approx. 50 g	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL9011">www.beckhoff.com/EL9011</a>	<a href="http://www.beckhoff.com/EL9180">www.beckhoff.com/EL9180</a>	<a href="http://www.beckhoff.com/EL9185">www.beckhoff.com/EL9185</a>	<a href="http://www.beckhoff.com/EL9186">www.beckhoff.com/EL9186</a>

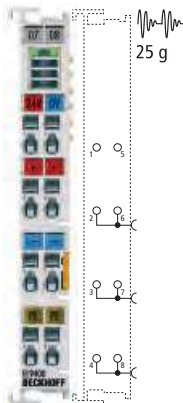
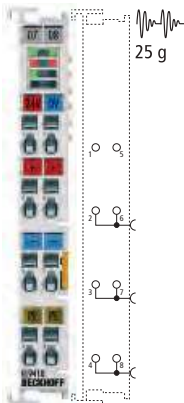
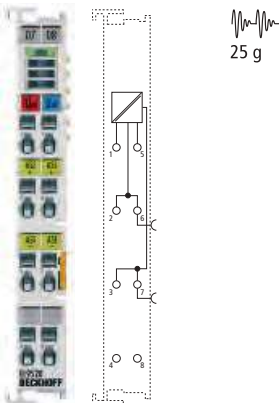
Potential distribution terminal, 8 x 0 V	Potential distribution terminal, 2 x 8 terminal points	Potential distribution terminal, 8 x 2 terminal points	Potential distribution terminal, 1 x 16 terminal points	Potential distribution terminal, 8 x 24 V, 8 x 0 V	Potential distribution terminal, 16 x 24 V	Potential distribution terminal, 16 x 0 V
EL9187   ES9187	EL9181	EL9182	EL9183	EL9184	EL9188	EL9189
						
≤ 60 V	≤ 60 V AC/DC	≤ 60 V AC/DC	≤ 60 V AC/DC	≤ 60 V	≤ 60 V	≤ 60 V
–	–	–	–	–	–	–
≤ 10 A	max. 10 A (per terminal point)	max. 10 A (per terminal point)	max. 10 A (per terminal point)	≤ 10 A	≤ 10 A	≤ 10 A
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	500 V (E-bus/field potential)	500 V (E-bus/field potential)	500 V (E-bus/field potential)	–	–	–
–	2 x 8-way bridge	8 x 2-way bridge	16-way bridge	direct plug-in technique	direct plug-in technique	direct plug-in technique
-25...+60 °C	0...+55 °C	0...+55 °C	0...+55 °C	-25...+60 °C	-25...+60 °C	-25...+60 °C
CE, UL, Ex	CE	CE	CE	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
approx. 50 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
www.beckhoff.com/EL9187	www.beckhoff.com/EL9181	www.beckhoff.com/EL9182	www.beckhoff.com/EL9183	www.beckhoff.com/EL9184	www.beckhoff.com/EL9188	www.beckhoff.com/EL9189

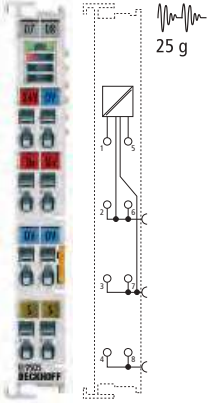
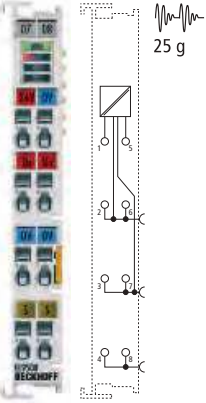
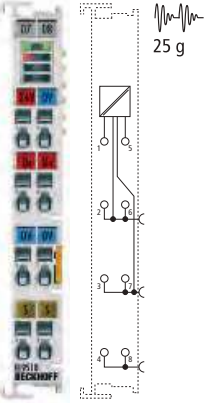
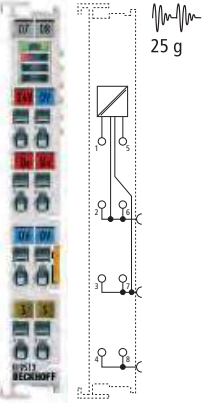
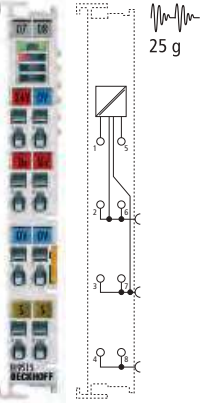
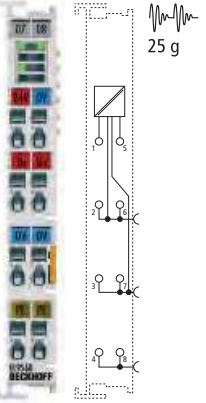


# System terminals | Power supply terminals

The EL94xx and EL95xx terminal series are designed for the modified feeding of the operating voltage into the terminal strand. The EL9400 and EL9410 power supply terminals enable the refreshment of the E-bus, via which data exchange takes place between the EtherCAT Coupler and the EtherCAT Terminals. Each EtherCAT Terminal requires a certain amount of current from the E-bus (see technical data: "Current consumption E-bus"). This current is fed into the E-bus by the relevant EtherCAT Coupler's power supply unit. When configuring a large number of EtherCAT Terminals, the 5 V power supply to the E-bus can be increased by 2 A via the EL9400/EL9410. As opposed to the EL9400, the EL9410 has a diagnostic function which is displayed by LED and on the process image.

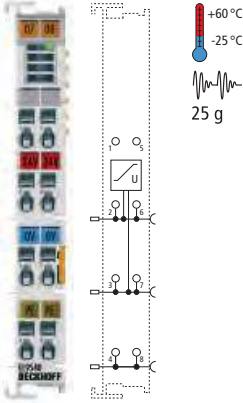
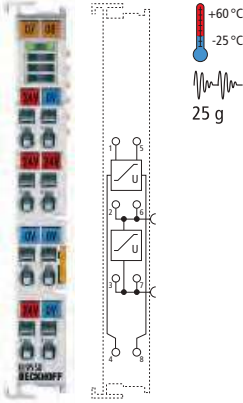
The EL95xx power supply terminals produce different output voltages from the input voltage (24 V DC) that can be accessed at the terminals. The following EtherCAT Terminals are also supplied with this voltage via the power contacts. The power LEDs indicate the operating states of the terminals; short-circuits or overloads are indicated by the overcurrent LEDs. There is no electrical isolation of the input and output voltage.

	Power supply terminal for refreshing the E-bus	Power supply terminal for refreshing the E-bus, with diagnostics	AS-Interface potential feed terminal, with filter
Technical data	EL9400   ES9400	EL9410   ES9410	EL9520   ES9520
Technology	power supply terminal		AS-Interface potential feed terminal
Diagnostics in the process image	–	yes	–
			
			The EL9520 potential feed terminal uncouples the input and output signal through an integrated filter and enables the supply of AS-Interface networks from standard power supply units or another AS-Interface network.
Input voltage	24 V DC	24 V DC	up to 35 V
Output voltage	5 V for E-bus supply	5 V for E-bus supply	up to 35 V
Input current	approx. 70 mA + (E-bus/4)	approx. 70 mA + (E-bus/4)	load-dependent
Max. output current	2 A	2 A	2 A
Short-circuit-proof	–	yes	–
Current consumption E-bus	–	–	–
Electrical isolation	–	–	–
Insulation voltage input/output	–	–	–
Special features	for new projects: please use EL9410	standard EL supply	no electrical isolation
Operating temperature	0...+55 °C	0...+55 °C	0...+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE
Weight	approx. 65 g	approx. 65 g	approx. 90 g
Further information	<a href="http://www.beckhoff.com/EL9400">www.beckhoff.com/EL9400</a>	<a href="http://www.beckhoff.com/EL9410">www.beckhoff.com/EL9410</a>	<a href="http://www.beckhoff.com/EL9520">www.beckhoff.com/EL9520</a>

	Power supply terminal, 5 V DC, with diagnostics	Power supply terminal, 8 V DC, with diagnostics	Power supply terminal, 10 V DC, with diagnostics	Power supply terminal, 12 V DC, with diagnostics	Power supply terminal, 15 V DC, with diagnostics	Power supply terminal, 24 V DC, electrical isolation
	EL9505   ES9505	EL9508   ES9508	EL9510   ES9510	EL9512   ES9512	EL9515   ES9515	EL9560   ES9560
	power supply terminal					
	yes					
						
	The EL9505 generates 5 V from the fed-in 24 V without electrical isolation.	The EL9508 generates 8 V from the fed-in 24 V without electrical isolation.	The EL9510 generates 10 V from the fed-in 24 V without electrical isolation.	The EL9512 generates 12 V from the fed-in 24 V without electrical isolation.	The EL9515 generates 15 V from the fed-in 24 V without electrical isolation.	24 V generation from the 24 V fed-in with electrical isolation, potential-free
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	5 V DC $\pm 1$ %	8 V DC $\pm 1$ %	10 V DC $\pm 1$ %	12 V DC $\pm 1$ %	15 V DC $\pm 1$ %	24 V DC (-15 %/+5 %)
	load-dependent	load-dependent	load-dependent	load-dependent	load-dependent	load-dependent
	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	0.1 A
	yes	yes	yes	yes	yes	yes
	90 mA	90 mA	90 mA	90 mA	90 mA	90 mA
	–	–	–	–	–	1,500 V AC constant load field side/E-bus
	–	–	–	–	–	500 V AC permanent load (field side)
	diagnostics overcurrent, output voltage	diagnostics overcurrent, output voltage	diagnostics overcurrent, output voltage	diagnostics overcurrent, output voltage	diagnostics overcurrent, output voltage	automatic restart after short-circuit, diagnostics $U_{in}/U_{out}$
	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
	CE, Ex	CE, Ex	CE, Ex	CE, Ex	CE, Ex	CE
	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g
	<a href="http://www.beckhoff.com/EL9505">www.beckhoff.com/EL9505</a>	<a href="http://www.beckhoff.com/EL9508">www.beckhoff.com/EL9508</a>	<a href="http://www.beckhoff.com/EL9510">www.beckhoff.com/EL9510</a>	<a href="http://www.beckhoff.com/EL9512">www.beckhoff.com/EL9512</a>	<a href="http://www.beckhoff.com/EL9515">www.beckhoff.com/EL9515</a>	<a href="http://www.beckhoff.com/EL9560">www.beckhoff.com/EL9560</a>

# System terminals | Surge filter system and field supply

The EL9540 system terminal contains an overvoltage filter for the 24 V field supply, the EL9550 for the 24 V field and system supply. The filter protects the EtherCAT Terminals from line-bound surge voltages that can occur due to high-energy disturbances such as switching overvoltages at inductive consumers or lightning strikes at the supply lines. The EtherCAT Terminals EL9540 or EL9550 protect the terminal station from damage in particularly harsh environments. The ship classification organisations require the use in shipbuilding applications and in the onshore/offshore sector.

	Surge filter field supply	Surge filter system and field supply
<b>Technical data</b>	EL9540   ES9540	EL9550   ES9550
<b>Technology</b>	surge filter field supply	surge filter system and field supply
<b>Diagnostics</b>	–	
		
<b>Nominal voltage</b>	24 V (-15 %/+20 %)	24 V (-15 %/+20 %)
<b>Surge filter field supply</b>	yes	yes
<b>Surge filter system supply</b>	–	yes
<b>Rated current field supply</b>	≤ 10 A	≤ 10 A
<b>Rated current system supply</b>	–	≤ 0.5 A
<b>PE connection</b>	yes	–
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex
<b>Weight</b>	approx. 50 g	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL9540">www.beckhoff.com/EL9540</a>	<a href="http://www.beckhoff.com/EL9550">www.beckhoff.com/EL9550</a>

# System terminals | Brake chopper terminal

The EL9576 EtherCAT Terminal contains high-performance capacitors for stabilising supply voltages. It can be used in connection with the drive terminals of the EL7xxx series, e.g. the EL70x1 stepper motor terminals, the EL73x2 DC motor terminals or the EL72x1 servomotor terminals.

Low internal resistance and high pulsed current capability enable good buffering in parallel with a power supply unit. Return currents are stored, particularly in the context of drive applications, thereby preventing overvoltages. If the fed back energy exceeds the capacity of the capacitors, the EL9576 switches the load voltage through to the terminal points 1 and 5. The energy is dissipated by the connection of an external ballast resistor.

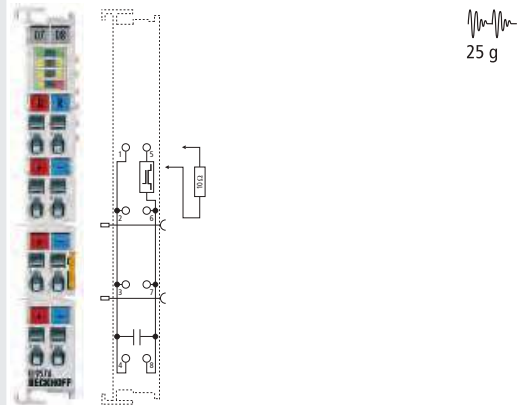
The EL9576 is characterised in particular by adjustable threshold values and various diagnostic possibilities.

EL7xxx | Motion terminals

see page **431**

Brake chopper terminal,  
72 V, 155  $\mu$ F

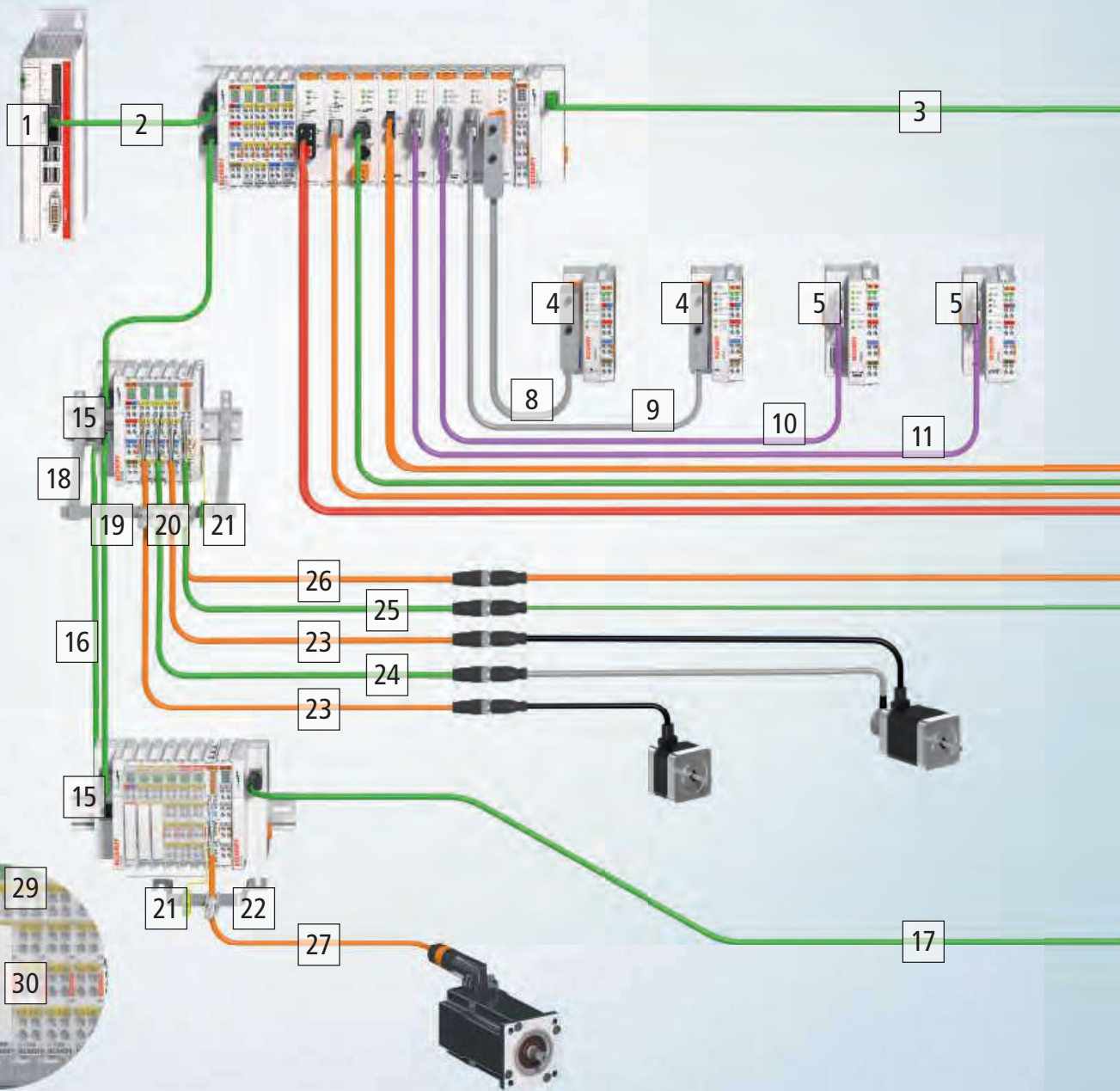
<b>Technical data</b>	EL9576   ES9576
<b>Technology</b>	brake chopper
<b>Diagnostics</b>	temperature on board, over-/undervoltage



The EL9576 buffers the connected voltage via its integrated capacitors and connects the external brake resistor if the preset threshold of the internal voltage is exceeded.

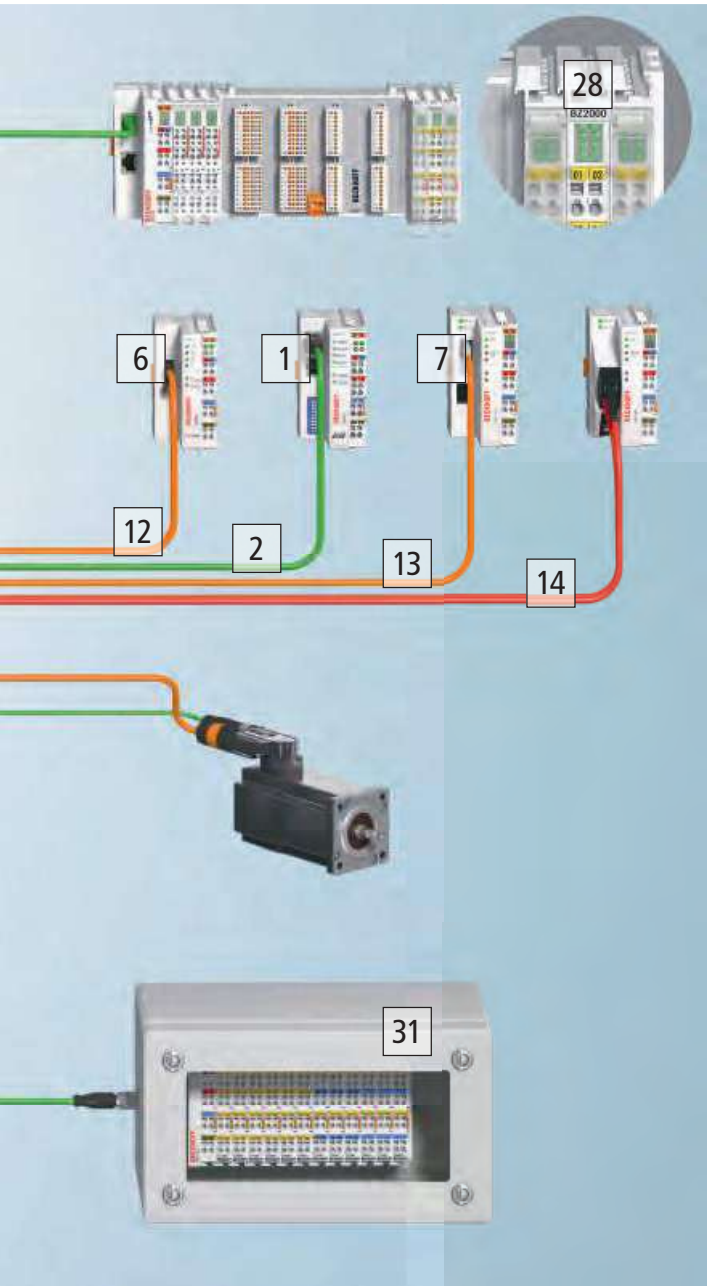
<b>Nominal voltage</b>	arbitrary up to 72 V
<b>Capacity</b>	155 $\mu$ F
<b>Ripple current (max.)</b>	10 A
<b>Internal resistance</b>	< 5 m $\Omega$
<b>Chopper voltage</b>	adjustable
<b>Recommended ballast resistor</b>	10 $\Omega$ , typ. 100 W (dependent on application)
<b>Overvoltage control range</b>	typ. 1 V, parametrisable by CoE data
<b>Ballast resistor clock rate</b>	load-dependent, max. 1 ms, 2-point control
<b>Electrical isolation</b>	1,500 V (E-bus/field potential)
<b>Special features</b>	adjustable threshold
<b>Operating temperature</b>	0...+55 $^{\circ}$ C
<b>Approvals</b>	CE
<b>Weight</b>	approx. 90 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EL9576">www.beckhoff.com/EL9576</a>

# Accessories EtherCAT Terminal



## Cordsets and connectors

- |  |   |   |  |
|--|---|---|--|
| <p>1 ZS1090-0003   EtherCAT/Ethernet RJ45 plug, IP 20, 4-pin, field assembly</p> <p>2 ZB9010   Industrial Ethernet/EtherCAT cable for fixed installation, category CAT 5e, 4-wires</p> <p>3 ZK1090-9191-xxxx   Industrial Ethernet/EtherCAT patch cable</p> <p>4 ZS1052-3000   5-pin open style connector for CANopen/DeviceNet with integrated termination resistor</p> | <p>446</p> <p>446</p> <p>446</p> <p>688</p> | <p>5 ZS1031-3000   9-pin D-sub connector for PROFIBUS (12 Mbaud) with integrated termination resistor</p> <p>6 Z1000   Standard connector for 1000 µm plastic fibre</p> <p>7 ZS1090-0008   Connector set for direct connector assembly for POF cables</p> <p>8 ZB5200   DeviceNet cable</p> <p>9 ZB5100   CAN cable</p> | <p>688</p> <p>688</p> <p>447</p> <p>690</p> <p>690</p> |
|--|---|---|--|



- 10** ZB4200 | Interbus remote bus cable 689
- 11** ZB3200 | PROFIBUS cable 689
- 12** Z1100 | Plastic fibre optic 688
- 13** Z1190 | Fibre-optic duplex cable for direct connector assembly 447
- 14** ZK1091-1001-xxxx | Fibre-optic multimode cable, SC duplex plug 447

- 15** ZS1090-0005 | EtherCAT/Ethernet RJ45 plug, IP 20, 8-pin, for field assembly 689
- 16** ZB9020 | Industrial Ethernet/EtherCAT cable, drag-chain suitable 690
- 17** ZK1090-6191-0xxx | EtherCAT cable, M12 plug, straight, d-coded, 4-pin – RJ45 plug, straight 515

#### Shielding connection system

- 18** ZB8520 | Mounting rail holder for shield busbar 448
- 19** ZB8510 | Shield busbar 10 x 3 mm 448
- 20** ZB8500 | Clamp strap for shield connection with knurled screw 448
- 21** ZB8530 | U-clamp terminal up to 4 mm<sup>2</sup> for PE connection to the rail 448
- 22** ZB8511 | Shield busbar clamp 448

#### Motor cables

- 23** ZK4000-6700-2xxx | Motor cable, shielded, for AS1000 stepper motors 870
- 24** ZK4000-5100-2xxx | Encoder cable for AS1000 stepper motors 870
- 25** ZK4724-0410 | Resolver cable for AM8100 and AM3100 servomotors 864
- 26** ZK4704-0411 | Motor cable for AM8100 and AM3100 servomotors 864
- 27** ZK4704-0421 | Motor cable for AM8100 servomotors with OCT 864

#### Accessories

- 28** BZ1xxx, BZ200x | Marking material, contact labels 447
- 29** BZ3200 | Insertable label cover, transparent, pluggable 448
- 30** BZ5100 | Push-in strips for labels 448
- 31** BG155x | Bus system housing with mounting rails and holes 449

► [www.beckhoff.com/EtherCAT-accessories](http://www.beckhoff.com/EtherCAT-accessories)

**Note:** The pictured products give examples of the wide range of EtherCAT Terminal accessories. For further variants and connection possibilities please see the respective catalog pages.

# Cables and connectors for field assembly

## EtherCAT cable (copper based)

### Pre-assembled cable

The pre-assembled Industrial Ethernet/EtherCAT cables with RJ45 plug enable fast, easy wiring inside the control cabinet and are suitable for short distances on the machine. The robust, industrial quality PUR cables distinguish themselves from office cables by both their mechanical and their EMC characteristics. Further lengths and variants on request.

Technical data	ZK1090-9191-xxxx	A
Cross-section	4 x 2 x AWG26/7...4 x 2 x 0.128 mm <sup>2</sup>	
Cable sheath material	PUR	
Colour	green (RAL 6018)	
Line configuration	SF/UTP (shielded)	
Diameter	sheath: typ. 5.9 mm ±0.2 mm	
Bending radius	> 5 x diameter	
Category/class	CAT 5, class D	
Operating/installation temperature	-40...+75 °C/-10...+60 °C	
Insertion cycles	min. 750	

Ordering information	for pre-assembled EtherCAT/Ethernet patch cables depending on cable lengths				
ZK1090-9191-0001	0.17 m	ZK1090-9191-0030	3.0 m	ZK1090-9191-0200	20.0 m
ZK1090-9191-0002	0.26 m	ZK1090-9191-0050	5.0 m	ZK1090-9191-0250	25.0 m
ZK1090-9191-0005	0.5 m	ZK1090-9191-0055	5.5 m	ZK1090-9191-0300	30.0 m
ZK1090-9191-0010	1.0 m	ZK1090-9191-0060	6.0 m	ZK1090-9191-0350	35.0 m
ZK1090-9191-0012	1.25 m	ZK1090-9191-0070	7.0 m	ZK1090-9191-0400	40.0 m
ZK1090-9191-0015	1.5 m	ZK1090-9191-0080	8.0 m	ZK1090-9191-0450	45.0 m
ZK1090-9191-0017	1.75 m	ZK1090-9191-0090	9.0 m	ZK1090-9191-0500	50.0 m
ZK1090-9191-0020	2.0 m	ZK1090-9191-0100	10.0 m		
ZK1090-9191-0025	2.5 m	ZK1090-9191-0150	15.0 m		

### Cables sold by the metre and connectors

Ordering information	Industrial Ethernet/EtherCAT cable	
ZB9010	Industrial Ethernet/EtherCAT cable, fixed installation, CAT 5e, 4 wires, SF/UTP	
ZB9020	Industrial Ethernet/EtherCAT cable, drag-chain suitable, CAT 5e, 4 wires, SF/UTP	
ZB903x	Industrial Ethernet/EtherCAT cable, for M8 wiring, SF/UTP, AWG 26, see page	514

Ordering information		Pict.
ZS1090-0003	RJ45 plug EtherCAT/Ethernet, IP 20, 4-pin, field assembly, AWG22-24, PU = 10	B
ZS1090-0005	RJ45 plug EtherCAT/Ethernet, IP 20, 8-pin, supports Gbit, field assembly, AWG22-26, PU = 10	C



## EtherCAT cable (fibre optic)

### Pre-assembled cable

Ordering information	for fibre-optic cables for EK1501, EK1521, CU1521, CU1521-0010 (multimode 50/125 µm)		
ZK1091-1001-0001	fibre-optic duplex cable, SC connector, 1 m	ZK1091-1001-0010	fibre-optic duplex cable, SC connector, 10 m
ZK1091-1001-0005	fibre-optic duplex cable, SC connector, 5 m		

Further lengths and variants on request

### Cables sold by the metre and connectors

Ordering information	POF fibre-optic for EK1561 and CU1561		
Z1190	POF fibre-optic duplex cable 980/1000 µm for direct connector assembly, sold by metre, PUR, 2-wire, for POF, drag-chain suitable, red		
ZS1090-0008	connector set for direct connector assembly for POF cables, contains 10 connectors and 1 polishing set including sanding gauge and polishing paper		

## Connectors (spare parts)

Ordering information	for terminals with plug-in wiring level		
ZS2010	10 connectors for KS and ES series, spare part (KS/ES terminals are supplied with connector.)		

Ordering information	for connectors for KM or EM modules, spare part (KM and EM terminals are supplied with connector.)		
ZS2001-0001	1-pin, without LED	ZS2001-0004	3-pin, with LED
ZS2001-0002	1-pin, with LED	ZS2001-0005	1-pin, without LED, labelling (1...10)

## Marking material and coding pins

### Standard contact signs

The EtherCAT Terminals can be individually labelled with standard contact signs. The marking material is not included in the delivery. Further versions ► [www.beckhoff.com/labelling](http://www.beckhoff.com/labelling)

Ordering information	for contact labels, unprinted (100 pcs)			D
BZ2000	white	BZ2006	blue	
BZ2002	yellow	BZ2007	orange	
BZ2005	red	BZ2008	light green	

Ordering information	for contact labels, printed (100 pcs)			D
BZ1100	0 V, blue	BZ1107	+, white	
BZ1102	–, blue	BZ1108	PE, light green	
BZ1104	24 V, red	BZ1300	ten of each: 0...7, 20 unprinted, white	
BZ1106	+, red	BZ1400	two of each: 00 01...48 49, white	

Ordering information	for equipment identification labels 12 x 7 mm for Bus Terminals with removable identification section (180 pcs)		
BZ3000	unprinted	BZ3010	printed according to customer specification (in Excel file)



## Slide-in label covers

The slide-in label covers BZ3200 enable clear labelling of the individual channels or text-based functional description of the EtherCAT Terminals. The labels are inserted in the designated slots. For connecting the individual channels the label cover can be tilted upwards.

Ordering information		E
BZ3200	insertable label cover, transparent, pluggable, 11.5 mm x 104.5 mm, packing unit = 50	
BZ5100	push-in strips for labels, A4 sheet, 160 pieces, pre-punched, packing unit = 10	

## Coding pins

The coding pins and sockets for KS/ES terminals with pluggable wiring level enable coding between terminal and plug in order to prevent incorrect plug insertion.

Ordering information		F
ZS2010-0010	The set contains 100 sockets and 100 pins.	



# Housing and assembly

## Shielding connection system

The shielding connection system enables the shielding to be located very close to the terminals of the shielded line, so that interference is reduced to a minimum. A shield busbar for attachment to a mounting rail or a bracket for separate mounting in the control cabinet are available.

Ordering information	Shield busbar with mounting rail holder	Pict.
ZB8500	clamp strap for shield connection with knurled screw, width 11 mm, shield diameter max. 8 mm, packing unit = 10	G
ZB8510	shield busbar 10 x 3 mm, 1000 mm galvanised Cu, packing unit = 1	H
ZB8520	mounting rail holder for shield busbar (10 x 3 mm), packing unit = 2	I
ZB8530	U-clamp terminal up to 4 mm <sup>2</sup> for PE connection to the rail (10 x 3 mm), packing unit = 20	

Ordering information	Shield busbar clamps	Pict.
ZB8500	clamp strap for shield connection with knurled screw, width 11 mm, shield diameter max. 8 mm, packing unit = 10	G
ZB8511	shield busbar clamp 10 x 3 mm for 5 Bus Terminals/EtherCAT Terminals 12 mm, packing unit = 10	J
ZB8530	U-clamp terminal up to 4 mm <sup>2</sup> for PE connection to the rail (10 x 3 mm), packing unit = 20	

## Bus system housing

The BG1558 and BG1559 housings are especially suitable for the construction of compact I/O stations with a higher protection class (IP 65). The housings are supplied with mounting rails. If desired, the housings can be supplied fully fitted with EtherCAT Terminals, flanges and PG threaded fittings. Further sizes are available on request.

Ordering information		Pict.
BG1558	bus system housing 400 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	K
BG1559	bus system housing 600 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	

## Assembly aids

Ordering information	
ZB8700	slot screwdriver assembly tool for pressing the spring force clamps on the coupler and the terminals

## EtherCAT demokit

The TC9910-B11x EtherCAT demokit offers a quick introduction into EtherCAT communication. It includes EtherCAT Terminals and a Coupler for testing simple I/O functions. The enclosed CD contains a step-by-step guide and a full version of TwinCAT 2 as programming environment for

the Beckhoff EtherCAT master. EtherCAT slaves of any type can be tested with this field-proven EtherCAT master. It also includes a comprehensive help collection that facilitates familiarisation with Beckhoff ADS communication and programming according to IEC 61131-3.

The demokit consists of:

- EK1100 EtherCAT Coupler
- 2 digital input terminals 24 V DC
- 2 digital output terminals 24 V DC
- Beckhoff product folder
- Beckhoff TwinCAT CD
- "TwinCAT Quickstart" documentation

- documentation describing the EK1100
- a 25 cm section of 35 mm mounting rail for fitting the terminal system
- TwinCAT 2 PLC license (only TC9910-B110)
- EL9011 end cap
- Ethernet cable

Ordering information		L
TC9910-B110	EtherCAT demokit, with TwinCAT 2 PLC license	
TC9910-B111	EtherCAT demokit, without TwinCAT 2 PLC license	
TC9910-B112	EtherCAT demokit, without TwinCAT 2 PLC license (1 instead of 2 digital input terminals)	

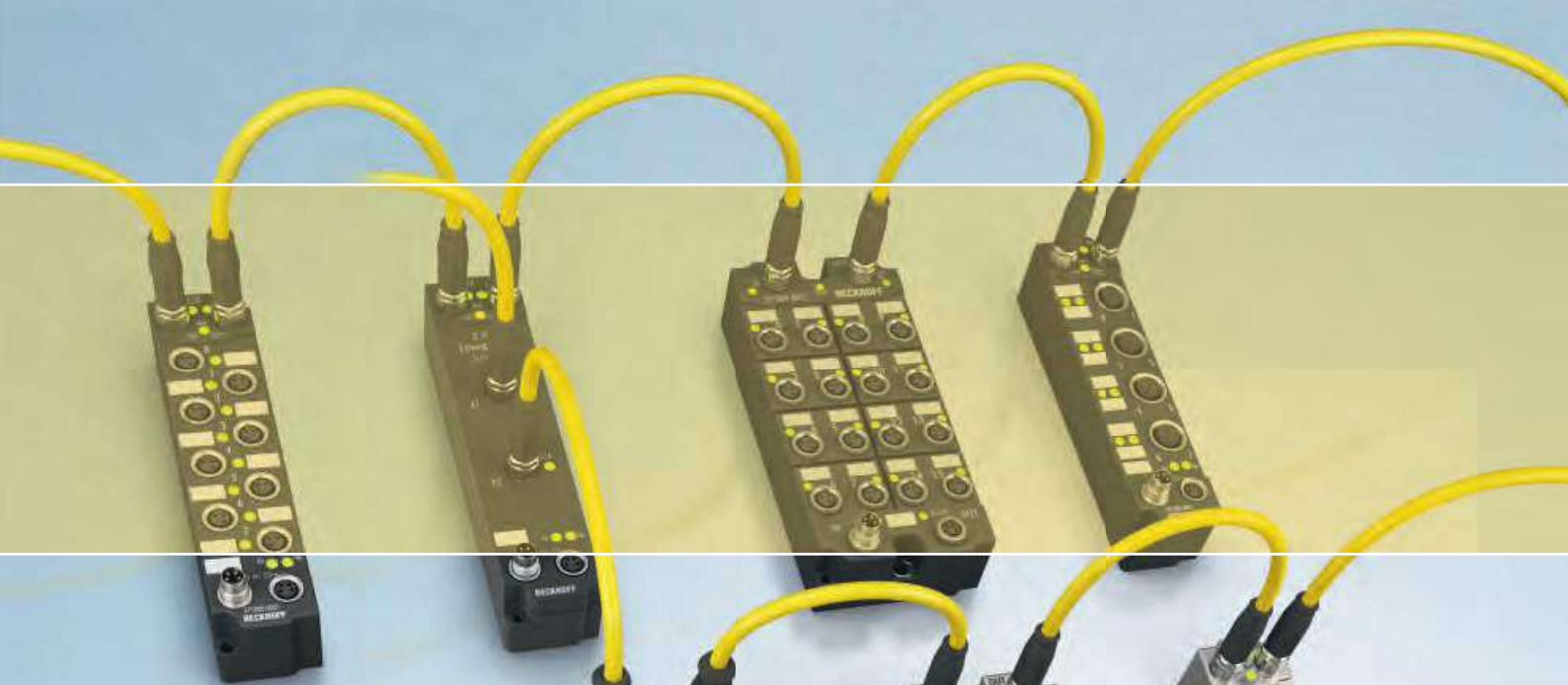


# EtherCAT®



# EtherCAT Box

High performance for harsh environments



462 EtherCAT Box (industrial housing)



464 EtherCAT Box (zinc die-cast housing)



504 EtherCAT Box (stainless steel housing)

# EtherCAT Box

EtherCAT extends its reach into the IP 67 world

454	Product overview
458	System description
460	Technical data

## 462 EtherCAT Box (industrial housing)

466	Digital input EP1xxx
473	Digital output EP2xxx
480	Digital combi EP23xx
486	Analog input EP3xxx
491	Analog output EP4xxx
492	Position measurement EP5xxx
494	Communication EP6xxx
496	Motion EP7xxx
499	Special functions EP8xxx
500	System EPxxx

## 504 EtherCAT Box (stainless steel housing)

506	Digital input EQ1xxx
507	Digital output EQ2xxx
508	Digital combi EQ23xx
510	Analog input EQ3xxx

## 464 EtherCAT Box (zinc die-cast housing)

466	Digital input ER1xxx
473	Digital output ER2xxx
480	Digital combi ER23xx
486	Analog input ER3xxx
491	Analog output ER4xxx
492	Position measurement ER5xxx
494	Communication ER6xxx
496	Motion ER7xxx
499	Special functions ER8xxx

## 512 Accessories

512	Product overview
514	Cables
522	Connectors
524	Further accessories

## 788 Infrastructure Components

788	Junction
789	Media converter

# Product overview EtherCAT Box

EtherCAT Box   Digital I/O							
Input		8 x M8	16 x M8	4 x M12	8 x M12	Other	
24 V DC	8-channel filter 3.0 ms	EP1008-0001 466		EP1008-0002 467	EP1008-0022 467		
		ER1008-0001 466		EQ1008-0002 506			
				ER1008-0002 467	ER1008-0022 467		
	8-channel filter 10 µs	EP1018-0001 466		EP1018-0002 467			
		ER1018-0001 466		ER1018-0002 467			
	8-channel filter 10 µs, negative switching	EP1098-0001 467					
		ER1098-0001 467					
	8-channel 2-channel timestamp	EP1258-0001 471		EP1258-0002 471			
		ER1258-0001 471		ER1258-0002 471			
	8-channel multi-function input			EP1518-0002 468			
				ER1518-0002 468			
	8-channel TwinSAFE, 8 safe inputs			EP1908-0002 472			
	16-channel filter 3.0 ms		EP1809-0021 470			EP1809-0022 470	
		ER1809-0021 470			EQ1809-0022 506		
					ER1809-0022 470		
16-channel filter 10 µs		EP1819-0021 470			EP1819-0022 470		
		ER1819-0021 470			ER1819-0022 470		
16-channel filter 10 µs, D-sub socket, 25-pin					EP1816-0008 469		
16-channel filter 10 µs, D-sub socket, 25-pin, acceleration sensor					EP1816-3008 469		
Output		8 x M8	16 x M8	4 x M12	8 x M12	Other	
24 V DC	8-channel $I_{MAX} = 0.5 A$	EP2008-0001 473		EP2008-0002 473	EP2008-0022 477		
		ER2008-0001 473		EQ2008-0002 507			
				ER2008-0002 473	ER2008-0022 477		
	8-channel $I_{MAX} = 2 A, \sum 4 A$	EP2028-0001 474		EP2028-0002 474			
		ER2028-0001 474		ER2028-0002 474			
	8-channel $I_{MAX} = 2.8 A, \sum 16 A$				EP2028-0032 475		
					ER2028-1032 475		
	8-channel $I_{MAX} = 2 A, \sum 4 A$ , with diagnostics	EP2038-0001 476		EP2038-0002 476			
		ER2038-0001 476		ER2038-0002 476			
	16-channel $I_{MAX} = 0.5 A, \sum 4 A$		EP2809-0021 477			EP2809-0022 477	
			ER2809-0021 477			EQ2809-0022 507	
						ER2809-0022 477	
	16-channel $I_{MAX} = 0.5 A, \sum 4 A$ , D-sub socket, 25-pin					EP2816-0008 478	
	16-channel $I_{MAX} = 0.5 A, \sum 4 A$ , 2 x D-sub socket, 9-pin					EP2816-0010 479	
16-channel $I_{MAX} = 0.5 A, \sum 4 A$ , M16, 19-pin					EP2816-0004 478		
24-channel $I_{MAX} = 0.1 A$ , D-sub socket, 25-pin					EP2817-0008 479		
25 V AC/ 30 V DC	4-channel relay output			EP2624-0002 479			
				ER2624-0002 479			

EPxxxx: industrial housing in IP 67, EQxxxx: stainless steel housing in IP 69K, ERxxxx: zinc die-cast housing in IP 67

## EtherCAT Box | Digital I/O

Combi	8 x M8	16 x M8	4 x M12	8 x M12	Other
<b>24 V DC</b>	<b>8-channel</b> 4 input + 4 output, filter 3.0 ms, I <sub>max</sub> = 0.5 A	EP2308-0001 480 ER2308-0001 480		EP2308-0002 481 ER2308-0002 481	
	<b>8-channel</b> 4 input + 4 output, filter 10 µs, I <sub>max</sub> = 0.5 A	EP2318-0001 480 ER2318-0001 480		EP2318-0002 481 ER2318-0002 481	
	<b>8-channel</b> 4 input + 4 output, filter 3.0 ms, I <sub>max</sub> = 2 A	EP2328-0001 483 ER2328-0001 483		EP2328-0002 483 ER2328-0002 483	
	<b>8-channel</b> 8 input/output, filter 10 µs, I <sub>max</sub> = 0.5 A	EP2338-0001 482 ER2338-0001 482		EP2338-0002 483 ER2338-0002 483	
	<b>8-channel</b> 8 input/output, filter 3.0 ms, I <sub>max</sub> = 0.5 A	EP2338-1001 482 ER2338-1001 482		EP2338-1002 483 ER2338-1002 483	
	<b>16-channel</b> 16 input/output, filter 3.0 ms, I <sub>max</sub> = 0.5 A, Σ 4 A		EP2339-0021 484 ER2339-0021 484		EP2339-0022 484 EQ2339-0022 508 ER2339-0022 484
	<b>16-channel</b> 16 input/output, filter 10 µs, I <sub>max</sub> = 0.5 A, Σ 4 A		EP2349-0021 485 ER2349-0021 485		EP2349-0022 485 ER2349-0022 485
	<b>16-channel</b> 8 input + 8 output, filter 10 µs, I <sub>max</sub> = 0.5 A, D-sub socket, 25-pin				EP2316-0008 481
	<b>16-channel</b> 8 input + 8 output, filter 10 µs, I <sub>max</sub> = 0.5 A, IP 20 plug				EP2316-0003 482



EtherCAT Box   Analog I/O			
Input		M8	M12
±10 V, 0/4...20 mA	2-channel parameterisable, with galvanic isolation, single-ended, 16 bit		EP3162-0002 486
	4-channel parameterisable, differential input, 16 bit		EP3174-0002 487 EQ3174-0002 510 ER3174-0002 487
	4-channel parameterisable, differential input, 16 bit, TwinSAFE SC		EP3174-0092 487
	4-channel parameterisable, single-ended, 16 bit		EP3184-0002 487 ER3184-0002 487
Resistance thermometer	4-channel resistance thermometer (RTD), PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000, 16 bit		EP3204-0002 487 EQ3204-0002 511 ER3204-0002 487
Thermo- couple/mV	4-channel thermocouple, type J, K, L, B, E, N, R, S, T, U, 16 bit		EP3314-0002 488 EQ3314-0002 511 ER3314-0002 488
Resistor bridge	1-channel resistor bridge, 24 bit, self-calibration		EP3356-0022 489
Pressure measuring	4-channel differential/absolute pressure measurement, 6 digital inputs, 2 digital outputs, 4 pressure inputs -1...1 bar (differential pressure to fifth connection)	EP3744-0041 490	
	4-channel differential/absolute pressure measurement, 6 digital inputs, 2 digital outputs, 4 pressure inputs 0...7 bar (differential pressure to fifth connection)	EP3744-1041 490	
Output		M8	M12
±10 V, 0/4...20 mA	4-channel parameterisable, 16 bit		EP4174-0002 491 ER4174-0002 491
	4-channel 2 input + 2 output, parameterisable, 16 bit		EP4374-0002 491 ER4374-0002 491

EPxxxx: industrial housing in IP 67, EQxxxx: stainless steel housing in IP 69K, ERxxxx: zinc die-cast housing in IP 67

EtherCAT Box   Special functions						
Function		M8	M12		Other	
Position measurement	Incremental encoder interface 32 or 16 bit, binary, RS485		EP5101-0002	492	EP5101-0011 D-sub	493
			ER5101-0002	492		
	Incremental encoder interface 32 or 16 bit, binary, 24 V sensor supply		EP5101-1002	493		
			ER5101-1002	493		
	Incremental encoder interface 32 or 16 bit, binary, 24 V		EP5151-0002	493		
			ER5151-0002	493		
Communication	Serial interface 1-channel, RS232, RS422/RS485, 5 V DC/1 A		EP6001-0002	494		
			ER6001-0002	494		
	Serial interface 2-channel, RS232, RS422/RS485		EP6002-0002	494		
			ER6002-0002	494		
	IO-Link master Class A		EP6224-2022	495		
IO-Link master Class B		EP6224-3022	495			
Motion	Stepper motor module 50 V DC, 1.5 A, incremental encoder, 2 digital inputs, 1 digital output		EP7041-1002	496		
			ER7041-1002	496		
	Stepper motor module 50 V DC, 5 A, incremental encoder, 2 digital inputs, 1 digital output		EP7041-0002	496		
			ER7041-0002	496		
			EP7041-2002	497		
			ER7041-2002	497		
			EP7041-3002	497		
			ER7041-3002	497		
	DC motor output stage 2-channel, 50 V DC, 3.5 A		EP7342-0002	498		
			ER7342-0002	498		
Special functions	Multi-functional I/O box 8 digital inputs/outputs, 2 x tachometer input, 2 x 0/4...20 mA input, 1 x 0/4...20 mA output, 1 x 1.2 A PWM output		EP8309-1022	499		
			ER8309-1022	499		
System	EtherCAT Box 3 decimal ID switches	EP1111-0000	500			
	EtherCAT junction 2-channel	EP1122-0001	500			
	Power distribution 4/4-channel				EP9214-0023	501
					7/8" plug, 7/8" socket	
Power distribution with current measurement/data logging 4/4-channel				EP9224-0023	501	
				7/8" plug, 7/8" socket		
PROFINET RT EtherCAT Box EtherCAT Box interface with PROFINET RT			EP9300-0022	502		
Infrastructure Components	EtherCAT junction 8 ports	EP9128-0021	788			
	EtherCAT media converter fibre optic 1-channel				EP9521-0020	789
EtherCAT media converter fibre optic 2-channel				EP9522-0020	789	

# The EtherCAT Box

## High performance, compact and waterproof design

### Robust

Robust construction allows fieldbus modules to be fitted directly to machines. Control cabinets and terminal boxes are now no longer required.

### Sealed

The modules in industrial housing meet the protection class IP 65, IP 66 and IP 67, are fully casted and thus ideally prepared for use in wet, dirty and dusty working environments. For use in extreme, corrosive industrial environments, modules in stainless steel housing in IP 69K protection are available. For harsh industrial and process environments the modules with zinc die-cast housing offer enhanced load capacity and protection e.g. against weld spatter.

### Small

The modules are extremely small and are thus suitable for use in applications where there is very little space available. The low weight of the EtherCAT Box modules makes them useful in applications where the I/O interface is in motion (e.g. on a robot arm).

### Ultra high-speed

The EtherCAT Box modules have a direct EtherCAT port. Virtually all sensors and actuators can be connected to the control system directly via the 100BASE-TX. XFC boxes are available for additional requirements, e.g. timestamp inputs.

### Quickly wired

The wiring of EtherCAT and of signals is significantly simplified through the use of pre-assembled cables. Wiring errors are minimised and the system setup is finished quickly.

### Flexible

In addition to the pre-assembled cables, field wireable connectors and cables are also available for maximum flexibility.

### Economical

Combined I/O modules and fine signal granularity lead to low system costs – you only have to buy what you really need. Due to the doubling of the number of channels per EtherCAT Box, the 16-channel series also saves time and costs with both the EtherCAT cabling and the power cabling.

### Complete

The wide variety of signal types allows the connection of almost any kind of sensor or actuator. The communication modules enable decentralised connection of, e.g., label printers, identification systems or special equipment. Stepper Motor Box modules are also available.

### Fitting

Sensors and actuators are connected through screw type connectors (M8 or M12). The screw type connectors offer the advantage of high resistance to being pulled out.

### Compatible

The EtherCAT Box devices behave very much like the Beckhoff EtherCAT Terminals – this means that the ideal distributed peripheral device can be used, whatever the particular application.

### For extreme climatic zones

The majority of the EtherCAT Box modules are approved for the extended temperature range of  $-25 \dots +60 \text{ }^\circ\text{C}$  (storage temperature  $-40 \dots +85 \text{ }^\circ\text{C}$ ).

The EtherCAT Box modules have an integrated direct EtherCAT interface and can be connected directly to an EtherCAT network. Conventional fieldbuses such as PROFIBUS or CANopen are connected via Coupler Box modules (see chapter Fieldbus Box, page [696](#) ).

EtherCAT topology and system description see page [284](#)

Infrastructure Components in IP 67 see page [788](#)

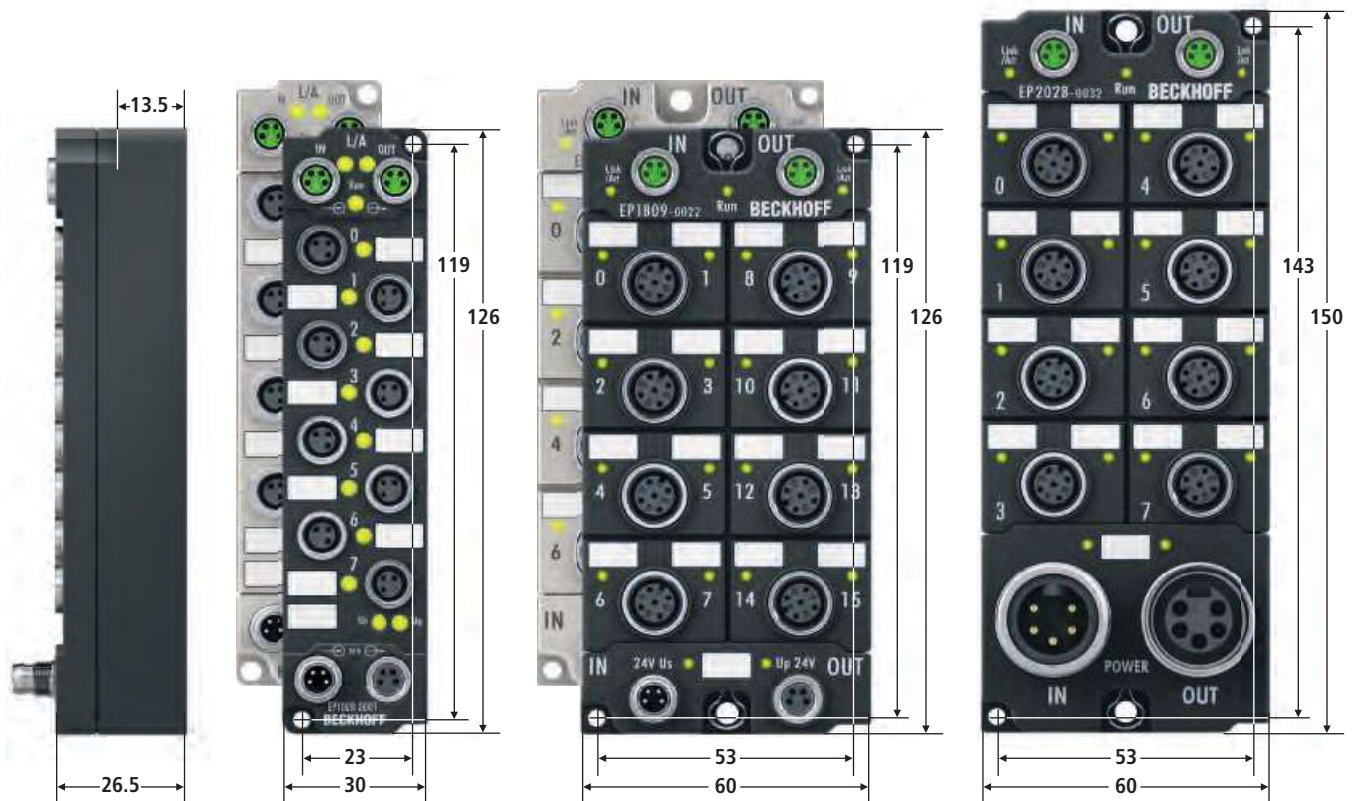


For further information on EtherCAT see ► [www.beckhoff.com/EtherCAT](http://www.beckhoff.com/EtherCAT)



# Technical data

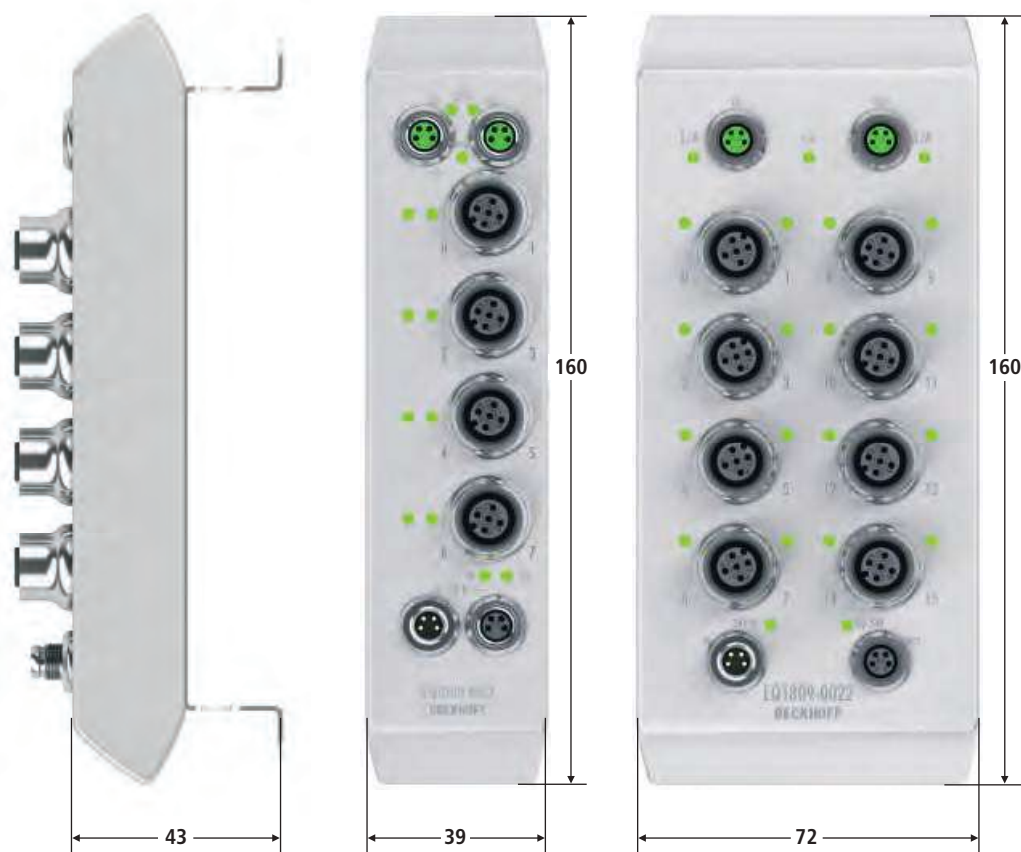
## EtherCAT Box (industrial and zinc die-cast housing)



Technical data	8 x M8, 4 x M12	16 x M8, 8 x M12	7/8" infeed
Dimensions (W x H x D)	30 mm x 126 mm x 26.5 mm	60 mm x 126 mm x 26.5 mm	60 mm x 150 mm x 26.5 mm
Weight	depending on device (typ. 165 g)	depending on device (typ. 250 g)	depending on device (typ. 440 g)
Material	PA6 (polyamide) for EPxxxx or zinc die-cast for ERxxxx		
Installation	2 fixing holes 3 mm diameter for M3	2 fixing holes 3 mm diameter for M3; 2 fixing holes 4.5 mm diameter for M4	2 fixing holes 3 mm diameter for M3; 2 fixing holes 4.5 mm diameter for M4
Operating/storage temperature	0...+55 °C/-25...+85 °C (extended temperature range: -25...+60 °C/-40...+85 °C)		
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)		
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 35 g, 11 ms); 1000 shocks per direction, 3 axes		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Power infeed/feed through	I <sub>MAX</sub> = 4 A	I <sub>MAX</sub> = 4 A	I <sub>MAX</sub> = 16 A

# Technical data

## EtherCAT Box (stainless steel housing)



Technical data	4 x M12	8 x M12
Dimensions (W x H x D)	39 mm x 160 mm x 43 mm	72 mm x 160 mm x 43 mm
Weight	depending on device (typ. 340 g)	depending on device (typ. 480 g)
Material	stainless steel	
Installation	2 fixing lugs for M5	
Operating/storage temperature	-25...+60 °C/-40...+85 °C	
Vibration resistance	conforms to EN 60068-2-6	
Shock resistance	conforms to EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 69K (according to EN 60529)/variable	
Power infeed/feed through	$I_{MAX} = 4 A$	

# EPxxxx | EtherCAT Box (industrial housing)

EtherCAT®



Signal status

EtherCAT output

EtherCAT input

Robust housing  
for industrial  
application

Signal status display

Standard labels

Connection of sensors/  
actuators via connector:  
– M8, screw type  
– M12, screw type

Watertight and dust-proof,  
due to protection class  
IP 65/66/67 (fully potted)

Ultra compact  
dimensions (H x W x D)  
126 x 30 x 26.5 mm

Power supply input  
– box supply  
– auxiliary voltage

Power supply  
status display:  
box supply and  
auxiliary voltage

Power supply down-  
stream connection



eXtreme Fast Control  
Technology



Extended operating/  
storage temperature  
+60 °C  
-25 °C



Extended mechanical  
load  
35 g

Mounting holes



8 x M8, 4 x M12  
(126 x 30 x 26.5 mm)



16 x M8, 8 x M12  
(126 x 60 x 26.5 mm)

## I/O connections



Connector M8,  
screw type, 3-pin



Connector M12,  
screw type, 5-pin

The robust design of the EtherCAT Box modules enables them to be used directly at the machine. Control cabinets and terminal boxes are now no longer required. The modules are fully sealed and therefore ideally prepared for wet, dirty or dusty conditions. Pre-assembled cables significantly simplify EtherCAT and signal wiring. Commissioning is optimised. In addition to pre-assembled EtherCAT, power and sensor cables, field-configurable connectors and cables are available for maximum flexibility. Depending on the application, the sensors and actuators are connected via M8 or M12 screw-type connectors or D-sub plugs.

The EtherCAT modules cover the typical range of requirements for IP 67 I/O signals: digital inputs with different filters

(3.0 ms or 10  $\mu$ s), digital outputs with 0.5 and 2 A output current, combination modules with freely selectable inputs or outputs, analog inputs and outputs with 16-bit resolution, thermocouple and RTD inputs, and stepper motor modules. XFC (eXtreme Fast Control) modules, including inputs with timestamp, are also available. The availability of XFC EtherCAT Box modules enables a wide range of new applications that were not possible in the past with an IP 67 module.

In addition, various EtherCAT Box modules are available for system tasks, e.g. media converters, EtherCAT hubs or power distribution.

### EPxxxx-00yz

- 1 = connector M8, screw type, 3-pin
- 2 = connector M12, screw type, 5-pin
- 3 = special connectors
- 4 = connector M16, screw type, 19-pin
- 8 = D-sub, 25-pin
- 10 = 2 x D-sub, 9-pin

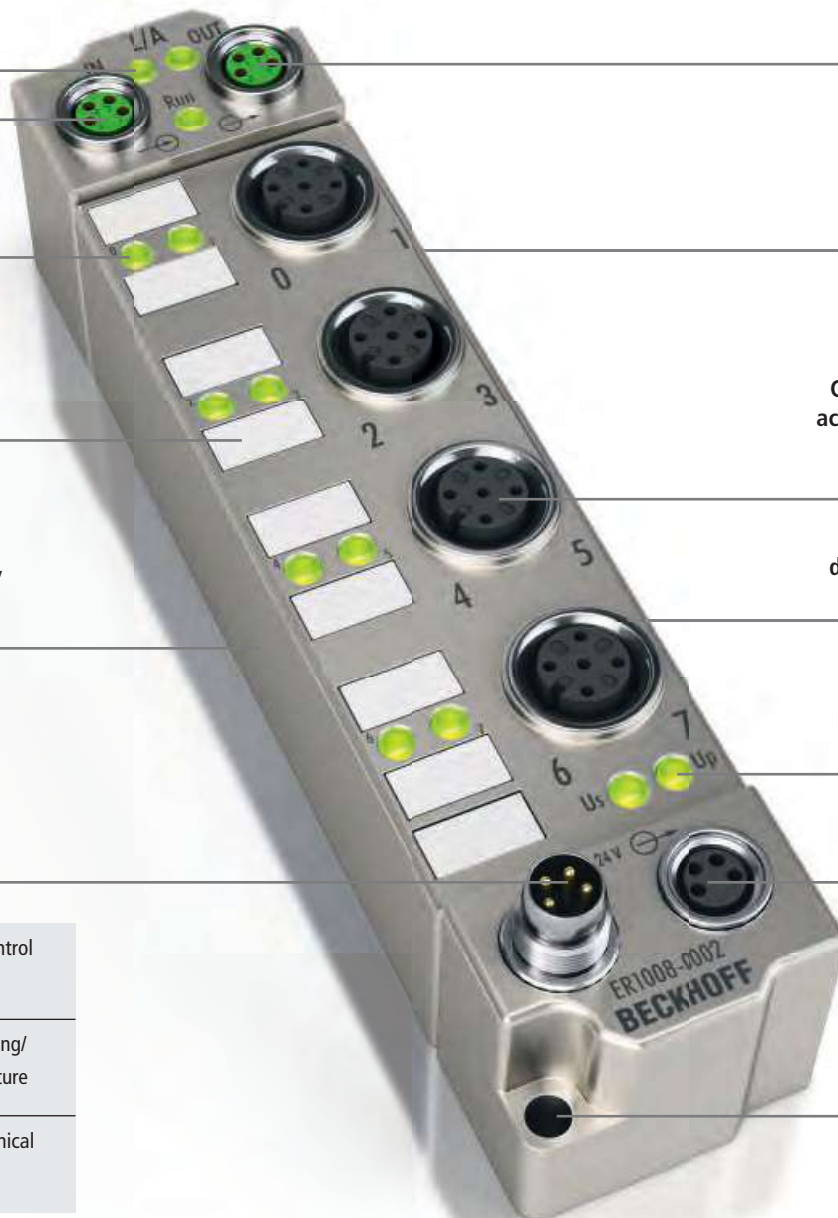
- 0 = width: 30 mm
- 2 = width: 60 mm
- 3 = 7/8" infeed
- 4 = pressure inputs

Signals see page 466



# ERxxxx | EtherCAT Box (zinc die-cast housing)

EtherCAT®



Signal status

EtherCAT input

Signal status display

Standard labels

Watertight and dust-proof,  
due to protection class  
IP 65/66/67 (fully potted)

Power supply input  
– box supply  
– auxiliary voltage

EtherCAT output

Metal housing  
for industrial  
application

Connection of sensors/  
actuators via connector:  
– M8, screw type  
– M12, screw type

Ultra compact  
dimensions (H x W x D)  
126 x 30 x 26.5 mm

Power supply  
status display:  
box supply and  
auxiliary voltage

Power supply down-  
stream connection

Mounting holes



eXtreme Fast Control  
Technology



Extended operating/  
storage temperature



Extended mechanical  
load

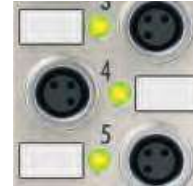


8 x M8, 4 x M12  
(126 x 30 x 26.5 mm)



16 x M8, 8 x M12  
(126 x 60 x 26.5 mm)

### I/O connections



Connector M8,  
screw type, 3-pin



Connector M12,  
screw type, 5-pin

The EtherCAT Box system is complemented by the ERxxxx modules with zinc die-cast housing. The housing shape of the ER series modules is identical to the plastic housings of the EP series. The zinc die-cast housing makes the IP 67 modules particularly robust, so that they are ready for use in harsh industrial and process environments. With the fully sealed design and metal surfaces the ER series is ideal for applications requiring enhanced load capacity and protection against weld spatter, for example. The ER series is the optimum complement to the plastic and stainless steel housing versions. All modules are compatible.

The EtherCAT Box modules with zinc die-cast housing cover the typical I/O signals: digital inputs with various filters, digital outputs with 0.5 A output current, and combi modules with

freely configurable digital inputs or outputs. In addition, analog input modules for current/voltage measurement are available. Temperature measurement modules, serial interfaces, encoder inputs and motion modules complement the product range. The modules are available in a slim 30 mm or the broader 60 mm format with different channel options, covering a wide I/O range. Signals can be connected via M8 or M12 connectors.

The modules of the ER series have an EtherCAT interface. Power supply and transmission takes place via M8 connectors or sockets. For high-current outputs, modules with 7/8" power supply and M12 EtherCAT sockets are available.

### ERxxxx-00yz

- 1 = connector M8, screw type, 3-pin
- 2 = connector M12, screw type, 5-pin

- 0 = width: 30 mm
- 2 = width: 60 mm
- 3 = 7/8" infeed

Signals see page 466

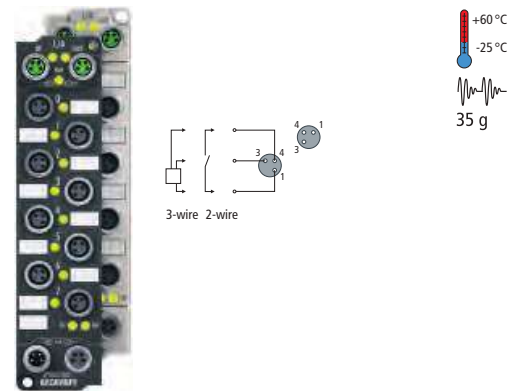
# Digital input | 24 V DC

The digital inputs on a 24 V supply are among the most frequently used signals. The EN 61131-2 standard describes the input characteristic and differentiates between three types. Type 1 has a low input current with low power loss. This input is optimised for mechanical switches and actively switched electronic outputs. Type 2 has a significantly higher input current and is optimised for 2-wire sensors with high quiescent current consumption. When switched on, however, the current consumption of this input is high and the associated power loss is generally unacceptable. Type 3 is a mixture of type 1 with low current when switched on and a sufficiently high quiescent current for most modern 2-wire sensors. The type 3 input can be used in nearly all applications in place of type 1. The diagram shows the typical current/voltage curves of the inputs of the modules and the permissible range of the standard conformity.

The input circuits differ in their filter function. The task of the filtering is to suppress electromagnetic interference. It is opposed by the disadvantage of signal delay. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and supplies a stable signal for simple PLC applications. Filter times of 10  $\mu$ s are suitable for applications with the shortest possible reaction times and can only be used for mechanical switches to a limited extent.

8-channel digital input,  
24 V DC, M8, type 1/3,  
positive switching

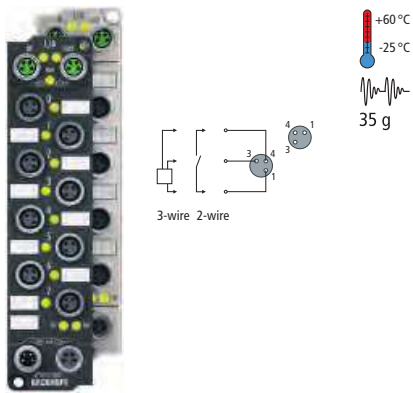
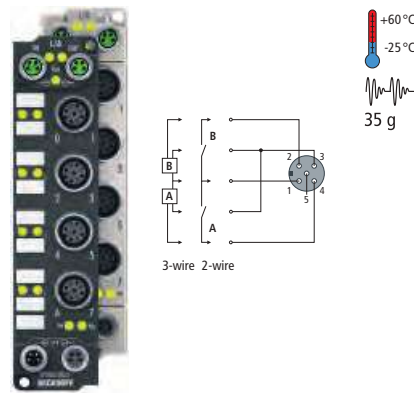
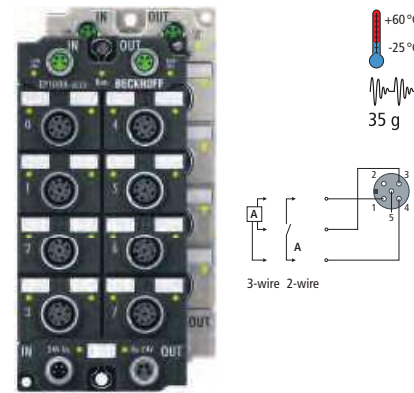
<b>Industrial housing</b>	EP1008-0001	EP1018-0001
<b>Zinc die-cast housing</b>	ER1008-0001	ER1018-0001
<b>Connection technology</b>	M8, screw type	
<b>Specification</b>	EN 61131-2, type 1/3	
<b>Input filter</b>	3.0 ms	10 $\mu$ s
<b>Number of inputs</b>	8	



The EP1008/ER1008 and EP1018/ER1018 EtherCAT Box modules with digital inputs acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the controller. The signals are connected via M8 screw type connectors.

The sensors are supplied from the box supply voltage  $U_B$ . The auxiliary voltage  $U_F$  is not used in the input module, but may be connected in order to be relayed downstream.

<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Counting frequency</b>	EtherCAT
<b>Protocol</b>	EtherCAT
<b>Bus interface</b>	2 x M8 socket, shielded, screw type
<b>Distributed clocks</b>	–
<b>Sensor supply</b>	from control voltage, max. 0.5 A total, short-circuit-proof
<b>Current consumption from <math>U_B</math> (without sensor current)</b>	120 mA
<b>Electrical isolation</b>	500 V
<b>Special features</b>	–
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	EP10x8: CE, UL, Ex; ER10x8: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP1008">www.beckhoff.com/EP1008</a> <a href="http://www.beckhoff.com/ER1008">www.beckhoff.com/ER1008</a>

	8-channel digital input, 24 V DC, M8, type 1/3, negative switching	8-channel digital input, 24 V DC, M12, type 1/3, positive switching	8-channel digital input, 24 V DC, M12, type 1/3, positive switching
	<b>EP1098-0001</b> <b>ER1098-0001</b>	<b>EP1008-0002</b> <b>ER1008-0002</b>	<b>EP1018-0002</b> <b>ER1018-0002</b>
	M8, screw type	M12, screw type	M12, screw type
	negative switching "0": 11...30 V DC, "1": 0...7 V DC, typ. 2.5 mA input current	EN 61131-2, type 1/3	EN 61131-2, type 1/3
	10 µs	3.0 ms	10 µs
	8	8	8
	 <p>The EP1098-0001/ER1098-0001 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M8 screw type connectors.</p> <p>The sensors are supplied from the box supply voltage <math>U_s</math>. The auxiliary voltage <math>U_P</math> is not used in the input module, but may be connected in order to be relayed downstream.</p>	 <p>The EP1008/ER1008 and EP1018/ER1018 EtherCAT Box modules with digital inputs acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the controller. The signals are connected via M12 screw type connectors.</p> <p>The sensors are supplied from the box supply voltage <math>U_s</math>. The auxiliary voltage <math>U_P</math> is not used in the input module, but may be connected in order to be relayed downstream.</p>	 <p>The EP1008-0022/ER1008-0022 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M12 screw type connectors.</p> <p>The sensors are supplied from the box supply voltage <math>U_s</math>. The auxiliary voltage <math>U_P</math> is not used in the input module, but may be connected in order to be relayed downstream.</p>
	24 V (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	–	EtherCAT	EtherCAT
	EtherCAT	EtherCAT	EtherCAT
	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
	–	–	–
	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
	120 mA	120 mA	120 mA
	control voltage/fieldbus: yes	500 V	500 V
	negative switching	–	1 input per M12 plug
	-25...+60 °C	-25...+60 °C	-25...+60 °C
	CE, UL	EP10x8: CE, UL, Ex; ER10x8: CE, UL	CE, UL
	<a href="http://www.beckhoff.com/EP1098">www.beckhoff.com/EP1098</a> <a href="http://www.beckhoff.com/ER1098">www.beckhoff.com/ER1098</a>	<a href="http://www.beckhoff.com/EP1008">www.beckhoff.com/EP1008</a> <a href="http://www.beckhoff.com/ER1008">www.beckhoff.com/ER1008</a>	<a href="http://www.beckhoff.com/EP1008-0022">www.beckhoff.com/EP1008-0022</a> <a href="http://www.beckhoff.com/ER1008-0022">www.beckhoff.com/ER1008-0022</a>

# Digital input | 24 V DC

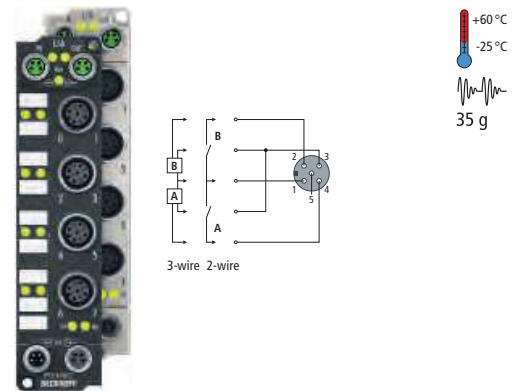
Pulses often need to be captured in technical control applications. This can be done with fast inputs such as the EP1018 and a central pulse counter. If the pulse length is the order of magnitude of the control cycle time or less, the controller cannot record these signals correctly any more. Pre-processing counter modules can then be used to count the number and direction of the pulses, which enables the controller to determine reliable values. The counter is adapted to the individual requirements, such as up/down counter or Gate/Latch-controlled, by fieldbus parameterisation. With a counting depth of 32 bit any overflow can be controlled reliably, even at high frequencies.

The multi-functional EP1518/ER1518 EtherCAT Box supports the following operating modes:

- 1 x 32 bit up/down counter (the counting direction is specified via the input)
- 1 x 32 bit gated counter (the counter is enabled via the input)
- 2 x 32 bit forward counter (no direction detection)

2-channel up/down counter  
24 V DC, 1 kHz, 32 bit,  
adjustable input filters  
0...100 ms, M12

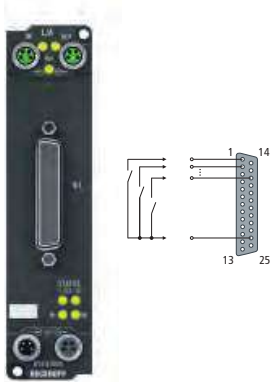
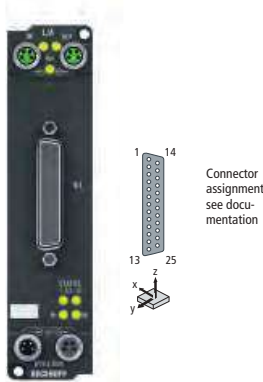
<b>Industrial housing</b>	<b>EP1518-0002</b>
<b>Zinc die-cast housing</b>	<b>ER1518-0002</b>
<b>Connection technology</b>	M12, screw type
<b>Specification</b>	EN 61131-2, type 1/3
<b>Input filter</b>	adjustable 0...100 ms
<b>Number of inputs</b>	8, 2 of which can be used as 32 bit up/down counters



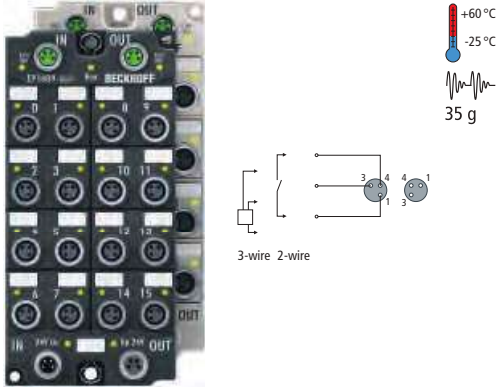
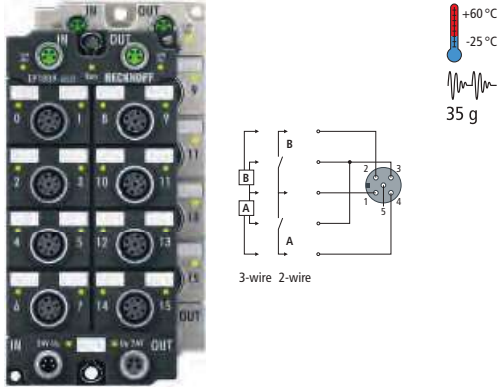
The EP1518/ER1518 EtherCAT Box with digital inputs acquires binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signal state is displayed by light emitting diodes. The signals are connected via M12 screw type connectors. The input filters can be set between 0 and 100 ms via EtherCAT. Inputs 0 and 4 can be used as 32-bit up/down counters. The sensors are supplied via the control voltage  $U_s$  in two groups of four sensors each. Any short circuits on the sensor side are detected and reported to the controller. The load voltage  $U_P$  is not used in the input module, but may optionally be connected in order to be relayed downstream.

<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Counting frequency</b>	max. 1 kHz
<b>Protocol</b>	EtherCAT
<b>Bus interface</b>	2 x M8 socket, shielded, screw type
<b>Distributed clocks</b>	yes
<b>Sensor supply</b>	from control voltage, max. 0.5 A per 4 sensors, short-circuit-proof
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	120 mA
<b>Electrical isolation</b>	500 V
<b>Special features</b>	adjustable filters
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	EP1518: CE, UL, Ex; ER1518: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP1518">www.beckhoff.com/EP1518</a> <a href="http://www.beckhoff.com/ER1518">www.beckhoff.com/ER1518</a>

# Digital input | 24 V DC, positive switching, D-sub

	16-channel digital input, 24 V DC, D-sub, type 1/3, positive switching	16-channel digital input, 24 V DC, D-sub, type 1/3, positive switching, 2 x 3-axis accelerometers
<b>Industrial housing</b>	<b>EP1816-0008</b>	<b>EP1816-3008</b>
<b>Connection technology</b>	D-sub socket, 25-pin	D-sub socket, 25-pin
<b>Specification</b>	EN 61131-2, type 1/3	EN 61131-2, type 1/3
<b>Input filter</b>	10 $\mu$ s	10 $\mu$ s
<b>Number of inputs</b>	16	16
	 <p>The EP1816 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are connected via 25-pin D-sub socket. The sensors are supplied from the box supply voltage <math>U_s</math>. The auxiliary voltage <math>U_p</math> is not used in the input module, but may be connected in order to be relayed downstream.</p>	 <p>The EP1816-3008 EtherCAT Box with 16 digital inputs acquires the binary control signals from the process level. The state of the signals is indicated by light emitting diodes. The signals are connected via 25-pin D-sub socket.</p> <p>The EtherCAT Box has 2 internal 3-axis accelerometers with 16 bit and a selectable resolution of <math>\pm 2</math> g, <math>\pm 4</math> g, <math>\pm 8</math> g and <math>\pm 16</math> g. Possible applications include the recording of vibrations and shocks/oscillations, and furthermore inclination measurements.</p> <p>The sensors are supplied from the box supply voltage <math>U_s</math>. Undervoltage detection (<math>U_s</math> and <math>U_p</math>) is integrated and is signalled to the controller.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Protocol</b>	EtherCAT	EtherCAT
<b>Bus interface</b>	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
<b>Distributed clocks</b>	yes	yes
<b>Sensor supply</b>	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	120 mA	120 mA
<b>Electrical isolation</b>	500 V	500 V
<b>Special features</b>	compact design	integrated accelerometers
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP1816">www.beckhoff.com/EP1816</a>	<a href="http://www.beckhoff.com/EP1816-3008">www.beckhoff.com/EP1816-3008</a>

## Digital input | 24 V DC, positive switching

	16-channel digital input, 24 V DC, M8, type 1/3		16-channel digital input, 24 V DC, M12, type 1/3	
<b>Industrial housing</b>	EP1809-0021	EP1819-0021	EP1809-0022	EP1819-0022
<b>Zinc die-cast housing</b>	ER1809-0021	ER1819-0021	ER1809-0022	ER1819-0022
<b>Connection technology</b>	M8, screw type		M12, screw type	
<b>Specification</b>	EN 61131-2, type 1/3		EN 61131-2, type 1/3	
<b>Input filter</b>	3.0 ms	10 $\mu$ s	3.0 ms	10 $\mu$ s
<b>Number of inputs</b>	16		16	
	 <p>The EP1809/ER1809 and EP1819/ER1819 EtherCAT Box modules with digital inputs acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the controller. The signals are connected via M8 screw type connectors.</p> <p>The sensors are supplied from the box supply voltage <math>U_s</math>. The auxiliary voltage <math>U_P</math> is not used in the input module, but may be connected in order to be relayed downstream.</p>		 <p>The EP1809/ER1809 and EP1819/ER1819 EtherCAT Box modules with digital inputs acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the controller. The signals are connected via M12 screw type connectors.</p> <p>The sensors are supplied from the box supply voltage <math>U_s</math>. The auxiliary voltage <math>U_P</math> is not used in the input module, but may be connected in order to be relayed downstream.</p>	
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
<b>Protocol</b>	EtherCAT		EtherCAT	
<b>Bus interface</b>	2 x M8 socket, shielded, screw type		2 x M8 socket, shielded, screw type	
<b>Distributed clocks</b>	–		–	
<b>Sensor supply</b>	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	130 mA		130 mA	
<b>Electrical isolation</b>	500 V		500 V	
<b>Operating temperature</b>	-25...+60 °C		-25...+60 °C	
<b>Approvals</b>	CE, UL		CE, UL	
<b>Further information</b>	www.beckhoff.com/EP1809 www.beckhoff.com/ER1809		www.beckhoff.com/EP1809 www.beckhoff.com/ER1809	

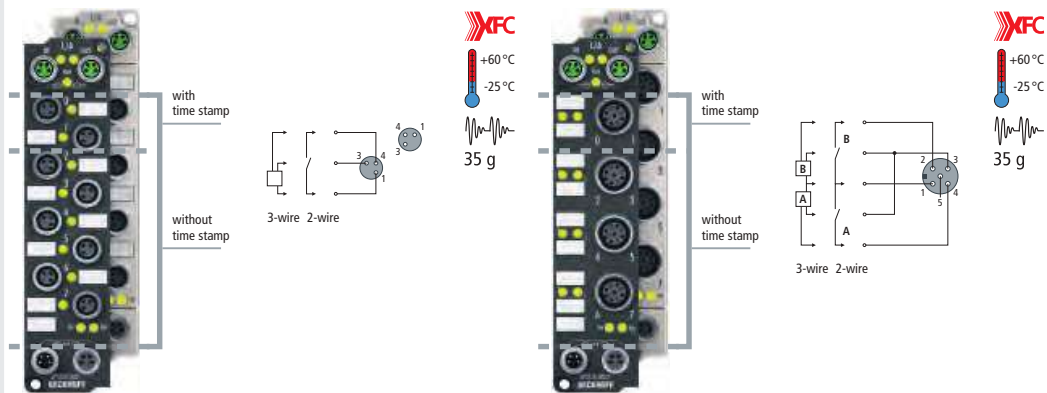
# XFC digital input | 24 V DC, positive, fast inputs



8-channel digital input  
with 2-channel timestamp,  
24 V DC, M8, type 1/3

8-channel digital input  
with 2-channel timestamp,  
24 V DC, M12, type 1/3

<b>Industrial housing</b>	<b>EP1258-0001</b>	<b>EP1258-0002</b>
<b>Zinc die-cast housing</b>	<b>ER1258-0001</b>	<b>ER1258-0002</b>
<b>Connection technology</b>	M8, screw type	M12, screw type
<b>Specification</b>	EN 61131-2, type 1/3	EN 61131-2, type 1/3
<b>Input filter</b>	10 $\mu$ s	10 $\mu$ s
<b>Number of inputs</b>	8 (2 with timestamp)	8 (2 with timestamp)



The EP1258/ER1258 EtherCAT Box with digital inputs acquires the fast binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are furnished with a timestamp that identifies the time of the last edge change with a resolution of 1 ns. This technology enables signals to be traced exactly over time and synchronised with the distributed clocks across the system. With this technology, machine-wide parallel hardware wiring of digital inputs or encoder signals for synchronisation purposes is often no longer required. In this way, the EP1258 enables responses with equidistant time intervals, largely independent of the bus cycle time.

<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Protocol</b>	EtherCAT	EtherCAT
<b>Bus interface</b>	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
<b>Resolution time stamp</b>	1 ns (channel 0/1)	1 ns (channel 0/1)
<b>Precision of time stamp</b>	10 ns (+ input delay) (channel 0/1)	10 ns (+ input delay) (channel 0/1)
<b>Distributed clocks</b>	yes	yes
<b>Distributed clock precision</b>	< 100 ns (channel 0/1)	< 100 ns (channel 0/1)
<b>Sensor supply</b>	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	120 mA	120 mA
<b>Electrical isolation</b>	500 V	500 V
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	EP1258: CE, UL, Ex; ER1258: CE, UL	EP1258: CE, UL, Ex; ER1258: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP1258">www.beckhoff.com/EP1258</a> <a href="http://www.beckhoff.com/ER1258">www.beckhoff.com/ER1258</a>	<a href="http://www.beckhoff.com/EP1258">www.beckhoff.com/EP1258</a> <a href="http://www.beckhoff.com/ER1258">www.beckhoff.com/ER1258</a>

Further information on XFC see page 298



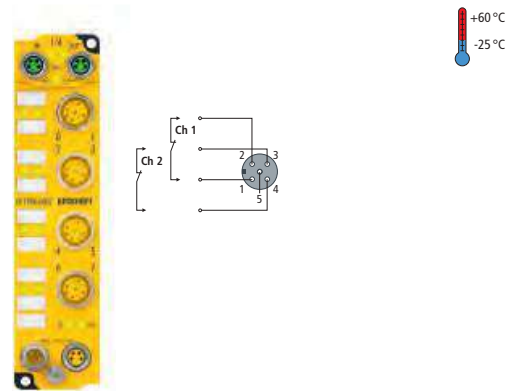
# Digital input | TwinSAFE

The EP1908 Safety Module is a digital input module for sensors with potential-free 24 V DC contacts and has eight fail-safe inputs. It conforms to the requirements of IEC 61508:2010 SIL 3 and DIN EN ISO 13849-1:2008 PL e.

For further information on TwinSAFE and the TwinSAFE products see page [966](#)

8-channel digital input module,  
TwinSAFE, 24 V DC

<b>Industrial housing</b>	<b>EP1908-0002</b>
<b>Connection technology</b>	M12, screw type
<b>Safety standard</b>	IEC 61508:2010 SIL 3 and DIN EN ISO 13849-1:2008 PL e
<b>Number of inputs</b>	8



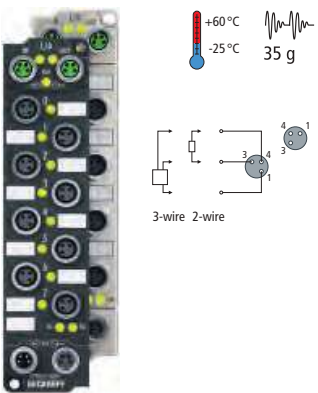
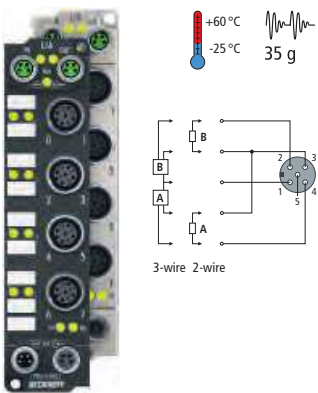
The EP1908 TwinSAFE EtherCAT Box has eight fail-safe inputs.

<b>Protocol</b>	TwinSAFE/Safety over EtherCAT
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Current consumption from <math>U_s/U_F</math></b>	80 mA/40 mA
<b>Response time</b>	typ. 4 ms (read input/write to bus)
<b>Fault response time</b>	≤ watchdog time (parameterisable)
<b>Installation position</b>	variable
<b>Special features</b>	8 safe inputs
<b>Operating/storage temperature</b>	-25...+60 °C/-40...+85 °C
<b>EMC immunity/emission</b>	conforms to EN 61000-6-2/EN 61000-6-4
<b>Vibration/shock resistance</b>	conforms to EN 60068-2-6/EN 60068-2-27
<b>Approvals</b>	CE, UL, TÜV SÜD
<b>Weight</b>	approx. 165 g
<b>Further information</b>	<a href="http://www.beckhoff.com/EP1908">www.beckhoff.com/EP1908</a>




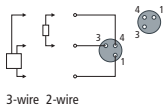



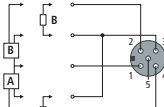
# Digital output | 24 V DC, positive switching

Many actuators are operated or actuated with 24 V DC. The EtherCAT Box modules in the category "positive switching" switch all output channels to 24 V DC. Beyond that, the output circuit offers functions such as short circuit current limitation, short circuit power-off and the dissipation of inductive energy from the coil.

The most common output circuit supplies a max. continuous current of 0.5 A. Special EtherCAT Box modules are available for higher currents. Any type of load (resistive, capacitive or inductive) can be connected to an output module.

	8-channel digital output, 24 V DC, M8, I <sub>MAX</sub> = 0.5 A	8-channel digital output, 24 V DC, M12, I <sub>MAX</sub> = 0.5 A
<b>Industrial housing</b>	EP2008-0001	EP2008-0002
<b>Zinc die-cast housing</b>	ER2008-0001	ER2008-0002
<b>Connection technology</b>	M8, screw type	M12, screw type
<b>Load type</b>	ohmic, inductive, lamp load	ohmic, inductive, lamp load
<b>Max. output current</b>	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
<b>Number of outputs</b>	8	8
	 <p>The EP2008/ER2008 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A. The signals are connected via M8 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.</p>	 <p>The EP2008/ER2008 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A. The signals are connected via M12 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption from U<sub>s</sub> (without sensor current)</b>	120 mA	120 mA
<b>Distributed clocks</b>	–	–
<b>Short circuit current</b>	typ. 1.5 A	typ. 1.5 A
<b>Auxiliary power current</b>	typ. 20 mA + load	typ. 20 mA + load
<b>Electrical isolation</b>	500 V	500 V
<b>Special features</b>	–	–
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	EP2008: CE, UL, Ex; ER2008: CE, UL	EP2008: CE, UL, Ex; ER2008: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP2008">www.beckhoff.com/EP2008</a> <a href="http://www.beckhoff.com/ER2008">www.beckhoff.com/ER2008</a>	<a href="http://www.beckhoff.com/EP2008">www.beckhoff.com/EP2008</a> <a href="http://www.beckhoff.com/ER2008">www.beckhoff.com/ER2008</a>

## Digital output | 24 V DC, positive switching

	8-channel digital output, 24 V DC, M8, $I_{\text{MAX}} = 2 \text{ A}$ ( $\Sigma 4 \text{ A}$ )	8-channel digital output, 24 V DC, M12, $I_{\text{MAX}} = 2 \text{ A}$ ( $\Sigma 4 \text{ A}$ )
<b>Industrial housing</b>	EP2028-0001	EP2028-0002
<b>Zinc die-cast housing</b>	ER2028-0001	ER2028-0002
<b>Connection technology</b>	M8, screw type	M12, screw type
<b>Load type</b>	ohmic, inductive, lamp load	ohmic, inductive, lamp load
<b>Max. output current</b>	2 A per channel, individually short-circuit safe, total current max. 4 A	2 A per channel, individually short-circuit safe, total current max. 4 A
<b>Number of outputs</b>	8	8
	    <p>3-wire 2-wire</p> <p>The EP2028/ER2028 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The signals are connected via M8 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.</p>	    <p>3-wire 2-wire</p> <p>The EP2028/ER2028 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The signals are connected via M12 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	120 mA	120 mA
<b>Distributed clocks</b>	–	–
<b>Short circuit current</b>	max. 7 A	max. 7 A
<b>Auxiliary power current</b>	typ. 20 mA + load	typ. 20 mA + load
<b>Electrical isolation</b>	500 V	500 V
<b>Special features</b>	load current up to 2 A	load current up to 2 A
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	EP2028: CE, UL, Ex; ER2028: CE, UL	EP2028: CE, UL, Ex; ER2028: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP2028">www.beckhoff.com/EP2028</a> <a href="http://www.beckhoff.com/ER2028">www.beckhoff.com/ER2028</a>	<a href="http://www.beckhoff.com/EP2028">www.beckhoff.com/EP2028</a> <a href="http://www.beckhoff.com/ER2028">www.beckhoff.com/ER2028</a>

8-channel digital output,  
24 V DC, M12,  $I_{MAX} = 2.8 \text{ A}$  ( $\Sigma 16 \text{ A}$ )

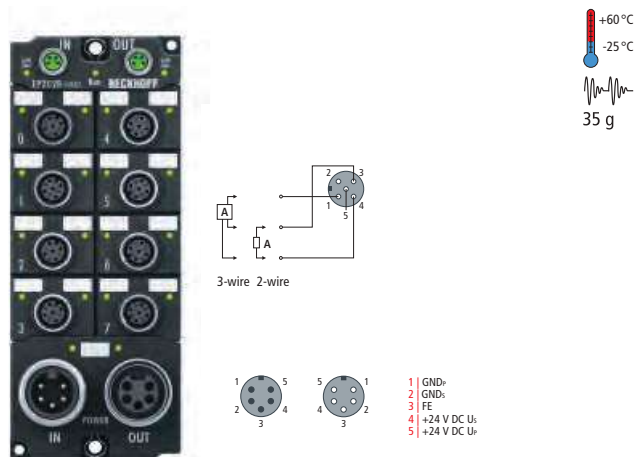
**EP2028-0032**

M12, screw type

ohmic, inductive, lamp load

2.8 A each channel, individually short-circuit-proof,  
total current max. 16 A

8



The EP2028-0032 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2.8 A each, although the total current is limited to 16 A. The signals are connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.

24 V DC (-15 %/+20 %)

130 mA

max. 14 A

typ. 20 mA + load

500 V

1 output per M12 plug, 16 A total current

-25...+60 °C

CE, UL in preparation

[www.beckhoff.com/EP2028-0032](http://www.beckhoff.com/EP2028-0032)

8-channel digital output,  
24 V DC, M12,  $I_{MAX} = 2.8 \text{ A}$  ( $\Sigma 16 \text{ A}$ )

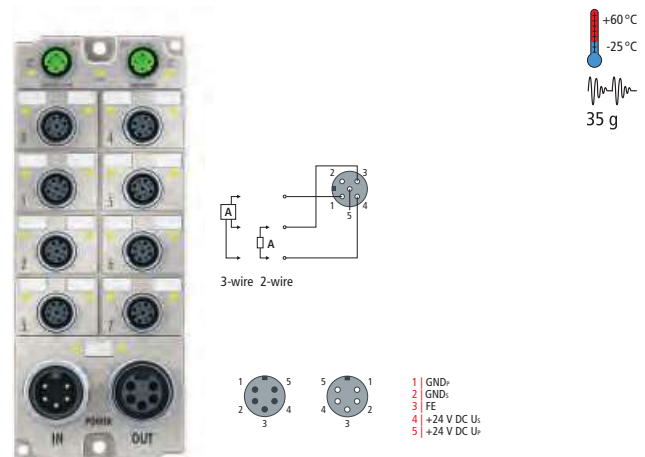
**ER2028-1032**

M12, screw type

ohmic, inductive, lamp load

2.8 A each channel, individually short-circuit-proof,  
total current max. 16 A

8



The ER2028-1032 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2.8 A each, although the total current is limited to 16 A. The signals are connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.

24 V DC (-15 %/+20 %)

130 mA

max. 14 A

typ. 20 mA + load

500 V


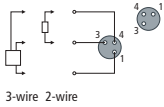




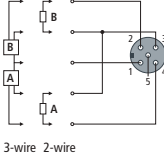


1 output per M12 plug, 16 A total current

-25...+60 °C

CE, UL in preparation

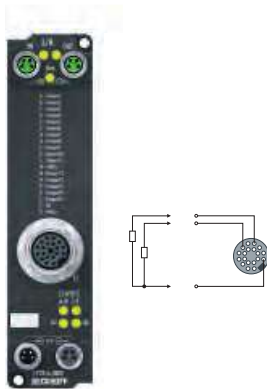
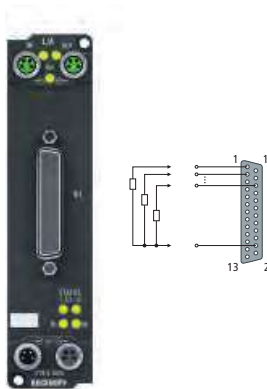
[www.beckhoff.com/ER2028-1032](http://www.beckhoff.com/ER2028-1032)

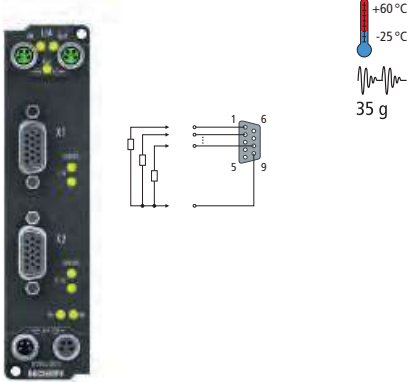
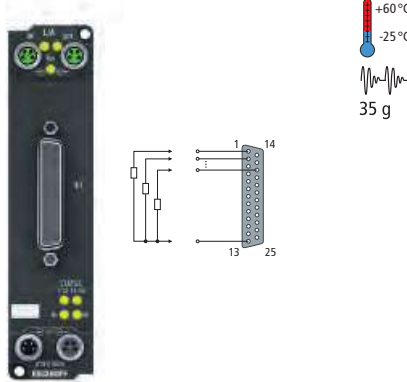
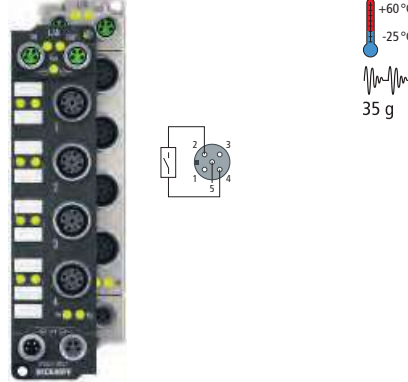
## Digital output | 24 V DC, positive switching

	8-channel digital output, 24 V DC, M8, $I_{\text{MAX}} = 2 \text{ A}$ ( $\Sigma 4 \text{ A}$ ), with diagnostics	8-channel digital output, 24 V DC, M12, $I_{\text{MAX}} = 2 \text{ A}$ ( $\Sigma 4 \text{ A}$ ), with diagnostics
<b>Industrial housing</b>	<b>EP2038-0001</b>	<b>EP2038-0002</b>
<b>Zinc die-cast housing</b>	<b>ER2038-0001</b>	<b>ER2038-0002</b>
<b>Connection technology</b>	M8, screw type	M12, screw type
<b>Load type</b>	ohmic, inductive, lamp load	ohmic, inductive, lamp load
<b>Max. output current</b>	2 A per channel, individually short-circuit safe, total current max. 4 A	2 A per channel, individually short-circuit safe, total current max. 4 A
<b>Number of outputs</b>	8	8
	    	   
	<p>The EP2038/ER2038 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The EP2038 offers output diagnostics in the form of short circuit and open circuit detection per channel. The signals are connected via M8 screw type connectors.</p>	<p>The EP2038/ER2038 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The EP2038 offers output diagnostics in the form of short circuit and open circuit detection per channel. The signals are connected via M12 screw type connectors.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	120 mA	120 mA
<b>Distributed clocks</b>	–	–
<b>Short circuit current</b>	max. 7 A	max. 7 A
<b>Auxiliary power current</b>	typ. 20 mA + load	typ. 20 mA + load
<b>Electrical isolation</b>	500 V	500 V
<b>Special features</b>	load current up to 2 A	load current up to 2 A
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP2038">www.beckhoff.com/EP2038</a> <a href="http://www.beckhoff.com/ER2038">www.beckhoff.com/ER2038</a>	<a href="http://www.beckhoff.com/EP2038">www.beckhoff.com/EP2038</a> <a href="http://www.beckhoff.com/ER2038">www.beckhoff.com/ER2038</a>

	<p>8-channel digital output, 24 V DC, M12, I<sub>MAX</sub> = 0.5 A (Σ 4 A)</p>	<p>16-channel digital output, 24 V DC, M8, I<sub>MAX</sub> = 0.5 A (Σ 4 A)</p>
<p><b>EP2008-0022</b> <b>ER2008-0022</b></p>	<p><b>EP2809-0021</b> <b>ER2809-0021</b></p>	<p><b>EP2809-0022</b> <b>ER2809-0022</b></p>
<p>M12, screw type</p>	<p>M8, screw type</p>	<p>M12, screw type</p>
<p>ohmic, inductive, lamp load</p>	<p>ohmic, inductive, lamp load</p>	<p>ohmic, inductive, lamp load</p>
<p>0.5 A each channel, individually short-circuit-proof, total current max. 4 A</p>	<p>0.5 A each channel, individually short-circuit-proof, total current max. 4 A</p>	<p>0.5 A each channel, individually short-circuit-proof, total current max. 4 A</p>
<p>8</p>	<p>16</p>	<p>16</p>
<div> </div> <p>The EP2008-0022/ER2008-0022 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 0.5 A current. The signals are connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.</p>	<div> </div> <p>The EP2809/ER2809 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. The signals are connected via M8 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.</p>	<div> </div> <p>The EP2809/ER2809 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. The signals are connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.</p>
<p>24 V DC (-15 %/+20 %)</p>	<p>24 V DC (-15 %/+20 %)</p>	<p>24 V DC (-15 %/+20 %)</p>
<p>130 mA</p>	<p>130 mA</p>	<p>130 mA</p>
<p>–</p>	<p>–</p>	<p>–</p>
<p>max. 1.5 A</p>	<p>max. 1.5 A</p>	<p>max. 1.5 A</p>
<p>typ. 20 mA + load</p>	<p>typ. 20 mA + load</p>	<p>typ. 20 mA + load</p>
<p>500 V</p>	<p>500 V</p>	<p>500 V</p>
<p>1 output per M12 plug</p>	<p>–</p>	<p>–</p>
<p>-25...+60 °C</p>	<p>-25...+60 °C</p>	<p>-25...+60 °C</p>
<p>CE, UL</p>	<p>CE, UL</p>	<p>CE, UL</p>
<p><a href="http://www.beckhoff.com/EP2008-0022">www.beckhoff.com/EP2008-0022</a> <a href="http://www.beckhoff.com/ER2008-0022">www.beckhoff.com/ER2008-0022</a></p>	<p><a href="http://www.beckhoff.com/EP2809">www.beckhoff.com/EP2809</a> <a href="http://www.beckhoff.com/ER2809">www.beckhoff.com/ER2809</a></p>	<p><a href="http://www.beckhoff.com/EP2809">www.beckhoff.com/EP2809</a> <a href="http://www.beckhoff.com/ER2809">www.beckhoff.com/ER2809</a></p>

## Digital output | 24 V DC, positive switching

	16-channel digital output, 24 V DC, M16, $I_{MAX} = 0.5 \text{ A}$ ( $\Sigma 4 \text{ A}$ )	16-channel digital output, 24 V DC, D-sub, $I_{MAX} = 0.5 \text{ A}$ ( $\Sigma 4 \text{ A}$ )
<b>Industrial housing</b>	<b>EP2816-0004</b>	<b>EP2816-0008</b>
<b>Zinc die-cast housing</b>		
<b>Connection technology</b>	M16, 19-pin	D-sub socket, 25-pin
<b>Load type</b>	ohmic, inductive, lamp load	ohmic, inductive, lamp load
<b>Max. output current</b>	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
<b>Number of outputs</b>	16	16
	 <p>The EP2816-0004 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. An output short-circuit is recognised and passed on to the controller. The signal connection is realised by a 19-pin M16 socket. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.</p>	 <p>The EP2816-0008 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. An output short-circuit is recognised and passed on to the controller. The signal connection is realised by a 25-pin D-sub socket. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	120 mA	120 mA
<b>Distributed clocks</b>	yes	yes
<b>Short circuit current</b>	max. 1.5 A	max. 1.5 A
<b>Auxiliary power current</b>	typ. 20 mA + load	typ. 20 mA + load
<b>Ohmic switching current</b>	–	–
<b>Operat. cycles mech. (min.)</b>	–	–
<b>Operat. cycles electr. (min.)</b>	–	–
<b>Minimum permitted load</b>	–	–
<b>Electrical isolation</b>	500 V	500 V
<b>Special features</b>	ideal for multi-pin connector valve terminals	ideal for multi-pin connector valve terminals
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP2816">www.beckhoff.com/EP2816</a>	<a href="http://www.beckhoff.com/EP2816">www.beckhoff.com/EP2816</a>

	16-channel digital output, 24 V DC, 2 x D-sub, I <sub>MAX</sub> = 0.5 A (Σ 4 A)	24-channel digital output, 24 V DC, D-sub, I <sub>MAX</sub> = 0.1 A	4-channel relay output, 25 V AC/30 V DC, M12
	<b>EP2816-0010</b>	<b>EP2817-0008</b>	<b>EP2624-0002</b> <b>ER2624-0002</b>
	2 x D-sub socket, 9-pin	D-sub socket, 25-pin	M12, screw type
	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.1 A each channel, individually short-circuit-proof	potential-free switch
	16	24	4 x make contacts
	 <p>The EP2816-0010 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. An output short-circuit is recognised and passed on to the controller. The signal connection is realised by two 9-pin D-sub sockets. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.</p>	 <p>The EP2817-0008 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 24 outputs handle load currents of up to 0.1 A each. An output short-circuit is recognised and passed on to the controller. The signal connection is realised by a 25-pin D-sub socket. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.</p>	 <p>The EP2624/ER2624 EtherCAT Box has four relays each of which has a single contact. The relay contact is suitable for use at up to 25 V AC or 30 V DC. The EP2624/ER2624 has potential-free contacts. The power supply is looped through.</p>
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	120 mA	120 mA	120 mA
	yes	yes	–
	max. 1.5 A	max. 1.0 A	–
	typ. 20 mA + load	typ. 20 mA + load	typ. 20 mA + load
	–	–	0.5 A AC/2 A DC
	–	–	1 x 10 <sup>8</sup>
	–	–	2 x 10 <sup>5</sup> (1 A/30 V DC)
	–	–	10 μA at 10 mV DC
	500 V	500 V	500 V
	ideal for multi-pin connector valve terminals	undervoltage detection for U <sub>S</sub> and U <sub>P</sub> < 18 V	potential-free switching
	-25...+60 °C	-25...+60 °C	-25...+60 °C
	CE, UL	CE, UL	EP2624: CE, UL, Ex; ER2624: CE, UL
	www.beckhoff.com/EP2816	www.beckhoff.com/EP2817	www.beckhoff.com/EP2624 www.beckhoff.com/ER2624



# Digital combi | 24 V DC, positive switching

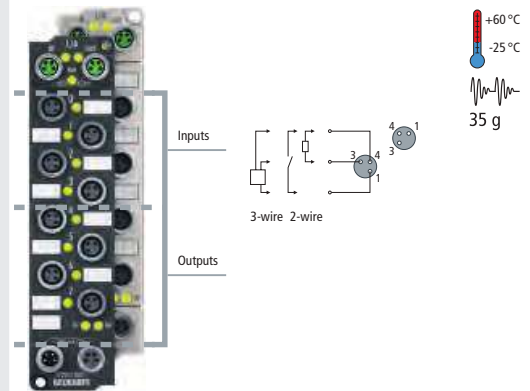
The digital combination modules combine inputs and outputs in one module. The input circuits differ in their filter function. The task of the filtering is to suppress electromagnetic interference. It is opposed by the disadvantage of signal delay. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and supplies a stable signal for simple PLC applications. Filter times of 10  $\mu$ s are suitable for applications with the shortest possible reaction times and can only be used to a limited extent for mechanical switches.

The output channels supply a maximum continuous current of 0.5 A. Special output modules are available for higher currents. Any type of load (resistive, capacitive or inductive) can be connected to an output module. Since lamp loads and capacitive loads are critical due to their high starting currents, they are limited by the output circuits of the modules. This ensures that the upstream circuit breaker does not trip. Inductive loads cause problems when switching off, since high induction voltages develop if the current is interrupted too quickly. An integrated freewheeling diode prevents this voltage peak. However, the current reduces so slowly that malfunctions occur in many control applications. A valve remains open for several milliseconds. The modules represent a compromise between the avoidance of overvoltage and switch-off. They suppress the induction voltage to approx. 24 V DC and achieve switch-off times that roughly correspond to the switch-on time of the coil.

In the event of a short circuit, the module switches the corresponding output off and cyclically attempts to switch it on again. This continues until either the short circuit is eliminated or the controller resets the output. The clock frequency depends on the ambient temperature and the loads on the other channels. The specification for the total current must be observed.

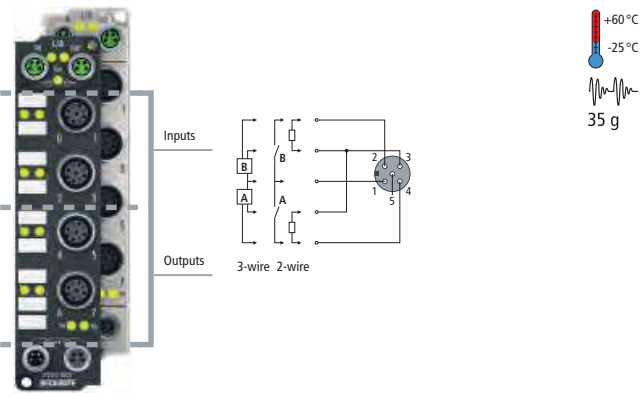
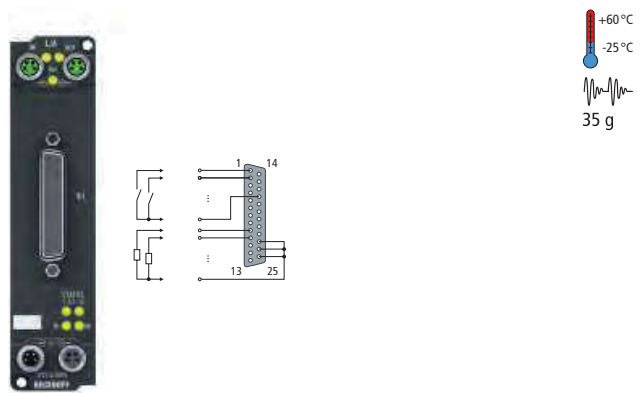
4 x digital input + 4 x digital output,  
24 V DC, M8,  $I_{MAX} = 0.5$  A

<b>Industrial housing</b>	EP2308-0001	EP2318-0001
<b>Zinc die-cast housing</b>	ER2308-0001	ER2318-0001
<b>Connection technology</b>	M8, screw type	
<b>Specification</b>	EN 61131-2, type 1/3	
<b>Input filter</b>	3.0 ms	10 $\mu$ s
<b>Number of channels</b>	4 inputs + 4 outputs	



The EP2308/ER2308 and EP2318/ER2318 EtherCAT Box modules combine four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via screw type M8 connectors.

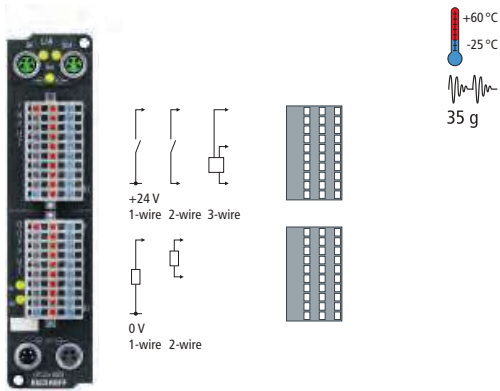
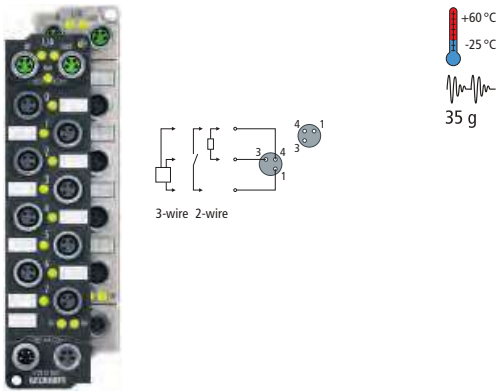
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Max. output current</b>	0.5 A per channel, individually short-circuit-proof
<b>Load type</b>	ohmic, inductive, lamp load
<b>Sensor supply</b>	from control voltage, max. 0.5 A total, short-circuit-proof
<b>Short circuit current</b>	typ. 1.5 A
<b>Auxiliary power current</b>	typ. 20 mA + load
<b>Current consumption from U<sub>s</sub> (without sensor current)</b>	120 mA
<b>Electrical isolation</b>	500 V
<b>Special features</b>	–
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	EP23x8: CE, UL, Ex; ER23x8: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP2308">www.beckhoff.com/EP2308</a> <a href="http://www.beckhoff.com/ER2308">www.beckhoff.com/ER2308</a>

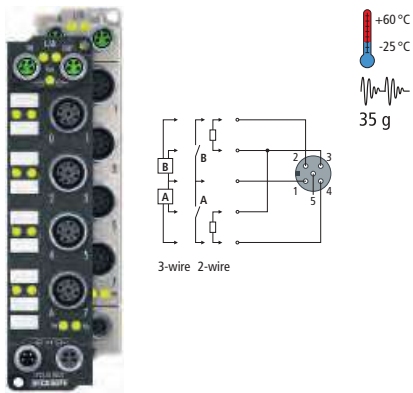
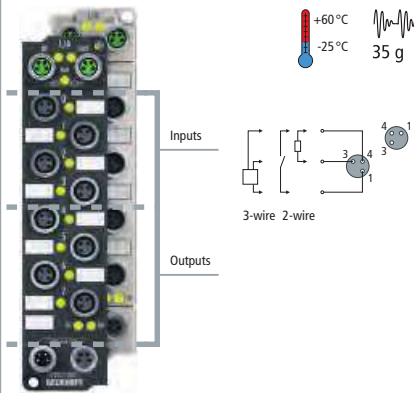
4 x digital input + 4 x digital output, 24 V DC, M12, I <sub>MAX</sub> = 0.5 A		8 x digital input + 8 x digital output, 24 V DC, D-sub, I <sub>MAX</sub> = 0.5 A	
<b>EP2308-0002</b> <b>ER2308-0002</b>		<b>EP2318-0002</b> <b>ER2318-0002</b>	
M12, screw type		D-sub socket, 25-pin	
EN 61131-2, type 1/3		EN 61131-2, type 1/3	
3.0 ms		10 µs	
4 inputs + 4 outputs		8 inputs + 8 outputs	
 <p>The EP2308/ER2308 and EP2318/ER2318 EtherCAT Box modules combine four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via screw type M12 connectors.</p>		 <p>The EP2316 EtherCAT Box combines eight digital inputs and eight digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via a 25-pin D-sub socket.</p>	
24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
0.5 A per channel, individually short-circuit-proof ohmic, inductive, lamp load		0.5 A per channel, individually short-circuit-proof ohmic, inductive, lamp load	
from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	
typ. 1.5 A		typ. 1.5 A	
typ. 20 mA + load		typ. 20 mA + load	
120 mA		120 mA	
500 V		500 V	
-		ideal for high number of channels	
-25...+60 °C		-25...+60 °C	
EP23x8: CE, UL, Ex; ER23x8: CE, UL		CE, UL	
www.beckhoff.com/EP2308 www.beckhoff.com/ER2308		www.beckhoff.com/EP2316	

# Digital combi | 24 V DC, positive switching

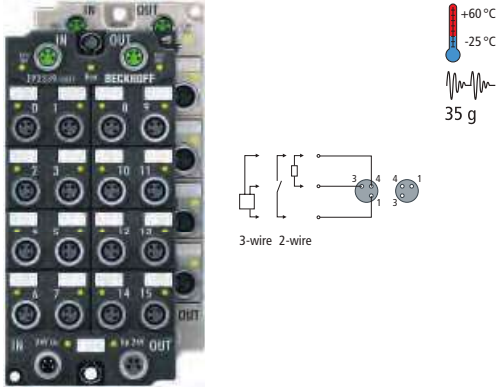
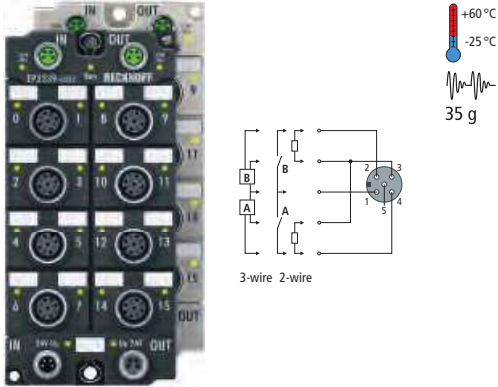
8 x digital input + 8 x digital output,  
24 V DC, I<sub>MAX</sub> = 0.5 A, IP 20 connector


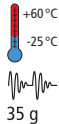
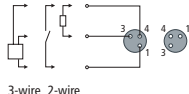

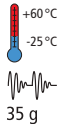
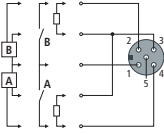
8-channel digital input or output,  
24 V DC, M8, I<sub>MAX</sub> = 0.5 A

<b>Industrial housing</b>	EP2316-0003	EP2338-0001	EP2338-1001
<b>Zinc die-cast housing</b>		ER2338-0001	ER2338-1001
<b>Connection technology</b>	connector with spring-loaded system	M8, screw type	
<b>Specification</b>	EN 61131-2, type 1/3	EN 61131-2, type 1/3	
<b>Input filter</b>	10 µs	10 µs	3.0 ms
<b>Number of channels</b>	8 inputs + 8 outputs	8 digital inputs or outputs	
	 <p>The EP2316-0003 EtherCAT Box combines eight digital inputs and eight digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. For the signal connection connectors with a spring-loaded system are used, optionally available with 1 or 3 pins. The module is supplied without connectors.</p> <p>Accessories:</p> <ul style="list-style-type: none"> <li>- ZS2001-0001: connector, 1-pin, without LED</li> <li>- ZS2001-0002: connector, 1-pin, with LED</li> <li>- ZS2001-0004: connector, 3-pin, with LED</li> </ul>	 <p>The EP2338/ER2338 EtherCAT Box has eight digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image.</p> <p>The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.</p>	
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	
<b>Max. output current</b>	0.5 A per channel, individually short-circuit-proof	0.5 A per channel, individually short-circuit-proof	
<b>Load type</b>	ohmic, inductive, lamp load	ohmic, inductive, lamp load	
<b>Sensor supply</b>	from control voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof	
<b>Short circuit current</b>	typ. 1.5 A	typ. 1.5 A	
<b>Auxiliary power current</b>	typ. 20 mA + load	typ. 20 mA + load	
<b>Current consumption from U<sub>s</sub> (without sensor current)</b>	120 mA	120 mA	
<b>Electrical isolation</b>	500 V	500 V	
<b>Special features</b>	IP 20, ideal for e.g. operating desks	-	
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C	
<b>Approvals</b>	CE	EP2338: CE, UL, Ex; ER2338: CE, UL	
<b>Further information</b>	<a href="http://www.beckhoff.com/EP2316-0003">www.beckhoff.com/EP2316-0003</a>	<a href="http://www.beckhoff.com/EP2338">www.beckhoff.com/EP2338</a> <a href="http://www.beckhoff.com/ER2338">www.beckhoff.com/ER2338</a>	

8-channel digital input or output, 24 V DC, M12, I <sub>MAX</sub> = 0.5 A		4 x digital input + 4 x digital output, 24 V DC, M8, I <sub>MAX</sub> = 2 A (Σ 4 A)	4 x digital input + 4 x digital output, 24 V DC, M12, I <sub>MAX</sub> = 2 A (Σ 4 A)
<b>EP2338-0002</b> <b>ER2338-0002</b>	<b>EP2338-1002</b> <b>ER2338-1002</b>	<b>EP2328-0001</b> <b>ER2328-0001</b>	<b>EP2328-0002</b> <b>ER2328-0002</b>
M12, screw type		M8, screw type	M12, screw type
EN 61131-2, type 1/3		EN 61131-2, type 1/3	EN 61131-2, type 1/3
10 μs	3.0 ms	3.0 ms	3.0 ms
8 digital inputs or outputs		4 inputs + 4 outputs	4 inputs + 4 outputs
 <p>The EP2338/ER2338 EtherCAT Box has eight digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.</p>		 <p>The EP2328/ER2328 EtherCAT Box combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The signals are connected via screw type M8 connectors. The sensors are powered by the box supply Us.</p>	
24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
0.5 A per channel, individually short-circuit-proof		2 A per channel, individually short-circuit safe, total current max. 4 A	
ohmic, inductive, lamp load		ohmic, inductive, lamp load	
from load supply voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	
typ. 1.5 A		typ. 4 A	
typ. 20 mA + load		typ. 20 mA	
120 mA		120 mA + load	
500 V		500 V	
-		-	
-25...+60 °C		-25...+60 °C	
EP2338: CE, UL, Ex; ER2338: CE, UL		EP2328: CE, UL, Ex; ER2328: CE, UL	
www.beckhoff.com/EP2338 www.beckhoff.com/ER2338		www.beckhoff.com/EP2328 www.beckhoff.com/ER2328	

## Digital combi | 24 V DC, positive switching

	16-channel digital input or output, 24 V DC, M8, $I_{\text{MAX}} = 0.5 \text{ A}$ ( $\Sigma 4 \text{ A}$ )	16-channel digital input or output, 24 V DC, M12, $I_{\text{MAX}} = 0.5 \text{ A}$ ( $\Sigma 4 \text{ A}$ )
<b>Industrial housing</b>	<b>EP2339-0021</b>	<b>EP2339-0022</b>
<b>Zinc die-cast housing</b>	<b>ER2339-0021</b>	<b>ER2339-0022</b>
<b>Connection technology</b>	M8, screw type	M12, screw type
<b>Specification</b>	EN 61131-2, type 1/3	EN 61131-2, type 1/3
<b>Input filter</b>	3.0 ms	3.0 ms
<b>Number of channels</b>	16 digital inputs or outputs	16 digital inputs or outputs
	 <p>The EP2339/ER2339 EtherCAT Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image.</p> <p>The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.</p>	 <p>The EP2339/ER2339 EtherCAT Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image.</p> <p>The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Max. output current</b>	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
<b>Load type</b>	ohmic, inductive, lamp load	ohmic, inductive, lamp load
<b>Sensor supply</b>	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
<b>Short circuit current</b>	typ. 1.5 A	typ. 1.5 A
<b>Auxiliary power current</b>	typ. 20 mA + load	typ. 20 mA + load
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	120 mA	120 mA
<b>Electrical isolation</b>	500 V	500 V
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP2339">www.beckhoff.com/EP2339</a> <a href="http://www.beckhoff.com/ER2339">www.beckhoff.com/ER2339</a>	<a href="http://www.beckhoff.com/EP2339">www.beckhoff.com/EP2339</a> <a href="http://www.beckhoff.com/ER2339">www.beckhoff.com/ER2339</a>

<p>16-channel digital input or output, 24 V DC, M8, I<sub>MAX</sub> = 0.5 A (Σ 4 A)</p>	<p>16-channel digital input or output, 24 V DC, M12, I<sub>MAX</sub> = 0.5 A (Σ 4 A)</p>
<p><b>EP2349-0021</b> <b>ER2349-0021</b></p>	<p><b>EP2349-0022</b> <b>ER2349-0022</b></p>
<p>M8, screw type</p>	<p>M12, screw type</p>
<p>EN 61131-2, type 1/3</p>	<p>EN 61131-2, type 1/3</p>
<p>10 μs</p>	<p>10 μs</p>
<p>16 digital inputs or outputs</p>	<p>16 digital inputs or outputs</p>
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  </div> <div style="width: 45%; text-align: right;">  <p>+60 °C -25 °C 35 g</p> </div> </div> <div style="text-align: center; margin-top: 10px;">  <p>3-wire 2-wire</p> </div> <p>The EP2349/ER2349 EtherCAT Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image.</p> <p>The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.</p>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  </div> <div style="width: 45%; text-align: right;">  <p>+60 °C -25 °C 35 g</p> </div> </div> <div style="text-align: center; margin-top: 10px;">  <p>3-wire 2-wire</p> </div> <p>The EP2349/ER2349 EtherCAT Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image.</p> <p>The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.</p>
<p>24 V DC (-15 %/+20 %)</p>	<p>24 V DC (-15 %/+20 %)</p>
<p>0.5 A each channel, individually short-circuit-proof, total current max. 4 A</p>	<p>0.5 A each channel, individually short-circuit-proof, total current max. 4 A</p>
<p>ohmic, inductive, lamp load</p>	<p>ohmic, inductive, lamp load</p>
<p>from load supply voltage, max. 0.5 A total, short-circuit-proof</p>	<p>from load supply voltage, max. 0.5 A total, short-circuit-proof</p>
<p>typ. 1.5 A</p>	<p>typ. 1.5 A</p>
<p>typ. 20 mA + load</p>	<p>typ. 20 mA + load</p>
<p>130 mA</p>	<p>130 mA</p>
<p>500 V</p>	<p>500 V</p>
<p>-25...+60 °C</p>	<p>-25...+60 °C</p>
<p>CE, UL</p>	<p>CE, UL</p>
<p><a href="http://www.beckhoff.com/EP2349">www.beckhoff.com/EP2349</a> <a href="http://www.beckhoff.com/ER2349">www.beckhoff.com/ER2349</a></p>	<p><a href="http://www.beckhoff.com/EP2349">www.beckhoff.com/EP2349</a> <a href="http://www.beckhoff.com/ER2349">www.beckhoff.com/ER2349</a></p>

# Analog input | -10...+10 V, 0/4...20 mA, RTD

The EP3162, EP3174/ER3174 and EP3184/ER3184 EtherCAT Box modules evaluate analog standard signals within the range of -10/0 V to +10 V or 0/4 mA to 20 mA with 16-bit resolution. The signal form is separately configurable for each channel. The EP3174/ER3174 and EP3184/ER3184 each have four galvanically connected analog inputs. The EP3162 has two analog inputs with galvanic isolation. The EP3174/ER3174 evaluates the difference between the two input signals Input+ and Input-. These must be referred to the ground potential of the load voltage  $U_L$ . The DC component does not affect the measurement, as long as it is in the common mode range. The measurement in the EP3184/ER3184 is single-ended and the negative reference potential is fixed to the ground potential of the supply voltage  $U_L$ . In the EP3162 the supply for each channel is galvanically isolated.

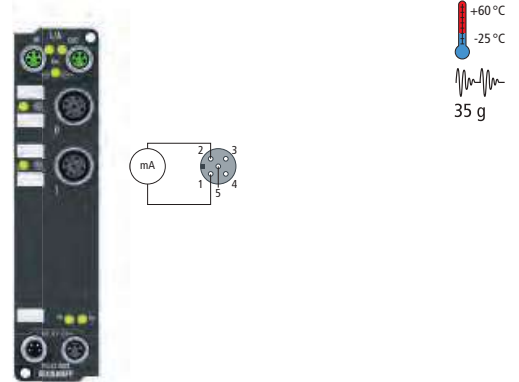
The EP3204/ER3204 analog input module is intended for the direct connection of resistance thermometers. The resistance is measured with a low measuring current, linearised and represented in 0.1 °C. The EtherCAT Box supports 2-, 3- and 4-wire measurement on all four channels. The measurements serve to eliminate or deduct the parasitic resistance of the sensor cable. All inputs are separately configurable for a wide range of sensors, for the three measurement procedures and for the direct measurement of resistance.

## EP3174-0092 with TwinSAFE SC

With the aid of the TwinSAFE SC technology it is possible to make use of standard signals for safety tasks in any network or fieldbus. To do this, EtherCAT I/Os from the areas of analog input, position measurement or communication (4...20 mA, incremental encoder, IO-Link, etc.) are extended by the TwinSAFE SC function. The data from these extended EtherCAT I/Os is fed to the TwinSAFE Logic, where they undergo safety-related multi-channel processing.

2-channel analog input,  
-10/0...+10 V or 0/4...20 mA,  
parameterisable, 16 bit,  
with galvanic isolation

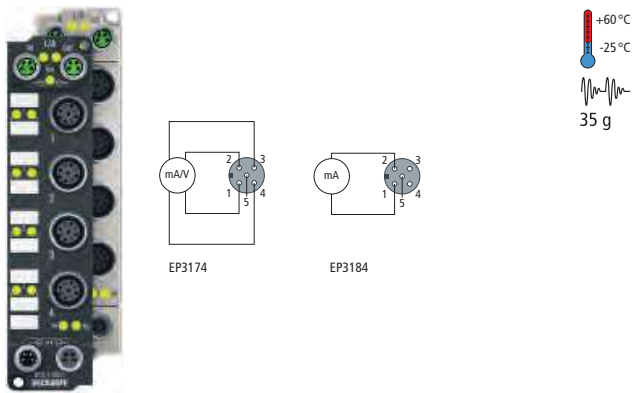
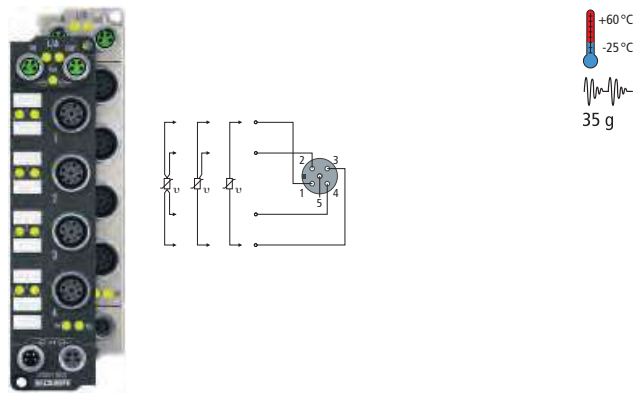
<b>Industrial housing</b>	<b>EP3162-0002</b>
<b>Zinc die-cast housing</b>	
<b>Connection technology</b>	M12, screw type
<b>Signal type</b>	-10/0...+10 V   0/4...20 mA
<b>Resolution</b>	16 bit (incl. sign)
<b>Conversion time</b>	~ 100 µs
<b>Number of inputs</b>	2 (single-ended)



The EP3162 has two analog inputs which can be individually parameterised, so that they process signals either in the -10...+10 V or the 0/4...20 mA range. The voltage or input current is digitised with a resolution of 16 bit, and is transmitted (electrically isolated) to the higher-level automation device. The two input channels are single-ended inputs with galvanic isolation. The input filter and therefore the conversion times are configurable in a wide range.

<b>Measuring error</b>	< ±0.3 % (relative to full scale value)
<b>Distributed clocks</b>	yes
<b>Sensor types</b>	–
<b>Measuring range</b>	–
<b>Internal resistance</b>	> 200 kΩ   85 Ω typ. + diode voltage
<b>Sensor supply</b>	from load supply voltage $U_L$ , DC, any value up to 30 V
<b>Current consumption from <math>U_L</math> (without sensor current)</b>	120 mA
<b>Special features</b>	galvanic isolation of the channels
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP3162">www.beckhoff.com/EP3162</a>

<b>Special modules</b>	
<b>Distinguishing features</b>	

4-channel analog input, -10/0...+10 V or 0/4...20 mA, parameterisable, 16 bit		4-channel analog input, PT100 (RTD), parameterisable, 16 bit	
<b>EP3174-0002</b> <b>ER3174-0002</b>		<b>EP3184-0002</b> <b>ER3184-0002</b>	
M12, screw type		M12, screw type	
-10/0...+10 V   0/4...20 mA		PT100	
16 bit (incl. sign)		0.1 °C per digit	
~ 100 µs		800 ms up to 2 ms, see documentation, default: approx. 85 ms	
4 (differential)		4 (single-ended)	
			
<p>The EP3174/ER3174 and EP3184/ER3184 have four analog inputs which can be individually parameterised, so that they process signals either in the -10...+10 V or the 0/4...20 mA range. The voltage or input current is digitised with a resolution of 16 bits, and is transmitted (electrically isolated) to the higher-level automation device. The four input channels have a common, internal ground potential. The input filter/conversion times are configurable in a wide range.</p>		<p>The EP3204/ER3204 with analog inputs allows resistance sensors to be connected directly. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The module can also be used for simple resistance measurement. Standard settings: resolution 0.1°C in the temperature range of PT100 sensors, 2-wire.</p>	
< ±0.3 % (relative to full scale value)		< ±0.5 °C for PT sensors (further types see documentation)	
yes		–	
–		PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000	
–		resistance measurement (e.g. potentiometer, 10 Ω...1.2/4 kΩ)	
–		-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)	
> 200 kΩ   85 Ω typ. + diode voltage		–	
from load supply voltage U <sub>p</sub> , DC, any value up to 30 V		–	
120 mA		120 mA	
current or voltage parameterisable (0/4...20 mA, -10/0...10 V)		open-circuit recognition	
-25...+60 °C		-25...+60 °C	
EP31x4: CE, UL, Ex; ER31x4: CE, UL		EP3204: CE, UL, Ex; ER3204: CE, UL	
<a href="http://www.beckhoff.com/EP3174">www.beckhoff.com/EP3174</a> <a href="http://www.beckhoff.com/ER3174">www.beckhoff.com/ER3174</a>		<a href="http://www.beckhoff.com/EP3184">www.beckhoff.com/EP3184</a> <a href="http://www.beckhoff.com/ER3184">www.beckhoff.com/ER3184</a>	
<b>i</b> EP3174-0092		<a href="http://www.beckhoff.com/EP3204">www.beckhoff.com/EP3204</a> <a href="http://www.beckhoff.com/ER3204">www.beckhoff.com/ER3204</a>	
TwinSAFE SC		324	

**i** For availability status see Beckhoff website at: [www.beckhoff.com/EP3174-0092](http://www.beckhoff.com/EP3174-0092)

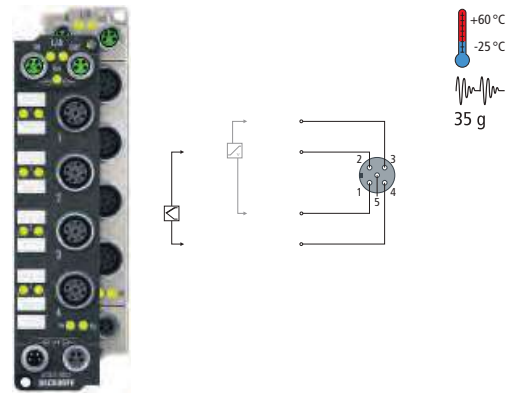


# Analog input | Thermocouple

The EP3314/ER3314 EtherCAT Box enables the measurement of temperature using thermocouples. The measured thermovoltage is linearised in accordance with the characteristic of the respective type and transferred to the controller as a temperature value in 1/10 °C or 1/100 °C. The inputs are separately configurable for a wide range of different sensor types. Parasitic thermovoltages arise at the interface of the measuring cable and the module, significantly falsifying the measurement. This error is eliminated by the ZS2000-3712 compensation connector.

4-channel analog input, thermocouple/mV, parameterisable, 16 bit

<b>Industrial housing</b>	<b>EP3314-0002</b>
<b>Zinc die-cast housing</b>	<b>ER3314-0002</b>
<b>Connection technology</b>	M12, screw type
<b>Signal type</b>	thermocouple
<b>Resolution</b>	0.1 °C per digit
<b>Conversion time</b>	2.5 s up to 20 ms, see documentation, default: approx. 250 ms
<b>Number of inputs</b>	4



The EP3314/ER3314 with analog inputs permits four thermocouples to be connected directly. The module's circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. The EP3314/ER3314 can also be used for mV measurement.

<b>Measuring error</b>	< ±0.3 % for type K (relative to full scale value), further types see documentation
<b>Distributed clocks</b>	–
<b>Sensor types</b>	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
<b>Measuring range</b>	depending on sensor type; preset value is type K, -100...+1,370 °C
<b>Current consumption from U<sub>s</sub> (without sensor current)</b>	120 mA
<b>Special features</b>	open-circuit recognition
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	EP3314: CE, UL, Ex; ER3314: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP3314">www.beckhoff.com/EP3314</a> <a href="http://www.beckhoff.com/ER3314">www.beckhoff.com/ER3314</a>

# XFC analog input | Load cell analysis

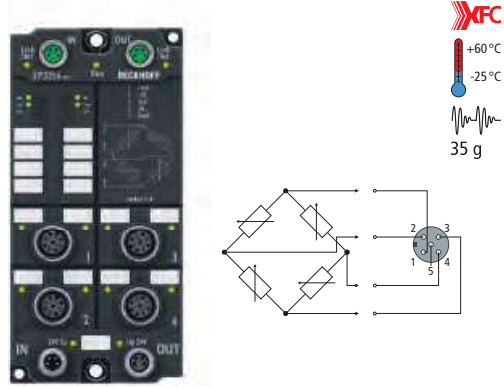
The EP3356 EtherCAT Box enables direct connection of a resistor bridge or load cell in a 4-wire connection technology. The ratio between the bridge voltage  $U_D$  and the supply voltage  $U_{REF}$  is determined simultaneously in the input circuit and the final load value is calculated as a process value on the basis of the settings in the EP3356. With automatic self-calibration (can be deactivated), dynamic filters and distributed clock support, the EP3356 with measuring cycles of 100  $\mu$ s can be used for fast and precise monitoring of torque or vibration sensors.

All four M12 sockets are connected, so that parallel operation of several strain gauges is possible.

For further information on XFC see page [298](#)



1-channel precise load cell analysis  
(resistor bridge), 24 bit

<b>Industrial housing</b>	EP3356-0022
<b>Connection technology</b>	M12, screw type
<b>Signal type</b>	resistor bridge, strain gauge
<b>Resolution</b>	24 bit, 32 bit presentation
<b>Conversion time</b>	0.1...250 ms, configurable, max. 10,000 samples/s
<b>Number of inputs</b>	2, for 1 resistor bridge in full bridge technology
	
<b>Measuring error</b>	< $\pm 0,01$ % for the calculated load value in relation to the final load value with a 12 V feed and 24 mV bridge voltage (hence nominal strain gauge characteristic value of 2 mV/V), self-calibration active, 50 Hz filter active
<b>Distributed clocks</b>	yes
<b>Sensor types</b>	–
<b>Measuring range</b>	$U_D$ : max. -25...+25 mV rated voltage $U_{REF}$ : max. -12...+12 V rated voltage
<b>Internal resistance</b>	> 200 k $\Omega$ ( $U_{REF}$ ), > 1 M $\Omega$ ( $U_D$ )
<b>Sensor supply</b>	10 V (supplied by the EP3356)
<b>Current consumption from <math>U_S</math> (without sensor current)</b>	120 mA
<b>Special features</b>	self-calibration, quadruple averager, dynamic filters, fast data sampling, parallel connection
<b>Operating temperature</b>	-25...+60 $^{\circ}$ C
<b>Approvals</b>	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP3356">www.beckhoff.com/EP3356</a>

# Analog input | Pressure measuring

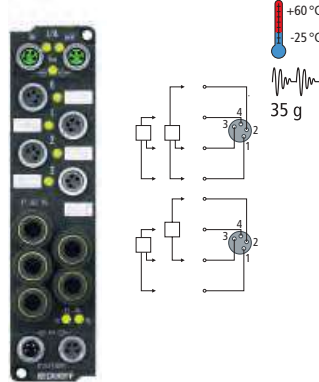
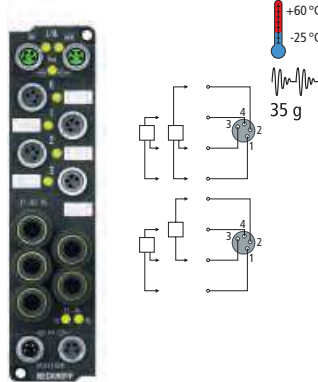
The EP3744 EtherCAT Box, equipped with six digital inputs, two digital outputs and four pressure inputs, acquires these signals and transmits them – electrically isolated – to the controller. The signal status is indicated by LEDs; the digital signals are connected via 4-pin M8 plug connectors.

The pressure is measured as the differential pressure to the fifth connection by an integrated 6 mm fitting. The pressure values are available as 16-bit values. Measurement can be made between  $-1 \dots 1$  bar (EP3744-0041) or  $-7 \dots 7$  bar (EP3744-1041), with the value being output in relation to the fifth connection, e.g. for vacuum measurement in relation to the ambient pressure at suction grippers.

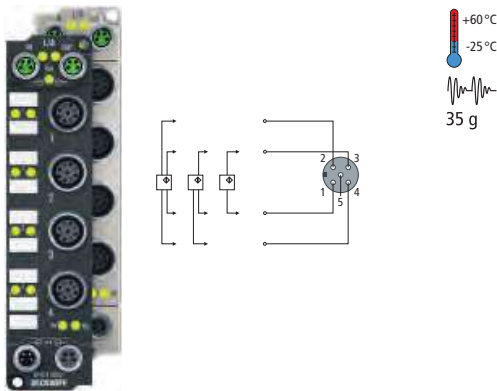
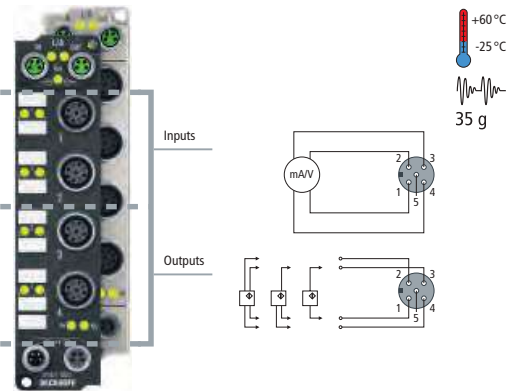
In absolute-pressure mode it is possible to measure pressures between  $0 \dots 1$  bar (EP3744-0041) or  $0 \dots 7$  bar (EP3744-1041).

Pressure measuring box,  
6 digital inputs 24 V DC,  
2 digital outputs 24 V DC, 0.5 A,  
4 pressure inputs  $0 \dots 1$  bar/ $-1 \dots 1$  bar

Pressure measuring box,  
6 digital inputs 24 V DC,  
2 digital outputs 24 V DC, 0.5 A,  
4 pressure inputs  $0 \dots 7$  bar/ $-7 \dots 7$  bar

Industrial housing	EP3744-0041	EP3744-1041
Connection technology	digital signals: 4-pin M8; pressure measurement: 6 mm fitting	digital signals: 4-pin M8; pressure measurement: 6 mm fitting
Signal type	air pressure	air pressure
Conversion time	~ 3.5 ms	~ 3.5 ms
Number of inputs	6 dig. and 4 pressure inputs, 2 dig. outputs	6 dig. and 4 pressure inputs, 2 dig. outputs
	 <p>The diagram shows the EP3744-0041 EtherCAT Box with a pressure sensor connected to the fifth connection. The sensor is labeled with terminals 1, 2, 3, and 4. A temperature range of <math>+60^\circ\text{C}</math> to <math>-25^\circ\text{C}</math> and a pressure range of 35 g are indicated.</p>	 <p>The diagram shows the EP3744-1041 EtherCAT Box with a pressure sensor connected to the fifth connection. The sensor is labeled with terminals 1, 2, 3, and 4. A temperature range of <math>+60^\circ\text{C}</math> to <math>-25^\circ\text{C}</math> and a pressure range of 35 g are indicated.</p>
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Sensor types	–	–
Measuring range	$0 \dots 1$ bar (0...15 psi)/ $-1 \dots 1$ bar (-15...15 psi)	$0 \dots 7$ bar (0...100 psi)/ $-7 \dots 7$ bar (-100...100 psi)
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
Current consumption from $U_s$ (without sensor current)	120 mA	120 mA
Special features	direct pressure measuring at the machine	direct pressure measuring at the machine
Operating temperature	$-25 \dots +60^\circ\text{C}$	$-25 \dots +60^\circ\text{C}$
Approvals	CE, UL	CE, UL
Further information	<a href="http://www.beckhoff.com/EP3744">www.beckhoff.com/EP3744</a>	<a href="http://www.beckhoff.com/EP3744-1041">www.beckhoff.com/EP3744-1041</a>

# Analog output | -10...+10 V, 0/4...20 mA

	4-channel analog output, -10/0...+10 V or 0/4...20 mA, parameterisable, 16 bit	2-channel analog input + 2-channel analog output, -10/0...+10 V or 0/4...20 mA, parameterisable, 16 bit
<b>Industrial housing</b>	<b>EP4174-0002</b>	<b>EP4374-0002</b>
<b>Zinc die-cast housing</b>	<b>ER4174-0002</b>	<b>ER4374-0002</b>
<b>Connection technology</b>	M12, screw type	M12, screw type
<b>Signal type</b>	-10/0...+10 V   0/4...20 mA	-10/0...+10 V   0/4...20 mA
<b>Resolution</b>	16 bit	16 bit
<b>Conversion time</b>	~ 40 µs	input: ~ 100 µs, output: ~ 40 µs
<b>Number of outputs</b>	4	2
<b>Number of inputs</b>	–	2
	 <p>The EP4174/ER4174 EtherCAT Box has four analog outputs which can be individually parameterised, so that they generate signals either in the -10...+10 V or the 0/4...20 mA range. The voltage or output current is supplied to the process level with a resolution of 15 bit (default), and is electrically isolated. The output scaling can be changed if required. Ground potential for the four output channels is common with the 24 V DC supply. The analog actuators are supplied from the load voltage (freely selectable up to 30 V DC). The applied load voltage is available for actuator supply of further EtherCAT Box modules.</p>	 <p>The EP4374/ER4374 EtherCAT Box combines two analog inputs and two analog outputs which can be individually parameterised, so that they process/generate signals either in the -10...+10 V or the 0/4...20 mA range. The resolution for the current and voltage signals is 16 bit (signed). The voltage or output current is supplied to the process level with a resolution of 15 bit (default), and is electrically isolated. Ground potential for the two output channels is common with the 24 V DC supply.</p>
<b>Measuring accuracy</b>	< 0.1 % (relative to full scale value)	input: < 0.3 %, output: < 0.1 % (each relative to full scale value)
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Distributed clocks</b>	yes	yes
<b>Load</b>	> 5 kΩ   < 500 Ω	output: > 5 kΩ   < 500 Ω
<b>Current consumption from U<sub>s</sub></b>	120 mA	120 mA
<b>Special features</b>	current or voltage parameterisable per channel	combi module, current or voltage parameterisable per channel
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	EP4174: CE, UL, Ex; ER4174: CE, UL	EP4374: CE, UL, Ex; ER4374: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP4174">www.beckhoff.com/EP4174</a> <a href="http://www.beckhoff.com/ER4174">www.beckhoff.com/ER4174</a>	<a href="http://www.beckhoff.com/EP4374">www.beckhoff.com/EP4374</a> <a href="http://www.beckhoff.com/ER4374">www.beckhoff.com/ER4374</a>

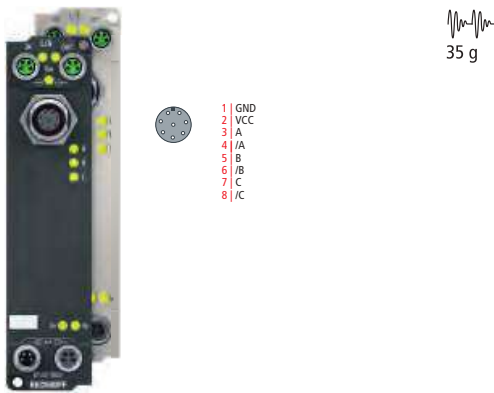
# Position measurement | Incremental encoder interfaces







The EP51x1/ER51x1 EtherCAT Box is an interface for the direct connection of incremental encoders with differential inputs (RS485) (EP5101/ER5101) or 24 V DC inputs (EP5151/ER5151). A 32/16 bit counter with a quadrature decoder and a 32/16 bit latch for the zero pulse can be read, set or enabled. Incremental encoders with alarm outputs can be connected at the EP5101/ER5101's status input. Interval measurement with a resolution of up to 100 ns is possible for EP5101/ER5101 and EP5151/ER5151. The gate input allows the counter to be halted. The counter state is taken over with a rising edge at the latch input (EP5101-0011). The EP5101-1002/ER5101-1002 offers a 24 V DC sensor supply.

Due to the optional interpolating micro-increment function, the EP5101 can supply even more precise axis positions for dynamic axes. In addition, it supports the synchronous reading of the encoder value together with other input data in the EtherCAT system via high-precision EtherCAT distributed clocks (DC).

The encoder is connected via an 8-pin M12 socket (EP5101-0002, EP5151-0002) or via a 15-pin D-sub socket (EP5101-0011). In the M12 version not all signals are available.

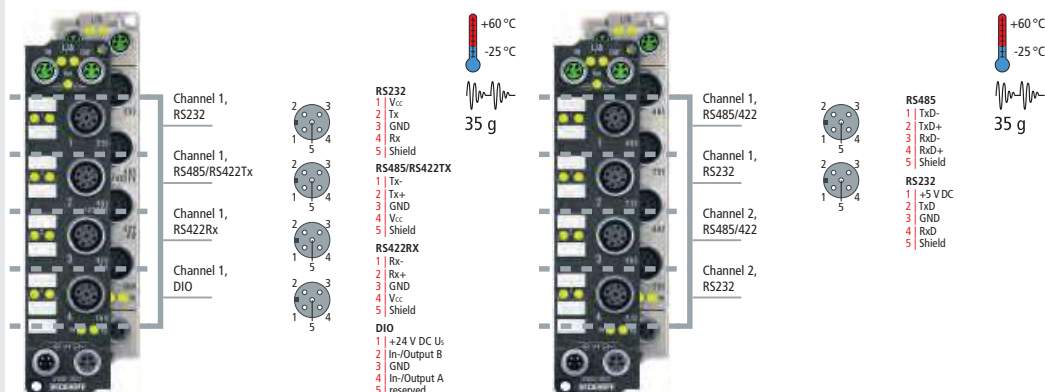
Incremental encoder interface,  
M12, 8-pin

<b>Industrial housing</b>	EP5101-0002
<b>Zinc die-cast housing</b>	ER5101-0002
<b>Connection technology</b>	M12, 8-pin
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Number of channels</b>	1
	
<b>Encoder operating voltage</b>	5 V DC
<b>Counter</b>	32 or 16 bit, binary
<b>Limit frequency</b>	4 million increments/s (with 4-fold evaluation)
<b>Quadrature decoder</b>	4-fold evaluation
<b>Zero-pulse latch</b>	16/32 bit
<b>Commands</b>	read, set, enable
<b>Distributed clocks</b>	yes
<b>Sensor supply</b>	+5 V DC, 150 mA (VCC)
<b>Current consumption from U<sub>s</sub> (without sensor current)</b>	typ. 130 mA + load
<b>Electrical isolation</b>	500 V
<b>Operating temperature</b>	0...+55 °C (-25...+60 °C in preparation)
<b>Approvals</b>	EP5101: CE, UL, Ex; ER5101: CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP5101">www.beckhoff.com/EP5101</a> <a href="http://www.beckhoff.com/ER5101">www.beckhoff.com/ER5101</a>

Incremental encoder interface, D-sub socket, 15-pin	Incremental encoder interface, M12, 8-pin, 24 V DC sensor supply	Incremental encoder interface, M12, 8-pin
<b>EP5101-0011</b>	<b>EP5101-1002</b> <b>ER5101-1002</b>	<b>EP5151-0002</b> <b>ER5151-0002</b>
D-sub socket, 15-pin	M12, 8-pin	M12, 8-pin
24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
1	1	1
  <ul style="list-style-type: none"> <li>1   A</li> <li>2   GND</li> <li>3   B</li> <li>4   VCC</li> <li>5   n.c.</li> <li>6   n.c.</li> <li>7   /C</li> <li>8   Latch</li> <li>9   /A</li> <li>10   GND</li> <li>11   /B</li> <li>12   VCC</li> <li>13   /ERR</li> <li>14   C</li> <li>15   Gate</li> </ul> <p style="text-align: right;">35 g</p>	  <ul style="list-style-type: none"> <li>1   GND</li> <li>2   VCC</li> <li>3   A</li> <li>4   /A</li> <li>5   B</li> <li>6   /B</li> <li>7   C</li> <li>8   /C</li> </ul> <p style="text-align: right;">35 g</p>	  <ul style="list-style-type: none"> <li>1   GND</li> <li>2   Enc_Supply</li> <li>3   A</li> <li>4   /Error</li> <li>5   B</li> <li>6   Latch</li> <li>7   C</li> <li>8   Gate</li> </ul> <p style="text-align: right;">35 g</p>
5 V DC	5 V DC	24 V DC
32 or 16 bit, binary	32 or 16 bit, binary	32 or 16 bit, binary
4 million increments/s (with 4-fold evaluation)	4 million increments/s (with 4-fold evaluation)	4 million increments/s (with 4-fold evaluation)
4-fold evaluation	4-fold evaluation	4-fold evaluation
16/32 bit	16/32 bit	16/32 bit
read, set, enable	read, set, enable	read, set, enable
yes	yes	yes
+5 V DC, 150 mA (VCC)	24 V DC, 500 mA (VCC)	24 V DC/0.5 A, short-circuit-proof
typ. 130 mA + load	typ. 130 mA + load	typ. 130 mA + load
500 V	500 V	500 V
0...+55 °C (-25...+60 °C in preparation)	0...+55 °C (-25...+60 °C in preparation)	0...+55 °C (-25...+60 °C in preparation)
CE, UL	CE, UL	CE, UL
<a href="http://www.beckhoff.com/EP5101">www.beckhoff.com/EP5101</a>	<a href="http://www.beckhoff.com/EP5101">www.beckhoff.com/EP5101</a> <a href="http://www.beckhoff.com/ER5101">www.beckhoff.com/ER5101</a>	<a href="http://www.beckhoff.com/EP5151">www.beckhoff.com/EP5151</a> <a href="http://www.beckhoff.com/ER5151">www.beckhoff.com/ER5151</a>

# Communication | Serial interfaces RS232, RS422/RS485

	1-channel serial interface, RS232, RS422/RS485	2-channel serial interface, RS232, RS422/RS485
<b>Industrial housing</b>	EP6001-0002	EP6002-0002
<b>Zinc die-cast housing</b>	ER6001-0002	ER6002-0002
<b>Connection technology</b>	M12, screw type	M12, screw type
<b>Data transfer rates</b>	300...115,200 baud; 9,600 baud (8 bits, no parity, 1 stop bit) is preset	300...115,200 baud; 9,600 baud (8 bits, no parity, 1 stop bit) is preset
<b>Number of digital inputs/outputs</b>	2, 24 V DC, 10 μs/0.5 A	–
<b>Data transfer channels</b>	1	2



The EP6001/ER6001 and EP6002/ER6002 serial interface modules allow the connection of devices with an RS232 or RS422/RS485 interface. The devices connected to the EP600x/ER600x communicate with the automation device via the coupler and the network. The modules transmit the data in a fully transparent manner to the higher-level automation device. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 864 byte receive buffer and a 128 byte send buffer are available. This way, any desired number of serial interfaces can be used in the application without having to consider structural restrictions in the control device. The serial interface can be positioned close to the place of use, this way reducing the necessary cable lengths.

The 1-channel version EP6001/ER6001 has an increased end device power supply of up to 1 A, the connector assignment depends on the selected interface. The two integrated digital inputs/outputs allow the connection of additional sensors/actuators in order, for example, to trigger the reading process of the barcode reader or, depending on the result, to initiate an action. In the EP6002/ER6002 the connector assignment depends on the interface. For each channel, RS232 or RS422/RS485 can be selected.

In conjunction with the TwinCAT Virtual Serial COM Driver (see page 963), the EP6001/ER6001 and EP6002/ER6002 can be used as normal Windows COM interfaces.

<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Distributed clocks</b>	–	–
<b>Bit distortion</b>	< 3 %	< 3 %
<b>Cable length</b>	RS232: max. 15 m; RS422/RS485: approx. 1,000 m	RS232: max. 15 m; RS422/RS485: approx. 1,000 m
<b>Data buffer</b>	864 bytes receive buffer, 128 bytes transmit buffer	864 bytes receive buffer, 128 bytes transmit buffer
<b>Sensor supply</b>	+ 5 V DC, 1 A	+5 V DC, 20 mA each
<b>Current consumption from U<sub>s</sub> (without sensor current)</b>	typ. 130 mA + load	typ. 130 mA + load
<b>Special features</b>	easy integration of serial end devices	easy integration of serial end devices
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL	EP6002: CE, UL, Ex; ER6002: CE, UL
<b>Further information</b>	www.beckhoff.com/EP6001 www.beckhoff.com/ER6001	www.beckhoff.com/EP6002 www.beckhoff.com/ER6002

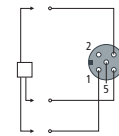
# Communication | IO-Link masters

An IO-Link system consists of IO-Link devices such as sensors, actuators or combinations of both. They are connected using the classic 3-wire technique. The EP6224 performs the IO-Link master function and is equipped with four ports. Only one IO-Link device can ever be connected to each port. IO-Link thus represents a point-to-point communication method and not a fieldbus.

	4-channel input/output, IO-Link master module, Class A	4-channel input/output, IO-Link master module, Class B
<b>Industrial housing</b>	EP6224-2022	EP6224-3022
<b>Connection technology</b>	M12, screw type	M12, screw type
<b>Data transfer rates</b>	4.8 kbaud, 38.4 kbaud and 230.4 kbaud	4.8 kbaud, 38.4 kbaud and 230.4 kbaud
<b>IO-Link interfaces</b>	4	4



 35 g



EP6224-2022	EP6224-3022
1   24 V DC	1   24 V DC U <sub>s</sub>
2   n. c.	2   24 V DC U <sub>v</sub>
3   GND	3   GND <sub>v</sub>
4   C/Ox	4   C/Ox
5   n. c.	5   GND <sub>v</sub>

The EP6224 IO-Link module enables connection of up to four IO-Link devices, e.g. actuators, sensors or combinations of both. A point-to-point connection is used between the terminal and the device. The terminal is parameterised via the EtherCAT master. IO-Link is designed as an intelligent link between the fieldbus level and the sensor, wherein parameterisation information can be exchanged bidirectionally via the IO-Link connection. The parameterisation of the IO-Link devices with service data can be done from TwinCAT via ADS.

In the standard setting, the EP6224 functions as a 4-channel input terminal, 24 V DC, which communicates with connected IO-Link devices, parameterises them and, if necessary, changes their operating mode.

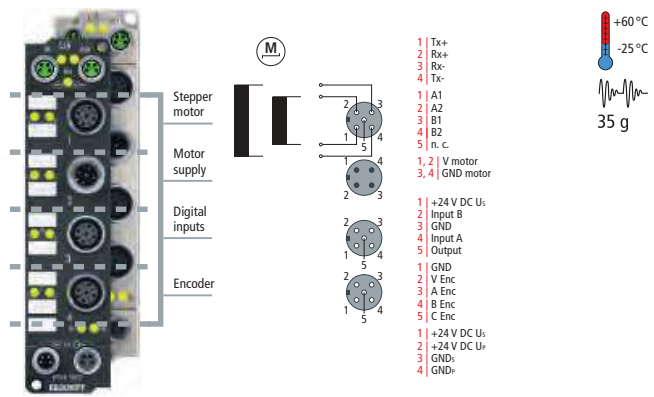
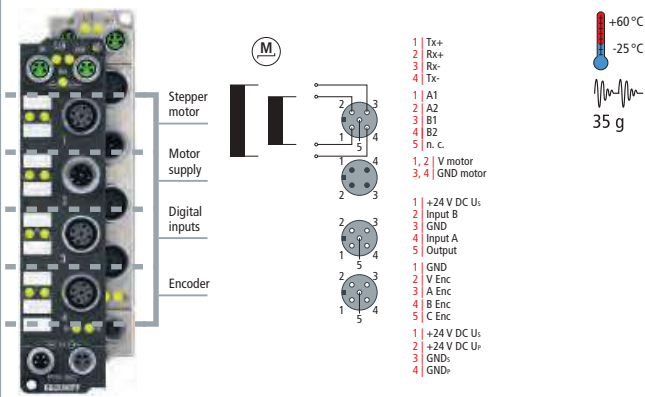
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Distributed clocks</b>	–	–
<b>Specification version</b>	IO-Link V1.1, Class A	IO-Link V1.1, Class B
<b>Cable length</b>	max. 20 m	max. 20 m
<b>Sensor supply</b>	24 V DC, 1.4 A, for all 4 ports, port Class A	24 V DC, 1.4 A, for all 4 ports, port Class B (4 A)
<b>Current consumption from U<sub>s</sub> (without sensor current)</b>	typ. 130 mA + load	typ. 130 mA + load
<b>Operating temperature</b>	0...+55 °C (-25...+60 °C in preparation)	0...+55 °C (-25...+60 °C in preparation)
<b>Approvals</b>	CE, UL	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP6224">www.beckhoff.com/EP6224</a>	<a href="http://www.beckhoff.com/EP6224">www.beckhoff.com/EP6224</a>



# Motion | Stepper motor modules

	Stepper motor module, 50 V DC, 5 A, with incremental encoder, 2 digital inputs, 1 digital output	Stepper motor module, 50 V DC, 1.5 A, with incremental encoder, 2 digital inputs, 1 digital output
<b>Industrial housing</b>	EP7041-0002	EP7041-1002
<b>Zinc die-cast housing</b>	ER7041-0002	ER7041-1002
<b>Connection method</b>	screw type M12	screw type M12
<b>Load type</b>	uni- or bipolar stepper motors	uni- or bipolar stepper motors
<b>Number of outputs</b>	1 stepper motor, 1 digital 24 V DC output	1 stepper motor, 1 digital 24 V DC output
<b>Number of inputs</b>	2 digital inputs, encoder system (24 V DC encoder)	2 digital inputs, encoder system (24 V DC encoder)
	<p>The EP7041-0002/ER7041-0002 and EP7041-1002/ER7041-1002 EtherCAT Box modules are intended for the direct connection of different stepper motors. The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range. The EP7041/ER7041 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro-stepping ensures particularly quiet and precise motor operation. Connection of an incremental encoder enables a simple servo axis to be realised. Two digital inputs and a digital 0.5 A output enable connection of end switches and a motor brake.</p>	
<b>Nominal voltage</b>	8...50 V DC	8...50 V DC
<b>Distributed clocks</b>	yes	yes
<b>Protocol</b>	EtherCAT	EtherCAT
<b>Output current</b>	2 x 3.5 A, 2 x 5 A peak current (overload- and short-circuit-proof)	2 x 1 A, 2 x 1.5 A peak current (overload- and short-circuit-proof)
<b>Maximum step frequency</b>	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)
<b>Step pattern</b>	64-fold micro stepping	64-fold micro stepping
<b>Current controller frequ.</b>	approx. 30 kHz	approx. 30 kHz
<b>Resolution</b>	approx. 5,000 positions (per revolution, depending on motor and encoder type)	approx. 5,000 positions (per revolution)
<b>Encoder signal</b>	5...24 V DC, 5 mA, single-ended	5...24 V DC, 5 mA, single-ended
<b>Pulse frequency</b>	max. 400,000 increments/s (with 4-fold evaluation)	max. 400,000 increments/s (with 4-fold evaluation)
<b>Current consumption from Us</b>	120 mA	120 mA
<b>Special features</b>	travel distance control, encoder input	travel distance control, encoder input
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	EP7041: CE, Ex; ER7041: CE	EP7041: CE, Ex; ER7041: CE
<b>Further information</b>	<a href="http://www.beckhoff.com/EP7041-0002">www.beckhoff.com/EP7041-0002</a> <a href="http://www.beckhoff.com/ER7041-0002">www.beckhoff.com/ER7041-0002</a>	<a href="http://www.beckhoff.com/EP7041-1002">www.beckhoff.com/EP7041-1002</a> <a href="http://www.beckhoff.com/ER7041-1002">www.beckhoff.com/ER7041-1002</a>

Stepper motor module, 50 V DC, 5 A, with incremental encoder, 2 digital inputs, 1 digital output, motor connection via plug	Stepper motor module, 50 V DC, 5 A, with incremental encoder, 2 digital inputs, 1 digital output, motor connection via plug, for high-speed applications
<b>EP7041-2002</b> <b>ER7041-2002</b>	<b>EP7041-3002</b> <b>ER7041-3002</b>
screw type M12	screw type M12
uni- or bipolar stepper motors	uni- or bipolar stepper motors
1 stepper motor, 1 digital 24 V DC output	1 stepper motor, 1 digital 24 V DC output
2 digital inputs, encoder system (24 V DC encoder)	2 digital inputs, encoder system (24 V DC encoder)
	2 digital inputs, encoder system (5 V DC encoder)



The EP7041-2002/ER7041-2002, EP7041-3002/ER7041-3002 and EP7041-3102 EtherCAT Box modules are intended for the direct connection of different stepper motors. The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range. The EP7041/ER7041 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro-stepping ensures particularly quiet and precise motor operation. Connection of an incremental encoder enables a simple servo axis to be realised. Two digital inputs and a digital 0.5 A output enable connection of end switches and a motor brake. The external motor is fed via an integrated plug.

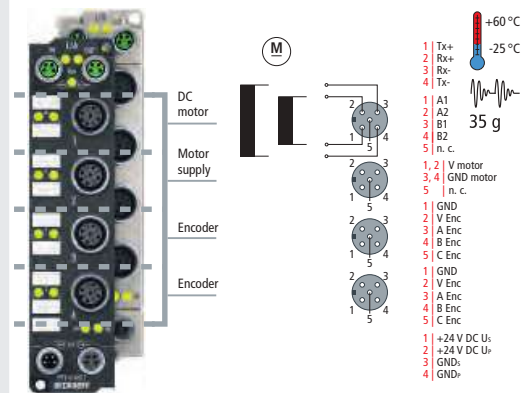
8...50 V DC	8...50 V DC
yes	yes
EtherCAT	EtherCAT
2 x 3.5 A, 2 x 5 A peak current (overload- and short-circuit-proof)	2 x 3.5 A, 2 x 5 A peak current (overload- and short-circuit-proof)
1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)
64-fold micro stepping	256-fold micro stepping
approx. 30 kHz	dynamic
approx. 5,000 positions (per revolution, depending on motor and encoder type)	approx. 5,000 positions (per revolution, depending on motor and encoder type)
5...24 V DC, 5 mA, single-ended	5...24 V DC, 5 mA, single-ended
max. 400,000 increments/s (with 4-fold evaluation)	max. 400,000 increments/s (with 4-fold evaluation)
120 mA	120 mA
travel distance control, encoder input, motor supply via plug	for high-speed applications, travel distance control, encoder input, load indication, motor supply via plug
-25...+60 °C	-25...+60 °C
EP7041: CE, Ex; ER7041: CE	EP7041: CE, Ex; ER7041: CE
<a href="http://www.beckhoff.com/EP7041-2002">www.beckhoff.com/EP7041-2002</a> <a href="http://www.beckhoff.com/ER7041-2002">www.beckhoff.com/ER7041-2002</a>	<a href="http://www.beckhoff.com/EP7041-3002">www.beckhoff.com/EP7041-3002</a> <a href="http://www.beckhoff.com/ER7041-3002">www.beckhoff.com/ER7041-3002</a>
	<a href="http://www.beckhoff.com/EP7041-3102">www.beckhoff.com/EP7041-3102</a>

# Motion | DC motor output stage

DC motors can replace the considerably more expensive servomotors in many applications if they are operated with an intelligent controller. A DC motor can be integrated very simply into the control system using the EP7342/ER7342 EtherCAT Box. All parameters are adjustable via the fieldbus. The small, compact design and the possibility to fit the modules directly to machines makes the EtherCAT DC motor output stage suitable for a wide range of applications. The output stage is protected against overload and short circuit and offers an integrated feedback system for incremental encoders. Two DC motors can be controlled by one module.

2-channel DC motor output stage,  
50 V DC, 3.5 A

<b>Industrial housing</b>	EP7342-0002
<b>Zinc die-cast housing</b>	ER7342-0002
<b>Connection method</b>	screw type M12
<b>Load type</b>	DC brush motors, inductive
<b>Number of outputs</b>	2



The EP7342/ER7342 EtherCAT Box enables direct operation of two DC motors. The speed or position is specified by the automation device via a 16 bit value. By connection of an incremental encoder, a simple servo axis can be realised. The output stage is protected against overload and short-circuit.

<b>Nominal voltage</b>	8...50 V DC
<b>Distributed clocks</b>	yes
<b>Protocol</b>	EtherCAT
<b>Output current</b>	max. 2 x 3.5 A (short-circuit-proof, common thermal overload warning for both output stages) per channel
<b>PWM clock frequency</b>	32 kHz with 180° phase shift each
<b>Duty factor</b>	0...100 % (voltage-controlled)
<b>Resolution</b>	max. 10 bits current, 16 bits speed
<b>Current consumption from U<sub>s</sub> (without sensor current)</b>	120 mA
<b>Special features</b>	travel distance control, encoder input
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	EP7342: CE, Ex; ER7342: CE
<b>Further information</b>	<a href="http://www.beckhoff.com/EP7342">www.beckhoff.com/EP7342</a> <a href="http://www.beckhoff.com/ER7342">www.beckhoff.com/ER7342</a>

# Special functions | Multi-functional I/O box

The EP8309-1022/ER8309-1022 EtherCAT Box has various digital and analog inputs and outputs: eight digital inputs/outputs, two digital tacho inputs, two analog inputs, one analog output and a 1.2 A PWMi output. The current signals have 12-bit resolution. The tacho outputs supply a speed-dependent velocity or frequency value via digital 24 V sensors. Proportional valves, for example, can be actuated directly using the PWMi output, while intelligent valves are switched by the analog output. With its combination of inputs and outputs, the EP8309-1022/ER8309-1022 offers a compact solution for the most diverse units that can be controlled over EtherCAT.

Multi-functional I/O box, 8 digital inputs/outputs, 2 digital tacho inputs, 2 analog inputs, 1 analog output, 1 PWMi output

<b>Industrial housing</b>	EP8309-1022
<b>Zinc die-cast housing</b>	ER8309-1022
<b>Signal connection</b>	M12, screw type

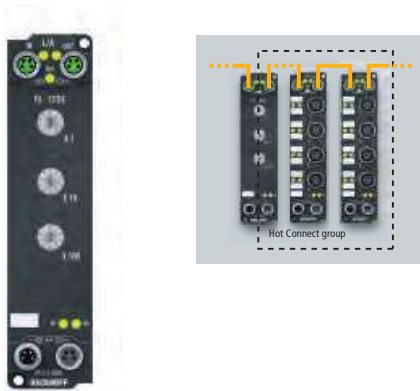
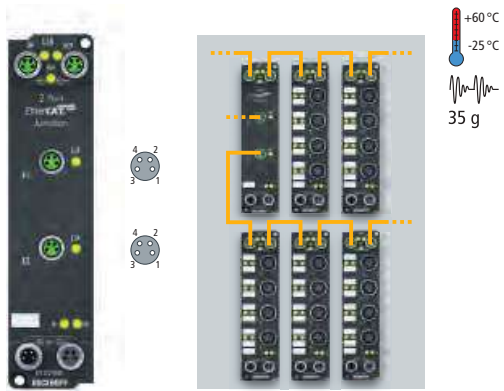


Connector assignment see documentation

+60 °C  
-25 °C  
35 g

<b>Number of digital inputs/outputs</b>	8, 24 V DC, 3 ms/0.5 A (6...13)
<b>Number of special inputs</b>	2 tacho inputs (4/5)
<b>Number of analog inputs</b>	2, single-ended, 12 bit, 0/4...20 mA (0/2)
<b>Number of analog outputs</b>	1, single-ended, 12 bit, 0/4...20 mA (15)
<b>Number of PWMi outputs</b>	1 x 1.2 A, max. 30 kHz (14)
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Measuring error</b>	input: < 0.3 %, output: < 0.1 % (each relative to full scale value)
<b>Limit frequency</b>	2.5 kHz
<b>Sensor supply</b>	from control voltage U <sub>s</sub>
<b>Actuator supply</b>	from the auxiliary voltage U <sub>P</sub>
<b>Special features</b>	multi-functional I/O box for universal use
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP8309">www.beckhoff.com/EP8309</a> <a href="http://www.beckhoff.com/ER8309">www.beckhoff.com/ER8309</a>

# System | EtherCAT Box with ID switch, EtherCAT junction

	EtherCAT Box with ID switch	2-port EtherCAT junction, Hot Connect
<b>Industrial housing</b>	EP1111-0000	EP1122-0001
<b>Task within EtherCAT system</b>	identification of any EtherCAT group in the EtherCAT network	coupling of EtherCAT junctions
<b>Data transfer rates</b>	100 Mbaud	100 Mbaud
<b>Protocol</b>	EtherCAT	EtherCAT
	 <p>The EP1111 has three decimal ID switches, with which a group of EtherCAT components can be assigned an ID. This group can be present in any position in the EtherCAT network, as a result of which variable topologies and Hot Connect groups can be realised in a simple manner. The EtherCAT connection is established via shielded M8 screw connectors with direct display of link and activity status.</p>	 <p>The 2-port EtherCAT junction enables configuration of EtherCAT star topologies. A modular EtherCAT star can be realised by using several EP1122 units in a station. Individual devices or complete EtherCAT strands can be connected at the junction ports. The EtherCAT junctions are connected via shielded M8 screw connectors with direct display of link and activity status. Through TwinCAT and other suitable EtherCAT masters the EP1122 also supports coupling and uncoupling of EtherCAT strands during operation (Hot Connect).</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Distributed clocks</b>	–	–
<b>Bus interface</b>	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
<b>Number of EtherCAT ports</b>	–	2
<b>Number of configurable IDs</b>	4,096	–
<b>Data transfer medium</b>	EtherCAT cable	EtherCAT cable
<b>Distance between stations</b>	100 m (100BASE-TX)	100 m (100BASE-TX)
<b>Current consumption</b>	typ. 120 mA	typ. 220 mA
<b>Sensor supply</b>	–	–
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL	CE, UL, Ex
<b>Further information</b>	<a href="http://www.beckhoff.com/EP1111">www.beckhoff.com/EP1111</a>	<a href="http://www.beckhoff.com/EP1122">www.beckhoff.com/EP1122</a>

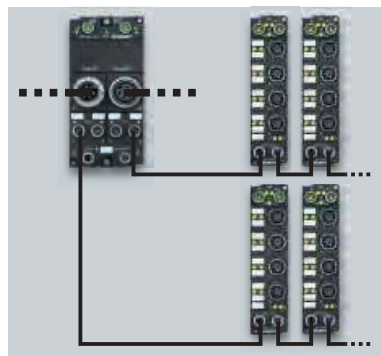
# System | Power distribution for EtherCAT Box modules

The EP9214-0023 and EP9224-0023 EtherCAT Box modules enable connection of four EtherCAT Box power supply branches. In each 24 V branch the current consumption for the control voltage  $U_s$  and the peripheral voltage  $U_P$  is monitored, limited, and, if necessary, switched off.

The power distribution is supplied via a 7/8" connector with up to 16 A (per voltage supply  $U_s/U_P$ ). Several modules can be configured in a cascade arrangement. In the event of a short-circuit in one of the four (eight) outputs, the affected output is switched off. The supply for the other branches remains active. The switch-off and control is done in such a way that the input voltage does not fall below 21 V. During startup consumers with large capacities can be added without problem.

The master can read diagnostic messages from the individual channels via the EtherCAT interface. Independent switching of individual consumer branches is also possible via the EtherCAT master.

With the EP9224-0023 the input voltage and current values of all outputs can be evaluated via the process data. A continuous data log of the relevant data can be retrieved when an error occurs in order to localise the cause of the error.



4/4-channel power distribution for EtherCAT Box modules

4/4-channel power distribution for EtherCAT Box modules with current measurement/data logging

Industrial housing	EP9214-0023	EP9224-0023
Number of outputs	4 x M8, 4-pin (per $U_s/U_P$ )	4 x M8, 4-pin (per $U_s/U_P$ )
Connection method	M8, 4-pin	M8, 4-pin
Max. output current	per M8: 4 A per $U_s$ and $U_P$	per M8: 4 A per $U_s$ and $U_P$
Load type	EtherCAT Box modules	EtherCAT Box modules
Protocol	EtherCAT	EtherCAT
Infeed	plug 7/8", max. 16 A per $U_s/U_P$	plug 7/8", max. 16 A per $U_s/U_P$
Power feed through	socket 7/8", max. 16 A per $U_s/U_P$	socket 7/8", max. 16 A per $U_s/U_P$
Signalling contact	potential-free make contact, M8	potential-free make contact, M8
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	–	–
Bus interface	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
Electrical isolation	500 V	500 V
Data logging	–	recording of relevant data in case of failure
Special features	energy-efficient switching on and off of EtherCAT devices	input voltages/currents, output currents via process data
Operating temperature	-25...+60 °C	-25...+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	<a href="http://www.beckhoff.com/EP9214">www.beckhoff.com/EP9214</a>	<a href="http://www.beckhoff.com/EP9224">www.beckhoff.com/EP9224</a>

Accessories see page 518

# System | PROFINET RT EtherCAT Box

The EP9300-0022 EtherCAT Box connects PROFINET RT networks to the EtherCAT Box modules (EPxxxx, EQxxxx and ERxxxx) and converts the telegrams from PROFINET RT to EtherCAT. One station consists of an EP9300-0022 and any number of EtherCAT Box modules. The box is connected to PROFINET RT via a d-coded M12 socket. In EtherCAT, the PROFINET RT box has at its disposal a lower-level, powerful and ultra-fast I/O system with a large selection of EtherCAT Box modules. The EP9300-0022 supports the PROFINET RT profile and fits seamlessly into PROFINET RT networks.



PROFINET RT EtherCAT Box

<b>Industrial housing</b>	EP9300-0022
<b>Task within EtherCAT system</b>	coupling of standard digital and analog EtherCAT Box modules to PROFINET RT networks
<b>Number of EtherCAT Box modules</b>	depending on the process data size
<b>Protocol</b>	PROFINET RT
<b>Data transfer rates</b>	10/100 Mbaud

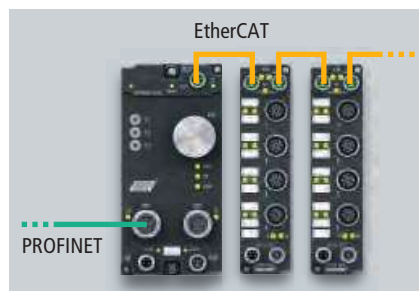


1 Tx+  
2 Rx+  
3 Rx-  
4 Tx-

35 g



1 Tx+  
2 Rx+  
3 Rx-  
4 Tx-  
SHLD Shield



<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Bus interface</b>	2 x M12 socket, d-coded (switched)
<b>Type/number of peripheral signals</b>	depending on the process data size
<b>Configuration</b>	automatic
<b>Power supply</b>	24 V DC (-15 %/+20 %)
<b>Electrical isolation</b>	500 V
<b>Special features</b>	potted, shock- and vibration-resistant
<b>Operating temperature</b>	0...+55 °C (-25...+60 °C in preparation)
<b>Approvals</b>	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EP9300">www.beckhoff.com/EP9300</a>



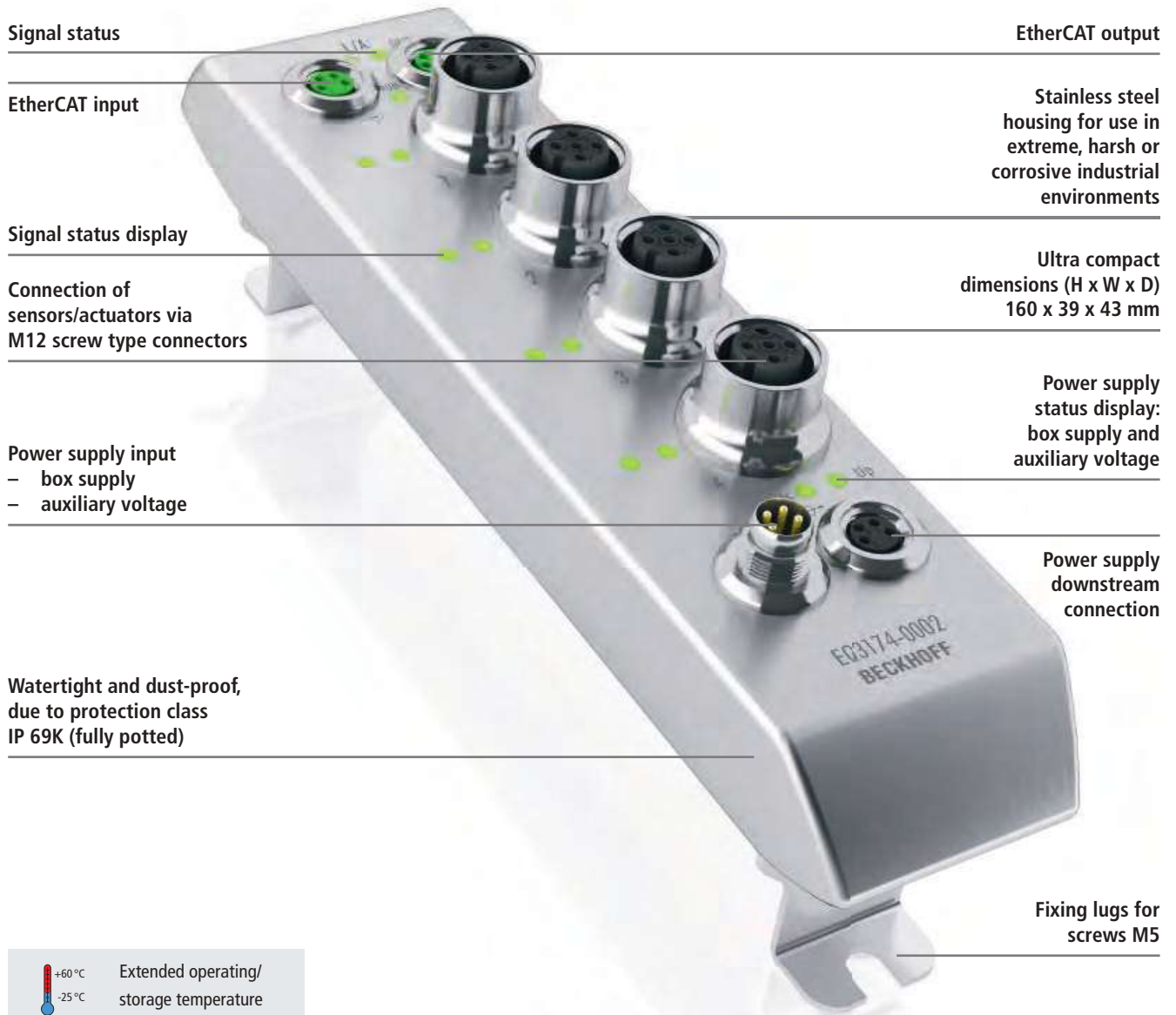


# EQxxxx | EtherCAT Box (stainless steel housing)

EtherCAT®

EtherCAT Box

504



Signal status

EtherCAT output

EtherCAT input

Stainless steel housing for use in extreme, harsh or corrosive industrial environments

Signal status display

Ultra compact dimensions (H x W x D)  
160 x 39 x 43 mm

Connection of sensors/actuators via M12 screw type connectors

Power supply status display: box supply and auxiliary voltage

Power supply input  
– box supply  
– auxiliary voltage

Power supply downstream connection

Watertight and dust-proof, due to protection class IP 69K (fully potted)

Fixing lugs for screws M5



Extended operating/  
storage temperature



4 x M12



8 x M12

The Beckhoff EtherCAT Box system is complemented by modules in stainless steel design. The modules of the EQxxxx series feature “Hygienic Design” throughout. They can be used in extreme, harsh and corrosive industrial environments and are therefore ideal for applications in the food, chemical or pharmaceutical industries, which require protection class IP 69K.

The stainless steel EtherCAT Box modules cover the typical range of requirements of I/O signals: digital inputs with a filter of 3.0 ms, digital outputs with 0.5 A output current, and combi modules with freely selectable digital inputs or outputs. In addition, analog input modules for current/voltage measurement

are available. Temperature measurement modules for resistance sensors or thermocouples complement the product range. The signals are connected via M12 connectors.

The modules of the EQxxxx series have an EtherCAT interface. The power supply and transfer takes place via M8 connectors or sockets.

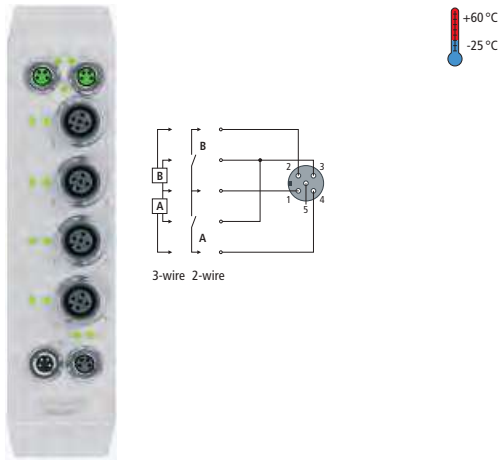
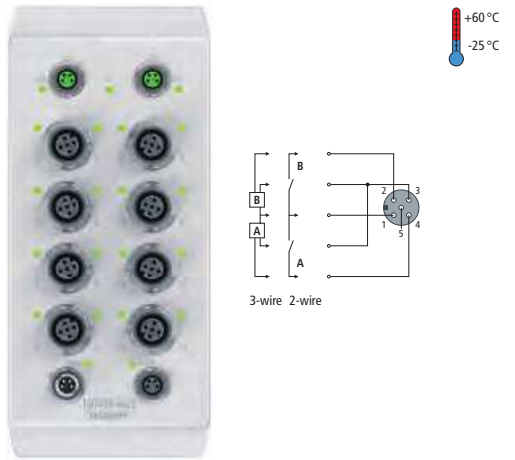
### EQxxxx-00yz

2 = connector M12, screw type, 5-pin


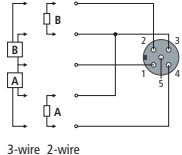


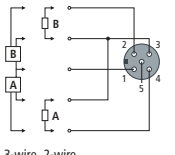

0 = width: 39 mm  
2 = width: 72 mm

Signals see page 506

## Digital input | 24 V DC, positive switching

	8-channel digital input, 24 V DC, M12, type 1/3	16-channel digital input, 24 V DC, M12, type 1/3
<b>Technical data</b>	<b>EQ1008-0002</b>	<b>EQ1809-0022</b>
<b>Connection technology</b>	M12, screw type	M12, screw type
<b>Specification</b>	EN 61131-2, type 1/3	EN 61131-2, type 1/3
<b>Input filter</b>	3.0 ms	3.0 ms
<b>Number of inputs</b>	8	16
	 <p>The EQ1008 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are connected via M12 screw type connectors.</p> <p>The sensors are supplied from the box supply voltage <math>U_s</math>. The auxiliary voltage <math>U_r</math> is not used in the input module, but may be connected in order to be relayed downstream.</p>	 <p>The EQ1809 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are connected via M12 screw type connectors.</p> <p>The sensors are supplied from the box supply voltage <math>U_s</math>. The auxiliary voltage <math>U_r</math> is not used in the input module, but may be connected in order to be relayed downstream.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Protocol</b>	EtherCAT	EtherCAT
<b>Bus interface</b>	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
<b>Distributed clocks</b>	–	–
<b>Sensor supply</b>	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	130 mA	130 mA
<b>Electrical isolation</b>	500 V	500 V
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EQ1008">www.beckhoff.com/EQ1008</a>	<a href="http://www.beckhoff.com/EQ1809">www.beckhoff.com/EQ1809</a>

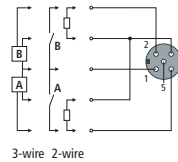
# Digital output | 24 V DC, positive switching

	8-channel digital output, 24 V DC, M12, $I_{MAX} = 0.5 \text{ A}$	16-channel digital output, 24 V DC, M12, $I_{MAX} = 0.5 \text{ A}$
<b>Technical data</b>	<b>EQ2008-0002</b>	<b>EQ2809-0022</b>
<b>Connection technology</b>	M12, screw type	M12, screw type
<b>Load type</b>	ohmic, inductive, lamp load	ohmic, inductive, lamp load
<b>Max. output current</b>	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
<b>Number of outputs</b>	8	16
	   <p>The EQ2008 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A. The signals are connected via M12 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.</p>	   <p>The EQ2809 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 0.5 A current. The signal state is indicated by means of light emitting diodes. The signals are connected via M12 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	120 mA	130 mA
<b>Distributed clocks</b>	–	–
<b>Short circuit current</b>	typ. 1.5 A	typ. 1.5 A
<b>Auxiliary power current</b>	typ. 20 mA + load	typ. 20 mA + load
<b>Electrical isolation</b>	500 V	500 V
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EQ2008">www.beckhoff.com/EQ2008</a>	<a href="http://www.beckhoff.com/EQ2809">www.beckhoff.com/EQ2809</a>

# Digital combi | 24 V DC, positive switching

16-channel digital input or output,  
24 V DC, M12,  $I_{\text{MAX}} = 0.5 \text{ A}$

<b>Technical data</b>	<b>EQ2339-0022</b>
<b>Connection technology</b>	M12, screw type
<b>Specification</b>	EN 61131-2, type 1/3
<b>Input filter</b>	3.0 ms
<b>Number of channels</b>	16 digital inputs or outputs



The EQ2339 EtherCAT Box has 16 digital inputs or outputs in one device. A filter constant of 3.0 ms is available for the inputs. The outputs are short-circuit-proof and protected against inverse polarity. They handle load currents of up to 0.5 A each, although the total current is limited to 4 A. The signals are connected via M12 screw type connectors. The sensors are powered by the load voltage  $U_s$ .

<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Max. output current</b>	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
<b>Load type</b>	ohmic, inductive, lamp load
<b>Sensor supply</b>	from load supply voltage, max. 0.5 A total, short-circuit-proof
<b>Distributed clocks</b>	–
<b>Short circuit current</b>	typ. 1.5 A
<b>Auxiliary power current</b>	typ. 20 mA + load
<b>Current consumption from <math>U_s</math> (without sensor current)</b>	130 mA
<b>Electrical isolation</b>	500 V
<b>Operating temperature</b>	-25...+60 °C
<b>Approvals</b>	CE, UL
<b>Further information</b>	<a href="http://www.beckhoff.com/EQ2339">www.beckhoff.com/EQ2339</a>



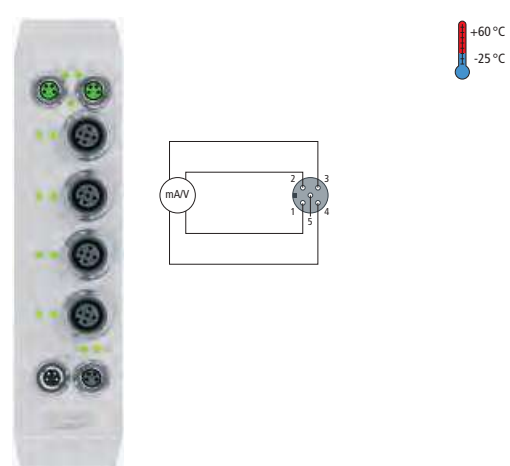
# Analog input | -10...+10 V, 0/4...20 mA, temperature


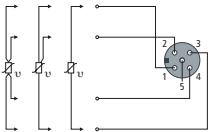


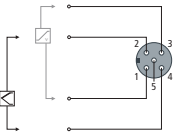

The EQ3174 EtherCAT Box evaluates analog standard signals within the range of -10/0 V to +10 V or 0/4 mA to 20 mA with 16-bit resolution. The signal form is separately configurable for each channel. The EQ3174 evaluates the difference between the two input signals Input+ and Input-. These must be referred to the ground potential of the load voltage  $U_r$ . The DC component does not affect the measurement, as long as it is in the common mode range.

The EQ3204 analog input module is intended for the direct connection of resistance thermometers. The resistance is measured with a low measuring current, linearised and represented in 0.1 °C. The EtherCAT Box supports 2-, 3- and 4-wire measurement on all four channels. The measurements serve to eliminate or deduct the parasitic resistance of the sensor cable. All inputs are separately configurable for a wide range of sensors, for the three measurement procedures and for the direct measurement of resistance.

The EQ3314 EtherCAT Box enables the measurement of temperature using thermocouples. The measured thermovoltage is linearised in accordance with the characteristic of the respective type and transferred to the controller as a temperature value in 1/10 °C or 1/100 °C. The inputs are separately configurable for a wide range of different sensor types. Parasitic thermovoltages arise at the interface of the measuring cable and the module, significantly falsifying the measurement. This error is eliminated by a compensation connector.

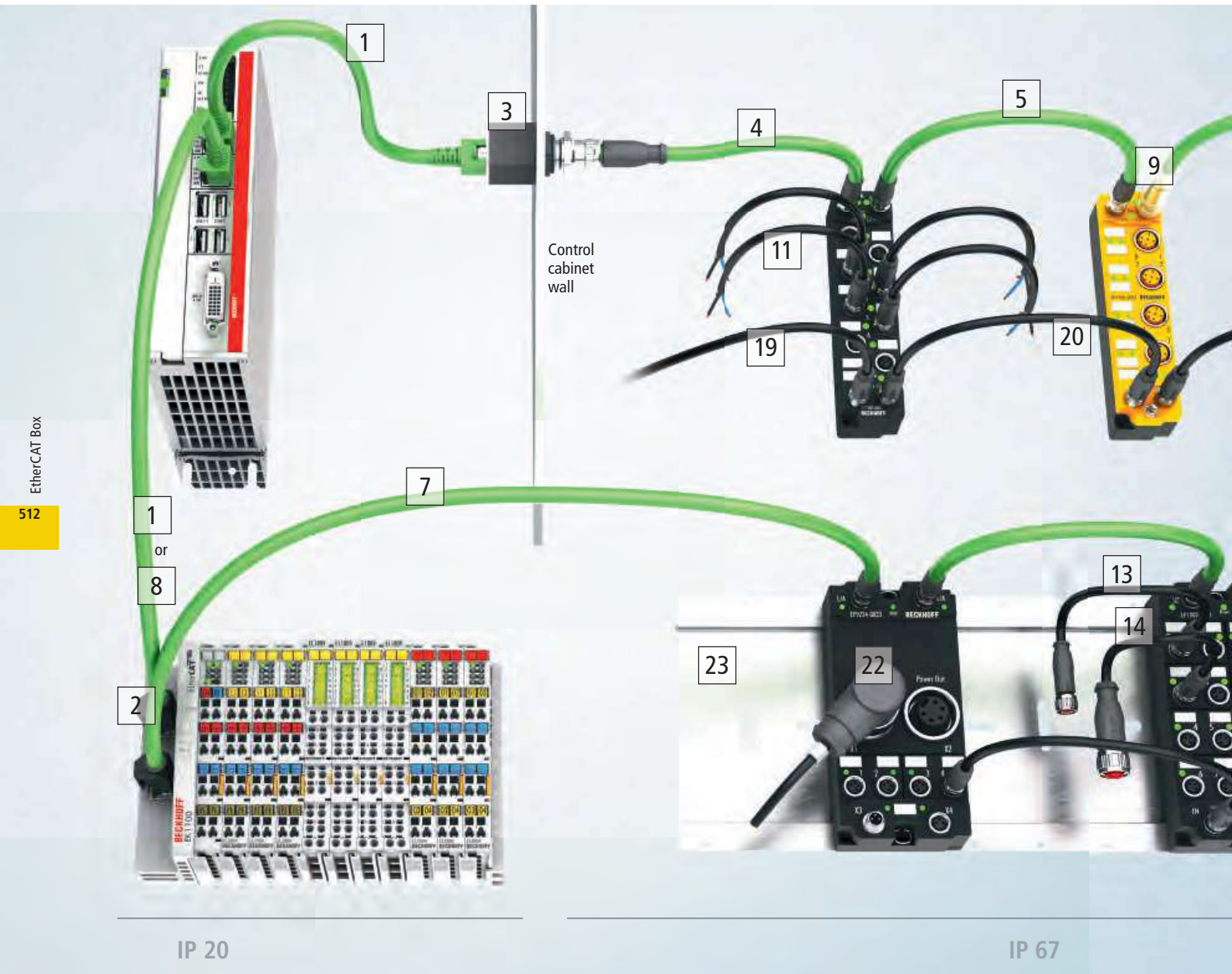
4-channel analog input,  
-10/0...+10 V or 0/4...20 mA,  
parameterisable, differential input,  
16 bit

Technical data	EQ3174-0002
Connection technology	M12, screw type
Signal type	-10/0...+10 V   0/4...20 mA
Resolution	16 bit (incl. sign)
Conversion time	~ 100 µs
Number of inputs	4
	
	<p>The EQ3174 EtherCAT Box has four analog inputs which can be individually parameterised, so that they process signals either in the -10...+10 V or the 0/4...20 mA range. The voltage or input current is digitised with a resolution of 16 bit, and is transmitted (electrically isolated) to the higher-level automation device. The four input channels have differential inputs and have a common, internal ground potential. The input filter and therefore the conversion times are configurable in a wide range.</p>
Measuring error	< ±0.3 % (relative to full scale value)
Distributed clocks	yes
Sensor types	–
Measuring range	–
Internal resistance	> 200 kΩ   85 Ω typ. + diode voltage
Sensor supply	from load supply voltage $U_r$ , DC, any value up to 30 V
Current consumption from $U_s$ (without sensor current)	120 mA
Operating temperature	-25...+60 °C
Approvals	CE, UL
Further information	<a href="http://www.beckhoff.com/EQ3174">www.beckhoff.com/EQ3174</a>

	4-channel analog input, PT100 (RTD), parameterisable, 16 bit	4-channel analog input, thermocouple/mV, parameterisable, 16 bit
	<b>EQ3204-0002</b>	<b>EQ3314-0002</b>
	M12, screw type	M12, screw type
	PT100	thermocouple
	0.1 °C per digit	0.1 °C per digit
	800 ms up to 2 ms, see documentation, default: approx. 85 ms	2.5 s up to 20 ms, see documentation, default: approx. 250 ms
	4	4
	   <p>The EQ3204 EtherCAT Box with analog inputs allows resistance sensors to be connected directly. The module's circuitry can operate the sensors using 2-, 3- or 4-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The module can also be used for simple resistance measurement. The module's standard settings are: resolution 0.1°C in the temperature range of PT100 sensors in 2-wire connection.</p>	   <p>The EQ3314 EtherCAT Box with analog inputs permits four thermocouples to be connected directly. The module's circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The EQ3314 can also be used for mV measurement.</p>
	< ±0.5 °C for PT sensors (further types see documentation)	< ±0.3 % for type K (relative to full scale value), further types see documentation
	–	–
	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω...1.2/4 kΩ)	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)	depending on sensor type; preset value is type K, -100...+1,370 °C
	–	–
	–	–
	120 mA	120 mA
	-25...+60 °C	-25...+60 °C
	CE, UL	CE, UL
	<a href="http://www.beckhoff.com/EQ3204">www.beckhoff.com/EQ3204</a>	<a href="http://www.beckhoff.com/EQ3314">www.beckhoff.com/EQ3314</a>



# Accessories EtherCAT Box



## IP 20 | EtherCAT

- 1** ZK1090-9191-0xxx | RJ45 Industrial Ethernet/ EtherCAT patch cable 446
- 2** ZS1090-0003 | Ethernet/EtherCAT RJ45 connector, 4-pin, IP 20, for field assembly 516

## IP 67 | EtherCAT

- 3** ZK1090-6292-0000 | M12 flange, straight, d-coded, 4-pin – RJ45 plug, straight 515

- 4** ZK1090-3161-xxxx | M8 plug, straight, 4-pin – M12 plug, straight, 4-pin 514
- 5** ZK1090-3131-xxxx | M8 plug, straight, 4-pin – M8 plug, straight, 4-pin, Highflex 514
- 6** ZK1090-3100-xxxx | M8 plug, straight, 4-pin – open end 514
- 7** ZK1090-3191-xxxx | RJ45 plug, straight, 4-pin – M8 plug, straight, 4-pin 514
- 8** ZB9010 | Industrial Ethernet/EtherCAT cable, fixed installation, CAT 5e, 4 wires, SF/UTP 690



- 8 ZB9020 | Industrial Ethernet/EtherCAT cable, drag-chain suitable, CAT 5e, 4 wires, SF/UTP 514
- 9 ZS1090-1006 | M8 plug, with shield, for field assembly 516
- 10 ZB9030 | EtherCAT/Ethernet cable, PVC, with shield 514  
 ZB9032 | EtherCAT/Ethernet cable, PUR, drag-chain suitable, Highflex 514

► [www.beckhoff.com/EtherCAT-cables](http://www.beckhoff.com/EtherCAT-cables)

#### IP 67 | Sensor

- 11 ZK2000-2100-xxxx | M8 plug, straight, 3-pin – open end 519
- 12 ZK2000-6100-xxxx | M12 plug, straight, 4-pin – open end 520
- 13 ZK2000-2122-xxxx | M8 plug, straight, 3-pin – M8 socket, straight, 3-pin 519
- 14 ZK2000-2162-xxxx | M8 plug, straight, 3-pin – M12 socket, straight, 4-pin 519
- 15 ZK2000-6162-xxxx | M12 plug, straight, 4-pin – M12 socket, straight, 4-pin 520
- 16 ZK2000-6500-xxxx | M12 plug, 4-pin – 2 x open end 521
- 17 ZK2000-6522-xxxx | M12 plug, 4-pin – 2 x M8 socket, straight, 3-pin 521
- 18 ZS2000-2630 | M12 plug, angled, for field assembly 523

► [www.beckhoff.com/sensor-cables](http://www.beckhoff.com/sensor-cables)

#### IP 67 | Power

- 19 ZK2020-3200-xxxx | M8 socket, straight, 4-pin – open end 517
- 20 ZK2020-3132-xxxx | M8 plug, straight, 4-pin – M8 socket, straight, 4-pin 517
- 21 ZS2000-2331 | M8 plug, angled, for field assembly 522
- 22 ZK2030-1xxx-xxxx | 7/8"-socket, angled, 5-pin 518

► [www.beckhoff.com/power-cables](http://www.beckhoff.com/power-cables)

#### Accessories

- 23 ZS5300-0011 | mounting plate for 15 Extension Box or EtherCAT Box modules, stainless steel, 500 mm 524
- 24 ZS5000-0020 | covering stopper M12, IP 67 (50 pieces) 524

**Note:** The pictured products give examples of the wide range of EtherCAT Box accessories. For further variants and connection possibilities please see the respective catalog pages.

# Cables

## Pre-assembled cables

Accessories for fieldbus components include a wide range of cable assemblies. For clarity, the order numbers are listed without cable length information in the following tables. For detailed ordering information referencing the cable length please see the web pages or the price list.

For technical data sheets see ► [www.beckhoff.com/datasheets](http://www.beckhoff.com/datasheets)

## M8 | EtherCAT cable

### For highly flexible applications

Ordering information	Sold by the metre
ZB9032	PUR, HIGHFLEX, 4-wire, S/UTP, AWG26, drag-chain suitable, green

Ordering information	AWG26 cable, pre-assembled with M8 plug (4-pin/straight) to	Pict.
ZK1090-3100-0xxx	open end	A
ZK1090-3131-0xxx	M8 plug (4-pin/straight)	B
ZK1090-3132-0xxx	M8 socket (4-pin/straight)	C
ZK1090-3134-0xxx	M8 socket (4-pin/angled)	D
ZK1090-3161-0xxx	M12 plug (4-pin/straight), d-coded	E
ZK1090-3163-0xxx	M12 plug (4-pin/angled), d-coded	F
ZK1090-3166-0xxx	M12 socket flange (4-pin/straight), d-coded	G
ZK1090-3191-0xxx	RJ45 plug (straight)	H

Ordering information	AWG26 cable, pre-assembled with M8 socket (4-pin/straight) to	Pict.
ZK1090-3200-0xxx	open end	I
ZK1090-3232-0xxx	M8 socket (4-pin/straight)	J
ZK1090-3291-0xxx	RJ45 plug (straight)	K

Ordering information	AWG26 cable, pre-assembled with M8 plug (4-pin/angled) to	Pict.
ZK1090-3333-0xxx	M8 plug (4-pin/angled)	L

### For flexible applications

Ordering information	Sold by the metre
ZB9020	PUR, FLEX, 4-wire, SF/UTP, AWG22, CAT 5e, drag-chain suitable, green

Ordering information	AWG22 cable, pre-assembled with M8 plug (4-pin/straight) to	Pict.
ZK1090-3100-1xxx	open end	A
ZK1090-3131-1xxx	M8 plug (4-pin/straight)	B
ZK1090-3132-1xxx	M8 socket (4-pin/straight)	C
ZK1090-3161-1xxx	M12 plug (4-pin/straight), d-coded	E
ZK1090-3191-1xxx	RJ45 plug (straight)	H

### For fixed installation

Ordering information	Sold by the metre
ZB9030	PVC, STANDARD, 4-wire, SF/UTP, AWG26, green

Ordering information	Cable, pre-assembled with M8 plug (4-pin/straight) to	Pict.
ZK1090-3100-3xxx	open end	A
ZK1090-3131-3xxx	M8 plug (4-pin/straight)	B
ZK1090-3132-3xxx	M8 socket (4-pin/straight)	C
ZK1090-3191-3xxx	RJ45 plug (straight)	H



## M12 | Ethernet/EtherCAT cable

For highly flexible applications

Ordering information	Sold by the metre
ZB9032	PUR, HIGHFLEX, 4-wire, S/UTP, AWG26, drag-chain suitable, green

Ordering information	Cable, d-coded and pre-assembled with M12 plug (4-pin/straight) to	Pict.
ZK1090-6100-4xxx	open end	M
ZK1090-6161-4xxx	M12 plug (4-pin/straight), d-coded	N
ZK1090-6191-4xxx	RJ45 plug (straight)	O

Ordering information	Cable, d-coded and pre-assembled with M12 socket flange (4-pin/straight) to	Pict.
ZK1090-6600-4xxx	open end	P
ZK1090-6292-4xxx	RJ45 plug (straight)	Q

For flexible applications

Ordering information	Sold by the metre
ZB9020	PUR, FLEX, 4-wire, SF/UTP, AWG22, CAT 5e, drag-chain suitable, green

Ordering information	Cable, d-coded and pre-assembled with M12 plug (4-pin/straight) to	Pict.
ZK1090-6100-0xxx	open end	M
ZK1090-6161-0xxx	M12 plug (4-pin/straight), d-coded	N
ZK1090-6166-0xxx	M12 socket flange (4-pin/straight), d-coded	R
ZK1090-6191-0xxx	RJ45 plug (straight)	O

Ordering information	Cable, d-coded and pre-assembled with M12 socket flange (4-pin/straight) to	Pict.
ZK1090-6600-0xxx	open end	P
ZK1090-6292-0xxx	RJ45 plug (straight)	Q

Ordering information	Cable, d-coded and pre-assembled with M12 plug (4-pin/angled) to	Pict.
ZK1090-6300-0xxx	open end	S
ZK1090-6363-0xxx	M12 plug (4-pin/angled), d-coded	

## For fixed installation

Ordering information	Sold by the metre
ZB9010	PVC, STANDARD, 4-wire, SF/UTP, AWG22, CAT 5e, green

Ordering information	Cable, d-coded and pre-assembled with M12 plug (4-pin/straight) to	Pict.
ZK1090-6191-3xxx	RJ45 plug (straight)	O



## Ethernet/EtherCAT connectors

Ordering information	RJ45 Ethernet/EtherCAT connectors IP 20 and IP 65/67	Pict.
ZS1090-0002	RJ45 plug, IP 65/67, 8-pin, AWG24-26	T
ZS1090-0003	RJ45 plug EtherCAT/Ethernet, IP 20, 4-pin, field assembly, AWG22-24, PU = 10	
ZS1090-0005	RJ45 plug EtherCAT/Ethernet, IP 20, 8-pin, supports Gbit, field assembly, AWG22-26, PU = 10	

Ordering information	M8 Ethernet/EtherCAT connectors IP 65/67
ZS1090-1006	M8 plug (4-pin/straight), EtherCAT/Ethernet, metal version, IP 65/67, OD ≤ 6.5 mm
ZS1090-1007	M8 socket (4-pin/straight), EtherCAT/Ethernet, metal version, IP 65/67, OD ≤ 6.5 mm

Ordering information	M12 Ethernet/EtherCAT connectors IP 65/67	Pict.
ZS1090-0004	M12 plug, d-coded, IP 65/67, AWG18-24	U
ZS1090-0010	M12 socket, d-coded, IP 65/67, AWG18-24	
ZK1090-6292-0000	adapter M12 socket to RJ45 socket (straight)	V



Illustrations similar

## M8 | Power cable

### For flexible applications

Ordering information	Sold by the metre	
ZB9050	PUR, FLEX, 4-wire, 4 x 0.34 mm <sup>2</sup> , drag-chain suitable, black	
Ordering information	Cable, pre-assembled with M8 socket (4-pin/straight) to	Pict.
ZK2020-3132-0xxx	M8 plug (4-pin/straight)	W
ZK2020-3200-0xxx	open end, 4-wire	a
Ordering information	Cable, pre-assembled with M8 socket (4-pin/angled) to	Pict.
ZK2020-3332-0xxx	M8 plug (4-pin/straight)	X
ZK2020-3334-0xxx	M8 plug (4-pin/angled)	Y
ZK2020-3400-0xxx	open end, 4-wire	Z

### For fixed installation

Ordering information	Sold by the metre	
ZB9051	PVC, STANDARD, 4-wire, 4 x 0.34 mm <sup>2</sup> , grey	
Ordering information	Cable, pre-assembled with M8 socket (4-pin/straight) to	Pict.
ZK2020-3132-3xxx	M8 plug (4-pin/straight)	W
ZK2020-3200-3xxx	open end, 4-wire	a



## 7/8" | Power cable

For flexible applications 1.5 mm<sup>2</sup>

Ordering information	Material specification	
ZB9050-0007	TPE-U (PUR), FLEX, 5-wire, 5 x 1.5 mm <sup>2</sup> , 5Li 9Y11Y, drag-chain suitable, black	
Ordering information	Cable, pre-assembled with 7/8" socket (5-pin/straight) to	Pict.
ZK2030-1200-0xxx	open end	b
ZK2030-1112-0xxx	7/8" plug (5-pin/straight)	c
Ordering information	Cable, pre-assembled with 7/8" socket (5-pin/angled) to	Pict.
ZK2030-1400-0xxx	open end	d
ZK2030-1314-0xxx	7/8" plug (5-pin/angled)	e
ZK2030-1114-0xxx	7/8" plug (5-pin/straight)	f

For flexible applications 2.5 mm<sup>2</sup>

Ordering information	Material specification	
ZK2031-xxxx-0xxx	TPE-U (PUR), FLEX, 5-wire, 5 x 2.5 mm <sup>2</sup> , 5Li 9Y11Y, drag-chain suitable, black	
Ordering information	Cable, pre-assembled with 7/8" socket (5-pin/straight) to	Pict.
ZK2031-1200-0xxx	open end	b
Ordering information	Cable, pre-assembled with 7/8" socket (5-pin/angled) to	Pict.
ZK2031-1400-0xxx	open end	d



## M8 | Sensor cable

For flexible applications

Ordering information	Sold by the metre
ZB9040	PUR, FLEX, 3-wire, 3 x 0.25 mm <sup>2</sup> , drag-chain suitable, black

Ordering information	Cable, pre-assembled with M8 plug (3-pin/straight) to	Pict.
ZK2000-2100-0xxx	open end	g
ZK2000-2122-0xxx	M8 socket (3-pin/straight)	h
ZK2000-2124-0xxx	M8 socket (3-pin/angled)	i
ZK2000-2132-0xxx	M8 socket (4-pin/straight)	
ZK2000-2162-0xxx	M12 socket (4-pin/straight)	
ZK2000-2164-0xxx	M12 socket (4-pin/angled)	

Ordering information	Cable, pre-assembled with M8 socket (3-pin/straight) to	
ZK2000-2200-0xxx	open end	

Ordering information	Cable, pre-assembled with M8 plug (3-pin/angled) to	Pict.
ZK2000-2300-0xxx	open end	j
ZK2000-2322-0xxx	M8 socket (3-pin/straight)	k
ZK2000-2324-0xxx	M8 socket (3-pin/angled)	l
ZK2000-2362-0xxx	M12 socket (4-pin/straight)	
ZK2000-2364-0xxx	M12 socket (4-pin/angled)	

Ordering information	Cable, pre-assembled with M8 socket (3-pin/angled) to	Pict.
ZK2000-2400-0xxx	open end	m

Ordering information	Sold by the metre	
ZB9041	PUR, FLEX, 4-wire, 4 x 0.25 mm <sup>2</sup> , drag-chain suitable, black	

Ordering information	Cable, pre-assembled with M8 plug (4-pin/straight) to	
ZK2000-3100-0xxx	open end	
ZK2000-3122-0xxx	M8 socket (3-pin/straight)	
ZK2000-3124-0xxx	M8 socket (3-pin/angled)	

Ordering information	Cable, pre-assembled with M8 plug (4-pin/angled) to	
ZK2000-3300-0xxx	open end	

Ordering information	Cable, pre-assembled with DUO M8 plug (4-pin/straight) to	Pict.
ZK2000-3500-0xxx	2 x open cable end, 3-wire	n
ZK2000-3522-0xxx	2 x M8 socket (3-pin/straight)	o
ZK2000-3532-0xxx	2 x M8 socket (4-pin/straight)	p

### For fixed installation 3 x 0.25 mm<sup>2</sup>

Ordering information	Sold by the metre	
ZB9042	PVC, STANDARD, 3-wire, 3 x 0.34 mm <sup>2</sup> , grey	

### For fixed installation 4 x 0.25 mm<sup>2</sup>

Ordering information	Sold by the metre	
ZB9043	PVC, STANDARD, 4-wire, 4 x 0.25 mm <sup>2</sup> , grey	

Ordering information	Cable, pre-assembled with M8 socket (4-pin/straight) to	Pict.
ZK2000-3132-3xxx	M8 plug (4-pin/straight)	q





## M12 | Sensor cable

For flexible applications

<b>Ordering information</b>	<b>Sold by the metre</b>	
ZB9041	PUR, FLEX, 4-wire, 4 x 0.25 mm <sup>2</sup> , drag-chain suitable, black	
<b>Ordering information</b>	<b>Cable, pre-assembled with M12 plug (4-pin/straight) to</b>	<b>Pict.</b>
ZK2000-6100-0xxx	open end	r
ZK2000-6162-0xxx	M12 socket (4-pin/straight)	
ZK2000-6164-0xxx	M12 socket (4-pin/angled)	
<b>Ordering information</b>	<b>Cable, pre-assembled with M12 socket (4-pin/straight) to</b>	<b>Pict.</b>
ZK2000-6200-0xxx	open cable end, 4-wire	s
<b>Ordering information</b>	<b>Cable, pre-assembled with M12 plug (4-pin/angled) to</b>	<b>Pict.</b>
ZK2000-6300-0xxx	open end	t
ZK2000-6362-0xxx	M12 socket (4-pin/straight)	

Ordering information	Cable, pre-assembled with M12 socket (4-pin/angled) to	Pict.
ZK2000-6400-0xxx	open cable end, 4-wire	<a href="#">u</a>
Ordering information	Cable, pre-assembled with M12 plug DUO (4-pin/straight) to	Pict.
ZK2000-6500-0xxx	2 x open cable end, 4-wire	<a href="#">v</a>
ZK2000-6522-0xxx	2 x M8 socket (3-pin/straight)	
ZK2000-6562-0xxx	2 x M12 socket (4-pin/straight)	

## For fixed installation

Ordering information	Sold by the metre
ZB9043	PVC, STANDARD, 4-wire, 4 x 0.25 mm <sup>2</sup> , grey



## M12 | Sensor cable, shielded

### For flexible applications

Ordering information	Cable, pre-assembled with M12 plug (5-pin/straight) incl. shield to	Pict.
ZK2000-7100-0xxx	open end, 5-wire incl. shield	<a href="#">w</a>
ZK2000-7122-0xxx	M8 socket (3-pin/angled) shielded	<a href="#">x</a>
ZK2000-7171-0xxx	M12 plug (5-pin/straight), shielded	<a href="#">y</a>
ZK2000-7172-0xxx	M12 socket (5-pin/straight), shielded	<a href="#">z</a>



# Connectors

For field installation Beckhoff offers a selection of connectors for different cable cross-sections.

## M8 | Connectors for field assembly

### Plugs

Ordering information	Plugs, 3-pin, field assembly	Pict.
ZS2000-1213	straight version, insulation displacement connection	
ZS2000-2210	straight version, screw type connection	AA

Ordering information	Plugs, 4-pin, field assembly	Pict.
ZS2000-1313	straight version, insulation displacement connection	
ZS2000-2310	straight version, screw type connection	AA
ZS2000-2311	straight version, solder connection	AB
ZS2000-2331	angled version, solder connection	AC

### Sockets

Ordering information	Sockets, 3-pin, field assembly	Pict.
ZS2000-1223	straight version, insulation displacement connection	
ZS2000-2220	straight version, screw type connection	AD
ZS2000-2221	straight version, solder connection	AE
ZS2000-2241	angled version, solder connection	AF

Ordering information	Sockets, 4-pin, field assembly	Pict.
ZS2000-1323	straight version, insulation displacement connection	
ZS2000-2320	straight version, screw type connection	AD
ZS2000-2321	straight version, solder connection	AE
ZS2000-2341	angled version, solder connection	AF



Illustrations similar

## M12 | Connectors for field assembly

### Plugs

Ordering information	Plugs, 4-pin, field assembly	Pict.
ZS2000-1613	straight version, insulation displacement connection, 4 A	
ZS2000-2610	straight version, screw type connection, 4 A	AG
ZS2000-2630	angled version, screw type connection, 4 A	AH
ZS2000-6610	straight version, screw type connection, 5 A	

Ordering information	Plugs, 4/5-pin, field assembly	Pict.
ZS2000-2710	straight version, screw type connection	AG
ZS2000-2730	angled version, screw type connection	AH
ZS2000-6710	straight version, shielded, screw type connection	

### Sockets

Ordering information	Sockets, 4-pin, field assembly	Pict.
ZS2000-2620	straight version, screw type connection, 4 A	AI
ZS2000-2640	angled version, screw type connection, 4 A	AJ
ZS2000-6620	straight version, screw type connection, 5 A	

Ordering information	Sockets, 4/5-pin, field assembly	Pict.
ZS2000-2720	straight version, screw type connection	AI
ZS2000-2740	angled version, screw type connection	AJ
ZS2000-6720	straight version, shielded, screw type connection	



Illustrations similar

## 7/8" | Connectors for field assembly

### Plugs

Ordering information	Plugs, 5-pin, field assembly
ZS2020-2810	7/8" plug, straight, field assembly, 5-pin
ZS2020-2830	7/8" plug, angled, field assembly, 5-pin

### Sockets

Ordering information	Sockets, 5-pin, field assembly
ZS2020-2820	7/8" socket, straight, field assembly, 5-pin
ZS2020-2840	7/8" socket, angled, field assembly, 5-pin

## Special connectors

Ordering information	
ZS2000-3711	M12 plug (5-pin/straight), for small cable cross sections, screw type connection
ZS2000-3712	M12 plug (5-pin/straight) for thermocouples with temperature compensation element, screw type connection
ZS2000-4722	M12 plug (4-pin/straight), splitter to 2 x M12
ZS2000-5911	M23 plug (12-pin/straight version), solder connection
ZS2002-0111	D-sub plug (25-pin/straight version), solder connection

## Further accessories EtherCAT Box and Fieldbus Box

Ordering information	Blanking plugs
ZS5000-0010	blanking plug, plastic (IP 67), for M8 socket, PU = 50
ZS5000-0020	blanking plug, plastic (IP 67), for M12 socket, PU = 50
ZS5000-0040	blanking plug, plastic (IP 67), for 7/8" socket, PU = 10
ZS5000-0041	blanking plug, plastic (IP 67), for 7/8" plug, PU = 10
ZS5000-0050	blanking plug, stainless steel (IP 69K), for M8 socket, PU = 2
ZS5000-0051	blanking plug, stainless steel (IP 69K), for M12 socket, PU = 4

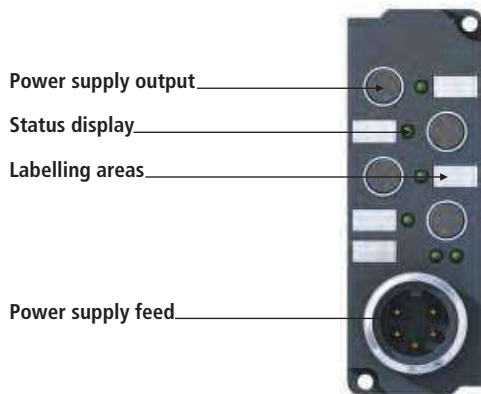
Ordering information	Fieldbus Box set
ZS5000-0000	Fieldbus Box set M8 (contact labels, blanking plugs)
ZS5000-0001	Fieldbus Box set 8 mm (contact labels, blanking plugs)
ZS5000-0002	Fieldbus Box set M12 (contact labels, blanking plugs)

Ordering information	Torque wrench
ZB8800	torque wrench for M8 cables with knurl, incl. ratchet
ZB8800-0001	ratchet, M12, for torque wrench ZB8800
ZB8800-0002	ratchet, M8 field assembly, for torque wrench ZB8800
ZB8801-0000	torque wrench for hexagonal plugs, adjustable
ZB8801-0001	torque cable key, M8/wrench size 9, for torque wrench ZB8801-0000
ZB8801-0002	torque cable key, M12/wrench size 13, for torque wrench ZB8801-0000
ZB8801-0003	torque cable key, M12F/wrench size 13, for torque wrench ZB8801-0000

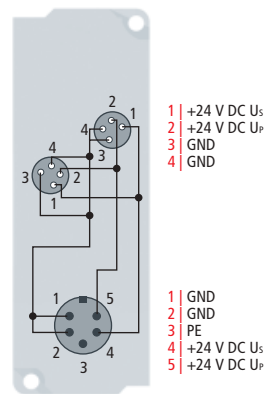
Ordering information	Mounting and marking material	Pict.
ZS5300-0001	mounting plate for 15 Extension Box or EtherCAT Box modules, stainless steel, 500 mm	AK
ZS5300-0011	mounting plate for 14 small or 7 wide EtherCAT Box modules, stainless steel, 500 mm	
ZS5300-0004	universal mounting bracket for a single small EtherCAT Box, stainless steel, 146 x 46 x 76 mm	
BG2000-0000	ATEX protective housing	
ZS5100-0000	marking labels, blank, 4 stripes à 10 pieces	
ZS5100-xxxx	marking labels, customised printing	



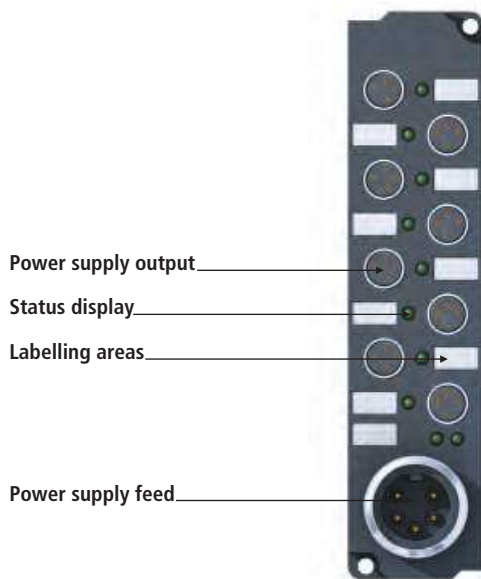
# Power distribution box



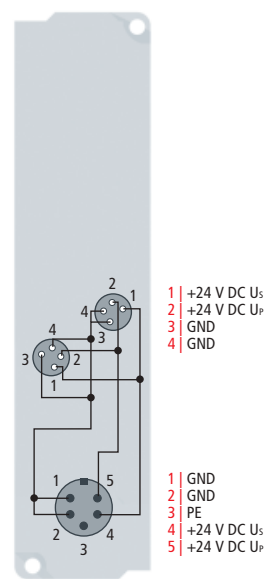
Power distribution box ZS2020-4304



Connector assignment



Power distribution box ZS2020-4308



Connector assignment

Technical data	ZS2020-4304	ZS2020-4308
Number of circuits	4	8
Power supply connection	7/8" plug, 5-pin	
Circuit connection	M8, screw type, 4-pin	
Current load	$I_{\Sigma} = 4 \text{ A}$	
Dimensions (W x H x D)	30 mm x 86 mm x 31 mm	30 mm x 126 mm x 31 mm
Operating temperature	-25...+60 °C	
Storage temperature	-40...+85 °C	
Protection class	IP 65/66/67 (according to EN 60529)	
Installation position	variable	

Accessories see page 514



EtherCAT®

# EtherCAT Plug-in Modules

Bus Terminals for circuit boards





EtherCAT® 

# EtherCAT Plug-in Modules

Efficient I/O solution for large-scale machine production

<b>530</b>	Product overview	<b>535</b>	<b>EtherCAT Couplers</b>	<b>540</b>	<b>EtherCAT plug-in modules special functions</b>
<b>532</b>	System description	<b>535</b>	EtherCAT Couplers E-bus	<b>540</b>	Motion EJ7xxx
<b>533</b>	Technical data	<b>536</b>	<b>EtherCAT plug-in modules digital I/O</b>	<b>541</b>	<b>System modules</b>
		<b>536</b>	Digital input EJ1xxx	<b>541</b>	System modules EJ9xxx
		<b>537</b>	Digital output EJ2xxx		
		<b>538</b>	<b>EtherCAT plug-in modules analog I/O</b>		
		<b>538</b>	Analog input EJ3xxx		
		<b>539</b>	Analog output EJ4xxx		

# Product overview EtherCAT plug-in modules

EtherCAT Couplers			
EtherCAT Couplers E-bus	EJ1100		535

EtherCAT plug-in modules   Digital input: EJ1xxx				
Signal	2-channel	4-channel	8-channel	16-channel
24 V DC (filter 3.0 ms)			EJ1008 type 3	EJ1809 type 3
			EJ1859 type 3, 8 inputs, 8 outputs, I <sub>MAX</sub> = 0.5 A	EJ1889 negative switching

EtherCAT plug-in modules   Digital output: EJ2xxx				
Signal	2-channel	4-channel	8-channel	16-channel
24 V DC (I <sub>MAX</sub> = 0.5 A)			EJ2008	EJ2809
			EJ1859 type 3, 8 inputs, 8 outputs, I <sub>MAX</sub> = 0.5 A	EJ2889 negative switching
PWM	EJ2502 24 V DC, 1.0 A			

EtherCAT plug-in modules   Analog input: EJ3xxx				
Signal	2-channel	4-channel	8-channel	16-channel
±10 V		EJ3004 single-ended, 12 bit	EJ3108 6 x differential inputs, 2 x single-ended, 16 bit	
Resistance thermometer (RTD)	EJ3202 16 bit	EJ3214 16 bit		

EN 61131-2 specification ► [www.beckhoff.com/EN61131-2](http://www.beckhoff.com/EN61131-2)

### EtherCAT plug-in modules | Analog output: EJ4xxx

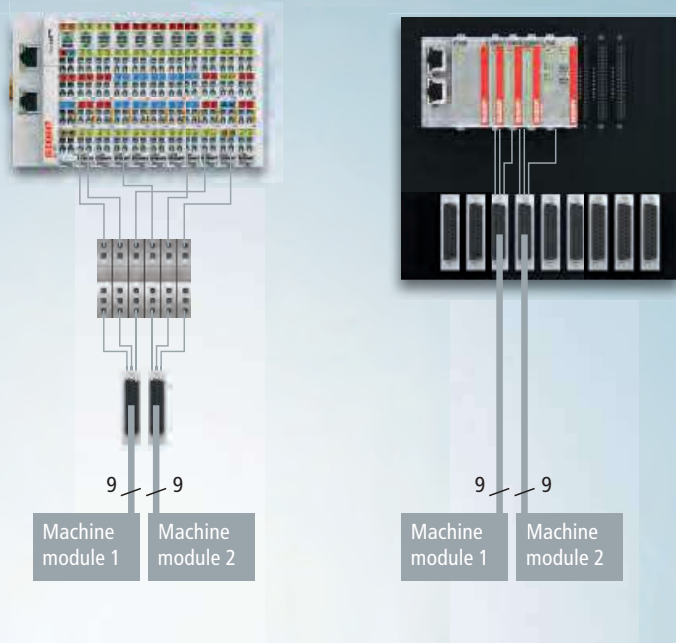
Signal	2-channel	4-channel
0...10 V	EJ4002 12 bit 539	
±10 V		EJ4134 16 bit 539

### EtherCAT plug-in modules | Special functions: EJ7xxx

Signal	1-channel	2-channel
Motion	EJ7047 stepper motor module, $I_{\text{MAX}} = 5.0 \text{ A}$ , 50 V DC, incremental encoder, vector control 540	EJ7342 DC motor output stage, 50 V DC, 3.5 A, incremental encoder 540
	EJ7211-0010 servomotor module, 50 V DC, 4.5 A <sub>RMS</sub> , OCT 540	

### EtherCAT plug-in modules | System: EJ9xxx

Signal	System
System	EJ9001 placeholder module 541
Signal	Power supply and accessories
µF	EJ9576 brake chopper module, up to 72 V DC, 155 µF 541



Signal distribution via single-core wiring

Signal distribution via signal distribution board

## EJxxxx | EtherCAT plug-in modules

The EtherCAT I/O plug-in modules are based electronically on the well-known EtherCAT Terminals, and they provide the same broad variety of signals, including functional safety (TwinSAFE). Their electromechanical design enables them to be plugged directly into an application-specific signal distribution board. This routing board distributes signals and power supply to machine modules via prefabricated cables with application-specific plug connectors. The main advantage of the signal distribution board is the highly automated production process, from the manufacture of the circuit board and its assembly through to the inspection. All connector interfaces can be placed on the circuit board according to customer specifications. The connector level, which is matched to the application, considerably optimises the wiring procedure, for example with the use of prefabricated cables and coded plug connectors.

The manufacturing process can be accelerated as far as possible and the risk of wiring errors is minimised. This saves working time and thus costs. It allows production at different worldwide locations with a minimum of risk, since errors are avoided through automation and coding.

The EtherCAT plug-in modules offer an alternative to conventional point-to-point wiring in control cabinets, since they simplify wiring, and reduce the system installation

time and testing costs where machines are manufactured in high numbers.

### Compact design for an optimised machine footprint

Similar to the EtherCAT Terminal system, a module strand consists of a Bus Coupler and any desired I/O modules. In contrast to the EtherCAT Terminals, however, the EtherCAT plug-in modules have no spring-loaded contacts, since the wiring level is implemented differently: for communication, signal distribution and the supply of power to the modules plug connectors on the back side of the modules and the conductive tracks of the signal distribution board are used.

Measuring just 12 x 55 x 66 mm, the EJ modules are extremely compact; compared to the EtherCAT Terminals they are almost 50 % smaller in relation to volume. In conjunction with coding holes in the signal distribution board, coding pins on the underside of the EJ modules ensure protection against incorrect plug insertion. Thus, the risk of errors can be minimised during assembly and service.

The EtherCAT plug-in modules and the plug level for sensors and actuators can be placed flexibly on the signal distribution board. The signal distribution board is developed either by the user or as custom solution by Beckhoff.

### I/O solution for standard applications

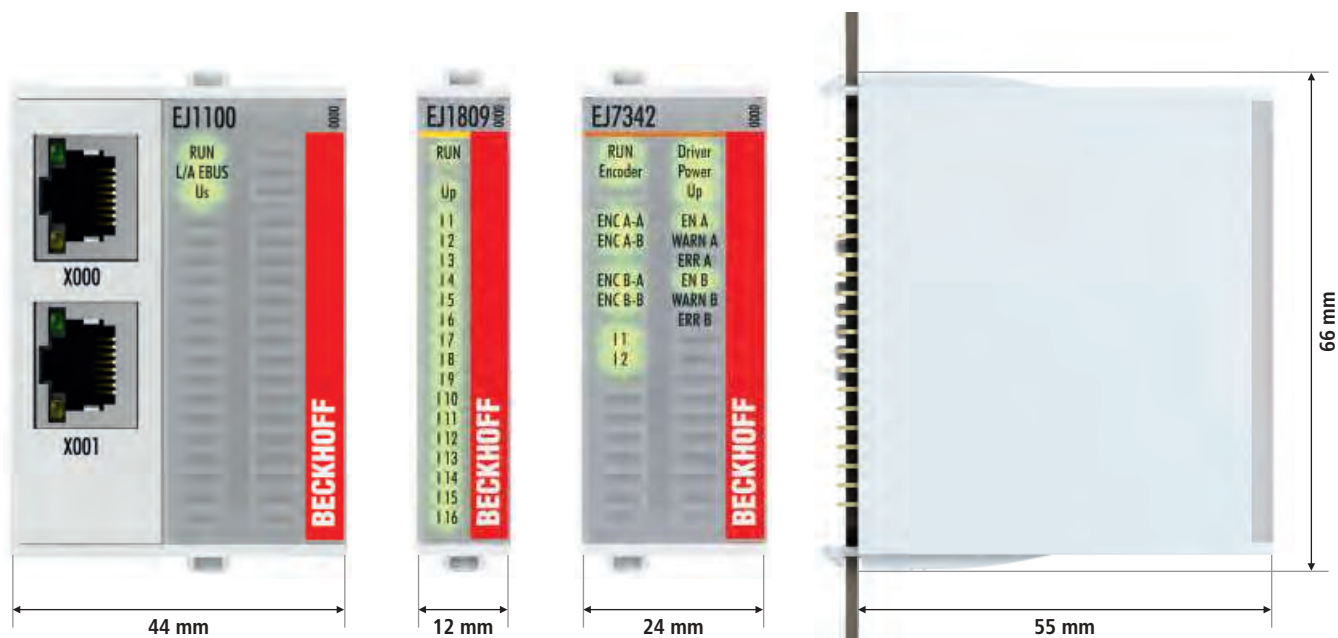
The EJ system supplements the modular Beckhoff I/O portfolio for controllers used in medium to high-volume production of standard machines. It is also suitable for applications where the reduction of error probability is critical for the exact replication of a machine. In general, the use of the EJ system is recommended for machine manufacturers who want to create a platform of common parts across their product range.

In addition, the EJ system directly addresses projects with a shortage of skilled workers. Especially when production facilities are distributed across various locations with different skill levels, the risk of errors increases along with the complexity of the machines. With the combination of I/O modules, signal distribution board and prefabricated cables, the EJ system offers efficient "Plug & Work" solutions for machine controllers.

### Signal distribution board

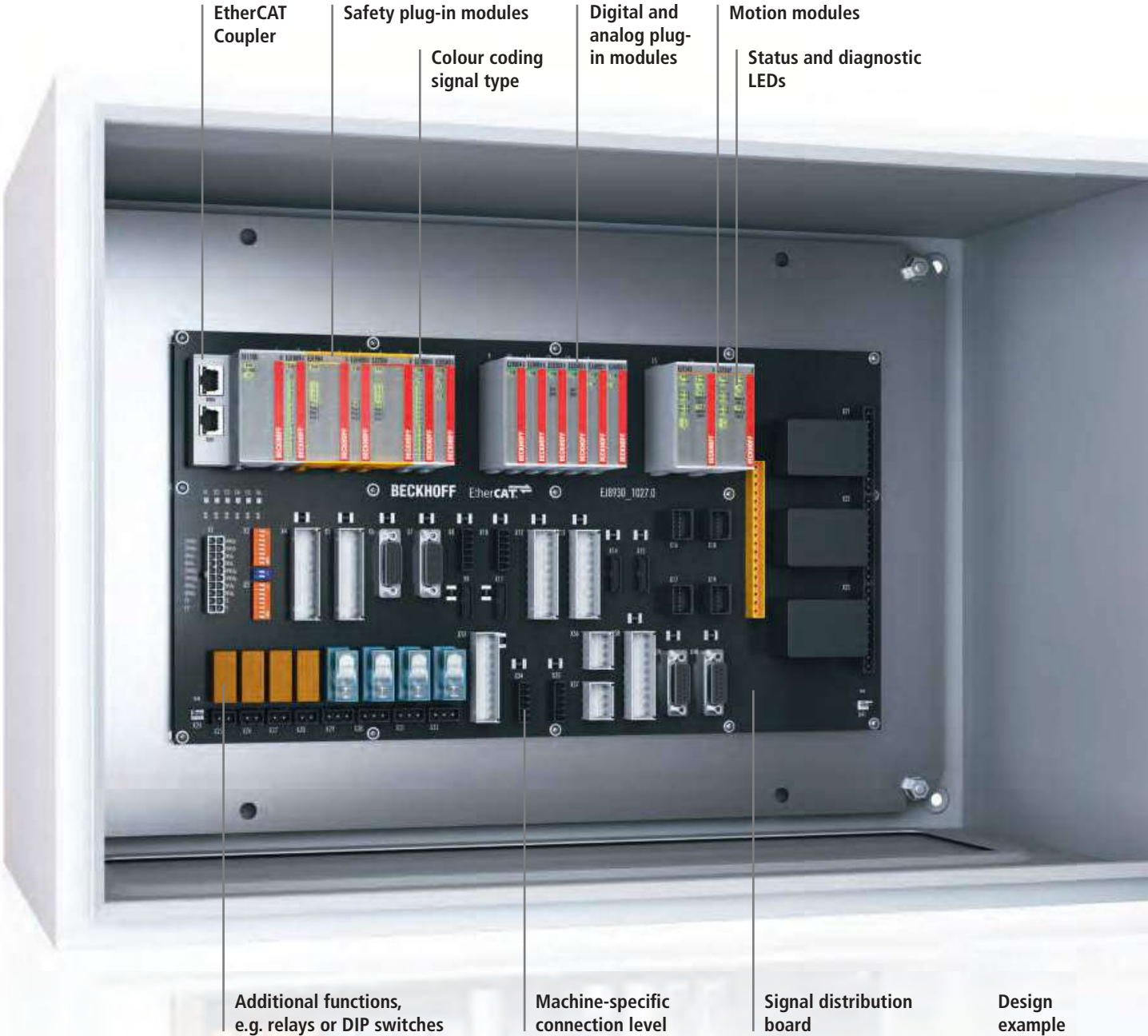
The EtherCAT plug-in modules can be directly attached to a PCB. This application-specific PCB (signal distribution board) distributes signals and power supply to individual application-specific plug connectors, in order to connect the controller to further machine modules.

# Technical data – EtherCAT plug-in modules



Technical data	EJ1100 coupler	12 mm EJ module	24 mm EJ module
Design form	EtherCAT I/O plug-in module		
Material	polycarbonate		
Installation	on signal distribution board		
Mechanical coding	EJ plug-in module: signal-specific coding pins on the housing, signal distribution board: holes in the printed circuit board		
Locking	latching lug in circuit board cut-out		
Connection method	field wiring: application-specific wiring level on the signal distribution board, EJ plug-in module: 2 x 20-pin socket strip		
EtherCAT connection	direct	via EJ1100 coupler	via EJ1100 coupler
Electrical isolation	500 V (E-bus/field potential)		
Current supply E-bus	2200 mA	–	–
Bus interface	2 x RJ45	–	–
Dimensions (W x H x D)	44 mm x 66 mm x 55 mm	12 mm x 66 mm x 55 mm	24 mm x 66 mm x 55 mm
Operating/storage temperature	0...+55 °C/-25...+85 °C		
Relative humidity	5...95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4 (with corresponding signal distribution board)		
Protection class/ installation position	EJ module: IP 20/horizontal, EJ system: dependent on signal distribution board and housing		

# EtherCAT Plug-in Modules



EtherCAT Coupler

Safety plug-in modules

Colour coding signal type

Digital and analog plug-in modules

Motion modules

Status and diagnostic LEDs

Additional functions, e.g. relays or DIP switches

Machine-specific connection level

Signal distribution board


Design example

# EtherCAT Coupler

The EJ1100 coupler connects EtherCAT with the EtherCAT plug-in modules (EJxxxx). It converts the passing telegrams from Ethernet 100BASE-TX to E-bus signal representation.








The coupler is connected to the network via the upper Ethernet interface. The lower RJ45 socket may be used to connect further EtherCAT devices in the same strand.

EtherCAT Coupler

Technical data	EJ1100
Task within EtherCAT system	coupling of EtherCAT plug-in modules (EJxxxx) to 100BASE-TX EtherCAT networks
Number of EtherCAT plug-in modules	up to 65,534
Data transfer rates	100 Mbaud
	
Bus interface	2 x RJ45
Type/number of peripheral signals	max. 4.2 GB addressable I/O points
Data transfer medium	Industrial Ethernet cable (min. CAT 5), shielded
Current consumption from U <sub>S</sub>	70 mA + (∑ E-bus current/4)
Current consumption from U <sub>P</sub>	load
Distance between stations	max. 100 m (100BASE-TX)
Delay	typ. 1 μs
Power supply	24 V DC (-15 %/+20 %)
Current supply E-bus	2200 mA
Operating temperature	0...+55 °C
Approvals	CE
Further information	<a href="http://www.beckhoff.com/EJ1100">www.beckhoff.com/EJ1100</a>

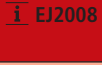
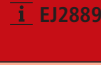






## Digital input | 24 V DC

	8-channel digital input, 24 V DC, type 1/3	16-channel digital input, 24 V DC, type 1/3	8-channel digital input + 8-channel digital output, 24 V DC, type 1/3	16-channel digital input, 24 V DC, negative switching
<b>Technical data</b>	 EJ1008	EJ1809	 EJ1859	 EJ1889
<b>Specification</b>	EN 61131-2, type 1/3			negative switching "0": 18...30 V DC, "1": 0...7 V DC, typ. 3 mA input current
<b>Input filter</b>	typ. 3.0 ms			
<b>Number of inputs</b>	8	16	8 inputs + 8 outputs	16
	 <p>The EJ1008 digital input acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit.</p>	 <p>The EJ1809 digital input acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit.</p>	 <p>The EJ1859 EtherCAT plug-in module combines eight digital inputs and eight digital outputs in one device.</p>	 <p>The EJ1889 digital input acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation device. The EJ1889 takes the 24 V power contact as its reference for all inputs.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption E-bus</b>	typ. 80 mA	typ. 80 mA	typ. 90 mA	typ. 80 mA
<b>Distributed clocks</b>	–	–	–	–
<b>Special features</b>	standard input module for bouncing signals (filter 3 ms)	standard input module with high number of channels for slow 24 V DC edges	combi module, 8 x output 24 V DC, max. output current 0.5 A, load type: ohmic, inductive, lamp load, reverse voltage protection	negative switching
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE	CE	CE
<b>Further information</b>	<a href="http://www.beckhoff.com/EJ1008">www.beckhoff.com/EJ1008</a>	<a href="http://www.beckhoff.com/EJ1809">www.beckhoff.com/EJ1809</a>	<a href="http://www.beckhoff.com/EJ1859">www.beckhoff.com/EJ1859</a>	<a href="http://www.beckhoff.com/EJ1889">www.beckhoff.com/EJ1889</a>





 For availability status see Beckhoff website at: [www.beckhoff.com](http://www.beckhoff.com)

# Digital output | 24 V DC

	8-channel digital output, 24 V DC, 0.5 A	16-channel digital output, 24 V DC, 0.5 A	16-channel digital output, 24 V DC, 0.5 A, negative switching	2-channel pulse width output, 24 V DC, 0.5 A
<b>Technical data</b>	 EJ2008	EJ2809	 EJ2889	EJ2502
<b>Load type</b>	ohmic, inductive, lamp load			
<b>Max. output current</b>	0.5 A (short-circuit-proof) per channel			
<b>Switching times</b>	typ. T <sub>ON</sub> : 60 µs, typ. T <sub>OFF</sub> : 300 µs	typ. T <sub>ON</sub> : 60 µs, typ. T <sub>OFF</sub> : 300 µs	typ. T <sub>ON</sub> : 50 µs, typ. T <sub>OFF</sub> : 200 µs	T <sub>ON</sub> : > 750 ns, T <sub>OFF</sub> : > 500 ns
<b>Number of outputs</b>	8	16	16	2
	 <p>The EJ2008 digital output connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation.</p>	 <p>The EJ2809 digital output connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation.</p>	 <p>The EJ2889 digital output connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation.</p>	 <p>The EJ2502 output modulates the pulse width of a binary signal and outputs it electrically isolated from the E-bus.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption E-bus</b>	typ. 110 mA	typ. 110 mA	typ. 130 mA	typ. 110 mA
<b>Distributed clocks</b>	–	–	–	–
<b>Base frequency</b>	–	–	–	1...20 kHz, 250 Hz default
<b>Duty factor</b>	–	–	–	0...100 %
<b>Resolution</b>	–	–	–	9...15 bit
<b>Breaking energy</b>	< 150 mJ/channel	< 150 mJ/channel	< 100 mJ/channel	–
<b>Reverse voltage protection</b>	yes	yes	yes	yes
<b>Short circuit current</b>	typ. < 2 A	typ. < 2 A	typ. < 7 A	typ. < 1.5 A
<b>Special features</b>	–	–	negative switching	separate frequency can be set for each channel
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE	CE	CE
<b>Further information</b>	<a href="http://www.beckhoff.com/EJ2008">www.beckhoff.com/EJ2008</a>	<a href="http://www.beckhoff.com/EJ2809">www.beckhoff.com/EJ2809</a>	<a href="http://www.beckhoff.com/EJ2889">www.beckhoff.com/EJ2889</a>	<a href="http://www.beckhoff.com/EJ2502">www.beckhoff.com/EJ2502</a>




 For availability status see Beckhoff website at: [www.beckhoff.com](http://www.beckhoff.com)

## Analog input | -10...+10 V, PT100

	4-channel analog input -10...+10 V, 12 bit, single-ended	8-channel analog input -10...+10 V, 16 bit, 6 differential and 2 single-ended inputs	2-channel analog input, PT100 (RTD), 16 bit	4-channel analog input, PT100 (RTD), 16 bit
Technical data	<b>EJ3004</b>	<b><i>i</i> EJ3108</b>	<b>EJ3202</b>	<b><i>i</i> EJ3214</b>
Resolution	12 bits (16 bits presentation)	16 bit	0.1 °C per digit	
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)		approx. 85 ms default setting, 2...800 ms configurable	approx. 170 ms default setting
Number of inputs	4 (single-ended)	6 (differential) + 2 (single-ended)	2	4
				
	The EJ3004 analog input processes signals in the range between -10 and +10 V.	The EJ3108 analog input processes signals in the range between -10 and +10 V.	The EJ3202 analog input allows resistance sensors to be connected directly.	The EJ3214 analog input allows resistance sensors to be connected directly in 3-wire connection.
Signal type	-10...+10 V	-10...+10 V	RTD	RTD
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.5 °C for PT sensors	< ±0.5 °C for PT sensors, 4x3-wire connection
Current consumption E-bus	typ. 120 mA	typ. 300 mA	typ. 165 mA	typ. 190 mA
Distributed clocks	–	–	–	–
Sensor types	–	–	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω...1.2/4 kΩ), KTY sensors (types see documentation)	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω...1.2/4 kΩ), KTY sensors (types see documentation)
Measuring range	-10...+10 V	-10...+10 V	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)
Internal resistance	> 130 kΩ	> 130 kΩ	–	–
Input filter limit frequency	1 kHz	1 kHz	typ. 1 kHz	typ. 1 kHz
Special features	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring, overload display in the process data	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring, overload display in the process data	integrated digital filter, limit value monitoring, variable connection technology	integrated digital filter, limit value monitoring, variable connection technology
Operating temperature	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
Approvals	CE	CE	CE	CE
Further information	<a href="http://www.beckhoff.com/EJ3004">www.beckhoff.com/EJ3004</a>	<a href="http://www.beckhoff.com/EJ3108">www.beckhoff.com/EJ3108</a>	<a href="http://www.beckhoff.com/EJ3202">www.beckhoff.com/EJ3202</a>	<a href="http://www.beckhoff.com/EJ3214">www.beckhoff.com/EJ3214</a>





**i** For availability status see Beckhoff website at: [www.beckhoff.com](http://www.beckhoff.com)

# Analog output | -10/0...10 V

	2-channel analog output, 0...10 V, 12 bit	4-channel analog output, -10...+10 V, 16 bit
<b>Technical data</b>	<b>EJ4002</b>	<b> EJ4134</b>
Signal voltage	0...10 V	-10...+10 V
Resolution	12 bit	16 bit
Conversion time	~ 150 µs	~ 200 µs (0...100 %)
Number of outputs	2	4
	 <p>The EJ4002 analog output generates signals in the range between 0 and 10 V.</p>	 <p>The EJ4134 analog output generates signals in the range between -10 and +10 V.</p>
Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Current consumption E-bus	typ. 90 mA	typ. 90 mA
Distributed clocks	–	yes
Distributed clock precision	–	<< 1 µs
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Special features	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Watchdog parameterisable; user synchronisation can be activated.
Operating temperature	0...+55 °C	0...+55 °C
Approvals	CE	CE
Further information	<a href="http://www.beckhoff.com/EJ4002">www.beckhoff.com/EJ4002</a>	<a href="http://www.beckhoff.com/EJ4134">www.beckhoff.com/EJ4134</a>


 For availability status see Beckhoff website at: [www.beckhoff.com/EJ4134](http://www.beckhoff.com/EJ4134)

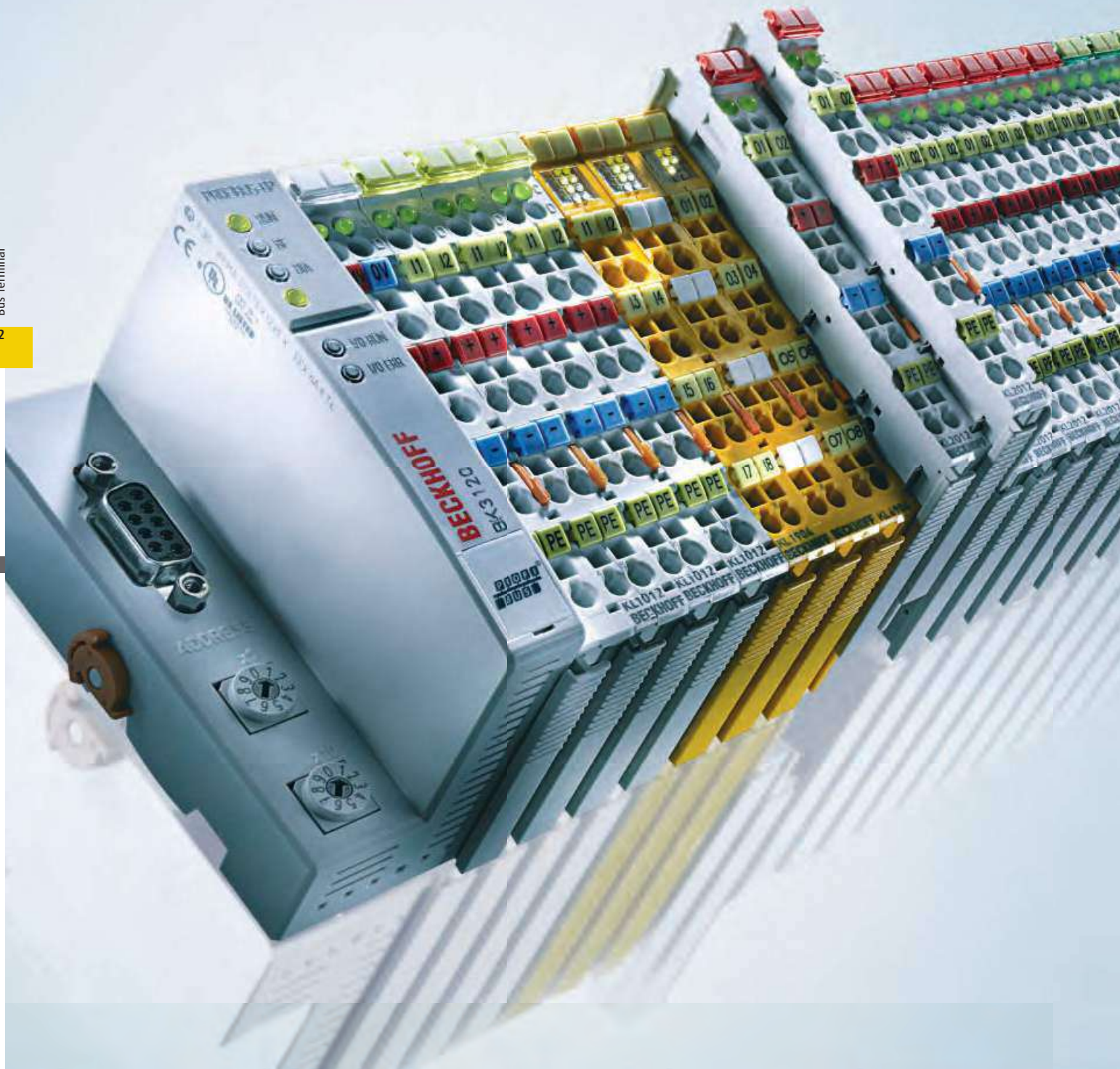
# Motion | Stepper, servo and DC motor modules

	Stepper motor module 50 V DC, 5 A, with incremental encoder, vector control	Servomotor module with OCT, 50 V DC, 4.5 A <sub>RMS</sub>	2-channel DC motor output stage 50 V DC, 3.5 A
<b>Technical data</b>	<b>EJ7047</b>	<b> EJ7211-0010</b>	<b>EJ7342</b>
<b>Technology</b>	direct motor connection		
<b>Load type</b>	uni- or bipolar stepper motors	permanent-magnet synchronous motors	DC brush motors, inductive
<b>Max. output current</b>	5 A (overload- and short-circuit-proof)	output current I <sub>N</sub> : 4.5 A (rms), peak current I <sub>N</sub> : 9.0 A (rms) for 1 s	2 x 3.5 A (short-circuit-proof, common thermal overload warning for both output stages) per channel
<b>Number of channels</b>	1 stepper motor, encoder input, 2 digital inputs, 1 output (0.5 A) configurable	1 servomotor, absolute feedback, motor brake, 2 digital inputs	2 DC motors, 2 digital inputs, encoder input
			
<b>Nominal voltage</b>	8...50 V DC	8...50 V DC	8...50 V DC
<b>Current consumption E-bus</b>	typ. 140 mA	typ. 130 mA	typ. 160 mA
<b>Distributed clocks</b>	yes	yes	yes
<b>Maximum step frequency</b>	1,000, 2,000, 4,000 or 8,000 full steps/s (configurable)	–	–
<b>Step pattern</b>	64-fold micro stepping	–	–
<b>Current controller frequency</b>	double PWM clock frequency	double PWM clock frequency	–
<b>Frequency range</b>	–	0...599 Hz	–
<b>PWM clock frequency</b>	32 kHz	16 kHz	30 kHz with 180° phase shift each
<b>Duty factor</b>	–	–	0...100 % (voltage-controlled)
<b>Control resolution</b>	approx. 5,000 positions in typ. applications (per revolution)	–	max. 10 bits current, 16 bits speed
<b>Encoder signal</b>	5...24 V DC, 5 mA, single-ended	–	5...24 V DC, 5 mA, single-ended
<b>Pulse frequency</b>	max. 400,000 increments/s (with 4-fold evaluation)	–	max. 400,000 increments/s (with 4-fold evaluation)
<b>Special features</b>	travel distance control, encoder input, vector control	compact and system-integrated, absolute feedback, One Cable Technology (OCT), plug-and-play	travel distance control, encoder input
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE	CE
<b>Further information</b>	<a href="http://www.beckhoff.com/EJ7047">www.beckhoff.com/EJ7047</a>	<a href="http://www.beckhoff.com/EJ7211-0010">www.beckhoff.com/EJ7211-0010</a>	<a href="http://www.beckhoff.com/EJ7342">www.beckhoff.com/EJ7342</a>

 For availability status see Beckhoff website at: [www.beckhoff.com/EJ7211-0010](http://www.beckhoff.com/EJ7211-0010)

# System | Placeholder, brake chopper

	Placeholder module	Brake chopper module, 72 V, 155 $\mu$ F
<b>Technical data</b>	<b>EJ9001</b>	<b>EJ9576</b>
<b>Technology</b>	placeholder module	brake chopper
<b>Diagnostics</b>	–	temperature on board, over-/undervoltage
	 <p>The placeholder modules can be plugged into unused slots on the signal distribution board. The slots reserved in such a way can be equipped with functional modules when the range of functions is extended.</p>	 <p>The EJ9576 buffers the connected voltage via its integrated capacitors and connects the external brake resistor if the preset threshold of the internal voltage is exceeded.</p>
<b>Nominal voltage</b>	–	arbitrary up to 72 V
<b>Current consumption E-bus</b>	typ. 60 mA	typ. 85 mA
<b>Capacity</b>	–	155 $\mu$ F
<b>Ripple current (max.)</b>	–	10 A
<b>Internal resistance</b>	–	< 5 m $\Omega$
<b>Chopper voltage</b>	–	adjustable
<b>Recommended ballast resistor</b>	–	10 $\Omega$ , typ. 100 W (dependent on application)
<b>Overvoltage control range</b>	–	typ. 1 V, parametrisable by CoE data
<b>Ballast resistor clock rate</b>	–	load-dependent, max. 1 ms, 2-point control
<b>Electrical isolation</b>	500 V (E-bus/field potential)	1,500 V (E-bus/field potential)
<b>Special features</b>	placeholder module for subsequent functional extensions	adjustable threshold
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE
<b>Further information</b>	<a href="http://www.beckhoff.com/EJ9001">www.beckhoff.com/EJ9001</a>	<a href="http://www.beckhoff.com/EJ9576">www.beckhoff.com/EJ9576</a>

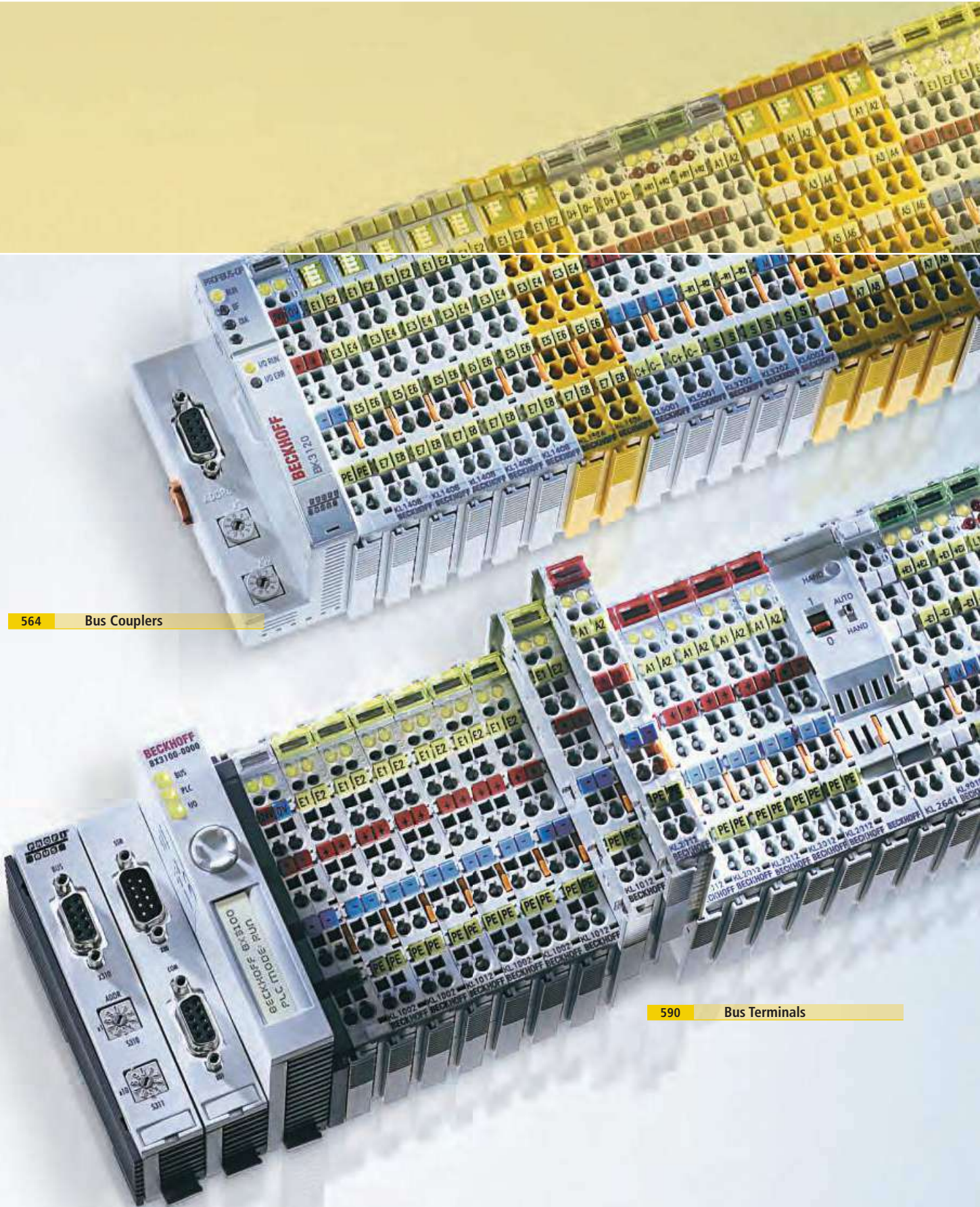


# Bus Terminal

The modular fieldbus system for automation



564 Bus Couplers



590 Bus Terminals

580 Bus Terminal Controllers

# Bus Terminal

Independence from signals and fieldbuses with one system

546	System overview
548	Product overview
554	System description
556	Features
561	Technical data

## 564 Bus Couplers

566	EtherCAT BK11x0, BK1250
567	Lightbus BK2xx0
568	PROFIBUS BK3xx0, LC3100
570	Interbus BK40x0
570	CANopen BK51xx, LC5100
572	DeviceNet BK52x0, LC5200
574	ControlNet BK7000
574	CC-Link BK7150
575	Modbus BK73x0
576	SERCOS interface BK75x0
576	RS232/RS485 BK8x00
577	Ethernet TCP/IP BK9xx0
578	PROFINET BK9xx3
579	EtherNet/IP BK9xx5
579	USB BK9500

## 580 Bus Terminal Controllers

582	PROFIBUS BC31x0, BX3100
583	CANopen BC5150, BX5100
584	DeviceNet BC5250, BX5200
585	Modbus BC7300
585	RS232/RS485 BC8x50, BX8000
587	Ethernet TCP/IP BC9xxx, BX9000

## 590 Bus Terminals digital I/O

592	Digital input KL1xxx, KS1xxx, KM1xxx
606	Digital output KL2xxx, KS2xxx, KM2xxx

## 630 Bus Terminals analog I/O

630	Analog input KL3xxx, KS3xxx, KM37xx
648	Analog output KL4xxx, KS4xxx, KM4602

## 656 Bus Terminals special functions

656	Position measurement KL5xxx, KS5xxx
660	Communication, master terminals KL6xxx, KS6xxx, KM6551
670	Manual operation KL85xx
672	Power terminals KL8xxx

## 674 System terminals









674	System terminals KL9xxx, KS9xxx
685	Special terminals KLxxx, KSxxx







## 688 Accessories

688	Connectors and cables
691	Marking material
693	Demokit
694	Accessories radio technology

## 966 TwinSAFE































































# System overview Bus Couplers

	Bus Coupler					PLC		
Features	Standard BKxx00	Economy BKxx10	Economy plus BKxx20	Compact BKxx5x	Low Cost LCxx00	Controller BCxx00	BCxx50	BC9191
								
Function	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave, with integrated IEC 61131-3 PLC	fieldbus slave, with integrated IEC 61131-3 PLC	Building Automation Room Controller
Program memory	–	–	–	–	–	32/96 kbyte	48 kbyte	BC9191: 48 kbyte, BC9191-0100: 128 kbyte
Main memory	–	–	–	–	–	–	–	–
Current supply K-bus	1,750 mA	500 mA	1,750 mA	1,000 mA	500 mA	1,750 mA	1,000 mA	200 mA
Fieldbus connection	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	direct to the spring-loaded terminals	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	2 x RJ45 (switched)
Supported Bus Terminals	all	only digital I/Os (except KL15xx, KL25xx, KL2692, KL27x1)	all	all	only digital I/Os (except KL15xx, KL25xx, KL2692, KL27x1)	all	all	all
Maximum number of Bus Terminals	64	64	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64	64	64 (255 with terminal bus extension)	64
Electrical isolation	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	PROFIBUS: yes, CANopen and DeviceNet: no	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between mains supply and internal 24 V power supply

		Embedded PC				
BCxx20	BXxx00	CX80xx	CX9xxx	CX9020	CX50xx	
						
fieldbus slave, with integrated IEC 61131-3 PLC	fieldbus slave, with integrated IEC 61131-3 PLC	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC, Motion Control, visualisation	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC, Motion Control, visualisation	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC, Motion Control, visualisation	
128 kbyte	256 kbyte	–	–	–	–	
–	–	64 Mbyte DDR2	64...128 Mbyte SDRAM	1 Gbyte DDR3 RAM	512 Mbyte DDR2	
1,750 mA	1,450 mA	2,000 mA	2,000 mA	2,000 mA	2,000 mA	
plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	–	optional, plug (design depends on the fieldbus)	optional, plug (design depends on the fieldbus)	
all	all	all	all	all	all	
64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	
between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between supply voltage and fieldbus	between supply voltage and fieldbus	between supply voltage and fieldbus	between supply voltage and fieldbus	

Further Embedded PCs see page 184

# Product overview Bus Couplers

Bus Coupler						PLC		
Fieldbus slave	Standard	Economy	Economy plus	Compact	Low Cost	Controller (IEC 61131-3)		
		only digital I/Os			only digital I/Os	Program memory 32/96 kbyte	Program memory 48 kbyte	Program memory 128 kbyte
<b>EtherCAT</b> 			BK1120  566	BK1150  566	BK1250  566			
<b>LIGHTBUS</b>	BK2000  567	BK2010  567	BK2020  567					
<b>PROFIBUS</b> 		BK3010  568 1.5 Mbaud						
	BK3100  568 12 Mbaud	BK3110  568 12 Mbaud	BK3120  569 12 Mbaud	BK3150  569 12 Mbaud	LC3100  569 12 Mbaud	BC3100  582 12 Mbaud	BC3150  582 12 Mbaud	
			BK3520  569 12 Mbaud, fibre optic					
<b>INTERBUS</b> 	BK4000  570		BK4020  570					
<b>CANopen</b>		BK5110  570	BK5120  571	BK5150  571	LC5100  571		BC5150  583	
				BK5151  571				
<b>DeviceNet</b>	BK5200  572	BK5210  572	BK5220  573	BK5250  573	LC5200  573		BC5250  584	
<b>ControlNet</b>	BK7000  574							
<b>CC-Link</b>				BK7150  574				
<b>Modbus</b>	BK7300  575			BK7350  575		BC7300  585	BC8050  585	
							BC8150  586	
<b>sercos</b> the automation bus	BK7500  576		BK7520  576					
<b>RS485</b>	BK8000  576						BC8050  585	
<b>RS232</b>	BK8100  577						BC8150  586	
<b>Ethernet TCP/IP</b>	BK9000  577			BK9050  577		BC9000  587	BC9050  587	BC9020  587
	BK9100  577 2-channel switch					BC9100  588 2-channel switch	BC9191  589 Room Controller	BC9191-0100  589 Room Controller
								BC9120  588 2-channel switch
<b>PROFINET</b> 	BK9103  578 2-channel switch			BK9053  578				
<b>EtherNet/IP</b>	BK9105  579 2-channel switch			BK9055  579				
<b>USB</b> 	BK9500  579							

		Embedded PC															
Program memory 256 kbyte		CX80xx	CX900x, CX9010	CX9020	CX1010	CX50xx	CX51xx	CX1020, CX1030	CX20xx								
		<b>CX8010</b>	<b>202</b>		optional <sup>(2)</sup>		optional <sup>(2)</sup>	optional <sup>(2)</sup>		optional <sup>(2)</sup>							
					optional <sup>(1)</sup>			optional <sup>(1)</sup>									
		<b>CX8030</b>	<b>202</b>		optional <sup>(2)</sup>	optional <sup>(1)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(1)</sup>	optional <sup>(2)</sup>							
		master															
<b>BX3100</b>	<b>583</b>	<b>CX8031</b>	<b>202</b>		optional <sup>(2)</sup>	optional <sup>(1)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(1)</sup>	optional <sup>(2)</sup>							
		slave															
<b>BX5100</b>	<b>583</b>	<b>CX8050</b>	<b>203</b>		optional <sup>(2)</sup>	optional <sup>(1)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(1)</sup>	optional <sup>(2)</sup>							
		master															
		<b>CX8051</b>	<b>203</b>		optional <sup>(2)</sup>	optional <sup>(1)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(1)</sup>	optional <sup>(2)</sup>							
		slave															
<b>BX5200</b>	<b>584</b>																
					optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	
		<b>CX8097</b>	<b>205</b>														
<b>BX8000</b>	<b>586</b>	<b>CX8080</b>	<b>203</b>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	
<b>BX8000</b>	<b>586</b>	<b>CX8080</b>	<b>203</b>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	optional <sup>(2)</sup>	
<b>BX9000</b>	<b>589</b>	<b>CX8090</b>	<b>204</b>	<b>CX9000</b>	<b>208</b>	<b>CX9020</b>	<b>214</b>	<b>CX1010</b>	<b>218</b>	<b>CX5010</b>	<b>224</b>	<b>CX5120</b>	<b>228</b>	<b>CX1020</b>	<b>232</b>	<b>CX2020</b>	<b>246</b>
				<b>CX9010</b>	<b>210</b>					<b>CX5020</b>	<b>224</b>	<b>CX5130</b>	<b>228</b>	<b>CX1030</b>	<b>234</b>	<b>CX2030</b>	<b>246</b>
										<b>CX5140</b>	<b>228</b>				<b>CX2040</b>	<b>246</b>	
		<b>CX8093</b>	<b>205</b>	optional <sup>(3)</sup>	optional <sup>(2)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	
		<b>CX8095</b>	<b>205</b>	optional <sup>(3)</sup>	optional <sup>(2)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(3)</sup>	optional <sup>(3)</sup>	optional <sup>(2,3)</sup>	optional <sup>(2,3)</sup>	

<sup>(1)</sup>via modular fieldbus interface, <sup>(2)</sup>via hardware, <sup>(3)</sup>via software library

**Bus Terminal | Digital input: KL1xxxx/KS1xxx** **KM1xxx**

Signal	2-channel	4-channel	8-channel	16-channel	4-/16-/32-/64-ch.
<b>5 V DC</b>		KL1124 <span style="background-color: #cccccc;">598</span> filter 0.2 ms			
<b>24 V DC (filter 3.0 ms)</b>	KL1002 <span style="background-color: #cccccc;">595</span> type 3	KL1104 <span style="background-color: #cccccc;">594</span> type 3	KL1304 <span style="background-color: #cccccc;">594</span> type 2	KL1408 <span style="background-color: #cccccc;">592</span> type 3	KL1809 <span style="background-color: #cccccc;">593</span> type 3
	KL1302 <span style="background-color: #cccccc;">595</span> type 2	KL1402 <span style="background-color: #cccccc;">595</span> type 3	KL1154 <span style="background-color: #cccccc;">597</span> positive/negative switching	KL1184 <span style="background-color: #cccccc;">596</span> negative switching	KL1488 <span style="background-color: #cccccc;">596</span> negative switching
	KL1862 <span style="background-color: #cccccc;">595</span> flat-ribbon cable, type 3	KL1002 <span style="background-color: #cccccc;">600</span> 16-channel, type 1	KL1052 <span style="background-color: #cccccc;">597</span> positive/negative switching	KL1352 <span style="background-color: #cccccc;">603</span> Namur	KL1404 <span style="background-color: #cccccc;">593</span> 4 x 2-wire connection, type 3
	KL1804 <span style="background-color: #cccccc;">594</span> 8 x 24 V, 4 x 0 V, type 3	KL1808 <span style="background-color: #cccccc;">593</span> 8 x 24 V DC, type 3	KL1889 <span style="background-color: #cccccc;">596</span> negative switching	KL1004 <span style="background-color: #cccccc;">600</span> 32-channel, type 1	
	KL1212 <span style="background-color: #cccccc;">594</span> short-circuit-protected sensor supply, type 1	KL1362 <span style="background-color: #cccccc;">603</span> break-in alarm		KL1859 <span style="background-color: #cccccc;">593</span> 8 inputs, 8 outputs, type 3, I <sub>max</sub> = 0.5 A	KL1862-0010 <span style="background-color: #cccccc;">596</span> flat-ribbon cable, type 3, negative switching
					KL1008 <span style="background-color: #cccccc;">600</span> 64-channel, type 1
<b>24 V DC (filter 0.2 ms)</b>	KL1012 <span style="background-color: #cccccc;">595</span> type 3	KL1312 <span style="background-color: #cccccc;">595</span> type 2	KL1114 <span style="background-color: #cccccc;">594</span> type 3	KL1314 <span style="background-color: #cccccc;">594</span> type 2	KL1418 <span style="background-color: #cccccc;">592</span> type 3
					KL1819 <span style="background-color: #cccccc;">593</span> type 3
	KL1412 <span style="background-color: #cccccc;">595</span> type 3	KL1164 <span style="background-color: #cccccc;">597</span> positive/negative switching	KL1194 <span style="background-color: #cccccc;">596</span> negative switching	KL1498 <span style="background-color: #cccccc;">596</span> negative switching	KL1872 <span style="background-color: #cccccc;">595</span> flat-ribbon cable, type 3
					KL1012 <span style="background-color: #cccccc;">600</span> 16-channel, type 1
		KL1414 <span style="background-color: #cccccc;">593</span> 4 x 2-wire connection, type 3	KL1434 <span style="background-color: #cccccc;">593</span> 4 x 2-wire connection, type 2		KL1014 <span style="background-color: #cccccc;">600</span> 32-channel, type 1
		KL1814 <span style="background-color: #cccccc;">594</span> 8 x 24 V, 4 x 0 V, type 3			KL1018 <span style="background-color: #cccccc;">600</span> 64-channel, type 1
<b>24 V DC</b>	KL1232 <span style="background-color: #cccccc;">602</span> pulse expansion	KL1382 <span style="background-color: #cccccc;">603</span> thermistor	KL1904 <span style="background-color: #cccccc;">605</span> TwinSAFE, 4 safe inputs		KL1644 <span style="background-color: #cccccc;">601</span> manual operation, 4-channel
<b>≥ 48 V DC</b>	KL1032 <span style="background-color: #cccccc;">598</span> filter 3.0 ms	KL1712-0060 <span style="background-color: #cccccc;">599</span>			
<b>120 V AC/DC</b>	KL1712 <span style="background-color: #cccccc;">599</span>				
<b>230 V AC</b>	KL1702 <span style="background-color: #cccccc;">599</span>	KL1722 <span style="background-color: #cccccc;">599</span> no power contacts			
<b>Counter (24 V DC)</b>	KL1501 <span style="background-color: #cccccc;">604</span> up/down, 100 kHz	KL1512 <span style="background-color: #cccccc;">604</span> up/down, 1 kHz, 16 bit			

The standard Bus Terminals (KLxxxx) can be optionally ordered as KSxxxx with pluggable wiring level.  
EN 61131-2 specification ► [www.beckhoff.com/EN61131-2](http://www.beckhoff.com/EN61131-2)

Bus Terminal   Digital output: KL2xxx/KS2xxx						KM2xxx
Signal	1-channel	2-channel	4-channel	8-channel	16-channel	2-/4-/16-/32-/64-ch.
5 V DC			KL2124 611			
24 V DC (I <sub>MAX</sub> = 0.5 A)		KL2012 609	KL2114 608	KL2408 606	KL2809 606	
					KL2819 607 with diagnostics	KM2002 610 16-channel
		KL2032 608 reverse voltage protection	KL2184 612 negative switching	KL2488 612 negative switching	KL2889 612 negative switching	KM2004 610 32-channel
			KL2134 608 reverse voltage protection	KL2808 607 8 x 0 V	KL2872 609 flat-ribbon cable	KM2008 610 64-channel
		KL2212 609 diagnostic, protected sensor supply	KL2404 607 4 x 2-wire	KL1859 607 8 inputs, 8 outputs, filter 3.0 ms, type 3	KL2872-0010 612 flat-ribbon cable, negative switching	KM2042 609 16-channel, D-sub connection
24 V DC (I <sub>MAX</sub> = 2.0 A)		KL2022 609	KL2424 607 4 x 2-wire	KL2828 607 8 x 2-wire		
30 V AC/DC (I <sub>MAX</sub> = 2.0 A), solid state relay			KL2784 613			
24 V DC		KL2442 608 2 x 4 A/1 x 8 A	KL2904 629 TwinSAFE, 4 safe outputs			
Relay 125/400 V AC	KL2631 615 400 V AC, make contact	KL2612 614 125 V AC, change-over				
230 V AC	KL2641 614 relay, make contact, manual operation, 16 A	KL2602 615 relay, make contact	KL2622 615 relay, make contact, no power contacts			KM2604 616 relay, 16 A, 4-channel
	KL2751 623 universal dimmer, 300 W	KL2652 615 relay, change-over	KL2702 619 solid state relay, 0.3 A			KM2614 616 relay, 16 A, 4-channel, manual operation
	KL2761 623 universal dimmer, 600 W	KL2712 618 triac	KL2722 618 triac, mutually locked outputs			KM2774 619 triac outputs
	KL2701 618 solid state relay, 3 A	KL2732 618 triac, mutually locked outputs, no power contacts	KL2692 620 cycle monitoring (watchdog)			KM2642 617 relay, 6 A, manual/ automatic operation, relay state readable
						KM2652 617 relay, 6 A, manual/auto- matic operation, switch and relay state readable
PWM		KL2502 622 24 V DC, 0.1 A	KL2512 622 24 V DC, 1.5 A, negative switching			
		KL2535 1 A, 622 24 V DC, current-controlled	KL2545 3.5 A, 622 50 V DC, current-controlled			
Frequency outp.	KL2521 621					
Stepper motor	KL2531 625 I <sub>MAX</sub> = 1.5 A					
	KL2541 625 I <sub>MAX</sub> = 5 A					
DC motor output stage		KL2532 627 24 V DC, 1 A	KL2552 627 50 V DC, 5 A	KL2284 627 I <sub>MAX</sub> = 2.0 A, reverse switching		
AC motor speed controller	KL2791 628 230 V AC, 200 VA					



Bus Terminal   Analog input: KL3xxx/KS3xxx, KM3xxx						
Signal	1-channel	2-channel	4-channel	8-channel		
0...2 V, 0...500 mV		KL3172 <sup>633</sup> 0...2 V, 16 bit, 0.05 %	KL3172-0500 <sup>633</sup> 0...500 mV, 16 bit, 0.05 %			
±2 V			KL3182 <sup>633</sup> 16 bit, 0.05 %			
0...10 V	KL3061 <sup>632</sup> single-ended, 12 bit	KL3062 <sup>632</sup> single-ended, 12 bit	KL3162 <sup>633</sup> 16 bit, 0.05 %	KL3064 <sup>632</sup> single-ended, 12 bit	KL3464 <sup>632</sup> single-ended, 12 bit	KL3468 <sup>633</sup> single-ended, 12 bit
±10 V	KL3001 <sup>630</sup> differential input, 12 bit	KL3002 <sup>630</sup> differential input, 12 bit	KL3102 <sup>631</sup> differential input, 16 bit	KL3404 <sup>631</sup> single-ended, 12 bit	KL3408 <sup>631</sup> single-ended, 12 bit	
			KL3132 <sup>631</sup> 16 bit, 0.05 %			
0...20 mA	KL3011 <sup>634</sup> differential input, 12 bit	KL3041 <sup>635</sup> with sensor supply, 12 bit	KL3012 <sup>634</sup> differential input, 12 bit	KL3112 <sup>635</sup> differential input, 16 bit	KL3044 <sup>634</sup> single-ended, 12 bit	KL3448 <sup>635</sup> single-ended, 12 bit
			KL3042 <sup>635</sup> with sensor supply, 12 bit	KL3142 <sup>635</sup> 16 bit, 0.05 %	KL3444 <sup>634</sup> single-ended, 12 bit	
4...20 mA	KL3021 <sup>636</sup> differential input, 12 bit	KL3051 <sup>637</sup> with sensor supply, 12 bit	KL3022 <sup>636</sup> differential input, 12 bit	KL3122 <sup>637</sup> differential input, 16 bit	KL3054 <sup>636</sup> single-ended, 12 bit	KL3458 <sup>637</sup> single-ended, 12 bit
			KL3052 <sup>637</sup> with sensor supply, 12 bit	KL3152 <sup>637</sup> 16 bit, 0.05 %	KL3454 <sup>636</sup> single-ended, 12 bit	
Resistance thermometer (RTD)	KL3201 <sup>639</sup> PT100...1000, Ni100, 16 bit	KL3202 <sup>639</sup> PT100...1000, Ni100, 16 bit	KL3222 <sup>639</sup> PT100, 4-wire connection, high-precision	KL3204 <sup>638</sup> PT100...1000, Ni100...1000, 2-wire connection	KL3208-0010 <sup>639</sup> PT1000, Ni1000, NTC 1.8... 100 k, potentiom. 1, 5, 10 kΩ	
				KL3214 <sup>638</sup> PT100...1000, Ni100...1000, KTY, 3-wire connection	KL3228 <sup>639</sup> PT1000, Ni1000	
Thermo-couple/mV	KL3311 <sup>640</sup> type J, K, L,...U, 16 bit	KL3312 <sup>641</sup> type J, K, L,...U, 16 bit		KL3314 <sup>641</sup> type J, K, L,...U, 16 bit		
Resistor bridge	KL3351 <sup>642</sup> strain gauge, 16 bit	KL3356 <sup>642</sup> strain gauge, 16 bit, self-calibration				
Oscilloscope	KL3361 <sup>643</sup> ±16 mV	KL3362 <sup>643</sup> ±10 V				
Measurement technology	KL3681 <sup>645</sup> digital multimeter terminal, 18 bit	KL3403 <sup>644</sup> 3-phase power measurement terminal, 1 A	KL3403-0010 <sup>644</sup> 3-phase power measurement terminal, 5 A			
Pressure measuring	KM3701 <sup>646</sup> differential pressure measuring, -100...+100 hPa	KM3701-0340 <sup>646</sup> differential pressure measuring, up to 340 hPa	KM3702 <sup>647</sup> relative pressure measuring, 7,500 hPa	KM3712 <sup>647</sup> relative pressure measuring, -1,000...+1,000 hPa		

Bus Terminal   Analog output: KL4xxx/KS4xxx					KM4xxx
Signal	1-channel	2-channel	4-channel	8-channel	2-channel
0...10 V	KL4001 <sup>650</sup> 12 bit, potential-free output	KL4002 <sup>650</sup> 12 bit	KL4004 <sup>650</sup> 12 bit, no power contacts		KM4602 <sup>651</sup> 12-bit manual/automatic operation
			KL4404 12 bit	KL4408 12 bit	
±10 V	KL4031 <sup>648</sup> 12 bit, potential-free output	KL4032 <sup>648</sup> 12 bit	KL4034 <sup>649</sup> 12 bit, no power contacts		
		KL4132 16 bit	KL4434 12 bit	KL4438 12 bit	
			KL4494 <sup>649</sup> 12 bit, 2 x input, 2 x output		
0...20 mA	KL4011 12 bit	KL4012 12 bit	KL4414 12 bit	KL4418 12 bit	
		KL4112 16 bit			
4...20 mA	KL4021 12 bit	KL4022 12 bit	KL4424 12 bit	KL4428 12 bit	

The standard Bus Terminals (KLxxx) can be optionally ordered as KSxxx with pluggable wiring level.

## Bus Terminal | Special functions: KL5xxx/KS5xxx, KL6xxx/KS6xxx, KL8xxx

Signal			
<b>Position measurement</b>	<b>KL5001</b> 656 SSI encoder interface	<b>KL5051</b> 656 bidirectional SSI encoder interface	<b>KL5121</b> 657 incremental encoder interface with programmable outputs
	<b>KL5101</b> 658 differential input, incremental encoder interface	<b>KL5152</b> 659 32 bit, 2-channel incremental encoder interface	<b>KL5151</b> 659 32 bit, incremental encoder interface
	<b>KL5111</b> 659 incremental encoder interface		
<b>Communication</b>	<b>KL6001</b> 660 serial interface RS232, 19.2 kbaud	<b>KL6031</b> 660 serial interface RS232, 115.2 kbaud	<b>KL6011</b> 661 serial interface TTY, 20 mA current loop
	<b>KL6051</b> 661 data exchange terminal, 32 bit	<b>KL6021</b> 661 serial interface RS422/RS485, 19.2 kbaud	<b>KL6041</b> 661 serial interface RS422/RS485, 115.2 kbaud
	<b>KL6023</b> 665 wireless adapter for EnOcean radio technology	<b>KL6021-0023</b> 665 RS485 interface for EnOcean signals	<b>KM6551</b> 663 wireless data exchange terminal
	<b>KL6201</b> 662 AS-Interface master terminal	<b>KL6211</b> 662 AS-Interface master terminal with power contacts	<b>KL6224</b> 666 IO-Link master
	<b>KL6301</b> 666 EIB/KNX Bus Terminal	<b>KL6401</b> 667 LON Bus Terminal	<b>KL6581</b> 664 EnOcean master
	<b>KL6583</b> 664 EnOcean transmitter/receiver	<b>KL6771</b> 667 MP-Bus master terminal	<b>KL6781</b> 667 M-Bus master terminal
	<b>KL6811</b> 668 DALI/DSI master and power supply terminal	<b>KL6831</b> 668 SMI terminal, LoVo	<b>KL6841</b> 668 SMI terminal, 230 V AC
<b>Safety</b>	<b>KL6904</b> 669 TwinSAFE Logic Bus Terminal, 4 safe outputs		

Signal		
<b>Manual operation</b>	<b>KL8519</b> 670 16-channel digital input signal module	
	<b>KL8524</b> 671 4 x 2-channel digital output, 24 V DC, 0.5 A	
	<b>KL8528</b> 671 8-channel digital output, 24 V DC, 0.5 A	
	<b>KL8548</b> 671 8-channel analog output, 0...10 V	
<b>Power terminals</b>	<b>KL8001</b> 672 switching capacity 5.5 kW, nominal current 0.9 to 9.9 A, connection mechanism for Siemens contactors (Sirius 3R series)	

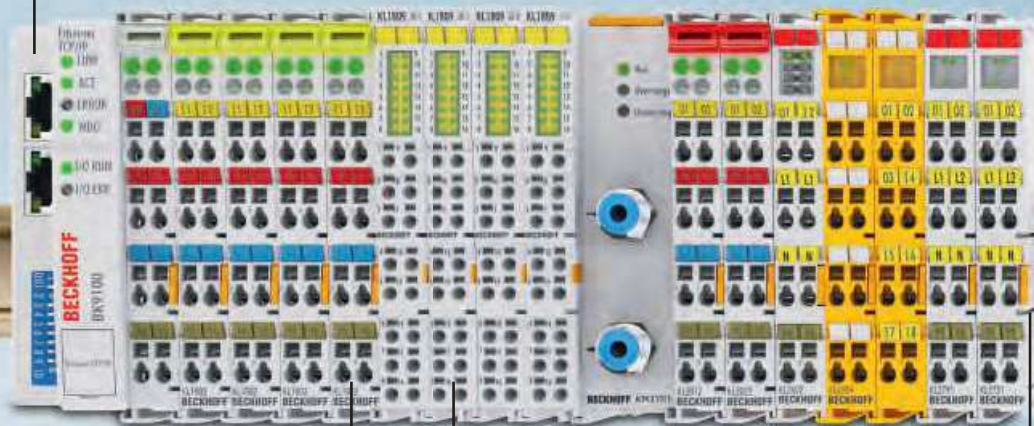
## Bus Terminal | System terminals: KL9xxx/KS9xxx

Signal	System	
<b>System</b>	<b>KL9010</b> 678 bus end terminal	<b>KL9070</b> 673 shield terminal
	<b>KL9020</b> 678 terminal bus extension end terminal	<b>KL9050</b> 678 terminal bus extension coupler terminal
	<b>KL9060</b> 678 adapter terminal for power terminal KL8xxx	<b>KL9309</b> 678 adapter terminal for KL85xx manual operating modules
	<b>KL9080</b> 673 isolation terminal	<b>KL9195</b> 673 shield terminal
<b>Potential distribution terminal</b>	<b>KL9180</b> 676 2 terminal points per power contact	<b>KL9181</b> 677 2 x 8 terminal points
	<b>KL9182</b> 677 8 x 2 terminal points	<b>KL9183</b> 677 1 x 16 terminal points
	<b>KL9184</b> 677 8 x 24 V DC, 8 x 0 V DC	<b>KL9185</b> 676 only 2 power contacts
	<b>KL9186</b> 676 8 x 24 V DC	<b>KL9187</b> 677 8 x 0 V DC
	<b>KL9188</b> 677 16 x 24 V DC	<b>KL9189</b> 677 16 x 0 V DC
	<b>KL9380</b> 623 mains filter, approx. 1 µF	
<b>Filter</b>	<b>KL9540</b> 683 surge filter terminal for field supply	
	<b>KL9540-0010</b> 683 surge filter field supply for analog terminals	<b>KL9550</b> 683 surge filter terminal for system/field supply
<b>Diode array</b>	<b>KL9300</b> 679 4 diodes, potential-free	
	<b>KL9301</b> 679 7 diodes, common cathode	<b>KL9302</b> 679 7 diodes, common anode

Signal	Potential supply	Power supply and accessories
<b>24 V DC</b>	<b>KL9100</b> 674  <b>KL9110</b> 674 diagnostic <b>KL9200</b> 675 with fuse <b>KL9210</b> 675 diagnostic, with fuse	<b>KL9400</b> 680 K-bus power supply, 2 A <b>KL9505</b> 680 output 5 V DC, 0.5 A <b>KL9508</b> 681 output 8 V DC, 0.5 A <b>KL9510</b> 681 output 10 V DC, 0.5 A <b>KL9512</b> 681 output 12 V DC, 0.5 A <b>KL9515</b> 681 output 15 V DC, 0.5 A <b>KL9520</b> 682 AS-Interface potential supply <b>KL9528</b> 682 AS-Interface power supply terminal <b>KL9560</b> 681 output 24 V DC, 0.1 A
<b>50 V DC</b>		<b>KL9570</b> 684 buffer capacitor terminal, 500 µF
<b>120... 230 V AC</b>	<b>KL9150</b> 674 diagnostic <b>KL9160</b> 675 with fuse <b>KL9250</b> 675 diagnostic, with fuse <b>KL9260</b> 675 diagnostic, with fuse	
<b>Up to 400 V AC</b>	<b>KL9190</b> 675 with fuse <b>KL9290</b> 675 with fuse	

Bus Coupler: the link between  
Bus Terminals and fieldbus

Fast and secure data  
connections by means  
of a serial terminal bus



Operation of up to  
64 Bus Terminals  
on one Bus Coupler  
(255 with K-bus  
extension KL9020  
and KL9050)

Bus Terminals in 1-, 2-, 4-, 8- and 16-channel modularity  
with combinations of any desired types of signal

Power contacts for automatic  
transfer of supply voltage

## The Bus Terminal system

The I/O signals are wired in a decentralised way to fieldbus devices or centrally to the controller. For both possibilities the available Bus Terminals enable an easy adaptation of different applications. With their compact design Beckhoff I/Os replace an entire group of devices with similar functions.

### Flexible and stable

The Beckhoff Bus Terminal is an open and fieldbus-neutral I/O system consisting of electronic terminal blocks. The head of an electronic terminal block is the Bus Coupler with the interface to the fieldbus. Bus Couplers are available e.g. for EtherCAT, PROFIBUS and CANopen. Please see page 548 for a complete Bus Coupler overview.

With the master terminals, fieldbus functionalities are also available in form of a standard Bus Terminal. This is particularly advantageous for bus systems that are integrated as subsystems into a higher-level system. It means that only one system is required for the subsystem and for the higher-level bus interface. Master terminals are available for the following bus systems: AS-Interface, EIB/KNX, LON, DALI, MP-Bus and M-Bus.

### Automation standard

The Beckhoff Bus Terminal ensures that control cabinets and terminal boxes are constructed more economically. Using the 4-wire terminating system, all of the usual sensors

and actuators with different types of signals can be connected directly without other connection systems. It is no longer necessary to wire the field devices between the first terminal connection in the control cabinet or in the terminal box and the controller. This significantly reduces the costs involved in controller design and saves space, material, work, and money.

The Beckhoff Bus Terminals have been tried and tested in a wide range of sectors worldwide, from machine construction to building management. Beckhoff Bus Terminal technology makes design, construction, wiring, commissioning and maintenance of equipment and machines very cost-effective.

### Design

The robust housing, secure contacts and the solidly built electronics are prominent features of our components. A station consists of one Bus Coupler and up to 64 electronic terminal blocks. With the K-bus extension it is possible to operate up to 255 Bus Terminals on one Bus Coupler.

The electronic terminal blocks are clipped onto the Bus Coupler. They connect by simply latching together. This means that each electronic terminal block can be exchanged separately and can be mounted on a standard mounting rail. In addition to horizontal type mounting, all other mounting types are permitted in the majority of the cases.

### Free mix of signals

The Beckhoff I/O system supports about 400 Bus Terminals and is thus probably the most comprehensive system on the market. Appropriate Bus Terminals are available for any digital or analog automation signal type, for currents and voltages with standardised signal levels and for PT100 and thermocouple signals. Intelligent devices can be connected via Bus Terminals with serial interfaces in accordance with RS232, RS485 or 20 mA TTY.

The fine granularity of the Bus Terminals enables bit-precise composition of the required I/O channels. The digital Bus Terminals are available as 2-, 4-, 8- or 16-channel terminals. In the 16-channel variant, digital input and output signals are arranged in an ultra-compact way within a standard Bus Terminal housing across a width of only 12 mm. The standard analog signals of -10...+10 V, 0...+10 V, 0...20 mA and 4...20 mA are all available as 1-, 2-, 4- and 8-channel variants within a standard housing. The system is thus highly modular and can be projected cost-effectively with an accuracy down to a single channel.

### Flexible connection system

The standard KLxxx Bus Terminals include electronics and connection level in a single enclosure. They have been tried and tested for years. They feature integrated screwless spring loaded technique for fast and simple assembly.



The HD Bus Terminals (High Density) 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. Single-wire conductors and conductors with a wire end sleeve can be inserted directly into the spring loaded terminal point without tools.

The KSxxxx type Bus Terminals feature a pluggable connection level. The assembly and wiring procedure for the KS series is the same as for the KL series. The KS series Bus Terminals enable the complete wiring to be removed as a plug connector from the top of the housing for servicing. The lower section can be removed from the Bus Terminal assembly 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 Bus Terminal only had to be changed slightly. The new connector adds about 3 mm. The maximum height of the Bus 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.

The Bus Terminal system is complemented by the compact version of the KMxxxx terminal modules with increased packing density. They are fully system-compatible.

Like the Bus Terminals, they are bus-neutral and can therefore be operated with any Beckhoff Bus Coupler or Bus Terminal Controller. Like the standard Bus Terminals, the KM modules are integrated in the I/O system and connected with the internal terminal bus (K-bus). Bus Terminals and terminal modules can be combined without restriction.

Like for the Bus Terminals, no tools are required for the wiring. Spring-loaded terminals are used, however with connectors (cable cross section 0.5...1.5 mm<sup>2</sup>).

The terminal modules combine 16, 32 or 64 digital inputs or outputs on a very small area. This compact and slimline design enables very high packing densities, leading to smaller control cabinets and terminal boxes.



Bus Terminal with standard wiring



HD Bus Terminals (High Density) with 16 terminal points



Bus Terminal with pluggable wiring



Terminal module with pluggable wiring with high packing density

# Bus Terminal features

Status LEDs for reliable and fast startup

Marking material for standard terminal blocks

Supply point for downstream inputs and outputs

Detachable labelling fields for clear text labels

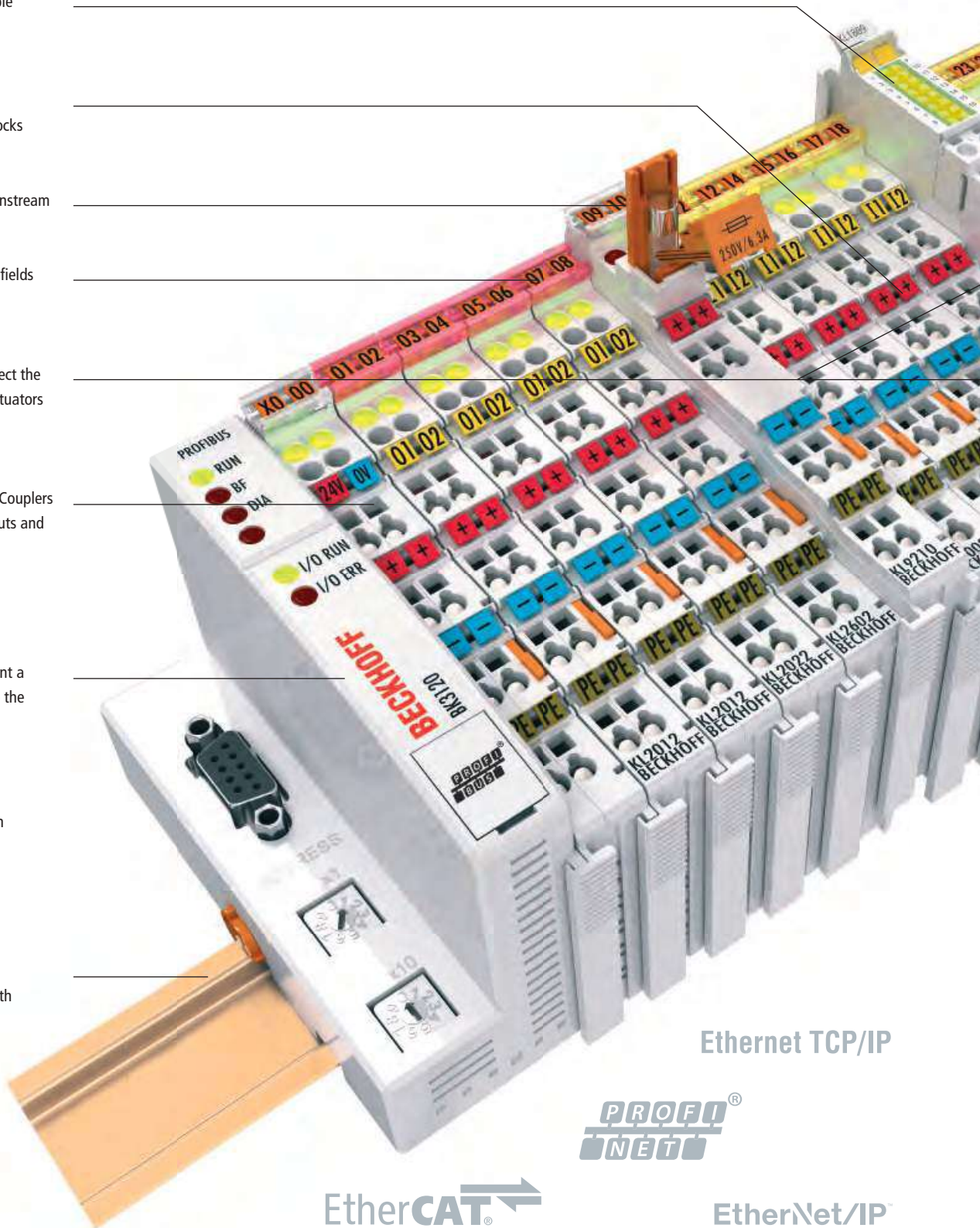
Power contacts connect the supply for sensors/actuators automatically.

Supply point for Bus Couplers and downstream inputs and outputs

Bus Couplers represent a universal interface to the fieldbuses.

Terminal block design  
W x H x D (mm):  
12 x 100 x 68

Assembly on 35 mm  
DIN mounting rail with  
no accessories



Ethernet TCP/IP



EtherNet/IP



# System overview fieldbus I/O



Bus Coupler series BK, the link between Bus Terminals and fieldbus



Bus Terminal Controller series BC with integrated IEC 61131-3 PLC



Bus Terminal Controller series BX with integrated IEC 61131-3 PLC and extended interfaces



Embedded PC series CX, further Embedded PCs see page 184

The head station of the Bus Terminals: from Bus Coupler with fieldbus interface to Embedded PC

Free mix of signals: about 400 different Bus Terminals for connection to all common sensors and actuators

Potential feed terminals enable configuration of different potential groups.

Bus Terminals in 1-, 2-, 4-, 8- and 16-channel modularity

The terminal modules with plug-in wiring combine 16, 32 or 64 digital I/Os within a very small space and with high packing density.



Compact Box



Coupler Box/PLC Box

IP 67 Fieldbus Box, further Fieldbus Box modules see page 696



Extension Box modules

IP-Link

3-phase power measurement capability enables all relevant electrical data of the supply network to be measured.

Communication terminals enable the integration of subsystems such as AS-Interface, RS232 and RS485.

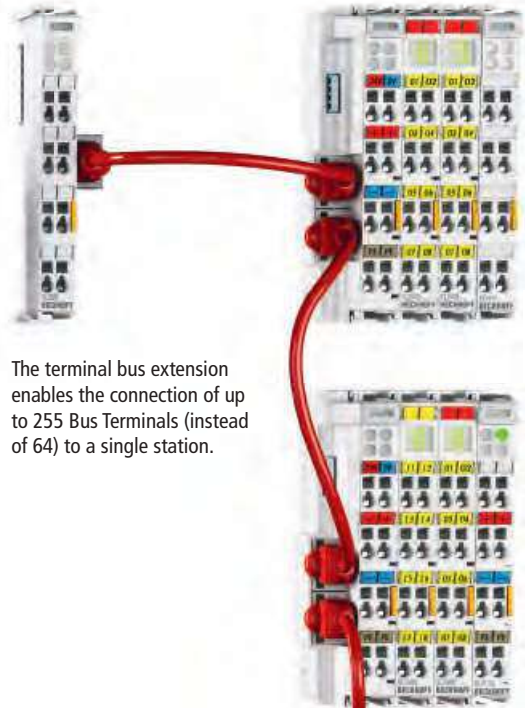
Integrated safety: the TwinSAFE Bus Terminals enable the connection of all common safety sensors and actuators.

Bus Terminals with a maximum measurement error of  $\pm 0.01\%$

IO-Link box modules



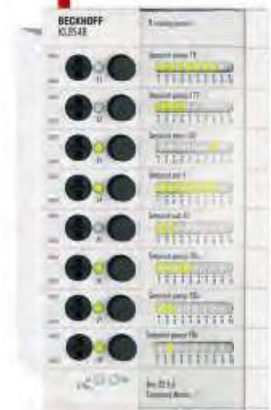
Bus end terminal



The terminal bus extension enables the connection of up to 255 Bus Terminals (instead of 64) to a single station.



Manual operating modules enable switching, controlling and monitoring of digital and analog signals as well as setting and reading of data and values in the event of a controller failure. Process data connection via K-bus interface with K-bus extension (up to 31 modules). Signal connection via KL9309.





Via the K-bus extension, the Bus Coupler "Economy plus" enables the connection of up to 255 Bus Terminals.

The coupler terminal KL9050 starts a further remote bus terminal block.

Operation of up to 64 Bus Terminals

Bus end terminal KL9010

Operation of up to 64 Bus Terminals

K-bus extension via screened Industrial Ethernet cable with two RJ45 plugs (distance up to 5 m)

Terminal bus extension, end terminal KL9020

Through the K-bus interconnection it is possible to connect further 30 stations (total extension 155 m).

## Terminal bus extension

The Bus Couplers and Bus Terminal Controllers link the bus systems to the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number of terminals between 1 and 64, and a bus end terminal. The "Economy plus" and "Compact" series support all Bus Terminals of the Beckhoff system. It is also possible to operate up to 255 Bus Terminals on this Bus Coupler series with the K-bus extension.

The Bus Terminal extension allows Bus Terminals to be located in up to 31 blocks in the control cabinet or in the application. With a distance of up to 5 m between the Bus Terminal blocks, the Bus Terminal system can be used over a wider area and helps save costs.

The Bus Coupler recognises the terminals to which it is connected, and performs the

assignment of the inputs and outputs to the bytes of the process image automatically. The blocks with terminal bus extensions are treated as one unit by the Bus Coupler. The extension is transparent for the fieldbus and higher-level systems.

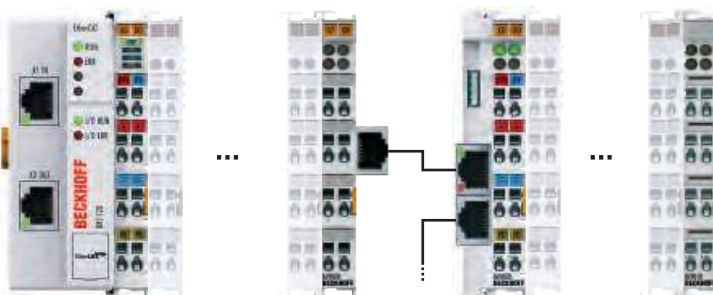
The system of Bus Coupler and Bus Terminal can be extended by replacing the KL9010 end terminal with the KL9020 extension. The KL9020 makes the K-bus signals available in an RJ45 socket for transmission onwards via a shielded Industrial Ethernet cable.

The KL9050 coupler terminal starts a further remote Bus Terminal block and provides the logical connection to the Bus Coupler via the Ethernet cable. 24 V DC, electrically isolated, for the field level can be input at

this coupler terminal. The internal K-bus shares the same potential as the K-bus of the coupler. The KL9050 can be used via a second socket for the extension to the next Bus Terminal block. This Bus Terminal block starts in the same way as the one with a KL9050 coupler terminal. This coupling works at up to 31 stations. The maximum distance between two Bus Terminal blocks is 5 m and allows a total extension of 155 m. The system uses shielded Industrial Ethernet cables with two RJ45 plugs for the transmission. The cable is supplied ready-made in different lengths or can be made-to-measure for applications with conventional Ethernet tools. Data transfer is based on the interference-free and RS485 industry standard in a double-screened cable.



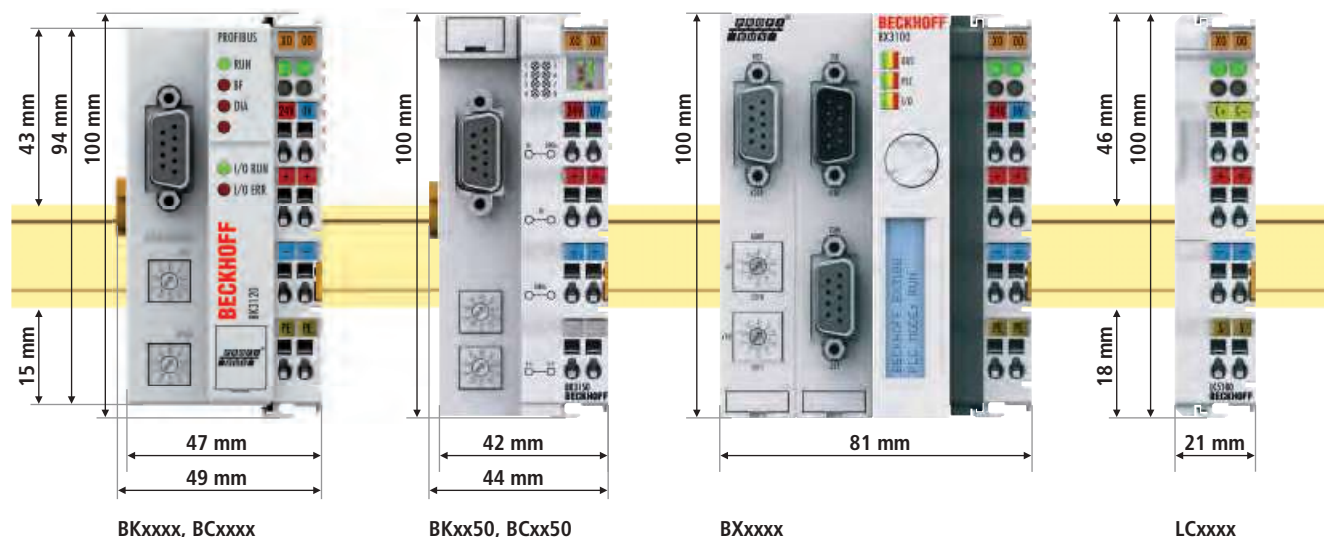
Operation with up to 64 Bus Terminals to one Bus Coupler with KL9010 bus end terminal



Operation with up to 255 Bus Terminals to one Bus Coupler with terminal bus extension end terminal KL9020 and coupler terminal KL9050

# Technical data – Bus Coupler housing

The Beckhoff Bus Coupler electronics can be mounted in a variety of housings. A housing has three power contacts, which, if the application requires, automatically implement a continued connection, carrying the potential of the power circuit to the next Bus Terminal. The supply voltage that is connected to the Bus Coupler spring-loaded terminals is 24 V DC. If a different voltage is required for the power contacts, the appropriate power feed terminal must be inserted after the Bus Coupler.

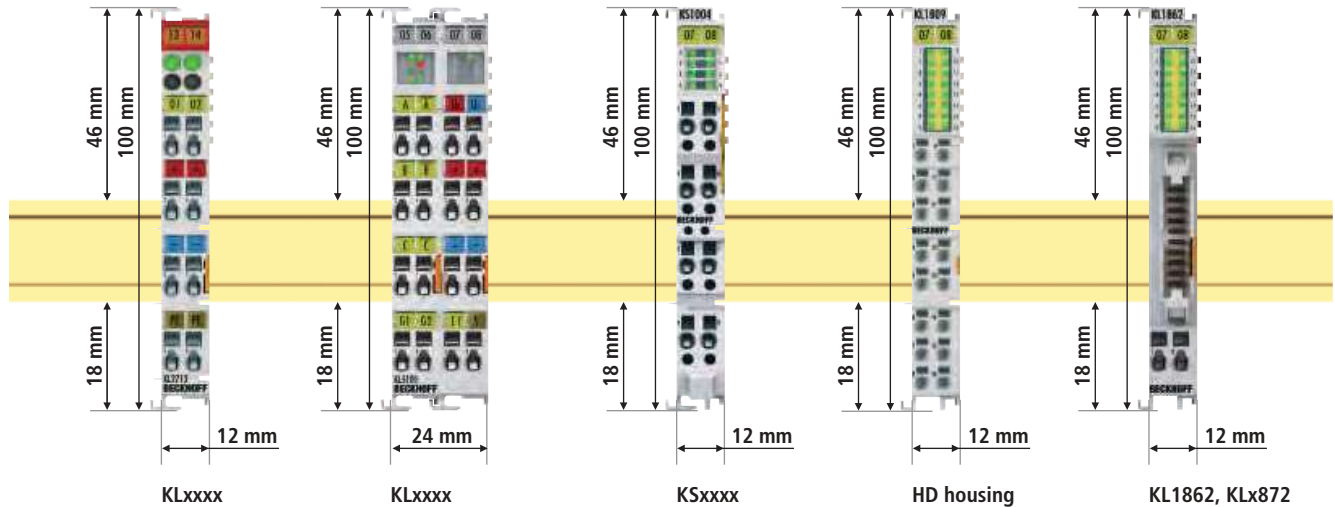


Mechanical data	BKxxxx, BCxxxx	BKxx50, BCxx50	BXxxxx	LCxxxx	BC9191
Design form	compact terminal housing with signal LED	compact terminal housing with signal LED	compact terminal housing with signal LED	compact terminal housing with signal LED	compact controller
Material	polycarbonate	polycarbonate	polycarbonate	polycarbonate	PC/ABS
Dimensions (W x H x D)	49 mm x 100 mm x 68 mm	44 mm x 100 mm x 68 mm	81 mm x 100 mm x 89 mm (BX8000: 61 mm x 100 mm x 89 mm)	21 mm x 100 mm x 68 mm	118 mm (127 mm with end cap and DIN rail mounting) x 100 mm x 70 mm
Installation	on 35 mm DIN rail, conforming to EN 60715 with lock				
Side by side mounting by means of	double slot and key connection				
Marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	connection points on housing labelled and numbered
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)				
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				

Connection	BKxxxx, BCxxxx	BKxx50, BCxx50	BXxxxx	LCxxxx	BC9191
Wiring	spring-loaded technique	spring-loaded technique	spring-loaded technique	spring-loaded technique	spring-loaded technique with plug-gable wiring level
Connection cross-section	0.08...2.5 mm <sup>2</sup> , AWG 28-14, stranded wire, solid wire	0.08...2.5 mm <sup>2</sup> , AWG 28-14, stranded wire, solid wire	0.08...2.5 mm <sup>2</sup> , AWG 28-14, stranded wire, solid wire	0.08...2.5 mm <sup>2</sup> , AWG 28-14, stranded wire, solid wire	0.08...1.5/2.5 mm <sup>2</sup> , AWG 28-14, stranded wire, solid wire
Stripping length	8...9 mm	8...9 mm	8...9 mm	8...9 mm	6...7 mm/8...9 mm
Fieldbus connection	depending on fieldbus	depending on fieldbus	depending on fieldbus	spring-loaded terminals	RJ45
Power contacts	3 spring contacts	3 spring contacts	3 spring contacts	3 spring contacts	none
Current load	I <sub>MAX</sub> : 10 A (125 A short-circuit)	I <sub>MAX</sub> : 10 A (125 A short-circuit)	I <sub>MAX</sub> : 10 A (125 A short-circuit)	I <sub>MAX</sub> : 10 A (125 A short-circuit)	–
Nominal voltage	24 V DC	24 V DC	24 V DC	24 V DC	110...240 V AC

# Technical data – Bus Terminal housing

The Beckhoff Bus Terminal electronics can be mounted in a variety of housings. Bus Terminals are available with up to three power contacts, and can have a variety of voltages. Care should be taken to ensure that a change in voltage always starts with a power feed terminal.



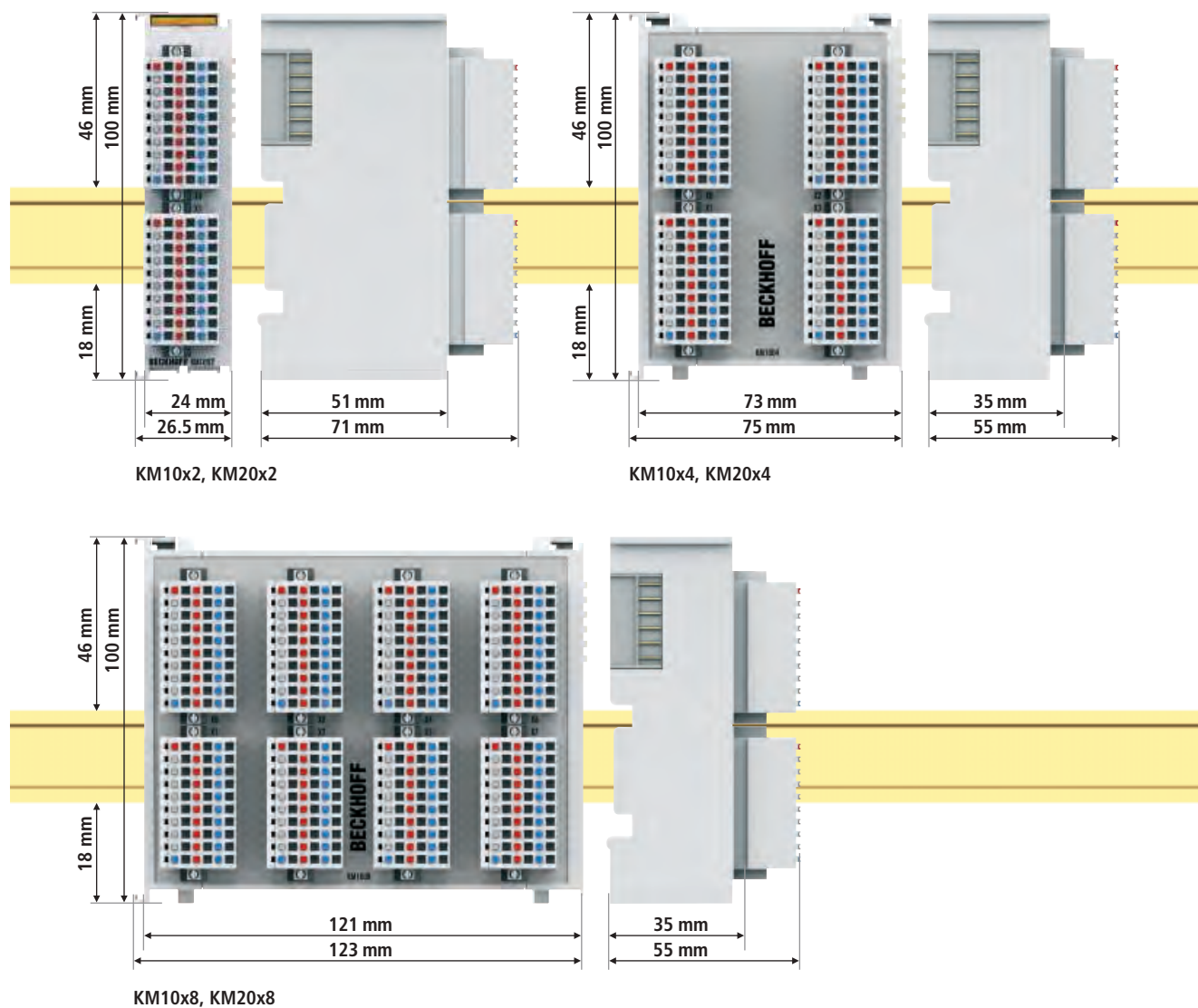
Mechanical data	KLxxx	KL5101	KSxxx	HD housing	KL1862, KLx872
Design form	compact terminal housing with signal LED	compact terminal housing with signal LED	terminal housing with pluggable wiring level	HD (High Density) housing with signal LED	compact terminal housing with signal LED
Material	polycarbonate				
Dimensions (W x H x D)	12 mm x 100 mm x 68 mm	24 mm x 100 mm x 68 mm	12/24 mm x 100 mm x 71 mm	12 mm x 100 mm x 68 mm	12 mm x 100 mm x 68 mm
Installation	on 35 mm DIN rail, conforming to EN 60715 with lock				
Side by side mounting by means of	double slot and key connection				
Marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	–	standard terminal block marking
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)				
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				

Connection	KLxxx	KL5101	KSxxx	HD housing	KL1862, KLx872
Wiring	spring-loaded technique	spring-loaded technique	spring-loaded technique	direct plug-in technique	flat-ribbon cable connection
Connection cross-section	s, st*: 0.08...2.5 mm <sup>2</sup> , AWG 28-14	s, st*: 0.08...2.5 mm <sup>2</sup> , AWG 28-14	s, st*: 0.08...1.5 mm <sup>2</sup> , AWG 28-16	s*: 0.08...1.5 mm <sup>2</sup> ; st: 0.25...1.5 mm <sup>2</sup> ; f: 0.14...0.75 mm <sup>2</sup>	common flat-ribbon cables, AWG 28, spacing 1.27 mm
Stripping length	8...9 mm	8...9 mm	9...10 mm	8...9 mm	–
Power contacts	up to 3 blade/spring contacts	none	2 blade/spring contacts	2 blade/spring contacts	none
Current load	I <sub>MAX</sub> : 10 A (125 A short-circuit)				
Nominal voltage	depends on Bus Terminal type				

\*s: solid wire; st: stranded wire; f: ferrule

# Technical data – Terminal module housing

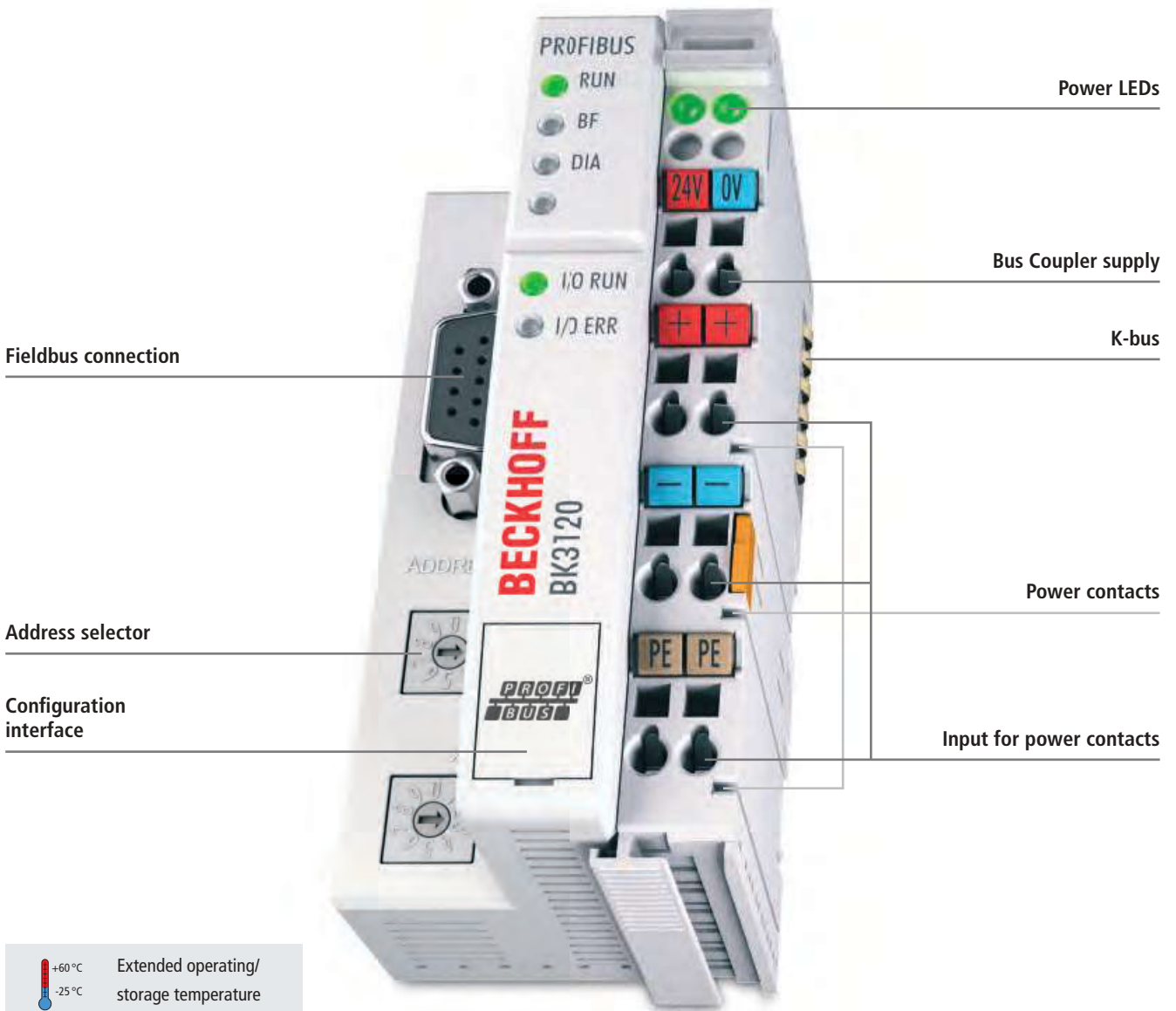
The Beckhoff terminal modules with pluggable connection level are mounted in enclosures of different size. Like for the HD Bus Terminals, spring-loaded terminals are used and no tools are required for the wiring.





Mechanical data	KMx0x2	KMx0x4	KMx0x8
Design form	compact terminal module with pluggable wiring level		
Dimensions (W x H x D)	26.5 mm x 100 mm x 71 mm	75 mm x 100 mm x 55 mm	123 mm x 100 mm x 55 mm
Installation	on 35 mm DIN rail, conforming to EN 60715 with lock		
Side by side mounting by means of	double slot and key connection		
Vibration resistance	conforms to EN 60068-2-6		
Shock resistance	conforms to EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Connection	KMx0x2, KMx0x4, KMx0x8		
Wiring	spring-loaded technique		
Connection cross-section	0.08...1.5 mm <sup>2</sup> , stranded wire, solid wire		
Stripping length	8 mm		
Power contacts	none		
Nominal voltage	depends on Bus Terminal type, max. 60 V DC		

# BKxxxx | Bus Couplers

The interface between fieldbus and terminals



Bus Terminal  
564

 +60 °C -25 °C	Extended operating/ storage temperature
 25 g	Extended mechanical load

For further information on the individual fieldbuses see page **262**



Standard | BKxx00



Economy | BKxx10



Economy plus | BKxx20



Compact | BKxx50



Low Cost | LCxx00

The Bus Couplers link the modularly expandable electronic terminal blocks with the respective fieldbus systems. The Bus Coupler performs all the monitoring and control tasks that are necessary for operation of the connected Bus Terminals. The specific settings of analog and multifunctional Bus Terminals are adapted to the application via the KS2000 configuration software.

In the standard Bus Couplers a unit consists of a Bus Coupler, any number of up to 64 terminals and a bus end terminal. The "Economy" versions enable particularly cost-effective configuration of peripheral

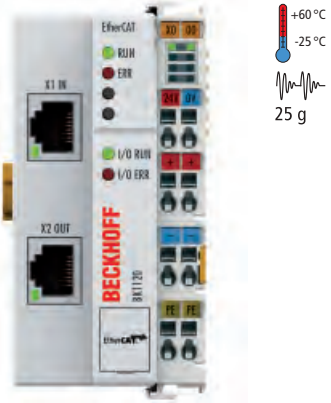
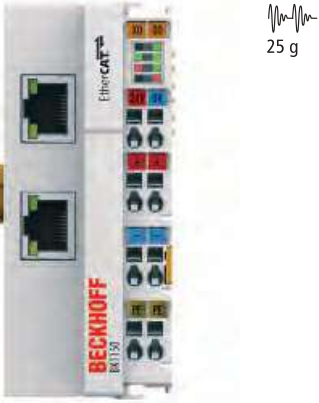

interfacing connections with up to 64 digital input/output terminals. In addition to digital signal types, the "Economy plus" Bus Couplers also support all other types. Up to 255 Bus Terminals can be connected via the K-bus extension. The "Compact" Bus Couplers have a particularly compact housing and also enable connection of up to 255 Bus Terminals via the terminal bus extension. The "Low Cost" Bus Couplers are characterised by small dimensions and cost-effective connection technology and enable connection of up to 64 digital input/output terminals.

Technical data	BKxxxx, LCxxxx
Power supply	24 V DC (-15 %/+20 %)
Operating/storage temperature	0...+55 °C/-25...+85 °C (extended temperature range: -25...+60 °C/-40...+85 °C)
Relative humidity	95 %, no condensation
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable

► [www.beckhoff.com/Bus-Coupler](http://www.beckhoff.com/Bus-Coupler)

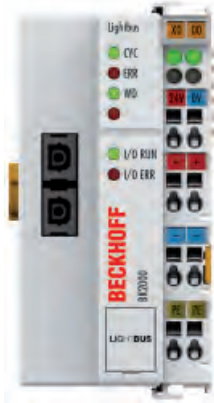

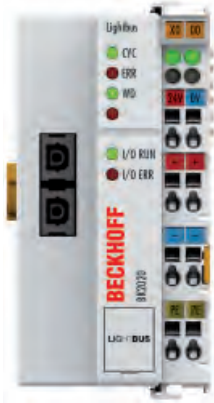
# EtherCAT | Bus Couplers



	EtherCAT "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	EtherCAT "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	EtherCAT "Compact" coupler between E-bus and K-bus Terminals
<b>Technical data</b>	<b>BK1120</b>	<b>BK1150</b>	<b>BK1250</b>
<b>Number of Bus Terminals</b>	64 (255 with K-bus extension)		
<b>Max. number of bytes fieldbus</b>	1,024 byte input and 1,024 byte output		
<b>Current supply K-bus</b>	1,750 mA	2,000 mA	500 mA
	 <p>The BK1120 Bus Coupler connects EtherCAT, the real-time Ethernet system, with the modular, extendable electronic terminal blocks. A unit consists of a Bus Coupler, any number (between 1 and 64) of terminals (255 with K-bus extension) and one end terminal.</p>	 <p>The BK1150 Bus Coupler connects EtherCAT to the modular extendable Bus Terminals (K-bus). A unit consists of a Bus Coupler, any number of terminals from 1 to 64 (with K-bus extension: 255) and a bus end terminal. The "Compact" Bus Coupler offers a cost-optimised alternative to the BK1120 EtherCAT Bus Coupler.</p>	 <p>The BK1250 is a "Bus Coupler in terminal housing" for mixed application of EtherCAT Terminals (ELxxxx) and standard Bus Terminals (KLxxxx) in a bus station. Up to 64 Bus Terminals (with K-bus extension up to 255) can be connected to a BK1250.</p>
<b>Bus interface</b>	2 x RJ45	2 x RJ45	via E-bus contacts
<b>Data transfer rates</b>	100 Mbaud	100 Mbaud	100 Mbaud
<b>Weight</b>	approx. 150 g	approx. 110 g	approx. 55 g
<b>Operating temperature</b>	-25...+60 °C	0...+55 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex	CE, Ex	CE, UL, Ex
<b>Further information</b>	<a href="http://www.beckhoff.com/BK1120">www.beckhoff.com/BK1120</a>	<a href="http://www.beckhoff.com/BK1150">www.beckhoff.com/BK1150</a>	<a href="http://www.beckhoff.com/BK1250">www.beckhoff.com/BK1250</a>
<b>Accessories</b>			
<b>Cordsets and connectors</b>	see page <b>688</b>	see page <b>688</b>	see page <b>688</b>
<b>PC Fieldbus Cards</b>	FC90xx <b>778</b>	FC90xx <b>778</b>	FC90xx <b>778</b>

# Lightbus | Bus Couplers




## LIGHTBUS

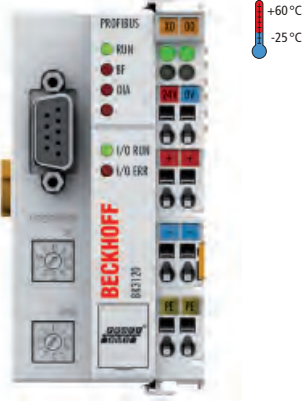
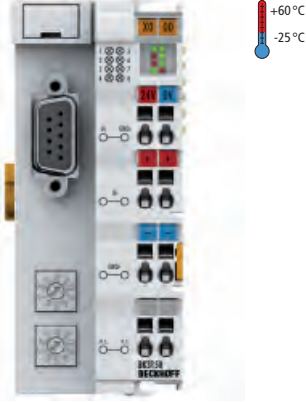


	Standard Lightbus Bus Coupler for up to 64 Bus Terminals	Lightbus "Economy" Bus Coupler for up to 64 digital Bus Terminals	Lightbus "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
<b>Technical data</b>	<b>BK2000</b>	<b>BK2010</b>	<b>BK2020</b>
<b>Number of Bus Terminals</b>	64		64 (255 with K-bus extension)
<b>Max. number of bytes fieldbus</b>	512 byte input and 512 byte output	32 byte input and 32 byte output	512 byte input and 512 byte output
<b>Current supply K-bus</b>	1,750 mA	500 mA	1,750 mA
	 <p>The BK2000 Bus Coupler connects the Lightbus system to the electronic terminal blocks, which can be expanded in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal.</p> <ul style="list-style-type: none"> <li>distance between stations: 45 m for APF fibre, 300 m HCS fibre</li> </ul>	 <p>The BK2010 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.</p> <ul style="list-style-type: none"> <li>distance between stations: 45 m for APF fibre, 300 m HCS fibre</li> </ul>	 <p>With the K-bus extension technology, the "Economy plus" Bus Coupler BK2020 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The "Economy plus" series supports all Beckhoff system Bus Terminals. It can process in its full configuration 1,020 digital signals and a maximum of 128 analog input and output channels per slave.</p> <ul style="list-style-type: none"> <li>distance between stations: 45 m for APF fibre, 300 m HCS fibre</li> </ul>
<b>Bus interface</b>	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)
<b>Data transfer rates</b>	2.5 Mbaud	2.5 Mbaud	2.5 Mbaud
<b>Weight</b>	approx. 150 g	approx. 130 g	approx. 150 g
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
<b>Further information</b>	<a href="http://www.beckhoff.com/BK2000">www.beckhoff.com/BK2000</a>	<a href="http://www.beckhoff.com/BK2010">www.beckhoff.com/BK2010</a>	<a href="http://www.beckhoff.com/BK2020">www.beckhoff.com/BK2020</a>
<b>Accessories</b>			
<b>Cordsets and connectors</b>	see page <b>688</b>	see page <b>688</b>	see page <b>688</b>
<b>PC Fieldbus Cards</b>	FC200x <b>771</b>	FC200x <b>771</b>	FC200x <b>771</b>



# PROFIBUS | Bus Couplers







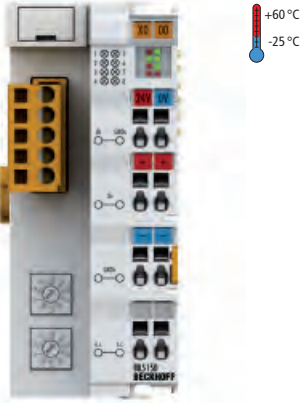


	PROFIBUS "Economy" Bus Coupler for up to 64 digital Bus Terminals, 1.5 Mbaud	Standard PROFIBUS DP/FMS Bus Coupler for up to 64 Bus Terminals, 12 Mbaud	PROFIBUS "Economy" Bus Coupler for up to 64 digital Bus Terminals, 12 Mbaud
<b>Technical data</b>	<b>BK3010</b>	<b>BK3100</b>	<b>BK3110</b>
<b>Number of Bus Terminals</b>	64		
<b>Max. number of bytes fieldbus</b>	64 byte input and 64 byte output	64 byte input and 64 byte output (DP and FMS mode), 128 byte input and 128 byte output (only DP mode)	64 byte input and 64 byte output
<b>Current supply K-bus</b>	500 mA	1,750 mA	500 mA
	 <p>The BK3010 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.</p>	 <p>The BK3100 Bus Coupler connects the PROFIBUS system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of the Bus Coupler, any number of up to 64 terminals and one end terminal.</p>	 <p>The BK3110 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.</p>
<b>Bus interface</b>	1 x D-sub 9-pin socket with shielding	1 x D-sub 9-pin socket with shielding	1 x D-sub 9-pin socket with shielding
<b>Data transfer rates</b>	automatic detection up to max. 1.5 Mbaud	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud
<b>Weight</b>	approx. 150 g	approx. 170 g	approx. 150 g
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
<b>Further information</b>	<a href="http://www.beckhoff.com/BK3010">www.beckhoff.com/BK3010</a>	<a href="http://www.beckhoff.com/BK3100">www.beckhoff.com/BK3100</a>	<a href="http://www.beckhoff.com/BK3110">www.beckhoff.com/BK3110</a>
<b>Accessories</b>			
<b>Cordssets and connectors</b>	see page <b>688</b>	see page <b>688</b>	see page <b>688</b>
<b>PC Fieldbus Cards</b>	FC310x <b>772</b>	FC310x <b>772</b>	FC310x <b>772</b>

	PROFIBUS "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	PROFIBUS "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	PROFIBUS "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	PROFIBUS "Low Cost" Bus Coupler for up to 64 digital Bus Terminals, 12 Mbaud
	<b>BK3120</b>	<b>BK3150</b>	<b>BK3520</b>	<b>LC3100</b>
	64 (255 with K-bus extension)			64
	128 byte input and 128 byte output			64 byte input and 64 byte output
	1,750 mA	1,000 mA	1,750 mA	500 mA
				
	The "Economy plus" version extends the existing PROFIBUS Bus Coupler series BK3xx0. The K-bus extension technology allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler.	The "Compact" Bus Coupler BK3150 for PROFIBUS extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing.	The particular feature for the BK3520 Bus Coupler is its fibre optic connection and its high transmission rate of up to 12 Mbaud.  – distance between stations: up to 40 m	The LC3100 "Low Cost" Bus Coupler is marked by a smaller design and a more economical connection method.
	1 x D-sub 9-pin socket with shielding	1 x D-sub 9-pin socket with shielding	4 x HP-Simplex sockets (HP-Simplex plugs ZS1031-3500 included)	connection via Bus Terminal
	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud
	approx. 170 g	approx. 100 g	approx. 170 g	approx. 100 g
	-25...+60 °C	-25...+60 °C	0...+55 °C	0...+55 °C
	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	<a href="http://www.beckhoff.com/BK3120">www.beckhoff.com/BK3120</a>	<a href="http://www.beckhoff.com/BK3150">www.beckhoff.com/BK3150</a>	<a href="http://www.beckhoff.com/BK3520">www.beckhoff.com/BK3520</a>	<a href="http://www.beckhoff.com/LC3100">www.beckhoff.com/LC3100</a>
	see page 688	see page 688	see page 688	see page 688
	FC310x 772	FC310x 772	FC310x 772	FC310x 772

# Interbus, CANopen | Bus Couplers






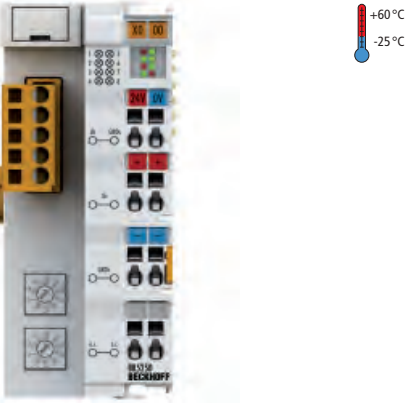

	Standard Interbus Bus Coupler for up to 64 Bus Terminals	Interbus "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	CANopen "Economy" Bus Coupler for up to 64 digital Bus Terminals
<b>Technical data</b>	<b>BK4000</b>	<b>BK4020</b>	<b>BK5110</b>
Number of Bus Terminals	64	64 (255 with K-bus extension)	64
Max. number of bytes fieldbus	64 byte input and 64 byte output		5 Tx/Rx PDOs
Current supply K-bus	1,750 mA	1,750 mA	500 mA
	 <p>The BK4000 Bus Coupler connects the Interbus bus system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal.</p>	 <p>With the K-bus extension technology, the "Economy plus" Bus Coupler BK4020 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The "Economy plus" coupler supports all Beckhoff system Bus Terminals and can process 512 bit digital inputs and outputs per slave.</p>	 <p>The BK5110 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.</p>
Bus interface	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock	1 x open style connector, 5-pin, included
Data transfer rates	500 kbaud	500 kbaud	up to 1 Mbaud
Weight	approx. 170 g	approx. 170 g	approx. 130 g
Operating temperature	0...+55 °C	0...+55 °C	0...+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex, GL
Further information	<a href="http://www.beckhoff.com/BK4000">www.beckhoff.com/BK4000</a>	<a href="http://www.beckhoff.com/BK4020">www.beckhoff.com/BK4020</a>	<a href="http://www.beckhoff.com/BK5110">www.beckhoff.com/BK5110</a>
<b>Accessories</b>			
Cordssets and connectors	see page <b>688</b>	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	–	–	FC510x <b>774</b>

	CANopen "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	CANopen "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	CANopen "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	CANopen "Low Cost" Bus Coupler for up to 64 digital Bus Terminals (255 with K-bus extension)
	<b>BK5120</b>	<b>BK5150</b>	<b>BK5151</b>	<b>LC5100</b>
	64 (255 with K-bus extension)			64
	16 Tx/Rx PDOs			5 Tx/Rx PDOs
	1,750 mA	1,000 mA	1,000 mA	500 mA
	 <p>With the K-bus extension technology, the "Economy plus" Bus Coupler BK5120 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The Bus Coupler works on the CAN protocol basis as defined in ISO 11898.</p>	 <p>The "Compact" Bus Coupler BK5150 for CANopen extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing. Up to 64 Bus Terminals are supported; with the terminal bus extension, up to 255 Bus Terminals can be connected. The CANopen Bus Coupler offers automatic baud rate detection up to 1 Mbaud and two address selection switches for address assignment.</p>	 <p>In contrast to the BK5150, the BK5151 has a 9-pin D-sub connector as a bus interface.</p>	 <p>The LC5100 "Low Cost" Bus Coupler is marked by a smaller design and a more economical connection method. All the bit-oriented terminals can be connected to the LC5100. All the digital input and output terminals are supported with the exception of the KL15xx, KL25x2, KL2692 and KL27x1 terminals. All the system terminals, with and without diagnostics, can also be connected.</p>
	1 x open style connector, 5-pin, included	open style connector, 5-pin	D-sub 9-pin socket	connection via Bus Terminal
	up to 1 Mbaud	automatic detection up to 1 Mbaud	automatic detection up to 1 Mbaud	up to 1 Mbaud
	approx. 150 g	approx. 100 g	approx. 100 g	approx. 100 g
	-25...+60 °C	-25...+60 °C	-25...+60 °C	0...+55 °C
	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	<a href="http://www.beckhoff.com/BK5120">www.beckhoff.com/BK5120</a>	<a href="http://www.beckhoff.com/BK5150">www.beckhoff.com/BK5150</a>	<a href="http://www.beckhoff.com/BK5151">www.beckhoff.com/BK5151</a>	<a href="http://www.beckhoff.com/LC5100">www.beckhoff.com/LC5100</a>
	see page 688	see page 688	see page 688	see page 688
	FC510x 774	FC510x 774	FC510x 774	FC510x 774

# DeviceNet | Bus Couplers

## DeviceNet™



	Standard DeviceNet Bus Coupler for up to 64 Bus Terminals	DeviceNet "Economy" Bus Coupler for up to 64 digital Bus Terminals
<b>Technical data</b>	<b>BK5200</b>	<b>BK5210</b>
Number of Bus Terminals	64	
Max. number of bytes fieldbus	512 byte input and 512 byte output	32 byte input and 32 byte output
Current supply K-bus	1,750 mA	500 mA
	 <p>The BK5200 Bus Coupler connects the DeviceNet bus system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal.</p>	 <p>The BK5210 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.</p>
Bus interface	1 x open pluggable connector, 5-pin, included	1 x open pluggable connector, 5-pin, included
Data transfer rates	automatic detection up to 500 kbaud	automatic detection up to 500 kbaud
Weight	approx. 150 g	approx. 130 g
Operating temperature	0...+55 °C	0...+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL
Further information	<a href="http://www.beckhoff.com/BK5200">www.beckhoff.com/BK5200</a>	<a href="http://www.beckhoff.com/BK5210">www.beckhoff.com/BK5210</a>
<b>Accessories</b>		
Cordsets and connectors	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	FC520x <b>776</b>	FC520x <b>776</b>

DeviceNet "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	DeviceNet "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	DeviceNet "Low Cost" Bus Coupler for up to 64 digital Bus Terminals (255 with K-bus extension)
BK5220	BK5250	LC5200
64 (255 with K-bus extension)		64
512 byte input and 512 byte output		32 byte input and 32 byte output
1,750 mA	1,000 mA	500 mA
 <p>With the K-bus extension technology, the "Economy plus" Bus Coupler BK5220 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The "Economy plus" series supports all Beckhoff system Bus Terminals and it can process in its full configuration 1,020 digital signals and a maximum of 256 analog input and output channels per slave.</p>	 <p>The "Compact" Bus Coupler BK5250 for DeviceNet extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing. The DeviceNet Bus Coupler offers automatic baud rate detection up to 500 kbaud and two address selection switches for address assignment. A 5-pin connector for the fieldbus connection is included in the scope of supply.</p>	 <p>The LC5200 "Low Cost" Bus Coupler is marked by a smaller design and a more economical connection method. All the bit-oriented terminals can be connected to the LC5200. All the digital input and output terminals are supported with the exception of the KL15xx, KL25x2, KL2692 and KL27x1 terminals. All the system terminals, with and without diagnostics, can also be connected.</p>
1 x open pluggable connector, 5-pin, included automatic detection up to 500 kbaud approx. 130 g -25...+60 °C CE, UL, Ex, GL <a href="http://www.beckhoff.com/BK5220">www.beckhoff.com/BK5220</a>	open style connector, 5-pin automatic detection up to 500 kbaud approx. 100 g -25...+60 °C CE, UL, Ex <a href="http://www.beckhoff.com/BK5250">www.beckhoff.com/BK5250</a>	connection via Bus Terminal automatic detection up to 500 kbaud approx. 100 g 0...+55 °C CE, UL, Ex <a href="http://www.beckhoff.com/LC5200">www.beckhoff.com/LC5200</a>
see page	see page	see page
FC520x	FC520x	FC520x
688	688	688
776	776	776

## ControlNet, CC-Link, Modbus | Bus Couplers

## ControlNet

## CC-Link

	Standard ControlNet Bus Coupler for up to 64 Bus Terminals	CC-Link "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
<b>Technical data</b>	<b>BK7000</b>	<b>BK7150</b>
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output	32 byte input and 32 byte output
Current supply K-bus	1,750 mA	1,000 mA
	 <p>The Bus Coupler BK7000 connects the ControlNet bus system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.</p> <p>The BK7000 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.</p>	 <p>The "Compact" Bus Coupler BK7150 connects the CC-Link system to the electronic terminal blocks, which can be extended in modular fashion.</p> <p>The BK7150 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.</p>
Bus interface	2 x BNC female connector + NAP	1 x open style connector, 5-pin, included
Data transfer rates	5 Mbaud	156 kbaud...10 Mbaud
Weight	approx. 170 g	approx. 100 g
Operating temperature	0...+55 °C	0...+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Further information	<a href="http://www.beckhoff.com/BK7000">www.beckhoff.com/BK7000</a>	<a href="http://www.beckhoff.com/BK7150">www.beckhoff.com/BK7150</a>
<b>Accessories</b>		
Cordsets and connectors	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	–	–

# Modbus




<p>Standard Modbus Bus Coupler for up to 64 Bus Terminals</p>	<p>Modbus "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)</p>
<p><b>BK7300</b></p>	<p><b>BK7350</b></p>
<p>64</p>	<p>64 (255 with K-bus extension)</p>
<p>512 byte input and 512 byte output</p>	
<p>1,750 mA</p>	<p>1,000 mA</p>
<div> </div> <p>The BK7300 Bus Coupler connects the Modbus bus system to the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.</p>	<div> </div> <p>The "Compact" BK7350 Bus Coupler is a cost-optimised version with compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected.</p>
<p>D-sub 9-pin, RS485</p>	<p>D-sub 9-pin, RS485</p>
<p>150 baud...38,400 baud</p>	<p>150 baud...38,400 baud</p>
<p>approx. 170 g</p>	<p>approx. 100 g</p>
<p>0...+55 °C</p>	<p>-25...+60 °C</p>
<p>CE, UL, Ex, GL</p>	<p>CE, UL, Ex</p>
<p><a href="http://www.beckhoff.com/BK7300">www.beckhoff.com/BK7300</a></p>	<p><a href="http://www.beckhoff.com/BK7350">www.beckhoff.com/BK7350</a></p>
<p>see page <b>688</b></p>	<p>see page <b>688</b></p>
<p>–</p>	<p>–</p>






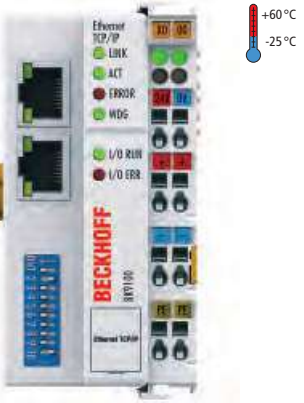
# SERCOS, RS485/RS232, Ethernet | Bus Couplers

**sercos**  
the automation bus

RS232  
↔  
RS485

	Standard SERCOS Bus Coupler for up to 64 Bus Terminals	SERCOS "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard RS485 Bus Coupler for up to 64 Bus Terminals
<b>Technical data</b>	<b>BK7500</b>	<b>BK7520</b>	<b>BK8000</b>
Number of Bus Terminals	64	64 (255 with K-bus extension)	64
Max. number of bytes fieldbus	32 byte input/32 byte output for the cyclic interface (depending on the master)	254 word I/O for the cyclic interface (depending on the master)	512 byte input and 512 byte output
Current supply K-bus	1,750 mA	1,750 mA	1,750 mA
	 <p>The Bus Coupler BK7500 connects the SERCOS bus system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.</p> <ul style="list-style-type: none"> <li>– distance between stations: 40 m plastic fibre optic</li> </ul>	 <p>Compared with the Bus Coupler BK7500, the BK7520 allows, with the K-bus extension technology, the connection of up to 255 Bus Terminals to one Bus Coupler. The Bus Coupler recognises the connected terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image.</p> <ul style="list-style-type: none"> <li>– distance between stations: 40 m plastic fibre optic</li> </ul>	 <p>The Bus Coupler BK8000 uses the physics of the RS485 specification for data transmission. Application of the Bus Coupler with a serial interface is suited to those cases in which the use of a fieldbus system can be omitted. The RS485 interface can be used by any automation device to gain access to the Bus Coupler. Data exchange is made via an open, documented protocol.</p>
Bus interface	F-SMA standard, IEC 872-2	F-SMA standard, IEC 872-2	RS485 D-sub
Data transfer rates	2/4 Mbaud, adjustable by means of configuration switch	2/4/8/16 Mbaud, adjustable by means of configuration switch	9.6 kbaud, 19.2 kbaud, 38.4 kbaud
Weight	approx. 170 g	approx. 170 g	approx. 170 g
Operating temperature	0...+55 °C	0...+55 °C	0...+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex, GL
Further information	<a href="http://www.beckhoff.com/BK7500">www.beckhoff.com/BK7500</a>	<a href="http://www.beckhoff.com/BK7520">www.beckhoff.com/BK7520</a>	<a href="http://www.beckhoff.com/BK8000">www.beckhoff.com/BK8000</a>
<b>Accessories</b>			
Cordssets and connectors	see page <b>688</b>	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	FC750x <b>777</b>	FC750x <b>777</b>	–

## Ethernet



	Standard RS232 Bus Coupler for up to 64 Bus Terminals	Standard Ethernet TCP/IP Bus Coupler for up to 64 Bus Terminals	Ethernet TCP/IP "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard Ethernet TCP/IP Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), with integrated 2-channel switch
	<b>BK8100</b>	<b>BK9000</b>	<b>BK9050</b>	<b>BK9100</b>
		64	64 (255 with K-bus extension)	
		512 byte input and 512 byte output		
	1,750 mA	1,750 mA	1,000 mA	1,750 mA
	 <p>The Bus Coupler BK8100 uses the physics of the RS232C (V.24) specification for data transmission. Application of the Bus Coupler with a serial interface is suited to those cases in which the use of a fieldbus system can be omitted. The RS232 interface can be used by any automation device (e.g. a PC with RS232 interface) to gain access to the Bus Coupler.</p>	 <p>The BK9000 Bus Coupler connects Ethernet with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.</p> <ul style="list-style-type: none"> <li>– distance between stations: 100 m between hub/switch and Bus Coupler</li> </ul>	 <p>The "Compact" BK9050 Bus Coupler is a cost-optimised version with compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected.</p> <ul style="list-style-type: none"> <li>– distance between stations: 100 m between hub/switch and Bus Coupler</li> </ul>	 <p>The BK9100 Bus Coupler connects Ethernet with the modular, extendable electronic terminal blocks. With the K-bus extension, up to 255 Bus Terminals can be connected.</p> <ul style="list-style-type: none"> <li>– distance between stations: 100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler</li> </ul>
	RS232 D-sub	1 x RJ45	1 x RJ45	2 x RJ45 (2-channel switch)
	9.6 kbaud, 19.2 kbaud, 38.4 kbaud	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate
	approx. 170 g	approx. 170 g	approx. 100 g	approx. 170 g
	0...+55 °C	-25...+60 °C	0...+55 °C	-25...+60 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
	<a href="http://www.beckhoff.com/BK8100">www.beckhoff.com/BK8100</a>	<a href="http://www.beckhoff.com/BK9000">www.beckhoff.com/BK9000</a>	<a href="http://www.beckhoff.com/BK9050">www.beckhoff.com/BK9050</a>	<a href="http://www.beckhoff.com/BK9100">www.beckhoff.com/BK9100</a>
	see page 688	see page 688	see page 688	see page 688
	–	FC90xx 778	FC90xx 778	FC90xx 778

# PROFINET, EtherNet/IP, USB | Bus Couplers







PROFINET "Compact" Bus Coupler  
for up to 64 Bus Terminals  
(255 with K-bus extension)

Standard PROFINET Bus Coupler  
for up to 64 Bus Terminals  
(with integrated 2-channel switch)

<b>Technical data</b>	<b>BK9053</b>	<b>BK9103</b>
Number of Bus Terminals	64 (255 with K-bus extension)	
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Current supply K-bus	1,750 mA	1,750 mA
	 <p>The BK9053 Bus Coupler connects PROFINET with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals (255 with K-bus extension) and one end terminal.</p> <ul style="list-style-type: none"> <li>– distance between stations: 100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler</li> </ul>	 <p>The BK9103 Bus Coupler connects PROFINET RT with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. In addition to the standard Bus Coupler functionalities, the BK9103 supports up to 255 terminals with the K-bus extension.</p> <ul style="list-style-type: none"> <li>– distance between stations: 100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler</li> </ul>
Bus interface	1 x RJ45	2 x RJ45 (2-channel switch)
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate	
Weight	approx. 100 g	approx. 170 g
Operating temperature	0...+55 °C	-25...+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL
Further information	<a href="http://www.beckhoff.com/BK9053">www.beckhoff.com/BK9053</a>	<a href="http://www.beckhoff.com/BK9103">www.beckhoff.com/BK9103</a>
<b>Accessories</b>		
Cordsets and connectors	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	FC90xx <b>778</b>	FC90xx <b>778</b>
TwinCAT Supplement	PROFINET RT Controller <b>933</b>	PROFINET RT Controller <b>933</b>

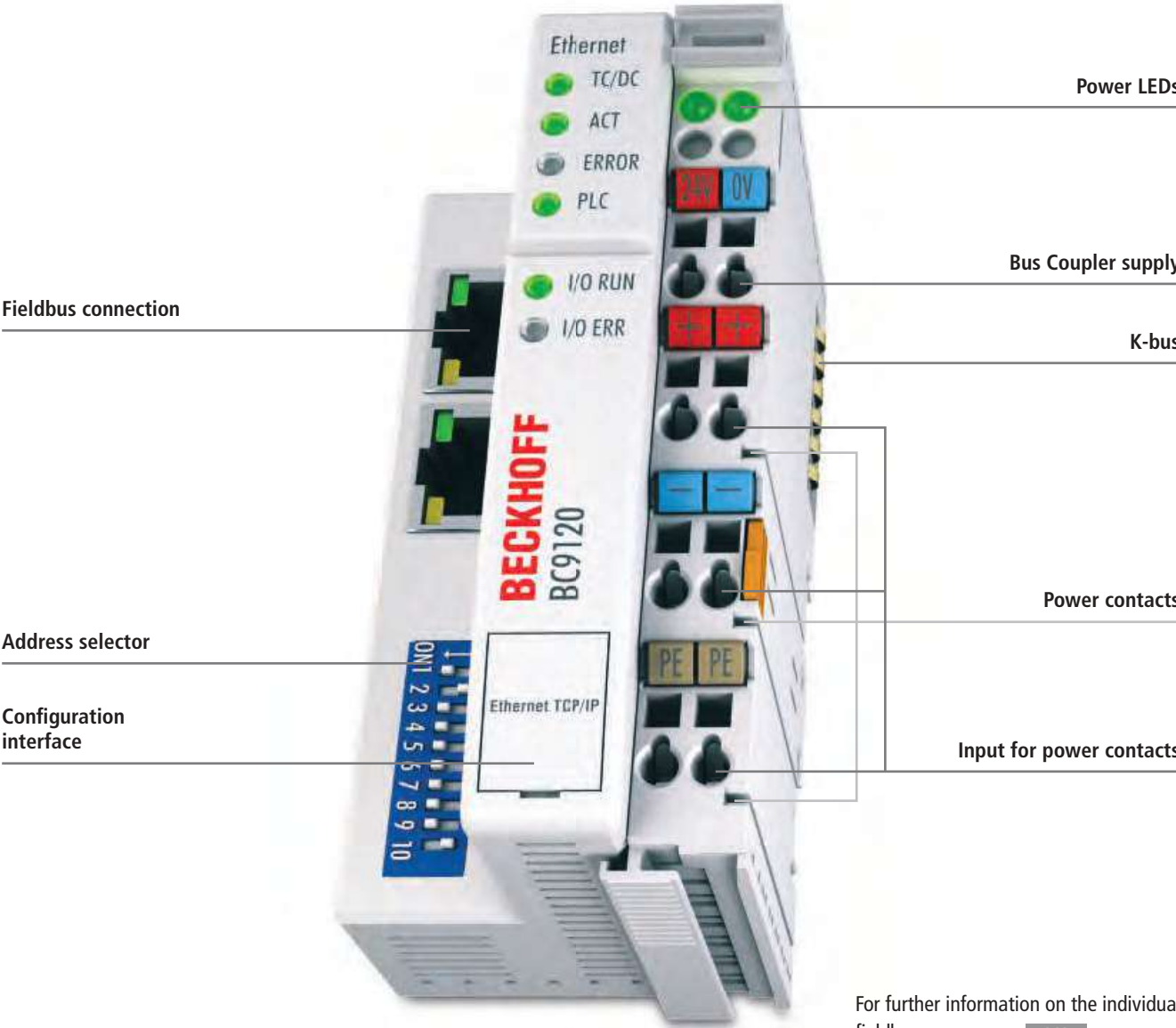
## EtherNet/IP™



EtherNet/IP "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard EtherNet/IP Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard USB Bus Coupler for up to 64 Bus Terminals
BK9055	BK9105	BK9500
64 (255 with K-bus extension)		64
512 byte input and 512 byte output		512 byte input and 512 byte output
1,000 mA	1,750 mA	1,750 mA (less downstream current)
 <p>The "Compact" BK9055 Bus Coupler is a cost-optimised version with compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected.</p> <ul style="list-style-type: none"> <li>– distance between stations: 100 m between hub/switch and Bus Coupler</li> </ul>	  <p>The BK9105 Bus Coupler connects EtherNet/IP with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. In addition to the standard Bus Coupler functionalities, the BK9105 supports up to 255 terminals with the K-bus extension.</p> <ul style="list-style-type: none"> <li>– distance between stations: 100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler</li> </ul>	 <p>The Bus Coupler BK9500 connects the Universal Serial Bus (USB) system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.</p> <ul style="list-style-type: none"> <li>– distance between stations: 30 m, 5 m from BK9500 to BK9500</li> </ul>
1 x RJ45	2 x RJ45 (2-channel switch)	1 x B type (upstream), 3 x A type (downstream)
10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate	12 Mbaud
approx. 100 g	approx. 170 g	approx. 170 g
0...+55 °C	-25...+60 °C	0...+55 °C
CE, UL, Ex	CE, UL, Ex, GL	CE, UL
www.beckhoff.com/BK9055	www.beckhoff.com/BK9105	www.beckhoff.com/BK9500
see page 688	see page 688	see page 688
FC90xx 778	FC90xx 778	–
–	–	driver included in TwinCAT


# BCxxxx, BXxxxx | Bus Terminal Controllers

Controllers with fieldbus interface



Bus Terminal

580

 +60 °C  
-25 °C  
Extended operating/  
storage temperature

For further information on the individual fieldbuses see page [262](#)

Embedded PCs are alternatively available, see page [184](#)



BCxxxx | Bus Terminal  
Controllers

The Bus Terminal Controllers of the BC and BX series are small controllers with a high degree of flexibility. The I/O system consisting of modularly expandable electronic terminal blocks, interfaces for all market-relevant fieldbus systems and the integrated IEC 61131-3 PLC enables the Bus Terminal Controllers to be used as stand-alone control systems or as intelligent fieldbus slaves. The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration or fieldbus interface of the controller is used for loading the PLC program.



BXxxxx | Bus Terminal  
Controllers

The main distinguishing features between the BX series and the BC series are the larger memory capacity and a larger number of expandable interfaces.

The BCxx00 Bus Terminal Controllers form a unit consisting of the controller, any number (up to 64) of terminals and a bus end terminal. In contrast to the BCxx50, BCxx20 and BXxx00 series, a terminal bus extension cannot be used.

The "Compact" BCxx50 and BCxx20 Bus Terminal Controllers are fitted in cost-optimised, compact housings and support the K-bus extension (up to 255 Bus Terminals).

The devices of the BX family have two serial interfaces. The device itself comprises an illuminated LC display with 2 lines of 16 characters each, a joystick switch and a real-time clock. Further peripheral devices, e.g. displays, can be connected via the integrated Beckhoff Smart System Bus (SSB).

Technical data	BCxxxx, BXxxxx
Power supply	24 V DC (-15 %/+20 %)
Programming	TwinCAT 2 (via programming interface or fieldbus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Operating/storage temperature	0...+55 °C/-25...+85 °C (extended temperature range: -25...+60 °C/-40...+85 °C)
Relative humidity	95 %, no condensation
Vibration resistance	conforms to EN 60068-2-6
Shock resistance	conforms to EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable


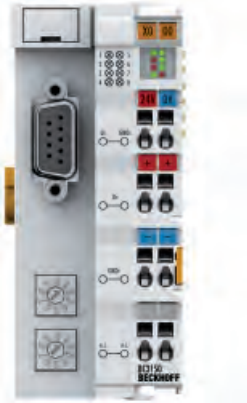

► [www.beckhoff.com/Bus-Terminal-Controller](http://www.beckhoff.com/Bus-Terminal-Controller)

# PROFIBUS, CANopen | Bus Terminal Controllers

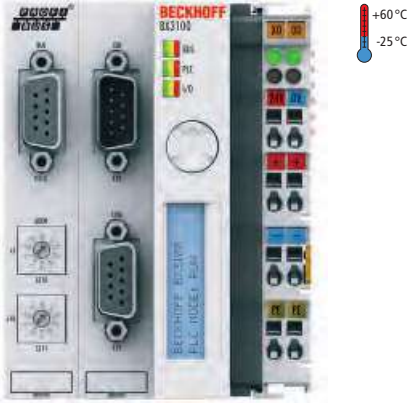
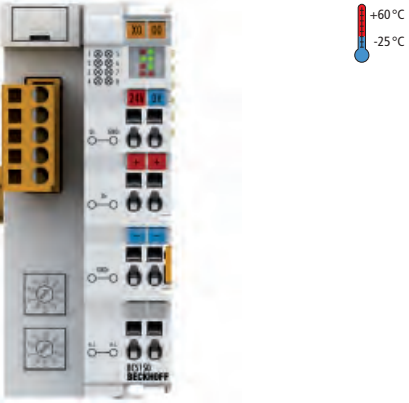
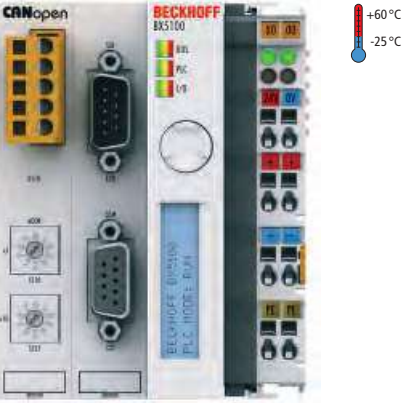


PROFIBUS Bus Terminal Controller  
for up to 64 Bus Terminals, 12 Mbaud

PROFIBUS "Compact" Bus Terminal  
Controller for up to 64 Bus Terminals  
(255 with K-bus extension), 12 Mbaud

Technical data	BC3100	BC3150
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	128 byte input and 128 byte output	
Current supply K-bus	1,750 mA	1,000 mA
	 <p>The Bus Terminal Controller BC3100 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for PROFIBUS. It is an intelligent slave and can be used as distributed intelligence in the PROFIBUS system.</p>	  <p>The "Compact" BC3150 Bus Terminal Controller is housed in a cost-optimised and compact housing. Unlike the BC3100, the BC3150 supports up to 255 Bus Terminals via the K-bus extension.</p>
Bus interface	1 x D-sub socket, 9-pin	1 x D-sub socket, 9-pin
Data transfer rates	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud
Program memory	32/96 kbytes	48 kbytes
Data memory	32/64 kbytes	32 kbytes
Remanent data	512 bytes	2 kbytes
Online change	–	yes
Weight	approx. 170 g	approx. 100 g
Operating temperature	0...+55 °C	-25...+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex
Further information	<a href="http://www.beckhoff.com/BC3100">www.beckhoff.com/BC3100</a>	<a href="http://www.beckhoff.com/BC3150">www.beckhoff.com/BC3150</a>
<b>Accessories</b>		
Cordsets and connectors	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	FC310x <b>772</b>	FC310x <b>772</b>
TwinCAT 2 PLC	see page <b>944</b>	see page <b>944</b>

# CANopen

<p>PROFIBUS Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud</p>	<p>CANopen "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)</p>	<p>CANopen Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)</p>
<p><b>BX3100</b></p>	<p><b>BC5150</b></p>	<p><b>BX5100</b></p>
<p>64 (255 with K-bus extension)</p>		
<p>244 byte input and 244 byte output</p>	<p>16 Tx/Rx PDOs</p>	<p>32 Tx/Rx PDOs</p>
<p>1,450 mA</p>	<p>1,000 mA</p>	<p>1,450 mA</p>
 <p>The BX3100 Bus Terminal Controller has a PROFIBUS slave interface with automatic baud rate detection up to 12 Mbaud and an address selection switch for address assignment.</p>	 <p>The "Compact" BC5150 Bus Terminal Controller for CANopen extends the Beckhoff small controller series by a cost-optimised version in a compact housing.</p>	 <p>The BX5100 Bus Terminal Controller has a CANopen slave interface. It has automatic baud rate detection up to 1 Mbaud and an address selection switch for address assignment.</p>
<p>1 x D-sub socket, 9-pin automatic detection up to 12 Mbaud 256 kbytes 256 kbytes 2 kbytes yes approx. 250 g -25...+60 °C CE, UL <a href="http://www.beckhoff.com/BX3100">www.beckhoff.com/BX3100</a></p>	<p>open style connector, 5-pin automatic detection up to 1 Mbaud 48 kbytes 32 kbytes 2 kbytes yes approx. 100 g -25...+60 °C CE, UL, Ex <a href="http://www.beckhoff.com/BC5150">www.beckhoff.com/BC5150</a></p>	<p>open style connector, 5-pin automatic detection up to 1 Mbaud 256 kbytes 256 kbytes 2 kbytes yes approx. 250 g -25...+60 °C CE, UL <a href="http://www.beckhoff.com/BX5100">www.beckhoff.com/BX5100</a></p>
<p>see page <b>688</b></p>	<p>see page <b>688</b></p>	<p>see page <b>688</b></p>
<p>FC310x <b>772</b></p>	<p>FC510x <b>774</b></p>	<p>FC510x <b>774</b></p>
<p>see page <b>944</b></p>	<p>see page <b>944</b></p>	<p>see page <b>944</b></p>





# DeviceNet, Modbus, RS232/RS485 | Bus Terminal Controllers

## DeviceNet™




DeviceNet Bus Terminal Controller  
for up to 64 Bus Terminals  
(255 with K-bus extension)

DeviceNet Bus Terminal Controller  
for up to 64 Bus Terminals  
(255 with K-bus extension)

Technical data	BC5250	BX5200
Number of Bus Terminals	64 (255 with K-bus extension)	
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Current supply K-bus	1,000 mA	1,450 mA
	 <p>The BC5250 Bus Terminal Controller with DeviceNet interface extends the Beckhoff small controller series by a cost-optimised version in a compact housing. The DeviceNet Controller offers automatic baud rate detection up to 500 kbaud and two address selection switches for address assignment.</p>	 <p>The BX5200 Bus Terminal Controller has a DeviceNet slave interface. It has automatic baud rate detection up to 500 kbaud and an address selection switch for address assignment. Up to 512 byte of input and 512 byte of output can be exchanged with the controller.</p>
Bus interface	open style connector, 5-pin	open style connector, 5-pin
Data transfer rates	automatic detection up to 500 kbaud	automatic detection up to 500 kbaud
Program memory	48 kbytes	256 kbytes
Data memory	32 kbytes	256 kbytes
Remanent data	2 kbytes	2 kbytes
Online change	yes	yes
Weight	approx. 100 g	approx. 250 g
Operating temperature	-25...+60 °C	-25...+60 °C
Approvals	CE, UL, Ex	CE, UL
Further information	<a href="http://www.beckhoff.com/BC5250">www.beckhoff.com/BC5250</a>	<a href="http://www.beckhoff.com/BX5200">www.beckhoff.com/BX5200</a>
<b>Accessories</b>		
Cordsets and connectors	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	FC520x <b>776</b>	FC520x <b>776</b>
TwinCAT 2 PLC	see page <b>944</b>	see page <b>944</b>

# Modbus





Modbus RS485 Bus Terminal Controller for up to 64 Bus Terminals	RS485 Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
<b>BC7300</b>	<b>BC8050</b>
64	64 (255 with K-bus extension)
512 byte input and 512 byte output	512 byte input and 512 byte output
1,750 mA	1,000 mA
 <p>The Bus Terminal Controller BC7300 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Modbus. The BC7300 is an intelligent slave and can be used as a non-central intelligence in the Modbus system.</p>	  <p>The Bus Terminal Controller BC8050 with serial RS485 interface extends the Beckhoff small controller series by a cost-optimised version in a compact housing. An open serial protocol – like in the BK8x00 Bus Couplers – and the Modbus RTU/ASCII protocol are implemented. The address and the protocol are selected via the two rotary selection switches.</p>
D-sub 9-pin, RS485	RS485 D-sub
150, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400 baud (default: 9,600 baud)	1.2 kbaud...38.4 kbaud
32/96 kbytes	48 kbytes
32/64 kbytes	32 kbytes
512 bytes	2 kbytes
–	yes
approx. 170 g	approx. 100 g
0...+55 °C	-25...+60 °C
CE, UL, Ex, GL	CE, UL, Ex
<a href="http://www.beckhoff.com/BC7300">www.beckhoff.com/BC7300</a>	<a href="http://www.beckhoff.com/BC8050">www.beckhoff.com/BC8050</a>
see page <b>688</b>	see page <b>688</b>
–	–
see page <b>944</b>	see page <b>944</b>

# RS232/RS485, Ethernet | Bus Terminal Controllers






RS232 Bus Terminal Controller  
for up to 64 Bus Terminals  
(255 with K-bus extension)

RS232/RS485 Bus Terminal  
Controller for up to 64 Bus Terminals  
255 with K-bus extension)



Technical data	BC8150	BX8000
Number of Bus Terminals	64 (255 with K-bus extension)	
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Current supply K-bus	1,000 mA	1,450 mA
	 <p>The Bus Terminal Controller BC8150 with serial RS232 interface extends the Beckhoff small controller series by a cost-optimised version in a compact housing. An open serial protocol – like in the BK8x00 Bus Couplers – and the Modbus RTU/ASCII protocol are implemented.</p>	 <p>The BX8000 Bus Terminal Controller is a stand-alone PLC. One unit consists of the BX8000 Bus Terminal Controller with up to 64 Bus Terminals and a bus end terminal. With the terminal bus extension system, the connection of up to 255 Bus Terminals is possible. The controller is programmed via the COM1 interface. In addition, the BX8000 has a second COM port, optionally RS232 or RS485. This can be used for connecting serial devices, such as displays.</p>
Bus interface	RS232 D-sub	open style connector, 5-pin
Data transfer rates	1.2 kbaud...38.4 kbaud	300 baud...115 kbaud
Program memory	48 kbytes	256 kbytes
Data memory	32 kbytes	256 kbytes
Remanent data	2 kbytes	2 kbytes
Online change	yes	yes
Weight	approx. 100 g	approx. 250 g
Operating temperature	-25...+60 °C	-25...+60 °C
Approvals	CE, UL, Ex	CE, UL
Further information	<a href="http://www.beckhoff.com/BC8150">www.beckhoff.com/BC8150</a>	<a href="http://www.beckhoff.com/BX8000">www.beckhoff.com/BX8000</a>
<b>Accessories</b>		
Cordsets and connectors	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	–	–
TwinCAT 2 PLC	see page <b>944</b>	see page <b>944</b>

## Ethernet

Ethernet Bus Terminal Controller for up to 64 Bus Terminals	Ethernet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	Ethernet TCP/IP Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
<b>BC9000</b>	<b>BC9050</b>	<b>BC9020</b>
64	64 (255 with K-bus extension)	
512 byte input and 512 byte output		
1,750 mA	1,000 mA	1,750 mA
 <p>The Bus Terminal Controller BC9000 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Ethernet. It is an intelligent slave that can be used as a non-central intelligence in the Ethernet system. One unit consists of the Bus Terminal Controller, any number of terminals between 1 and 64, and a bus end terminal.</p>	 <p>The BC9050 Bus Terminal Controller with Ethernet interface extends the Beckhoff small controller series by a cost-optimised version in a compact housing.</p>	 <p>The BC9020 Bus Terminal Controller is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Ethernet. It is an intelligent slave and can be used as decentralised intelligence in the Ethernet system.</p>
1 x RJ45	1 x RJ45	1 x RJ45
10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate
64/96 kbytes	48 kbytes	128 kbytes
64/128 kbytes	32 kbytes	128 kbytes
4,080 bytes	2 kbytes	2 kbytes
–	yes	yes
approx. 170 g	approx. 100 g	approx. 170 g
-25...+60 °C	0...+55 °C	-25...+60 °C
CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex, GL
www.beckhoff.com/BC9000	www.beckhoff.com/BC9050	www.beckhoff.com/BC9020
see page	see page	see page
688	688	688
FC90xx	FC90xx	FC90xx
778	778	778
see page	see page	see page
944	944	944

# Ethernet | Bus Terminal Controllers

## Ethernet

	Ethernet TCP/IP Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension, with integrated 2-channel switch)	Ethernet TCP/IP Bus Terminal Controller for up to 64 Bus Terminals (with integrated 2-channel switch)
<b>Technical data</b>	<b>BC9120</b>	<b>BC9100</b>
Number of Bus Terminals	64 (255 with K-bus extension)	64
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Current supply K-bus	1,750 mA	1,750 mA
	 <p>In contrast to the BC9020, the BC9120 has an additional RJ45 port. Both Ethernet ports operate as 2-channel switches.</p>	 <p>The Bus Terminal Controller BC9100 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Ethernet. The BC9100 is an intelligent slave and can be used as a non-central intelligence in the Ethernet system.</p>
Bus interface	2 x RJ45 (2-channel switch)	2 x RJ45 (2-channel switch)
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate
Program memory	128 kbytes	64/96 kbytes
Data memory	128 kbytes	64/128 kbytes
Remanent data	2 kbytes	4,080 bytes
Online change	yes	–
Weight	approx. 170 g	approx. 170 g
Operating temperature	-25...+60 °C	-25...+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Further information	<a href="http://www.beckhoff.com/BC9120">www.beckhoff.com/BC9120</a>	<a href="http://www.beckhoff.com/BC9100">www.beckhoff.com/BC9100</a>
<b>Accessories</b>		
Cordsets and connectors	see page <b>688</b>	see page <b>688</b>
PC Fieldbus Cards	FC90xx <b>778</b>	FC90xx <b>778</b>
TwinCAT 2 PLC	see page <b>944</b>	see page <b>944</b>

### Ethernet Room Controller

<p>Ethernet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)</p>	<p>Building Automation Room Controller, 48 kbyte, sub bus for KL6583 (EnOcean)</p>	<p>Building Automation Room Controller, 128 kbyte, RS485 interface</p>
<p><b>BX9000</b></p>	<p><b>BC9191</b></p>	<p><b>BC9191-0100</b></p>
<p>64 (255 with K-bus extension)</p>	<p>64</p>	
<p>1,450 mA</p>		<p>512 byte input and 512 byte output</p>
<div> </div> <p>The BX9000 Bus Terminal Controller has an Ethernet slave/master interface. The controller has automatic baud rate detection up to 100 Mbaud. The address can optionally be entered via DHCP, BootP, ARP or with the joystick switch.</p>	<div> </div> <p><b>Digital inputs:</b> 3 contacts (e.g. window contact, dew point, occupancy sensor) <b>Analog inputs:</b> 1 x PT/Ni1000; 1 x resistance measurement for set point; 3 x 0...10 V <b>Digital outputs:</b> 1 x LED, 10 mA; 1 x 230 V AC, 10 A, relay; 3 x 230 V AC, 1 A, relay; 2 x 230 V AC, 1 A, triac <b>Analog outputs:</b> 2 x 0...10 V</p> <p>The BC9191 and BC9191-0100 Ethernet Room Controllers cover the standard functionalities for room control in a compact design. The two versions differ in terms of the memory capacity of the integrated PLC and the sub bus. The BC9191 has an integrated interface to the KL6583 (EnOcean), the BC9191-0100 has an RS485 interface. Both versions have the necessary I/O signals and two switched Ethernet interfaces. They can be extended with Bus Terminals. A parameterisable PLC program for room temperature control is included in the delivery.</p>	
<p>RJ45</p>	<p>2 x RJ45 (switched)</p>	
<p>10/100 Mbaud, automatic recognition of the transmission rate</p>	<p>10/100 Mbaud, automatic recognition of the transmission rate</p>	
<p>256 kbytes</p>	<p>48 kbytes</p>	<p>128 kbytes</p>
<p>256 kbytes</p>	<p>32 kbytes</p>	<p>128 kbytes</p>
<p>2 kbytes</p>	<p>2 kbytes</p>	
<p>yes</p>	<p>yes</p>	
<p>approx. 250 g</p>	<p>approx. 345 g</p>	
<p>0...+55 °C</p>	<p>0...+55 °C</p>	
<p>CE, UL</p>	<p>CE</p>	
<p><a href="http://www.beckhoff.com/BX9000">www.beckhoff.com/BX9000</a></p>	<p><a href="http://www.beckhoff.com/BC9191">www.beckhoff.com/BC9191</a></p>	<p><a href="http://www.beckhoff.com/BC9191-0100">www.beckhoff.com/BC9191-0100</a></p>
<p>see page</p>	<p>see page</p>	<p>688</p>
<p>FC90xx</p>	<p>FC90xx</p>	<p>778</p>
<p>see page</p>	<p>see page</p>	<p>944</p>

# KLxxxx | Bus Terminals

The Bus Terminals have a galvanic isolation between the field level and the communication level (K-bus). A terminal is equipped with 1...n input or output channels. The channels within a terminal are usually not electrically isolated from each other.

The power contacts on the left hand side (if available) supply the terminals with field voltage. Depending on the terminals 24 V DC, 230 V AC or other voltages are transferred. The supply power required is listed in the technical data. The maximum load of the power contacts is 10 A.

Beckhoff Bus Terminals feature function-dependant coloured labels: yellow for digital inputs, red for digital outputs, green for analog inputs, blue for analog outputs. The LED frames for HD Bus Terminals are also colour-coded accordingly.

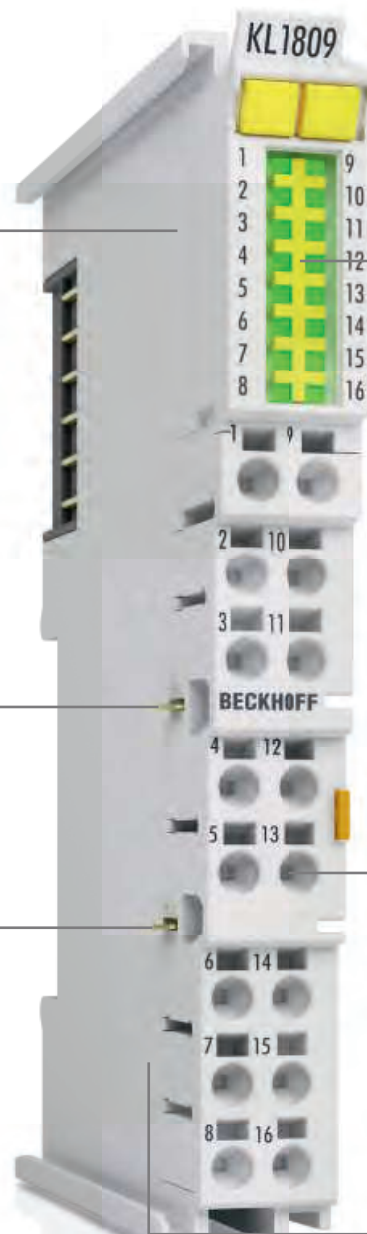
Different field level connection techniques can be used for Bus Terminals:

- standard terminal point: 0.08...2.5 mm<sup>2</sup> spring-loaded technique
- HD Bus Terminal: 0.08...0.75 mm<sup>2</sup> (with ferrule); 0.08...1.5 mm<sup>2</sup> (single-wire); spring-loaded technique; direct plug-in technique
- ribbon: especially used in Asia for digital input/output channels
- plug-in wiring level: KS terminals

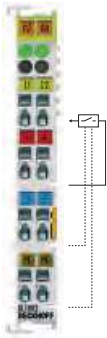
Some 2-channel Bus Terminals have a PE power contact, which can be used for PE distribution by connecting it together with similar terminals. The EMC spring contact on the underside of the terminal only serves to remove interference ⚡ and may not be used as a protective earth ⚡.

+60 °C  
-25 °C  
Extended operating/  
storage temperature

Extended mechanical  
load  
25 g



Technical data see page 561



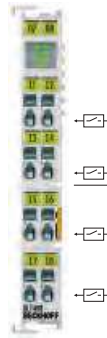
### 2-channel terminals

The 2-channel terminals provide additional power (+24 V DC), ground (0 V DC) and in many cases also PE for each channel. Connection is carried out with 3- or 4-wire connection.



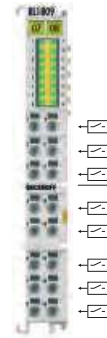
### 4-channel terminals

Along with four channels the 4-channel terminals have another four connection points available. These can provide 24 V DC or ground. Connection is carried out with 2-wire connection.



### 8-channel terminals

The 8-channel terminals have one channel per connection point due to a high packing density. The power contact of the terminal will be used as the common reference potential. Connection is carried out with 1-wire connection.



### 16-channel terminals

The HD (High Density) housing allows 16 channels to be accommodated on a unit that is only 12 mm wide. The power contact of the terminal will be used as the common reference potential. Connection is carried out with 1-wire connection.

The Bus Terminals offer the possibility to directly connect many different signals. No signal converter or additional evaluation device is needed. The direct connection reduces the costs and simplifies the control technology. Each Bus Terminal separates the internal electronics from the connection level and thus simplifies the creation of voltage groups with different voltages. In addition, interfering voltages on the signal connector lose their adverse effects.

The KL1xxx, KL2xxx Bus Terminal product family is designed for the processing of digital or binary signals. There are "High" and "Low" states. In the positive switching logic

the High state corresponds to the level of the supply voltage, the Low state corresponds to ground level. For negative switching logic it is the other way around. The Bus Terminal product family supports both types of logic for various supply voltages. 1-, 2-, 3- and 4-wire connections allow the use of Bus Terminals in almost all applications without further wiring work.

The KL3xxx and KL4xxx Bus Terminal product family processes analog signals. The most commonly used are 0 to 10 V, ±10 V, 0 to 20 mA and 4 to 20 mA. Also many other industry-standard voltage and current signals are supported and pre-processed.

In the KL5xxx and KL6xxx Bus Terminal product families other complex signals, such as position values and digital interfaces, are supported. Some Bus Terminals act as fieldbus masters for subordinate bus systems. The Bus Terminal station thus becomes a universal gateway between different systems.

The KL9xxx system terminals round off the application of Bus Terminals with power feed and power supply units.

Technical data	KLxxxx   KSxxxx
Electrical isolation	500 V (K-bus/field potential); if not indicated otherwise
Operating/storage temperature	0...+55 °C/-25...+85 °C (extended temperature range: -25...+60 °C/-40...+85 °C)
Relative humidity	95 %, no condensation
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Pluggable wiring	for all KSxxxx Bus Terminals

► [www.beckhoff.com/BusTerminal](http://www.beckhoff.com/BusTerminal)



# Digital input | 24 V DC, positive switching

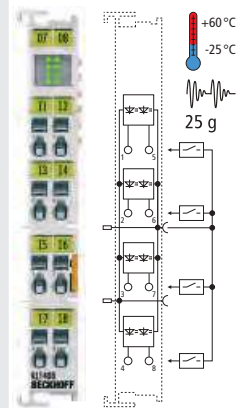
The digital inputs of a 24 V supply are among the most used signals. The EN 61131-2 standard describes the input characteristic and distinguishes three types. Type 1 has a small input current with low power dissipation. This input is optimised for mechanical switches and actively-switched electronic outputs. Type 2 has a significantly larger input current and is optimised for 2-wire sensors with a high quiescent current consumption. In switched-on state the current consumption of this input is high. The related power dissipation is generally not acceptable. Type 3 is a combination between type 1, with low current in switched-on state, and a satisfactorily high quiescent current for the majority of modern 2-wire sensors. The type 3 input can be used in almost all applications as a replacement for type 1.

The diagram shows the typical current/voltage curves of the Bus Terminal inputs and the allowable range of conformity in accordance with the standard.

The input circuits differ in their filtering functions. The filtering has the task of suppressing electromagnetic interference. However, this does have the drawback of signal deceleration. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and delivers a stable signal for simple PLC applications. Filter times of 0.2 ms are suitable for applications with shortest possible reaction times and should be used for mechanical switches only in a restricted manner.

8-channel digital input terminal, 24 V DC, 1-wire, type 1/3

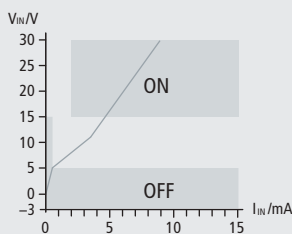
Technical data	KL1408   KS1408	KL1418   KS1418
Connection technology	1-wire	
Specification	EN 61131-2, type 1/3	
Input filter	typ. 3.0 ms	typ. 0.2 ms
Number of inputs	8	



The KL1408 and KL1418 digital input terminals have eight inputs, which are each assigned to a connection point. This way, a high packing density can be achieved for signal sources with common grounds.

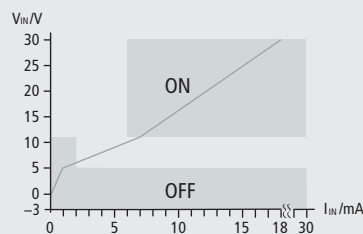
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 2 mA + load
Current consumpt. K-bus	typ. 5 mA
Operating temperature	-25...+60 °C
Approvals	CE, UL, Ex, GL
Weight	approx. 55 g
Further information	<a href="http://www.beckhoff.com/KL1408">www.beckhoff.com/KL1408</a>

Type 1



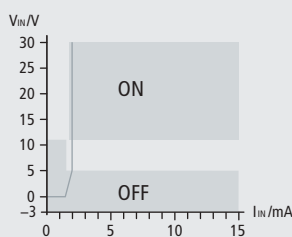
Signal voltage "0": -3...5 V DC  
Signal voltage "1": 15...30 V DC

Type 2



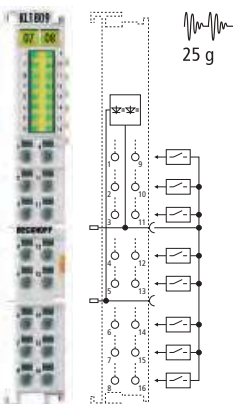
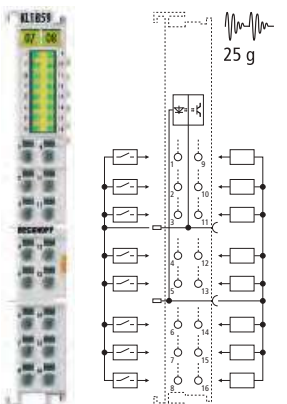
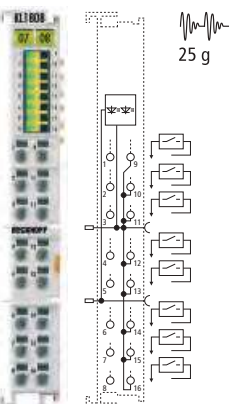
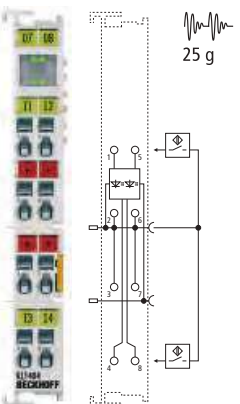
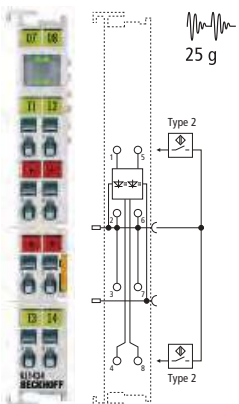
Signal voltage "0": -3...5 V DC  
Signal voltage "1": 11...30 V DC

Type 3

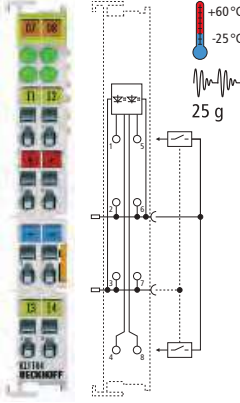
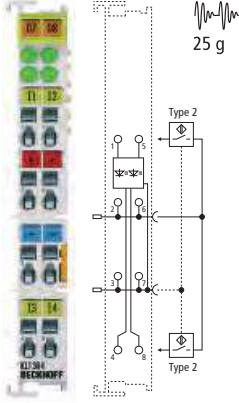
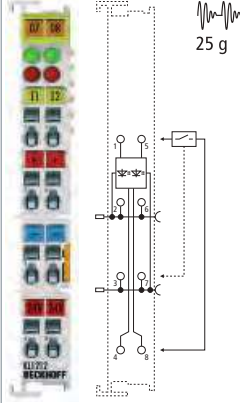
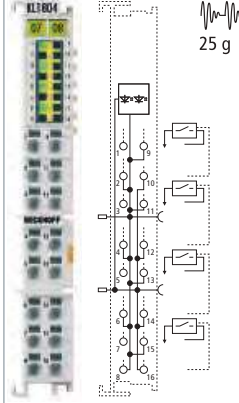


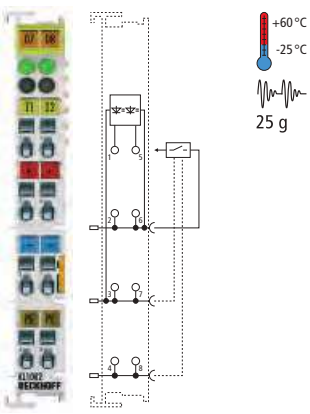
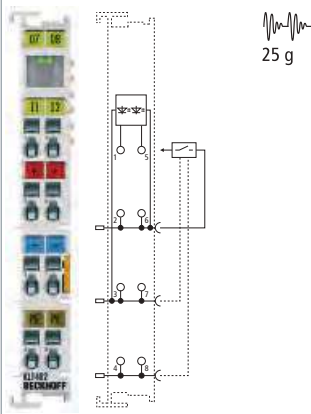
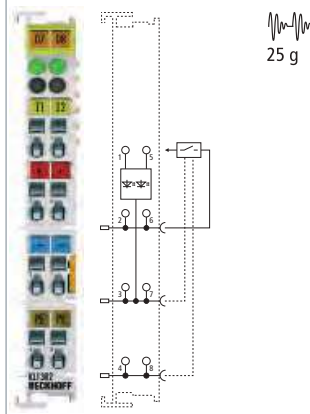
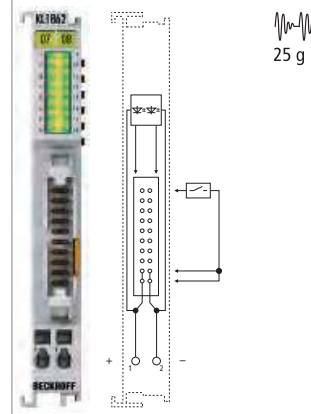
Signal voltage "0": -3...5 V DC  
Signal voltage "1": 11...30 V DC

Characteristics of the 3 input types according to EN 61131-2 (24 V DC)

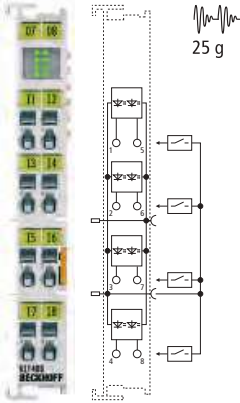
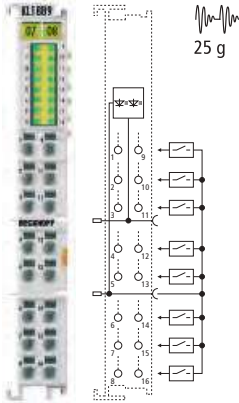
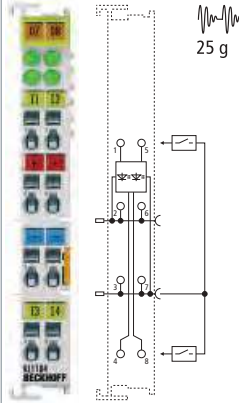
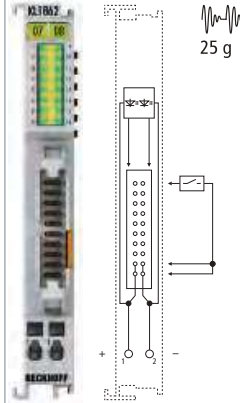
16-channel digital input terminal, 24 V DC, 1-wire, type 1/3		8-channel digital input + 8-channel digital output, 24 V DC, 1-wire, type 1/3		8-channel digital input terminal, 24 V DC, 2-wire, type 1/3		4-channel digital input terminal, 24 V DC, 2-wire, type 1/3		4-channel digital input terminal, 24 V DC, 2-wire, type 2	
KL1809   KL1819		KL1859		KL1808		KL1404   KS1404   KL1414   KS1414		KL1434   KS1434	
								2-wire	
								EN 61131-2, type 2	
typ. 3.0 ms		typ. 0.2 ms		typ. 3.0 ms		typ. 3.0 ms		typ. 0.2 ms	
16		8 inputs + 8 outputs		8		4		4	
									
<p>The HD (High Density) Bus Terminals with higher packing density contain 16 terminal points housed in a 12 mm terminal block.</p>		<p>The KL1859 digital Bus Terminal combines eight digital inputs and eight digital outputs in one device.</p> <ul style="list-style-type: none"> <li>– number of outputs: 8</li> <li>– max. output current: 0.5 A (per channel)</li> <li>– load type: ohmic, inductive, lamp load</li> <li>– reverse voltage protection: yes</li> </ul>		<p>The KL1808 HD (High Density) Bus Terminal has eight inputs and eight 24 V connections, which are suitable for the connection of 2-wire sensors.</p>		<p>The KL1404 and KL1414 digital input terminals are suitable for the connection of four 2-wire sensors.</p>		<p>The KL1434 digital input terminal is suitable for the connection of four 2-wire sensors of type 2 (EN 61131-2).</p>	
24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
typ. 4 mA + load		typ. 15 mA + load		typ. 2 mA + load		typ. 1 mA + load		only load	
typ. 20 mA		typ. 25 mA		typ. 15 mA		typ. 3 mA		typ. 3 mA	
0...+55 °C		0...+55 °C		0...+55 °C		0...+55 °C		0...+55 °C	
CE, UL, Ex, GL		CE, UL, Ex, GL		CE, UL, Ex, GL		CE, UL, Ex, GL		CE, UL, Ex	
approx. 60 g		approx. 60 g		approx. 60 g		approx. 50 g		approx. 50 g	
www.beckhoff.com/KL1809		www.beckhoff.com/KL1859		www.beckhoff.com/KL1808		www.beckhoff.com/KL1404		www.beckhoff.com/KL1434	

# Digital input | 24 V DC, positive switching

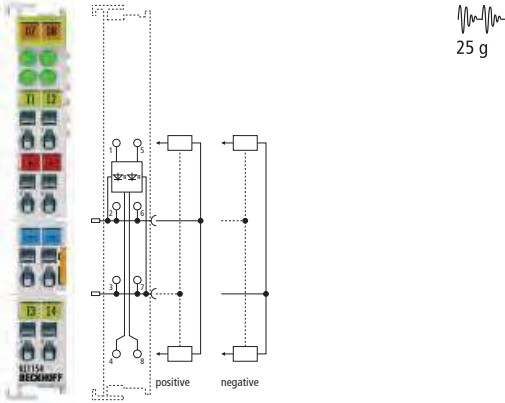
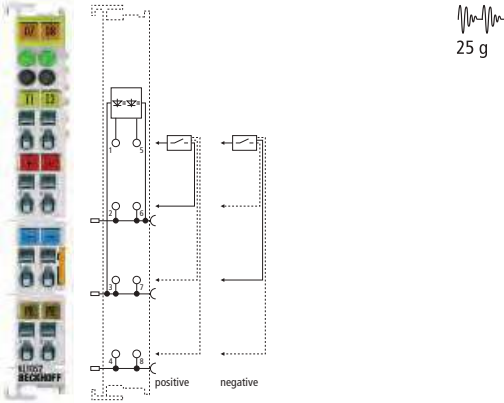
	4-channel digital input terminal, 24 V DC, 2-/3-wire, type 1/3		4-channel digital input terminal, 24 V DC, 2-/3-wire, type 2		2-channel digital input terminal, 24 V DC, with short-circuit protected sensor supply and diagnostics, 3-wire, type 1		4-channel digital input terminal, 24 V DC, 3-wire, type 1/3		
<b>Technical data</b>	KL1104   KS1104   KL1114   KS1114		KL1304   KS1304   KL1314   KS1314		KL1212   KS1212		KL1804   KL1814		
<b>Connection technology</b>	2-/3-wire					3-wire			
<b>Specification</b>	EN 61131-2, type 1/3			EN 61131-2, type 2		EN 61131-2, type 1		EN 61131-2, type 1/3	
<b>Input filter</b>	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms		typ. 3.0 ms	typ. 0.2 ms	
<b>Number of inputs</b>	4		4		2		4		
	 <p>The KL1104 and KL1114 digital input terminals have four inputs and also provide 24 V DC and ground per channel.</p>		 <p>The KL1304 and KL1314 digital input terminals have four inputs and also provide 24 V DC and ground per channel. The terminals are especially suitable for sensors which require a high quiescent current.</p>		 <p>The KL1212 digital input terminal contains two inputs, which are suitable for the connection of 3-wire sensors. The terminal offers a short-circuit-proof sensor supply voltage with integrated diagnostic. A short-circuit or an open lead in the sensor supply is detected and the terminal status is relayed to the controller via the K-bus.</p>		 <p>The KL1804 and KL1814 HD Bus Terminals contain four inputs, 24 V DC and ground connections, which are suitable for the application of 3-wire sensors.</p>		
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		
<b>Current consumption power contacts</b>	only load		only load		only load		typ. 1 mA + load		
<b>Current consumpt. K-bus</b>	typ. 5 mA		typ. 3 mA		typ. 8 mA		typ. 10 mA		
<b>Operating temperature</b>	-25...+60 °C		0...+55 °C		0...+55 °C		0...+55 °C		
<b>Approvals</b>	CE, UL, Ex, GL		CE, UL, Ex		CE, UL, Ex, GL		CE, UL, Ex, GL		
<b>Weight</b>	approx. 55 g		approx. 50 g		approx. 55 g		approx. 60 g		
<b>Further information</b>	www.beckhoff.com/KL1104		www.beckhoff.com/KL1304		www.beckhoff.com/KL1212		www.beckhoff.com/KL1804		
<b>Special terminals</b>									
<b>Distinguishing features</b>									

2-channel digital input terminal, 24 V DC, 4-wire, type 1/3		2-channel digital input terminal, 24 V DC, 4-wire, type 1/3		2-channel digital input terminal, 24 V DC, 4-wire, type 2		16-channel digital input terminal, 24 V DC, 1-wire, flat-ribbon cable connection, type 1/3	
KL1002   KS1002	KL1012   KS1012	KL1402   KS1402	KL1412   KS1412	KL1302   KS1302	KL1312   KS1312	KL1862	KL1872
4-wire						flat-ribbon cable	
				EN 61131-2, type 2		EN 61131-2, type 1/3	
typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms
2		2		2		16	
							
<p>The KL1002 and KL1012 digital input terminals have two inputs, which are suitable for the connection of 4-wire sensors.</p>		<p>The current/voltage characteristics have been optimised for 4-wire sensors. The input current in low state is increased to a minimum value of 1.5 mA and therefore supports the majority of commercially available 4-wire sensors. A typical value for the energy-saving high current is 2.2 mA.</p>		<p>The KL1302 and KL1312 digital input terminals have two inputs, which are suitable for the connection of 4-wire sensors. The terminals are especially suitable for sensors which require a high quiescent current.</p>		<p>A 20-pin plug connector with 2.54 mm contact spacing enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points.</p>	
24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
only load		typ. 1 mA + load		only load		typ. 4 mA from the 24 V supply (no power contacts)	
typ. 3 mA		typ. 3 mA		typ. 3 mA		typ. 3 mA	
-25...+60 °C		0...+55 °C		0...+55 °C		0...+55 °C	
CE, UL, Ex, GL		CE, UL, Ex, GL		CE, UL, Ex		CE, UL, Ex	
approx. 50 g		approx. 50 g		approx. 50 g		approx. 50 g	
www.beckhoff.com/KL1002		www.beckhoff.com/KL1402		www.beckhoff.com/KL1302		www.beckhoff.com/KL1862	
						KL1862-0010	
						negative switching	

## Digital input | 24 V DC, negative switching

	8-channel digital input terminal, 24 V DC, 1-wire		16-channel digital input terminal, 24 V DC, 1-wire		4-channel digital input terminal, 24 V DC, 2-/3-wire		16-channel digital input terminal, 24 V DC, 1-wire, flat-ribbon cable									
<b>Technical data</b>	KL1488   KS1488		KL1498   KS1498		KL1889		KL1184   KS1184		KL1194   KS1194		KL1862-0010					
<b>Connection technology</b>	1-wire					2-/3-wire		flat-ribbon cable								
<b>Specification</b>	negative switching															
<b>Input filter</b>	typ. 3.0 ms		typ. 0.2 ms		typ. 3.0 ms		typ. 3.0 ms		typ. 0.2 ms		typ. 3.0 ms					
<b>Number of inputs</b>	8				16				4				16			
	 <p>The negative switching KL1488 and KL1498 digital input terminals are suitable for the connection of eight sensors by 1-wire technology.</p>				 <p>The HD (High Density) Bus Terminals with higher packing density contain 16 terminal points housed in a 12 mm terminal block.</p>				 <p>Negative switching sensors can be connected to the KL1184 and KL1194 digital input terminals.</p>				 <p>A 20-pin plug connector with 2.54 mm contact spacing enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points.</p>			
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)				24 V DC (-15 %/+20 %)				24 V DC (-15 %/+20 %)				24 V DC (-15 %/+20 %)			
<b>Current consumption power contacts</b>	typ. 2 mA + load				typ. 4 mA + load				only load				typ. 4 mA from the 24 V supply (no power contacts)			
<b>Current consumpt. K-bus</b>	typ. 5 mA				typ. 20 mA				typ. 8 mA				typ. 3 mA			
<b>Operating temperature</b>	0...+55 °C				0...+55 °C				0...+55 °C				0...+55 °C			
<b>Approvals</b>	CE, UL, Ex				CE, UL, Ex, GL				CE, UL, Ex				CE			
<b>Weight</b>	approx. 55 g				approx. 55 g				approx. 55 g				approx. 50 g			
<b>Further information</b>	www.beckhoff.com/KL1488				www.beckhoff.com/KL1889				www.beckhoff.com/KL1184				www.beckhoff.com/KL1862			
<b>Special terminals</b>													KL1862			
<b>Distinguishing features</b>													positive switching		595	

# Digital input | 24 V DC, positive/negative switching

	4-channel digital input terminal, 24 V DC, 2-/3-wire		2-channel digital input terminal, 24 V DC, 4-wire
<b>Technical data</b>	<b>KL1154   KS1154</b>	<b>KL1164   KS1164</b>	<b>KL1052   KS1052</b>
<b>Connection technology</b>	2-/3-wire		4-wire
<b>Specification</b>	positive and negative switching		
<b>Input filter</b>	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms
<b>Number of inputs</b>	4		2
	 <p>Positive or negative switching sensors can be connected to the KL1154 and KL1164 digital input terminals.</p> <ul style="list-style-type: none"> <li>– signal voltage "0": 7.6...17.4 V DC</li> <li>– signal voltage "1": 0...7 V DC and 18...30 V DC</li> </ul>		 <p>Positive or negative switching sensors can be connected to the KL1052 digital input terminal.</p> <ul style="list-style-type: none"> <li>– signal voltage "0": 7.6...17.4 V DC</li> <li>– signal voltage "1": 0...7 V DC and 18...30 V DC</li> </ul>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
<b>Current consumption power contacts</b>	–		–
<b>Current consumpt. K-bus</b>	typ. 8 mA		typ. 8 mA
<b>Operating temperature</b>	0...+55 °C		0...+55 °C
<b>Approvals</b>	CE, UL, Ex		CE, UL, Ex
<b>Weight</b>	approx. 55 g		approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL1154">www.beckhoff.com/KL1154</a>		<a href="http://www.beckhoff.com/KL1052">www.beckhoff.com/KL1052</a>
<b>Special terminals</b>	<b>KL1052-0010</b>		
<b>Distinguishing features</b>	96 V DC (not in accordance with the EN 61131-2 specifications)		

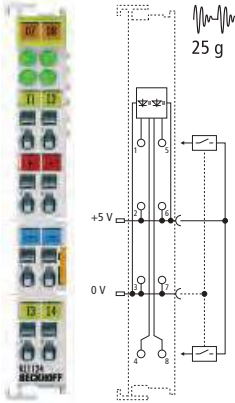
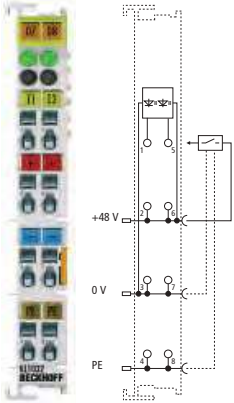
# Digital input | 5...230 V

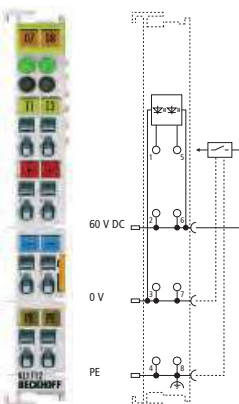
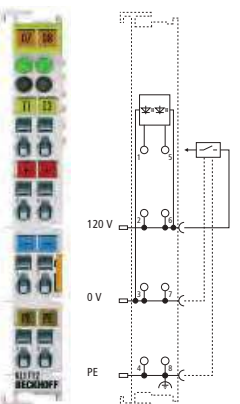
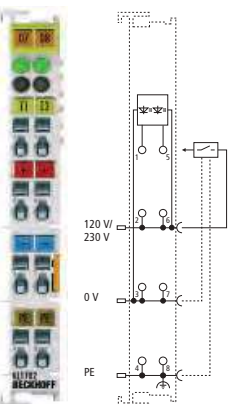
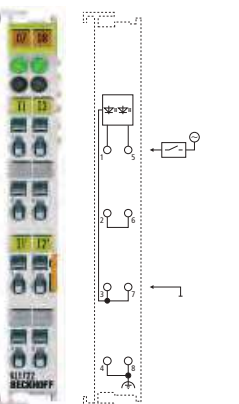
Rather than the usual 24 V DC control voltage, additional voltage range/potentials are implemented for sensors and actuators. The digital input terminals from the signal range 5...230 V allow direct input of these special sensor/actuator supplies without a further level conversion. The Bus Terminals are separately supplied with the corresponding control voltage by a power feed terminal, so that a Bus Terminal station can be operated with various different potential groups.

KL9xxx power feed terminals  
see page [674](#)

4-channel digital  
input terminal,  
5 V DC,  
2-/3-wire

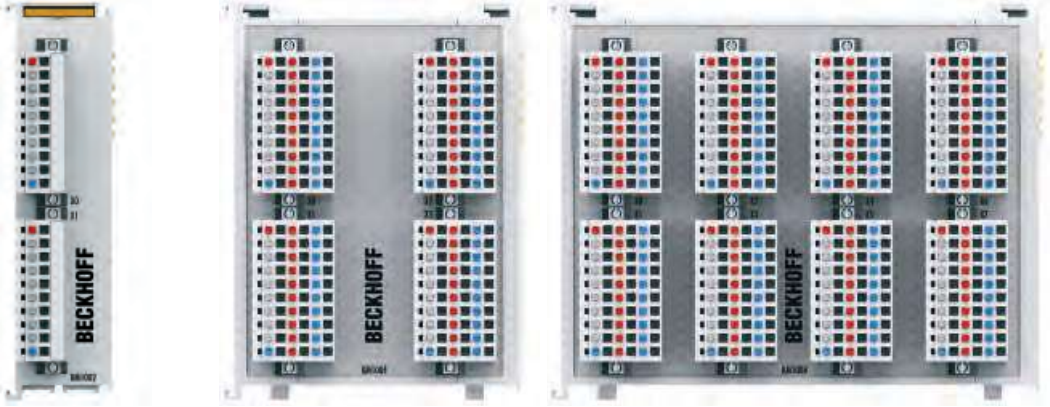
2-channel digital  
input terminal,  
48 V DC,  
4-wire, type 1

Technical data	KL1124   KS1124	KL1032   KS1032
Connection technology	2-/3-wire	4-wire
Signal voltage logic "0"	CMOS (< 0.8 V)	-6...+34 V
Signal voltage logic "1"	CMOS (> 2.4 V)	34...60 V
Input filter	typ. 0.2 ms	typ. 3.0 ms
Number of inputs	4	2
	 <p>The KL1124 digital input terminal is suitable for the reading of 5 V DC logic signals. The 5 V DC supply voltage can be generated with the KL9505 power supply unit terminal and fed in via the power contacts.</p>	 <p>The KL1032 digital input terminal is suitable for the reading of 48 V DC logic signals.</p>
Nominal voltage	5 V DC	48 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 1 mA + load	–
Current consumpt. K-bus	typ. 5 mA	typ. 3 mA
Electrical isolation	500 V (K-bus/field potential)	500 V (K-bus/field potential)
Special features	supply 5 V DC via power contacts	further voltage values on request
Operating temperature	0...+55 °C	0...+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL
Weight	approx. 50 g	approx. 50 g
Further information	<a href="http://www.beckhoff.com/KL1124">www.beckhoff.com/KL1124</a>	<a href="http://www.beckhoff.com/KL1032">www.beckhoff.com/KL1032</a>
Special terminals		
Distinguishing features		

	2-channel digital input terminal, 60 V DC, 4-wire, type 1	2-channel digital input terminal, 120 V AC/DC, 4-wire, type 1	2-channel digital input terminal, 120/230 V AC, 4-wire, type 1	2-channel digital input terminal, 120/230 V AC, 2-wire, type 1
	<b>KL1712-0060   KS1712-0060</b>	<b>KL1712   KS1712</b>	<b>KL1702   KS1702</b>	<b>KL1722   KS1722</b>
				2-wire
	0...20 V	0...40 V	0...40 V	0...40 V
	40...70 V	80...140 V	79...260 V	79...260 V
	typ. 10 ms	typ. 10 ms	typ. 10 ms	typ. 10 ms
	2	2	2	2
	 <p>The KL1712-0060 digital input terminal is suitable for the reading of 60 V DC logic signals.</p>	 <p>The KL1712 digital input terminal is suitable for the acquisition of direct and alternating voltage logic signals.</p>	 <p>The KL1702 digital input terminal is suitable for the acquisition of logic signals in the alternating voltage range from 120...230 V AC.</p>	 <p>The KL1722 digital input terminal does not have a power contact, so that individual potential groups can be built up. The voltage between input 1 and input 2 must not exceed 230 V AC.</p>
	60 V DC	120 V AC/DC	120/230 V AC	120/230 V AC
	–	–	–	–
	typ. 3 mA	typ. 3 mA	typ. 3 mA	typ. 3 mA
	500 V (K-bus/mains voltage); 3,750 V AC, 1 min.	500 V (K-bus/mains voltage); 3,750 V AC, 1 min.	500 V (K-bus/mains voltage); 3,750 V AC, 1 min.	500 V (K-bus/mains voltage); 3,750 V AC, 1 min.
	60 V DC rail applications	120 V AC power grids	ohmic/capacitive input behaviour	ohmic/capacitive input behaviour
	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
	CE	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
	<a href="http://www.beckhoff.com/KL1712-0060">www.beckhoff.com/KL1712-0060</a>	<a href="http://www.beckhoff.com/KL1712">www.beckhoff.com/KL1712</a>	<a href="http://www.beckhoff.com/KL1702">www.beckhoff.com/KL1702</a>	<a href="http://www.beckhoff.com/KL1722">www.beckhoff.com/KL1722</a>
		<b>KL1712-0010</b>	<b>KL1702-0010</b>	
		24 V AC/DC input circuit	230 V AC input circuit with type 2 characteristics	



## Digital input | 24 V DC, terminal modules

	16-channel digital input module, 24 V DC, plug connector, type 1		32-channel digital input module, 24 V DC, plug connector, type 1		64-channel digital input module, 24 V DC, plug connector, type 1	
Technical data	KM1002	KM1012	KM1004	KM1014	KM1008	KM1018
Connection technology	plug					
Specification	EN 61131-2, type 1					
Input filter	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms
Number of inputs	16 (2 x 8)		32 (4 x 8)		64 (8 x 8)	
						
	<p>Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are optionally available with 1 or 3 pins. LEDs integrated in the plug indicate the signal state for each channel directly at the wire.</p> <p>Ordering information:</p> <ul style="list-style-type: none"> <li>KM10xx-0000 without plugs</li> <li>-0001 1-pin plug (without status LED)</li> <li>-0002 1-pin plug (with status LED)</li> <li>-0004 3-pin plug (with status LED)</li> </ul>					
Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
Current consumption power contacts	– (no power contacts)		– (no power contacts)		– (no power contacts)	
Current consumpt. K-bus	typ. 3 mA		typ. 3 mA		typ. 3 mA	
Operating temperature	0...+55 °C		0...+55 °C		0...+55 °C	
Approvals	CE		CE		CE	
Weight	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector		approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector		approx. 310 g with 1-pin connector, approx. 390 g with 3-pin connector	
Further information	www.beckhoff.com/KM1002		www.beckhoff.com/KM1004		www.beckhoff.com/KM1008	
Special terminals	KM10x2-000x		KM10x4-000x		KM10x8-000x	
Distinguishing features	different connectors		different connectors		different connectors	

# Digital input | Manual operation

Manual input of process data directly to the terminal is suitable for example for:

- training and test installations
- emergency operating levels in buildings
- operating levels in the control cabinet
- program development/simulation


It is possible to have a response directly on the module by the LEDs controlled by the process image.

Together with the following terminals, further manual operational functions can be implemented:

- KL2641 | 1-channel relay output terminal, 230 V AC, 16 A, bistable, manual operation, see page [614](#)
- KM2642, KM2652 | 2-channel relay module, 230 V AC, 6 A, manual/automatic operation, see page [617](#)
- KM2614 | 4-channel relay module, 230 V AC, 16 A, automatic operation/manual operation on the relay, see page [616](#)
- KM4602 | 2-channel analog output terminal, 0...10 V, manual/automatic operation, see page [651](#)

The manual operating modules of the KL85xx series (see page [670](#)) are installed in the control cabinet door. This way, the modules can be operated without having to open the control cabinet.

4-channel manual operation,  
4 x switch,  
4 x LED

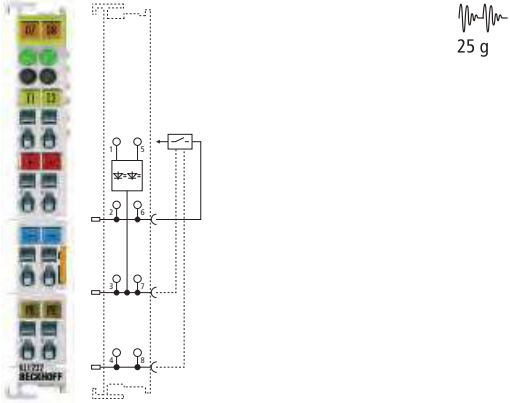
<b>Technical data</b>	<b>KM1644</b>
<b>Specification</b>	manual operation level
<b>Number of channels</b>	4 inputs + 4 outputs
	
	<p>The digital KM1644 input terminal is used for manual input directly in the process data. The four switches supply their status to the control system as digital bit information. The four LEDs indicate the four output bits from the process data and cannot be activated directly via the switches.</p>
<b>Nominal voltage</b>	–
<b>Current consumption power contacts</b>	– (no power contacts)
<b>Current consumpt. K-bus</b>	typ. 5 mA
<b>Switch settings</b>	ON, OFF, PUSH
<b>Special features</b>	manual/emergency operation
<b>Operating temperature</b>	0...+55 °C
<b>Approvals</b>	CE, UL
<b>Weight</b>	approx. 65 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KM1644">www.beckhoff.com/KM1644</a>

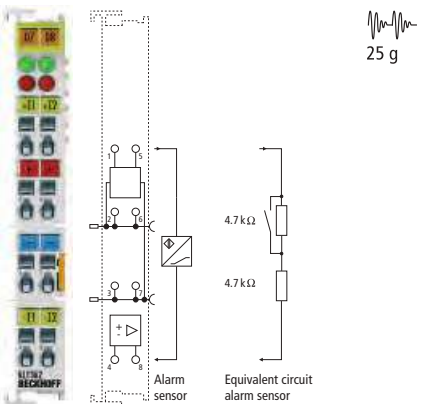
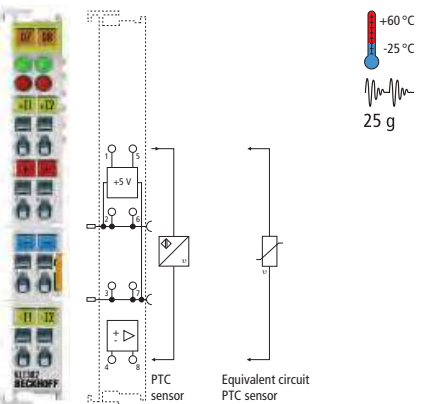
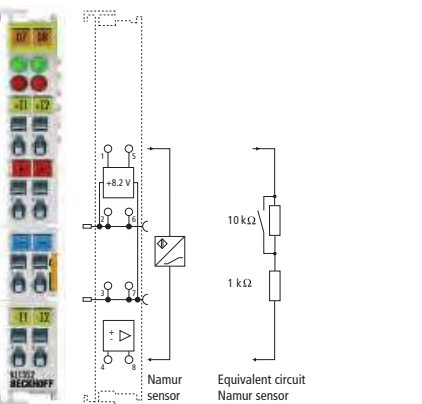
## Digital input | Special functions

A specific alignment of the logic signals to the application is possible with the special terminals. The signal is either pre-processed inside the terminal or prepared as far as possible by a specialised input circuit, so that no additional module needs to be switched between sensor and Bus Terminal.

The KL1362, KL1382 and KL1352 Bus Terminals generate a voltage internally for sensor supply. Depending on the logical state of the sensor this changes the current or the voltage. The Bus Terminal evaluates this state and transmits it to the process image of the controller. If required, a diagnostic for wiring breaks and short-circuits is available in the event of a fault.

2-channel digital input terminal, 24 V DC, with edge triggered pulse expansion

<b>Technical data</b>	<b>KL1232   KS1232</b>
<b>Connection technology</b>	4-wire
<b>Specification</b>	pulse expansion
<b>Input filter</b>	0.2 ms
<b>Number of inputs</b>	2
	
	<p>The KL1232 has an input circuit that extends plus-switched signals, triggered on the rising edge, to 100 ms. The KL1232 is particularly suitable for recording very short signals in control systems with a longer processing time than the signal length.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>"0" signal voltage</b>	-3...+5 V
<b>"1" signal voltage</b>	15...30 V
<b>Current consumption power contacts</b>	–
<b>Current consumpt. K-bus</b>	typ. 5 mA
<b>Special features</b>	edge triggered pulse expansion
<b>Operating temperature</b>	0...+55 °C
<b>Approvals</b>	CE, UL, Ex
<b>Weight</b>	approx. 55 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL1232">www.beckhoff.com/KL1232</a>
<b>Special terminals</b>	<b>KL1232-xxxx</b>
<b>Distinguishing features</b>	special terminals see page <b>685</b>

<p>2-channel digital input terminal, 24 V DC, for break-in alarm</p>	<p>2-channel digital input terminal, 24 V DC, thermistor</p>	<p>2-channel digital input terminal, 24 V DC, for Namur sensors</p>
<p><b>KL1362   KS1362</b>                      <b>KL1382   KS1382</b>                      <b>KL1352   KS1352</b></p>		
<p>2-wire</p>		
<p>break-in alarm</p>	<p>thermistor PTC</p>	<p>Namur</p>
<p>3.0 ms</p>	<p>30 ms</p>	<p>3.0 ms</p>
<p>2</p>		
<div style="display: flex; align-items: center;">  </div> <p>The digital KL1362 input terminal analyses the input signals of break-in sensors with the aid of a current loop. It enables safe monitoring of alarm contacts with fixed resistance ratio. In the process image, the state of the sensor is indicated by one bit each. A further bit reports short circuits or line interruptions.</p> <ul style="list-style-type: none"> <li>- line interruption: &lt; 0.1 mA</li> <li>- short circuit: &gt; 3 mA</li> <li>- cable resistance: ≤ 200 Ω</li> </ul>	<div style="display: flex; align-items: center;">  </div> <p>The digital KL1382 input terminal analyses the input signal of thermistor sensors with the aid of a current loop and a voltage of less than 5 V. It is a monitoring device for the thermal machine protection of PTC sensors, suitable for the direct monitoring of motors, bearings and equipment. In the process image, the state of the sensor is indicated by one bit each. A further bit reports short circuits or line interruptions.</p> <ul style="list-style-type: none"> <li>- sensor voltage: ≤ 5 V</li> <li>- diagnostics: open-circuit: &gt; 8 kΩ short-circuit: &lt; 25 Ω</li> </ul>	<div style="display: flex; align-items: center;">  </div> <p>The digital input terminal KL1352 analyses the input signal from Namur sensors in accordance with EN 50277 (previously DIN 19234). One bit indicates the sensor's signal state in the process image. A further bit reports short circuits or line interruptions.</p> <ul style="list-style-type: none"> <li>- switching hysteresis: 0.2 mA</li> <li>- short circuit current: &lt; 8.2 mA</li> <li>- short circuit detection: &gt; 6.5 mA</li> </ul>
<p>24 V (-15 %/+20 %)</p>	<p>24 V (-15 %/+20 %)</p>	<p>24 V (-15 %/+20 %)</p>
<p>"0" signal current: &lt; 1 mA</p>	<p>≤ 1.5 kΩ</p>	<p>≤ 1.2 mA</p>
<p>"1" signal current: &gt; 1 mA</p>	<p>≥ 3 kΩ</p>	<p>≥ 2.1 mA</p>
<p>-</p>		
<p>typ. 35 mA</p>	<p>typ. 60 mA</p>	<p>typ. 70 mA</p>
<p>monitoring of alarm contacts</p>	<p>monitoring device for thermal machine protection</p>	<p>Namur</p>
<p>0...+55 °C</p>	<p>-25...+60 °C</p>	<p>0...+55 °C</p>
<p>CE, UL, Ex, GL</p>	<p>CE, UL, Ex, GL</p>	<p>CE, UL, Ex, GL</p>
<p>approx. 55 g</p>	<p>approx. 55 g</p>	<p>approx. 55 g</p>
<p><a href="http://www.beckhoff.com/KL1362">www.beckhoff.com/KL1362</a></p>	<p><a href="http://www.beckhoff.com/KL1382">www.beckhoff.com/KL1382</a></p>	<p><a href="http://www.beckhoff.com/KL1352">www.beckhoff.com/KL1352</a></p>

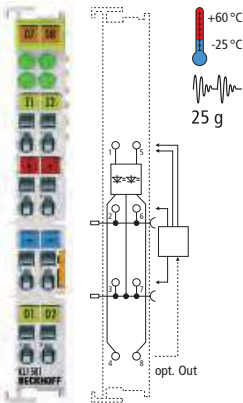
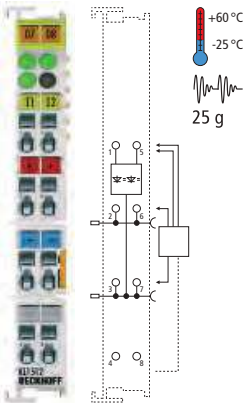
# Digital input | Counters

Pulses often need to be captured in technical control applications. If the pulse length is the order of magnitude of the control cycle time or less, the controller cannot record these signals correctly any more. Pre-processing is then required. The "counter terminals" can count the number of pulses and deliver reliable values to the controller, even though the controller cannot capture the pulse at that speed. The counter is adapted to the individual requirements, such as forwards/backwards counter or Gate/Latch-controlled, by parameterisation. With a counter depth of 16- or 32-bit an overflow, even at high frequencies, can easily be managed by the controller.

The KL1501 is optimised for particularly fast signals. On this basis, other input voltages and special pre-processing are available with special varieties of terminals. The KL1512 is developed for price-sensitive areas of application and has certain limitations in relation to speed, bit width and functionality.

Up/down counter,  
24 V DC, 100 kHz, 32 bit

Up/down counter,  
24 V DC, 1 kHz, 16 bit

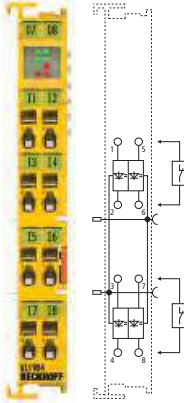
Technical data	KL1501   KS1501	KL1512   KS1512
Input filter	–	0.2 ms
Number of inputs	2	
	 <p>The up/down counter counts binary pulses, and transmits the counter state, in an electrically isolated form, to the higher-level automation device. In the KL1501 Bus Terminal it is possible to choose the (32-bit) counting direction (forwards/backwards) using the forwards/backwards input, and the gate connection can be used to trigger the counter.</p>	 <p>In the KL1512 digital input terminal it is possible to choose forwards or backwards counter (16-bit) direction. It is particularly suitable for simple counting tasks.</p>
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
"0" signal voltage	-3...+5 V	-3...+5 V
"1" signal voltage	15...30 V	15...30 V
Current consum. pow. cont.	–	–
Current consumpt. K-bus	typ. 50 mA	typ. 50 mA
Counting frequency	max. 100 kHz (2 kHz for switching up and down)	max. 1 kHz
Max. output current	0.5 A typ. (short-circuit-proof) per channel	–
Counter depth	32 bit	16 bit
Special features	2 additional outputs	–
Operating temperature	-25...+60 °C	-25...+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 50 g	approx. 55 g
Further information	<a href="http://www.beckhoff.com/KL1501">www.beckhoff.com/KL1501</a>	<a href="http://www.beckhoff.com/KL1512">www.beckhoff.com/KL1512</a>
Special terminals	KL1501-001x	
Distinguishing features	special terminals see	685

# Digital input | TwinSAFE

The KL1904 safety Bus Terminal is a digital input terminal for sensors with potential-free 24 V DC contacts and comprises four fail-safe inputs. The KL1904 meets the requirements of DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3).

For further information on TwinSAFE and the TwinSAFE products see page **966**

4-channel digital input terminal, TwinSAFE, 24 V DC

Technical data	KL1904
Connection technology	2-wire
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Number of inputs	4
	 <p>The KL1904 Safety Bus Terminal has four fail-safe inputs.</p>
Protocol	TwinSAFE/Safety over EtherCAT
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	–
Current consumpt. K-bus	48 mA
Response time	typ. 4 ms (read input/write to K-bus)
Fault response time	≤ watchdog time (parameterisable)
Permitted degree of contamination	2
Climate class EN 60721-3-3	3K3
Installation position	horizontal
Special features	4 safe inputs
Operating temperature	0...+55 °C
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
Approvals	CE, UL, Ex, TÜV SÜD
Weight	approx. 50 g
Protection class	IP 20
Further information	<a href="http://www.beckhoff.com/KL1904">www.beckhoff.com/KL1904</a>

# Digital output | 24 V DC, positive switching

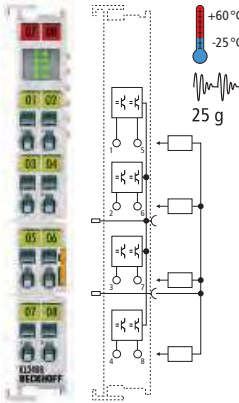
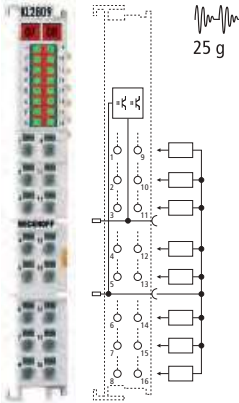
Many actuators are driven or controlled with 24 V DC. The Bus Terminals of the "positive switching" category switch all output channels to 24 V DC, so all connected actuators are hard-wired to ground (0 V). The output of a Bus Terminal can be considered as a functional 24 V DC relay contact. The output circuit offers further functions such as short-circuit-current limitation, short-circuit switch-off and the rapid depletion of inductive energy from the coil.

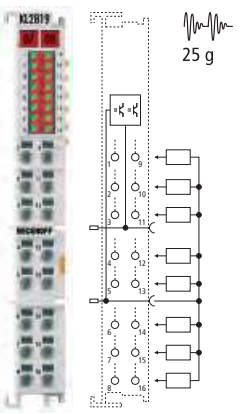
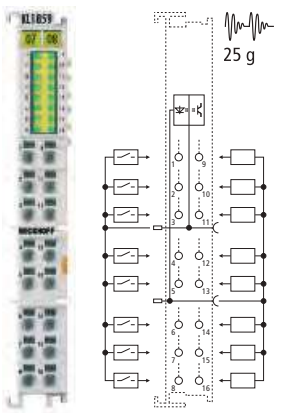
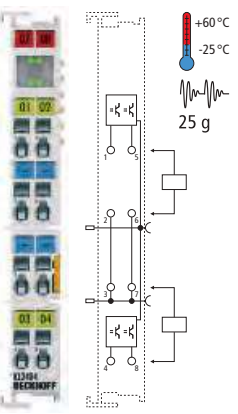
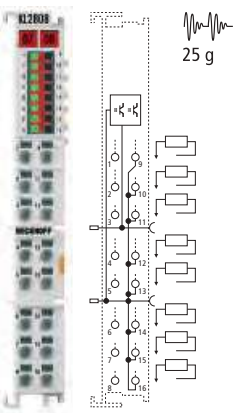
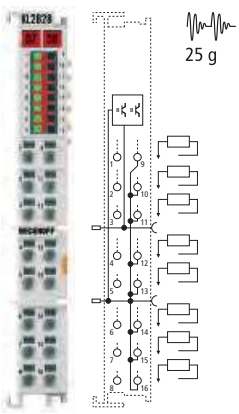
The most common output circuit delivers a maximum continuous current of 0.5 A. Special output terminals are available for higher currents. Any type of load (ohmic, capacitive, inductive) can be connected to an output terminal. As lamp and capacitive loads are critical due to their high starting currents, they are limited by the output circuits of the Bus Terminals. This ensures that the upstream circuit-breaker is not triggered. Inductive loads are problematic at switch-off, as high induction voltages develop if the current is interrupted too fast. An integrated freewheeling diode prevents this voltage peak. However, the current is reduced so slowly that it leads to faults in many technical control applications. For example, a valve remains open for many milliseconds. The Bus Terminals represent a compromise between prevention of overvoltage and rapid switch-off. They suppress the induction voltage to about 24 V DC and realise switch-off times which approximately correspond to the switch-on time of the coil.

In the case of short-circuit, the output circuit limits the current and prevents the activation of the upstream circuit-breaker. The Bus Terminal maintains this current until important self-heating and finally switches off. After the circuit has cooled, it switches back on. The output signal is driven in time until the output of the controller is switched off or the short-circuit is rectified. The clock frequency depends on the ambient temperature and the load of the other terminal channels. The overload protection of the output is also realised by thermal switch-off. The total current specified should be observed. If a total current is not given, it is not limited.

8-channel digital output terminal, 24 V DC, 1-wire

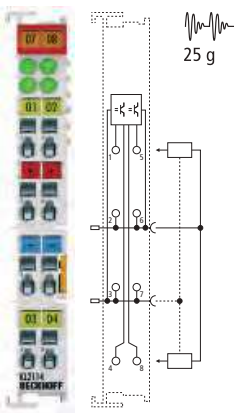
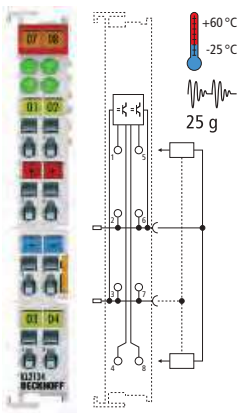
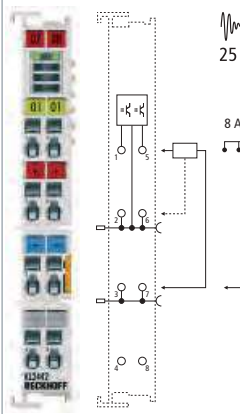
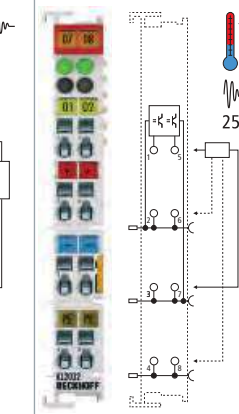
16-channel digital output terminal, 24 V DC, 1-wire

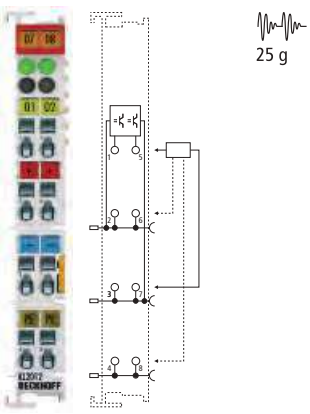
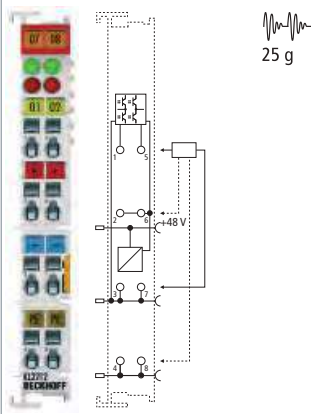
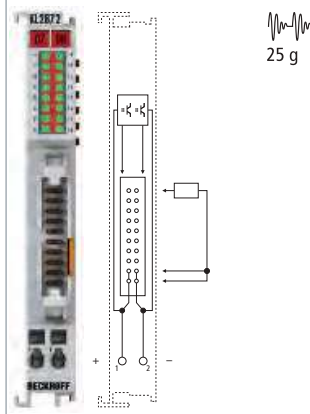

Technical data	KL2408   KS2408	KL2809
Connection technology	1-wire	
Load type	ohmic, inductive, lamp load	
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Number of outputs	8	16
	 <p>The KL2408 digital output terminal has 8 outputs, each one is assigned a terminal point. This way, a high packing density can be achieved for actuators with common ground potential.</p>	 <p>The KL2809 HD (High Density) Bus Terminal has 16 digital outputs and is suitable for applications in which a very high packing density is required.</p>
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 60 mA + load	typ. 35 mA + load
Current consumpt. K-bus	typ. 18 mA	typ. 35 mA
Breaking energy	< 150 mJ/channel	< 150 mJ/channel
Reverse voltage protection	yes	yes
Short circuit current	< 2 A	< 2 A
Operating temperature	-25...+60 °C	0...+55 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 70 g	approx. 70 g
Further information	<a href="http://www.beckhoff.com/KL2408">www.beckhoff.com/KL2408</a>	<a href="http://www.beckhoff.com/KL2809">www.beckhoff.com/KL2809</a>

16-channel digital output terminal, 24 V DC, 1-wire, with diagnostics	8-channel digital input + 8-channel digital output, 24 V DC, 1-wire	4-channel digital output terminal, 24 V DC, 2-wire	8-channel digital output terminal, 24 V DC, 2-wire	8-channel digital output terminal, 24 V DC, 2-wire	
KL2819	KL1859	KL2404   KS2404	KL2424   KS2424	KL2808	KL2828
2-wire					
					ohmic, inductive, capacitive
0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	2.0 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	2 A (∑ 10 A)
16	8 outputs + 8 inputs	4		8	8
 <p>The KL2819 HD (High Density) Bus Terminal has 16 digital outputs and is suitable for applications in which a very high packing density is required. Diagnostic information on overtemperature and lack of voltage supply are evaluated by the controller.</p>	 <p>The KL1859 digital Bus Terminal combines eight digital inputs and eight digital outputs in one device.</p> <ul style="list-style-type: none"> <li>- number of inputs: 8</li> <li>- input filter: 3.0 ms</li> <li>- type 1/3</li> </ul>	 <p>The KL2404 and KL2424 digital input terminals are suitable for the connection of four 2-wire actuators.</p>	 <p>The KL2808 High Density Bus Terminal contains eight outputs and eight ground connection points for the connection of 2-wire actuators and thus allows a very high packing density.</p>	 <p>The KL2828 High Density Bus Terminal contains eight outputs and eight ground connection points for the connection of 2-wire actuators and thus allows a very high packing density.</p>	
24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
typ. 50 mA + load	typ. 15 mA + load	typ. 30 mA + load	typ. 15 mA + load	typ. 15 mA + load	typ. 15 mA + load
typ. 80 mA	typ. 25 mA	typ. 9 mA	typ. 20 mA	typ. 18 mA	typ. 18 mA
< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel	< 1.7 J/channel	< 150 mJ/channel	< 1.2 J/channel
yes	yes	yes	yes	yes	yes
< typ. 1 A	< 2 A	< 2 A	< 70 A	< 2 A	< 40 A typ.
0...+55 °C	0...+55 °C	-25...+60 °C	0...+55 °C	0...+55 °C	0...+55 °C
CE	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex, GL	CE
approx. 70 g	approx. 60 g	approx. 70 g	approx. 65 g	approx. 70 g	approx. 70 g
www.beckhoff.com/KL2819	www.beckhoff.com/KL1859	www.beckhoff.com/KL2404	www.beckhoff.com/KL2808	www.beckhoff.com/KL2828	

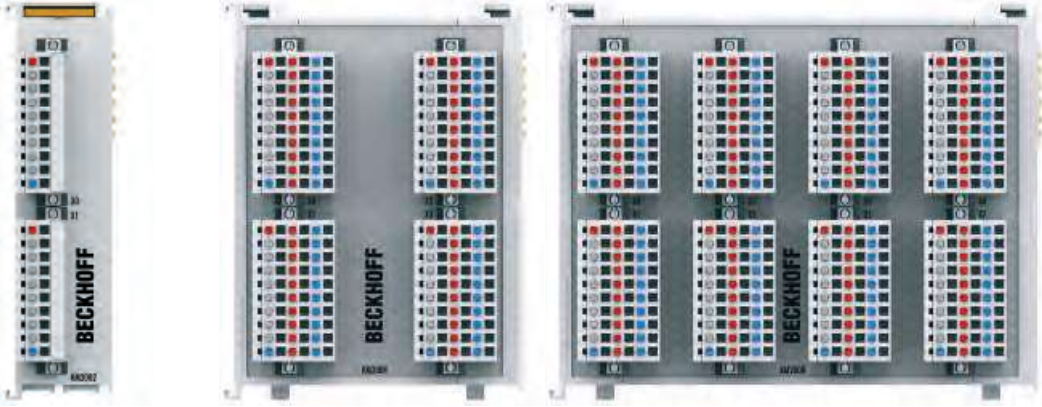


## Digital output | 24 V DC, positive switching

	4-channel digital output terminal, 24 V DC, 2-/3-wire	4-channel digital output terminal, 24 V DC, 2-/3-wire	2-channel digital output terminal, 24 V DC, 3-wire	2-channel digital output terminal, 24 V DC, 4-wire
<b>Technical data</b>	KL2114   KS2114	KL2134   KS2134	KL2442	KL2032   KS2032
<b>Connection technology</b>	2-/3-wire		3-wire	4-wire
<b>Load type</b>	ohmic, inductive, lamp load			
<b>Max. output current</b>	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	4.0 A (short-circuit-proof) per channel, 8 A for parallel connection	0.5 A (short-circuit-proof) per channel
<b>Number of outputs</b>	4	4	2	2
	 <p>The KL2114 digital output terminal connects the control signals to the actuators in an electrically isolated manner.</p>	 <p>The KL2134 digital output terminal connects the control signals to the actuators in an electrically isolated manner. It is protected against reverse polarity connection.</p>	 <p>The KL2442 is suitable for the connection of actuators with high current requirement of 4 A. For parallel switched outputs, even 8 A is possible.</p>	 <p>The KL2032 digital output terminal connects the control signals to the actuators in an electrically isolated manner.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption power contacts</b>	typ. 30 mA + load	typ. 30 mA + load	typ. 30 mA + load	typ. 20 mA + load
<b>Current consumpt. K-bus</b>	typ. 9 mA	typ. 9 mA	typ. 9 mA	typ. 5 mA
<b>Breaking energy</b>	< 150 mJ/channel	< 150 mJ/channel	no data	< 150 mJ/channel
<b>Reverse voltage protection</b>	–	yes	yes	yes
<b>Short circuit current</b>	< 2 A	< 2 A	< 70 A	< 2 A
<b>Operating temperature</b>	0...+55 °C	-25...+60 °C	0...+55 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex, GL	CE	CE, UL, Ex, GL
<b>Weight</b>	approx. 70 g	approx. 70 g	approx. 70 g	approx. 55 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2114">www.beckhoff.com/KL2114</a>	<a href="http://www.beckhoff.com/KL2134">www.beckhoff.com/KL2134</a>	<a href="http://www.beckhoff.com/KL2442">www.beckhoff.com/KL2442</a>	<a href="http://www.beckhoff.com/KL2032">www.beckhoff.com/KL2032</a>
<b>Special terminals</b>				
<b>Distinguishing features</b>				

2-channel digital output terminal, 24 V DC, 4-wire		2-channel digital output terminal, 24 V DC, 4-wire, with diagnostics		16-channel digital output terminal, 24 V DC, flat-ribbon cable connection		16-channel digital output terminal, 24 V DC, D-sub connection	
KL2012   KS2012		KL2022   KS2022		KL2212   KS2212		KL2872	
				flat-ribbon cable		D-sub	
0.5 A (short-circuit-proof) per channel		2.0 A (short-circuit-proof) per channel		0.5 A (short-circuit-proof) per channel		0.5 A (short-circuit-proof) per channel	
2		2		16		16	
 <p>The digital output terminals KL2012 and KL2022 connect the control signals to the actuators in an electrically isolated manner.</p>		 <p>Diagnostic possibilities:                      – short-circuit to 24 V                      – short-circuit to 0 V                      – undervoltage</p>		 <p>The KL2872 allows the connection of 16 actuators by direct ribbon cable via a 20-pin contact strip with a 2.54 mm contact spacing. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points.</p>		 <p>The digital output terminal KM2042 allows direct connection of actuators by D-sub connection, which is common in e.g. valve terminals. Plug X2 included in the scope of supply.</p>	
24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
typ. 15 mA + load		typ. 20 mA + load		typ. 15 mA + load		typ. 60 mA from the supply (no power contacts)	
typ. 5 mA		typ. 15 mA		typ. 5 mA		typ. 5 mA	
< 150 mJ/channel		< 1.7 J/channel		< 150 mJ/channel		< 150 mJ/channel	
–		–		yes		yes	
< 2 A		< 70 A		< 2 A		< 2 A	
0...+55 °C		0...+55 °C		0...+55 °C		0...+55 °C	
CE, UL, Ex		CE, UL, Ex, GL		CE, UL, Ex		CE	
approx. 55 g		approx. 60 g		approx. 55 g		approx. 90 g	
www.beckhoff.com/KL2012		www.beckhoff.com/KL2212		www.beckhoff.com/KL2872		www.beckhoff.com/KM2042	
				KL2872-0010			
				negative switching		612	

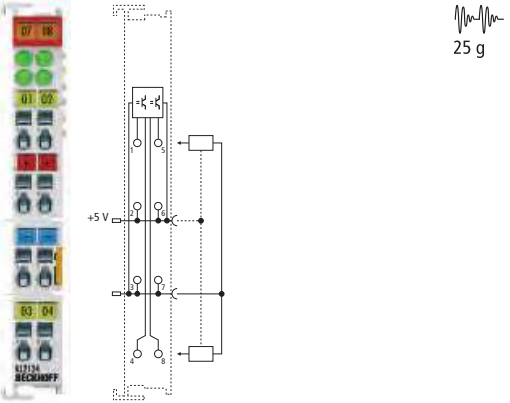
## Digital output | 24 V DC, terminal modules

	16-channel digital output, 24 V DC, plug connector	32-channel digital output, 24 V DC, plug connector	64-channel digital output, 24 V DC, plug connector
<b>Technical data</b>	<b>KM2002</b>	<b>KM2004</b>	<b>KM2008</b>
Connection technology	plug		
Load type	ohmic, inductive, lamp load		
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Number of outputs	16 (2 x 8)	32 (4 x 8)	64 (8 x 8)
			
	<p>Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are optionally available with 1 or 3 pins. LEDs integrated in the plug indicate the signal state for each channel directly at the wire.</p> <p>Ordering information:</p> <p>KM200x-0000 without plugs  -0001 1-pin plug (without status LED)  -0002 1-pin plug (with status LED)  -0004 3-pin plug (with status LED)</p>		
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	– (no power contacts)	– (no power contacts)	– (no power contacts)
Current consumpt. K-bus	typ. 5 mA	typ. 5 mA	typ. 5 mA
Breaking energy	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel
Reverse voltage protection	yes	yes	yes
Short circuit current	< 2 A	< 2 A	< 2 A
Operating temperature	0...+55 °C	0...+55 °C	0...+55 °C
Approvals	CE	CE	CE
Weight	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector	approx. 310 g with 1-pin connector, approx. 390 g with 3-pin connector
Further information	<a href="http://www.beckhoff.com/KM2002">www.beckhoff.com/KM2002</a>	<a href="http://www.beckhoff.com/KM2004">www.beckhoff.com/KM2004</a>	<a href="http://www.beckhoff.com/KM2008">www.beckhoff.com/KM2008</a>
<b>Special terminals</b>	<b>KM2002-000x</b>	<b>KM2004-000x</b>	<b>KM2008-000x</b>
Distinguishing features	different connectors	different connectors	different connectors

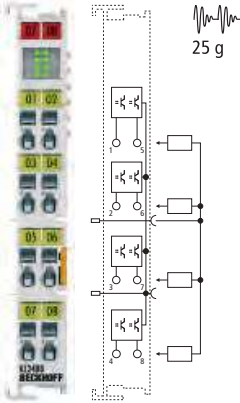
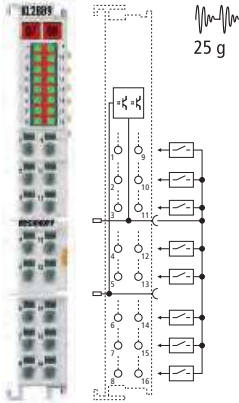
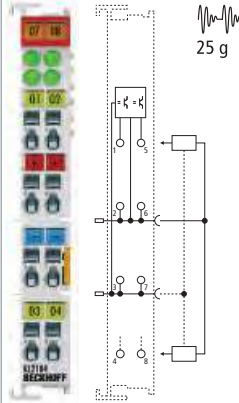
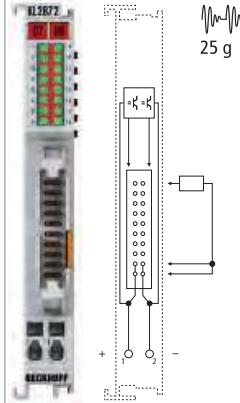
## Digital output | 5 V DC, positive switching

The KL2124 digital output terminal connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The load current outputs of the KL2124 version are protected against overload and short-circuit. The Bus Terminal contains four channels that indicate their signal state by means of light emitting diodes.

4-channel digital output terminal, 5 V DC, 2-/3-wire

<b>Technical data</b>	KL2124   KS2124
<b>Connection technology</b>	2-/3-wire
<b>Load type</b>	ohmic, inductive, lamp load
<b>Max. output current</b>	±20 mA (short-circuit-proof) per channel, 8 mA signal current
<b>Number of outputs</b>	4
	 <p>The positive-switching KL2124 output terminal offers four outputs and additionally provides 5 V DC and ground (0 V) for each channel.</p>
<b>Nominal voltage</b>	5 V DC
<b>Current consumption power contacts</b>	typ. 16 mA + load
<b>Current consumpt. K-bus</b>	typ. 14 mA
<b>Breaking energy</b>	–
<b>Reverse voltage protection</b>	yes
<b>Short circuit current</b>	–
<b>Operating temperature</b>	0...+55 °C
<b>Approvals</b>	CE, UL, Ex
<b>Weight</b>	approx. 70 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2124">www.beckhoff.com/KL2124</a>

## Digital output | 24 V DC, negative switching

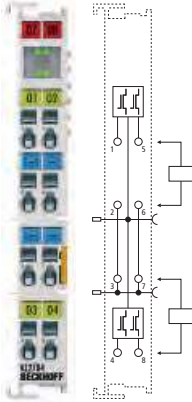
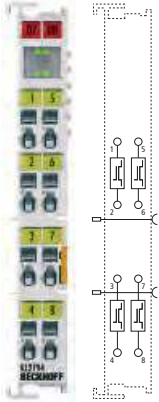
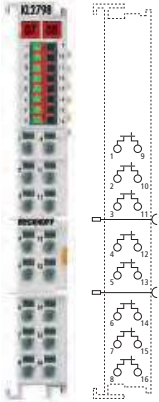
	8-channel digital output terminal, 24 V DC, 1-wire	16-channel digital output terminal, 24 V DC, 1-wire	4-channel digital output terminal, 24 V DC, 2-/3-wire	16-channel digital output terminal, 24 V DC, flat-ribbon cable connection
<b>Technical data</b>	KL2488   KS2488	KL2889	KL2184   KS2184	KL2872-0010
<b>Connection technology</b>	1-wire		2-/3-wire	flat-ribbon cable
<b>Load type</b>	ohmic, inductive, lamp load			
<b>Max. output current</b>	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
<b>Number of outputs</b>	8	16	4	16
	 <p>The KL2488 digital output terminal is suitable for the connection of eight negative switching actuators using 1-wire connection technology.</p>	 <p>The KL2889 HD (High Density) Bus Terminal offers terminal points for 16 negative switching actuators using 1-wire connection technology and thus a very high packing density.</p>	 <p>The KL2184 digital output terminal offers four outputs and additionally provides 24 V DC and ground (0 V) for each channel.</p>	 <p>A 20-pin plug connector with 2.54 mm contact spacing enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points 1 and 2.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption power contacts</b>	typ. 60 mA + load	typ. 35 mA + load	typ. 30 mA + load	typ. 60 mA from the supply (no power contacts)
<b>Current consumpt. K-bus</b>	typ. 18 mA	typ. 45 mA	typ. 9 mA	typ. 5 mA
<b>Breaking energy</b>	< 100 mJ/channel	< 100 mJ/channel	< 100 mJ/channel	< 100 mJ/channel
<b>Reverse voltage protection</b>	yes	yes	yes	yes
<b>Short circuit current</b>	< 7 A	< 7 A	< 7 A	< 7 A
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex	CE, Ex
<b>Weight</b>	approx. 70 g	approx. 70 g	approx. 70 g	approx. 55 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2488">www.beckhoff.com/KL2488</a>	<a href="http://www.beckhoff.com/KL2889">www.beckhoff.com/KL2889</a>	<a href="http://www.beckhoff.com/KL2184">www.beckhoff.com/KL2184</a>	<a href="http://www.beckhoff.com/KL2872">www.beckhoff.com/KL2872</a>

# Digital output | 30 V AC/DC, solid state relays

The KL2784, KL2794 and KL2798 digital output terminals each provide four (KL27x4) or eight (KL2798) switches, which can be used like a relay contact for AC/DC voltages. The KL2784 uses a power contact as a common potential. In the KL2794 and KL2798, the power contacts are passed directly to the circuit without connection.

The electronic switch in the Bus Terminal is implemented by efficient MOSFET transistors with a low switch-on resistance. The electronics are virtually wear-free. The switch itself is not short-circuit-proof, but can conduct a high current with its high pulse current capability long enough, until the circuit-breaker switches off. It behaves like a robust relay contact.

Inductive loads can be switched directly, without further safety measures. The circuit switches relatively slowly and prevents high peak voltages. No break sparks are created in the terminal and thus no electromagnetic interference pulse.

	4-channel digital output terminal, 30 V AC/DC, solid state relay	4-channel digital output terminal, 30 V AC/DC, solid state relay, potential-free	8-channel digital output terminal, 30 V AC/DC, solid-state relay
<b>Technical data</b>	KL2784   KS2784	KL2794   KS2794	KL2798
<b>Connection technology</b>	2-wire		
<b>Load type</b>	AC/DC loads		
<b>Max. output current</b>	2 A	2 A	2 A
<b>Number of outputs</b>	4 x make contacts	4 x make contacts	8 x make contacts
	 <p>4 electronic switches on the power contact</p>	 <p>4 potential-free electronic switches</p>	 <p>8 potential-free electronic switches</p>
<b>Nominal voltage</b>	0...30 V AC/DC (only ohmic load; 0...48 V DC)	0...30 V AC/DC (only ohmic load; 0...48 V DC)	0...30 V AC/DC (only ohmic load; 0...48 V DC)
<b>Current consum. pow. cont.</b>	only load	–	–
<b>Current consumpt. K-bus</b>	80 mA	80 mA	80 mA
<b>Breaking energy</b>	no data	no data	no data
<b>Short circuit current</b>	90 A	90 A	5 A (100 ms), < 50 A (10 ms), observe the cut-off characteristic of the fuse
<b>Surge voltage protection</b>	> 39 V	> 39 V	> 39 V
<b>Peak current</b>	5 A (100 ms), < 50 A (10 ms)	5 A (100 ms), < 50 A (10 ms)	5 A (100 ms), < 50 A (10 ms)
<b>On-resistance</b>	typ. 0.03 Ω	typ. 0.03 Ω	typ. 0.03 Ω
<b>Switching on speed</b>	typ. 1.8 ms, max. 5 ms	typ. 1.8 ms, max. 5 ms	typ. 1.8 ms, max. 5 ms
<b>Switching off speed</b>	typ. 30 ms, max. 50 ms	typ. 30 ms, max. 50 ms	typ. 30 ms, max. 50 ms
<b>Special features</b>	alternative for relay contacts	alternative for relay contacts, potential-free	substitute for relay contacts, potential-free
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, Ex	CE, Ex	CE
<b>Weight</b>	approx. 70 g	approx. 70 g	approx. 70 g
<b>Further information</b>	<a href="http://www.beckhoff.com/ KL2784">www.beckhoff.com/ KL2784</a>	<a href="http://www.beckhoff.com/ KL2794">www.beckhoff.com/ KL2794</a>	<a href="http://www.beckhoff.com/ KL2798">www.beckhoff.com/ KL2798</a>

# Digital output | Relay outputs up to 400 V AC

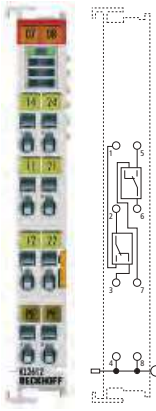
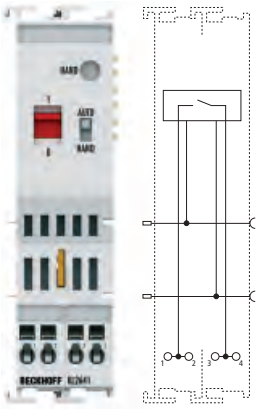
The Bus Terminals switch a relay as a function of the bits in the process image. The relays completely isolate the current flow by a mechanical contact; there is no residual current through the open contact. The Bus Terminals are not equipped with a protective circuit, so as not to allow for residual current by parallel switched components. The relay contacts differ in their contact material. Signal contacts also switch small voltages and currents; large current here lead to a change in the contact characteristics. Power contacts can switch large loads. An oxide layer on the power contacts prevents safe contact for small voltages below 1 V DC.

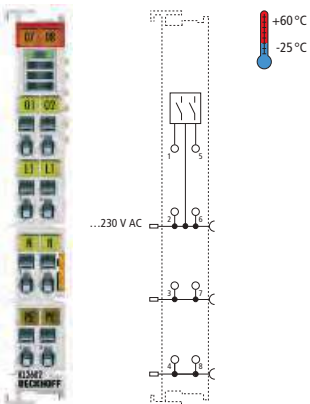
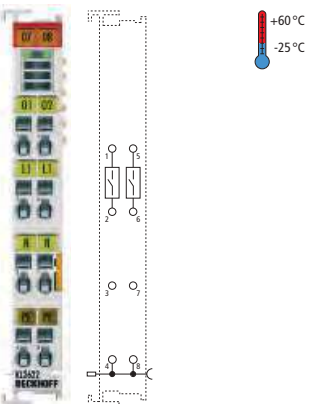
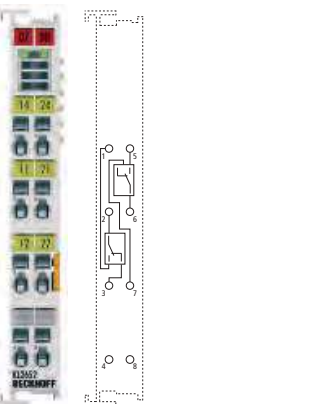
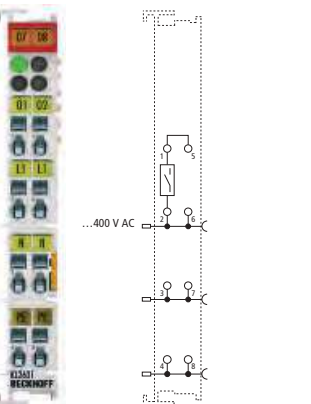
Switching on is accompanied by a bouncing. The electrical connection is initially switched on and off briefly, until the contact is securely in its closed location. With an inductive load (coil) this behaviour leads to a spark and to corresponding electromagnetic radiation. Capacitive loads create a short-circuit for a brief period of time. This can – particularly with alternating voltages – lead to such high switch-on currents at switch-on under peak value that the bouncing contact is burned shut. A capacitive load can also be electronic devices, which are typically equipped with a rectifier in the input and a relatively large smoothing capacitor. Electronic ballast is especially critical for fluorescent lamps. The maximum switch-on currents of the devices, which should be observed, are shown in the technical data numerous times.

The switch-off of a relay takes place by mechanical opening the contact. An arc burns for a short moment and warms the contact. For an inductive load (coil) a large part of the magnetic energy stored in the coil is additionally released as heat at the contact. This load on the contact determines the service life of the relay and is called the electrical service life. The mechanical service life is defined as the number of switching operations without current flow through the contact.

2-channel relay output terminal, 125 V AC

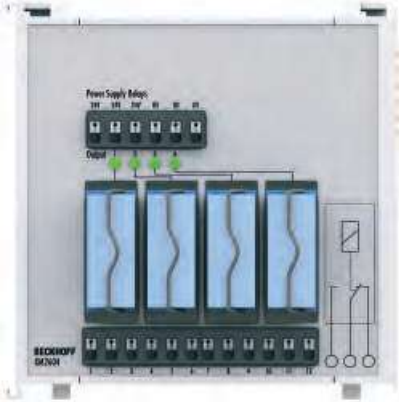

1-channel relay output terminal, 230 V AC, bistable, manual operation



Technical data	KL2612   KS2612	KL2641
Load type	ohmic	ohmic, inductive, lamp load
Max. output current	2 A	16 A
Number of outputs	2 x change-over	1 make contact
	 <p>The KL2612 Bus Terminal is equipped with potential-free contacts.</p>	 <p>The KL2641 output terminal has a relay with a single contact, which can be used universally for the switching of mains voltage consumers. The relay can optionally be switched in manual or automatic mode.</p>
Nominal voltage	125 V AC/30 V DC	230 V AC (max. switching voltage 440 V AC)
Current consum. pow. cont.	– (no power contacts)	typ 65 mA + load
Current consumpt. K-bus	typ. 60 mA	typ. 5 mA
Switching current	0.5 A AC/2 A DC (ohmic)	16 A AC
Operat. cycles mech. (min.)	1 x 10 <sup>8</sup>	1 x 10 <sup>6</sup>
Operat. cycles electr. (min.)	2 x 10 <sup>5</sup> (1 A/30 V DC)	no data
Lamp test, electronic ballast	max. 2 A starting current	max. 16 A starting current
Minimum permitted load	10 µA at 10 mV	–
Special features	signal relay	manual operation; bistable relay contact
Operating temperature	0...+55 °C	0...+55 °C
Approvals	CE, UL, Ex, GL	CE
Weight	approx. 80 g	approx. 110 g
Further information	<a href="http://www.beckhoff.com/KL2612">www.beckhoff.com/KL2612</a>	<a href="http://www.beckhoff.com/KL2641">www.beckhoff.com/KL2641</a>

	2-channel relay output terminal, 230 V AC	2-channel relay output terminal, 230 V AC	2-channel relay output terminal, 230 V AC, 300 V DC	1-channel relay output terminal, 400 V AC, 300 V DC
	KL2602   KS2602	KL2622   KS2622	KL2652   KS2652	KL2631   KS2631
	5 A			2 A
	2 x make contacts for power contact	2 x make contacts	2 x change-over	1 x make contacts for power contact
	 <p>The KL2602 output terminal has two relays each of which has a single contact. The relay contact is connected to the power contacts, which are suitable for use at up to 230 V AC, and can be generally used for switching devices requiring mains power.</p>	 <p>The KL2622 Bus Terminal has potential-free contacts; the power contacts are not looped through.</p>	 <p>The KL2652 output terminal has two relays each with a changeover contact, which can be used universally for the switching of mains voltage consumers of 230 V AC or 300 V DC. The KL2652 Bus Terminal is equipped with potential-free contacts.</p>	 <p>The KL2631 output terminal has a relay with a single contact, which is connected with the power contacts (usable up to 400 V AC) and can be used universally for the switching of mains voltage consumers. In order to use high voltages of up to 400 V AC, the KL2631 must be supplied via the KL9190 power feed terminal.</p>
	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC (max. switching voltage 250 V AC/300 V DC)	400 V AC/300 V DC
	only load	–	– (no power contacts)	only load
	typ. 80 mA	typ. 85 mA	typ. 90 mA	typ. 80 mA
	5 A AC/DC (ohmic)/ 2 A AC/DC (inductive)	5 A AC/DC (ohmic)/ 2 A AC/DC (inductive)	max. 1 A AC/1 A DC at 40 V DC; max. 0.15 A at 300 V DC (UL: max. 230 V AC, 1 A)	switching capacity DC: 300 V = 0.15 A; 24 V = 5 A; non-linear; switching capacity AC: 1,500 VA
	2 x 10 <sup>7</sup>	2 x 10 <sup>7</sup>	5 x 10 <sup>6</sup>	1 x 10 <sup>7</sup>
	1 x 10 <sup>5</sup> (5 A/30 V DC)	1 x 10 <sup>5</sup> (5 A/30 V DC)	1 x 10 <sup>6</sup> (1 A/250 V AC)	1.3 x 10 <sup>5</sup> (2 A/250 V AC)
	max. 5 A starting current (4 x 58 W)	max. 5 A starting current (4 x 58 W)	max. 6 A starting current	no data
	10 mA at 5 V DC	10 mA at 5 V DC	100 mA (12 V DC)	no data
	power relay	potential-free contacts	reverse switching realisable	400 V contact
	-25...+60 °C	-25...+60 °C	0...+55 °C	0...+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE	CE, GL
	approx. 85 g	approx. 80 g	approx. 55 g	approx. 85 g
	www.beckhoff.com/KL2602	www.beckhoff.com/KL2622	www.beckhoff.com/KL2652	www.beckhoff.com/KL2631

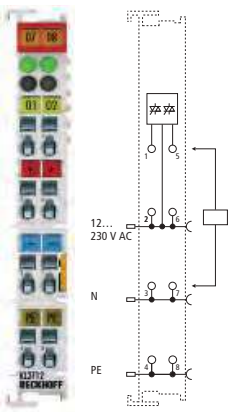
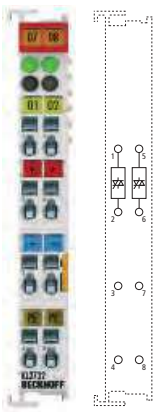
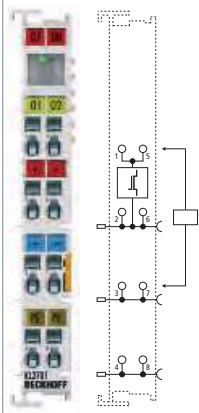


# Digital output | Relay outputs up to 400 V AC

	4-channel relay module, 230 V AC	4-channel relay module, 230 V AC, automatic/manual operation
<b>Technical data</b>	<b>KM2604</b>	<b>KM2614</b>
Load type	ohmic, inductive, lamp load	
Max. output current	16 A	
Number of outputs	4 x change-over	4 x change-over
	 <p>The KM2604 terminal module combines four pluggable power relays in one fieldbus module. The high switching capacity of 16 A at 230 V AC enables direct mains connection of consumers with high current consumption. The relays are positioned at the top and can therefore be exchanged easily.</p>	 <p>The KM2614 terminal module combines four pluggable power relays in one fieldbus module. The high switching capacity of 16 A at 230 V AC enables direct mains connection of consumers with high current consumption. The relays are positioned at the top and can therefore be exchanged easily. Each relay can be manually switched to the ON status. A seal indicates the initial manual operation.</p>
Nominal voltage	230 V AC (max. switching voltage 250 V AC/30 V DC)	230 V AC (max. switching voltage 250 V AC/30 V DC)
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumpt. K-bus	typ. 15 mA	typ. 15 mA
Switching current	16 A AC/12 A DC at 30 V DC	16 A AC/12 A DC at 30 V DC
Operat. cycles mech. (min.)	5 x 10 <sup>6</sup>	5 x 10 <sup>6</sup>
Operat. cycles electr. (min.)	1 x 10 <sup>6</sup> (1 A/250 V AC)	1 x 10 <sup>6</sup> (1 A/250 V AC)
Lamp test, electronic ballast	max. 25 A starting current	max. 25 A starting current
Minimum permitted load	5 mA (10 V DC)	5 mA (10 V DC)
Special features	–	automatic/manual operation at the relay
Operating temperature	0...+55 °C	0...+55 °C
Approvals	CE	CE
Weight	approx. 250 g	approx. 250 g
Further information	<a href="http://www.beckhoff.com/KM2604">www.beckhoff.com/KM2604</a>	<a href="http://www.beckhoff.com/KM2614">www.beckhoff.com/KM2614</a>

	2-channel relay module, 230 V AC, manual/automatic operation	2-channel relay module, 230 V AC, manual/automatic operation
	KM2642	KM2652
	6 A	
	2 x change-over	2 x change-over
	 <p>The digital KM2642 output terminal has two independent relay change-over contacts, which can be used for switching mains current consumers. For each channel a switch enables selection between automatic, manual on, manual off. In automatic mode the logical state of an output bit switches the relay. For manual mode a 24 V supply is required for the Bus Coupler. The output state can be read by the controller.</p>	 <p>The digital KM2652 output terminal has two independent relay change-over contacts, which can be used for switching mains current consumers. For each channel a switch enables selection between automatic, manual on, manual off. In automatic mode the logical state of an output bit switches the relay. For manual mode a 24 V supply is required for the Bus Coupler. The state of the output and the switch can be read by the controller.</p>
	230 V AC (max. switching voltage 250 V AC) – (no power contacts)	230 V AC (max. switching voltage 250 V AC) – (no power contacts)
	typ. 130 mA 6 A AC/4 A DC at 30 V DC 1 x 10 <sup>6</sup> 1 x 10 <sup>5</sup> (3 A/250 V AC) max. 10 A starting current	typ. 130 mA 6 A AC/4 A DC at 30 V DC 1 x 10 <sup>6</sup> 1 x 10 <sup>5</sup> (3 A/250 V AC) max. 10 A starting current
	100 mA (12 V DC) manual/automatic operation	100 mA (12 V DC) manual/automatic operation, switch setting readable
	0...+55 °C	0...+55 °C
	CE	CE
	approx. 110 g	approx. 110 g
	<a href="http://www.beckhoff.com/KM2642">www.beckhoff.com/KM2642</a>	<a href="http://www.beckhoff.com/KM2652">www.beckhoff.com/KM2652</a>

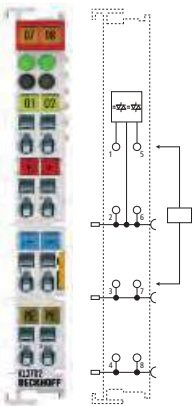
## Digital output | Triac outputs up to 230 V AC

	2-channel triac output terminal, 12...230 V AC		2-channel triac output terminal, 12...230 V AC	1-channel solid state load relay up to 230 V AC/DC
<b>Technical data</b>	KL2712   KS2712	KL2722   KS2722	KL2732   KS2732	KL2701   KS2701
<b>Connection technology</b>	4-wire		2-wire	2-/3-/4-wire
<b>Load type</b>	ohmic, inductive			
<b>Max. output current</b>	2 x 0.025...0.5 A	1 x 1 A	1 x 1 A	3 A steady load
<b>Number of outputs</b>	2 x make contacts		2 x make contacts	1 make contact
	 <p>The KL2712 and KL2722 output terminals use a power switch to control mains voltage from 12 V to 230 V AC. The switching element is a Triac which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear.</p>		 <p>The KL2732 output terminal uses a power switch to control mains voltage from 12 V to 230 V AC. The switching element is a Triac. As a semiconductor switch, it is not subject to wear.</p>	 <p>The KL2701 output terminal uses an electronic load relay to switch a mains voltage of up to 230 V AC/DC. The switching element is a high-power MOSFET which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear.</p>
<b>Nominal voltage</b>	12...230 V AC		12...230 V AC	0...230 V AC/DC
<b>Current consum. pow. cont.</b>	only leakage and load current		– (no power contacts)	only leakage and load current
<b>Current consumpt. K-bus</b>	typ. 10 mA		typ. 10 mA	typ. 65 mA
<b>Switching times</b>	0.1...10 ms, zero crossing		0.1...10 ms, zero crossing	1.5...5 ms
<b>Frequency range</b>	47...63 Hz		47...63 Hz	DC...100 Hz
<b>Surge voltage protection</b>	> 275 V AC		> 275 V AC	from 400 V AC
<b>Peak current</b>	40 A (16 ms), 1.5 A (30 s)		40 A (16 ms), 3 A (30 s)	5 A (20 s), 50 A (100 ms)
<b>Leakage current (OFF state)</b>	typ. 0.8 mA, max. 1.5 mA		typ. 0.8 mA, max. 1.5 mA	<< 1 mA
<b>Switch-off time</b>	T/2		T/2	2...4 ms
<b>Maximum residual voltage</b>	1.5 V		1.5 V	(100 mΩ)
<b>Special features</b>	reverse motors (blinds)		reverse motors (blinds)	–
<b>Operating temperature</b>	0...+55 °C		0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex, GL	CE, Ex, GL	CE, GL	CE
<b>Weight</b>	approx. 55 g		approx. 55 g	approx. 55 g
<b>Further information</b>	www.beckhoff.com/KL2712		www.beckhoff.com/KL2732	www.beckhoff.com/KL2701
<b>Special terminals</b>	KL27x2-0010		KL2732-0010	
<b>Distinguishing features</b>	special terminals see page	685	special terminals see page	685

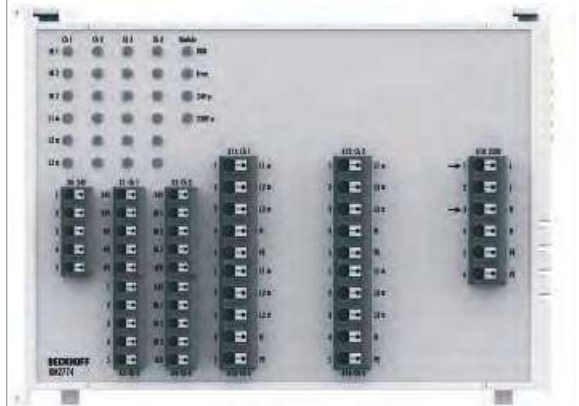
2-channel solid state load relay up to 230 V AC/DC		4-channel triac output module for 4 blind motors	
KL2702   KS2702	KL2702-0020	KL2702-0002	KM2774

mixed			
-------	--	--	--

0.3 A steady load on each channel	1.5 A steady load on each channel	2 A steady load on each channel	1.5 A per channel
2 x make contacts	2 x make contacts	2 x make contacts, mutually locked	4 x 3 make contacts



The KL2702 output terminal uses an electronic load relay to switch a mains voltage of up to 230 V AC/DC. The switching element is a high-power MOSFET which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear.



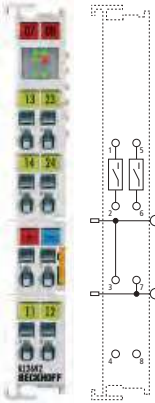
Mixed module 24 V DC/230 V AC for the direct control of blinds applications

0...230 V AC/DC (DC...100 Hz)			80...230 V AC
only leakage and load current			– (no power contacts)
typ. 10 mA	typ. 50 mA	typ. 50 mA	typ. 30 mA
1.5...5 ms			0.1...10 ms, zero crossing
DC...100 Hz			50 Hz
from 400 V AC			> 275 V AC
0.5 A (20 s), 1.5 A (100 ms)	2.5 A (20 s), 7.5 A (100 ms)	2.5 A (20 s), 7.5 A (100 ms)	40 A (16 ms), 3 A (30 s)
<< 1 mA			typ. 0.8 mA, max. 1.5 mA
0.05...0.1 ms	5...8 ms	5...8 ms	T/2
(2.1 Ω)	(200 mΩ)	(300 mΩ)	1.5 V
–			–
0...+55 °C			0...+55 °C
CE, UL, Ex, GL	CE	CE	CE
approx. 55 g			approx. 270 g
www.beckhoff.com/KL2702			www.beckhoff.com/KM2774

## Digital output | Cycle monitoring

The KL2692 Bus Terminal monitors a bit that is toggled by the controller during each cycle. If the toggle signal fails, the terminal switches off two potential-free relays in order to prevent damage to the machine. Failure of the toggle signal may be caused by the PLC cycle stopping, by a fault in the bus cable or connector, or by a fault in a bus device. The cycle monitoring time can be parameterised. The Bus Terminal has an enable input that enables the relay to be switched on if a correct toggle signal is detected.

Cycle monitoring terminal (watchdog)

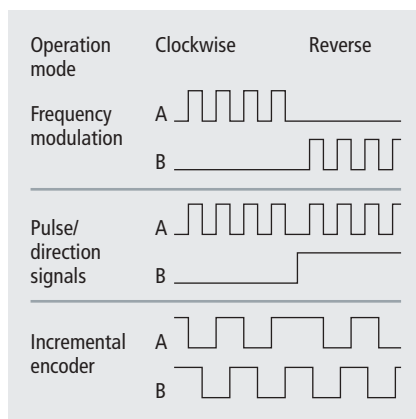
<b>Technical data</b>	KL2692   KS2692
<b>Connection technology</b>	2-wire
<b>Max. output current</b>	3 A
<b>Number of outputs</b>	2 potential-free relay outputs (normally-open contacts)
<b>Number of inputs</b>	2 digital 24 V inputs
	
<b>Nominal voltage</b>	30 V DC
<b>Current consumption power contacts</b>	–
<b>Current consumpt. K-bus</b>	approx. 165 mA
<b>Switching times</b>	parameterisable
<b>Ohmic switching current</b>	5 A AC/DC
<b>Inductive switching current</b>	2 A AC/DC
<b>Operat. cycles mech. (min.)</b>	2 x 10 <sup>7</sup>
<b>Operat. cycles electr. (min.)</b>	1 x 10 <sup>5</sup> (5 A/30 V DC)
<b>Minimum permitted load</b>	10 mA at 5 V DC
<b>Operating temperature</b>	0...+55 °C
<b>Approvals</b>	CE, UL
<b>Weight</b>	approx. 60 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2692">www.beckhoff.com/KL2692</a>
<b>Special terminals</b>	KL2692-1001
<b>Distinguishing features</b>	2 digital inputs, 2 potential-free relays, end terminal variant

# Digital output | Frequency output (pulse train)

The KL2521-xxxx output terminals provide a parameterisable pulse sequence through both their outputs. The relation between channel A and B is adjustable, e.g. as encoder characteristic. The pulse rate and the frequency are specified by the controller via a 16-bit value. The LEDs are driven in time with the outputs and each displays an active output. The galvanic isolation of the K-bus is realised.

The KL2521 has two RS422-compatible differential outputs, which are fed electrically isolated from the K-bus. For the KL2521-0024 both output channels are implemented as potential-free FET switches and must be fed externally. The 100 mA switch output is short-circuit-proof.

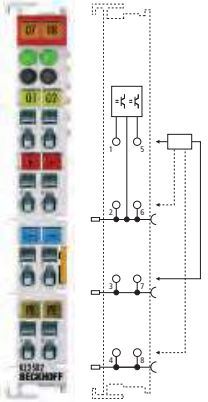
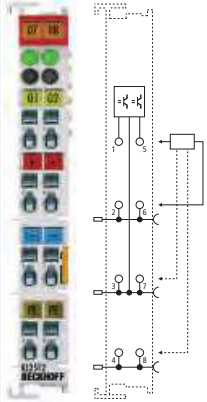
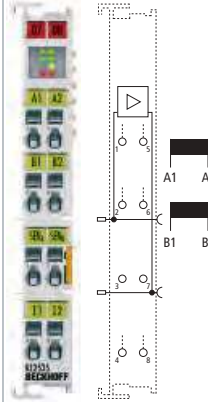
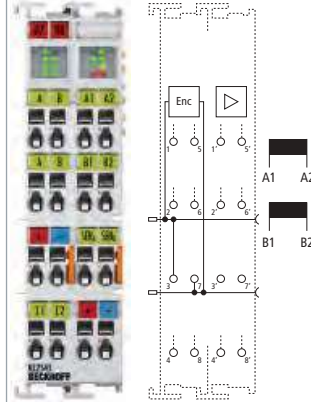
The KL2521 series offers different modes of operation: frequency modulation on the individual channels, incremental encoder or pulse/direction signals. A travel distance control can also be parameterised.



Frequency pulse patterns

	1-channel pulse train output terminal, RS422	1-channel pulse train output terminal, 24 V DC
<b>Technical data</b>	KL2521   KS2521	KL2521-0024   KS2521-0024
<b>Output pattern</b>	pulse direction, encoder simulation	
<b>Max. output current</b>	RS422 specification	0.5 A
<b>Number of outputs</b>	1 channel (2 differential outputs A, B)	1 channel (2 single-ended low side switches A, B)
<b>Number of inputs</b>	2 (+T, +Z)	2 (+T, +Z)
<b>Nominal voltage</b>	RS422 level	24 V DC (externally supplied)
<b>Current consumption power contacts</b>	– (no power contacts)	– (no power contacts)
<b>Current consumption K-bus</b>	typ. 50 mA, max. 120 mA (load-dependent)	typ. 50 mA, max. 120 mA (load-dependent)
<b>PWM clock frequency</b>	1...500 kHz, 50 kHz default	1...500 kHz, 50 kHz default
<b>Duty factor</b>	50 % (±20 %)	50 % (±20 %)
<b>Resolution</b>	max. 15 bit	max. 15 bit
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex	CE
<b>Weight</b>	approx. 50 g	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2521">www.beckhoff.com/KL2521</a>	<a href="http://www.beckhoff.com/KL2521">www.beckhoff.com/KL2521</a>
<b>Special terminals</b>	KL2521-0010	
<b>Distinguishing features</b>	with additional outputs (230 V AC/DC, 100 mA) instead of the additional inputs of the default variant	

# Digital output | 24/50 V DC, PWM outputs

	2-channel pulse width output terminal, 24 V DC	2-channel pulse width output terminal, 24 V DC	2-channel pulse width current terminal, 24 V DC	2-channel pulse width current terminal, 50 V DC
<b>Technical data</b>	<b>KL2502   KS2502</b>	<b>KL2512   KS2512</b>	<b>KL2535   KS2535</b>	<b>KL2545   KS2545</b>
<b>Load type</b>	ohmic		inductive > 1 mH, valves, coils	
<b>Max. output current</b>	0.1 A (1 A driver component) per channel	1.5 A per channel	2 x 1 A (short-circuit-proof, thermal overload-proof for both channels together)	2 x 3.5 A (short-circuit-proof, thermal overload-proof for both channels together)
<b>Number of outputs</b>	2	2	2	2
	 <p>The KL2502 digital output terminal modulates the pulse width of a binary signal, and outputs it electrically isolated from the K-bus. The mark/space ratio is prescribed by a 16-bit value from the automation unit.</p>	 <p>The negative switching KL2512 output terminal enables direct connection of different ohmic loads. The output signal is a pulse-width modulated voltage. The typical load of an LED group or an incandescent lamp is connected between the positive side of the supply voltage and the output of the KL2512.</p>	 <p>The KL2535 digital output terminal controls an output current via pulse width control of the supply voltage. It is electrically isolated from the K-bus. The current value (0 to 1 A) is specified by the automation device via a 16-bit value.</p>	 <p>The KL2545 digital output terminal controls an output current via pulse width control of the supply voltage. It is electrically isolated from the K-bus. The current value (0 to 3.5 A) is specified by the automation device via a 16-bit value.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	8...50 V DC
<b>Current consum. pow. cont.</b>	typ. 10 mA + load	typ. 10 mA + load	only load	typ. 30 mA + load
<b>Current consumpt. K-bus</b>	typ. 18 mA	typ. 18 mA	typ. 60 mA	typ. 100 mA
<b>PWM clock frequency</b>	1...20 kHz, 250 Hz default	1...20 kHz, 250 Hz default	36 kHz	36 kHz
<b>Duty factor</b>	0...100 % ( $T_{ON} > 750 \text{ ns}$ , $T_{OFF} > 500 \text{ ns}$ )	0...100 %	0...100 % (current-controlled)	0...100 % (current-controlled)
<b>Resolution</b>	max. 10 bit	max. 10 bit	max. 12 bit	max. 12 bit
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex	CE, Ex	CE	CE
<b>Weight</b>	approx. 50 g	approx. 50 g	approx. 55 g	approx. 100 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2502">www.beckhoff.com/KL2502</a>	<a href="http://www.beckhoff.com/KL2512">www.beckhoff.com/KL2512</a>	<a href="http://www.beckhoff.com/KL2535">www.beckhoff.com/KL2535</a>	<a href="http://www.beckhoff.com/KL2545">www.beckhoff.com/KL2545</a>
<b>Special terminals</b>	KL2502-xxxx			
<b>Distinguishing features</b>	special terminals see page 685			

# Digital output | Universal dimmers up to 230 V AC

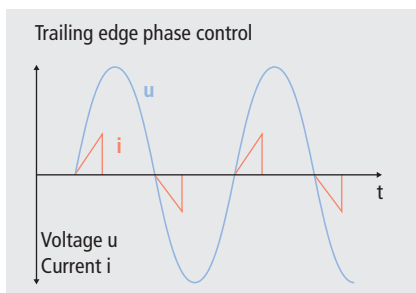
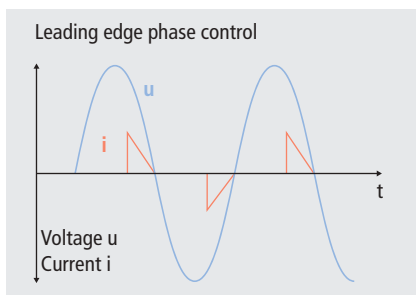
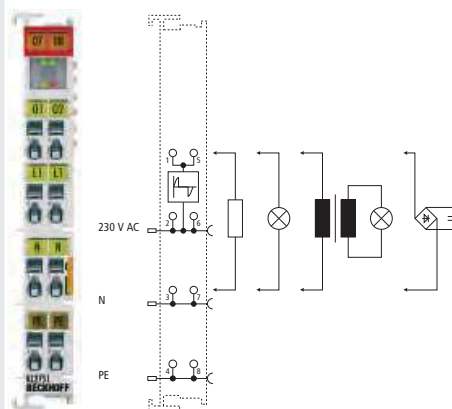
To dim light efficiently means electronically regulating the current flow through the lighting medium using the phase control principle. The ratio of the switch-on time to the switch-off time determines the output light quantity via the flow of current. Depending on the load connected (ohmic, capacitive, inductive) either the switch-on time (leading edge phase control | load type: L) or the switch-off time (trailing edge phase control | load type: C, R) must be regulated. The load type of an electronic ballast depends on the transformer used and must be taken into account.

The KL2751 and KL2761 universal dimmer terminals automatically recognise the connected load and select the corresponding control principle. The short-circuit resistance prevents damage to the fuse, so that no additional maintenance work is necessary when exchanging the lamp.

If high-energy, high-frequency interference pulses are likely to occur in the 230 V AC mains power supply, they can be eliminated by an upstream KL9380 feed and filter terminal.

1-channel universal dimmer terminal,  
230 V AC

Technical data	KL2751   KS2751	KL2761   KS2761
Connection technology	4-wire	
Load type	ohmic, inductive or capacitive (not mixed), lamp load, automatic load detection	
Max. output current	1.35 A	2.7 A
Number of outputs	1	
Nominal voltage	230 V AC	
Current consumption power contacts	only load	
Current consumpt. K-bus	typ. 65 mA	
Short circuit current	10...20 A	20...40 A
Mains voltage	230 V AC (50 Hz)	
Rated output	300 VA (W)	600 VA (W)
Rated current	max. 1.35 A	max. 2.7 A
Control type	phase control	
Resolution	1 %	
Leakage current	< 1 mA (OFF state)	
Special features	dimmers with fieldbus functionality	
Operating temperature	0...+55 °C	
Approvals	CE	
Weight	approx. 60 g	
Further information	<a href="http://www.beckhoff.com/KL2751">www.beckhoff.com/KL2751</a>	<a href="http://www.beckhoff.com/KL2761">www.beckhoff.com/KL2761</a>
Special terminals	KL2751-0011	KL2761-0011
Distinguishing features	without power contacts	600 W, 50 Hz (without power contacts)
Accessories		
KL9380	mains filter terminal for dimmers see <a href="http://www.beckhoff.com/KL9380">www.beckhoff.com/KL9380</a>	





## Digital output | 24/50 V DC, stepper motor terminals

Stepper motors are often used in positioning drives. They allow, by the combination of single steps, a positioning process without feedback of the rotor positions. This "open control chain" mode of operation and the longevity of a stepper motor are particularly interesting for price-sensitive fields of application. However, safe positioning is only guaranteed within the performance limits.

In contrast with a DC motor the control of a stepper motor is carried out by the different energisation of the individual motor windings following a defined pattern of pulses. The electromagnetic field of the stator is switched intermittently so that the shaft turns through the step angle  $\alpha$ . The motor follows the impulse pattern of the control unit, until the coupled momentum exceeds its holding momentum or the impulse demand is too dynamic, which leads to standstill of the motor. With the KL2531 and KL2541 stepper motor terminals, which are suitable for highly dynamic movement, this problem in areas of higher speeds of rotation can be solved.

The KL2531 and KL2541 stepper motor terminals are designed for direct connection of medium capacity stepper motors. A high frequency clocked PWM output stage regulates the currents through the motor coils. The stepper motor terminals are synchronised with the motor by parameterising. Unipolar as well as bipolar stepper motors can be driven.

Additional inputs support functions like homing and final position monitoring. 64-fold micro stepping ensures particularly quiet and precise motor operation. Together with a stepper motor, the stepper motor terminals represent an inexpensive small servo axis. The KL2541 also includes an incremental encoder interface to read position data.

Both KL2531 and KL2541 stepper motor terminals can be controlled like a servo drive by a speed interface from a Motion Control software such as TwinCAT for example. In applications with a less complex and less powerful CPU the control is also possible via a position interface (travel distance control). The stepper motor terminals move the motor themselves to a desired position. Ramp steepness and maximum speed can be entered as parameters.

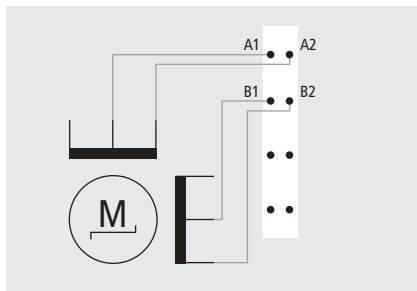
Irregular operation at certain speed ranges, particularly without coupled load, indicates that the stepper motor is being run at its resonance frequency. Under certain circumstances the motor may even stop. Resonances in the lower frequency range essentially result from the mechanical motor parameters. Apart from their impact on smooth running, such resonances can lead to significant loss of torque, or even loss of step of the motor, and are therefore particularly undesirable. Due to their sine/cosine current profile, KL2531 and KL2541 stepper motor terminals are able to prevent

this effect in almost all standard motors. The rotor is not moved from step to step, so it no longer jumps to the next position, but moves through 64 intermediate steps. So the rotor is carefully moved from one step to the next. The usual loss of torque at certain speeds is avoided and operation can be optimised for the particular application. This means that the lower speed range, where particularly high torque is available, can be fully utilised.

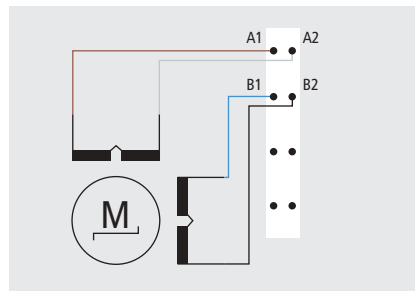
The KL2531 stepper motor terminal is designed exclusively for 24 V supply voltage. The motor current can reach up to 1.5 A. The KL2541 covers a supply voltage range from 8 V DC to 50 V DC and also needs a 24 V supply from the power contacts. The motor current can be set from 1 to 5 A.

The peak current may briefly significantly exceed the rated current and in this way makes the whole drive system very dynamic. In such dynamic applications, negative acceleration causes the feedback of energy, which leads to voltage peaks at the power supply unit. A KL9570 buffer capacitor terminal protects from the effects of overvoltage, in that it absorbs some of the energy. If the voltage exceeds the capacity of the terminal, it gets rid of the excess energy via an external resistance.

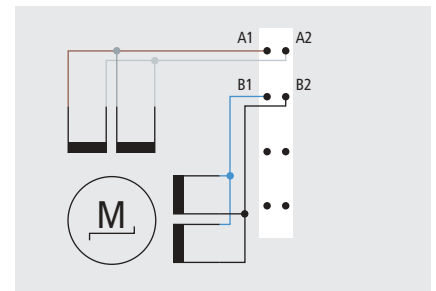
AS10xx | Stepper motors see page **869**



Connection of a unipolar stepper motor



Connection of a bipolar AS10xx stepper motor, serial



Connection of a bipolar AS10xx stepper motor, parallel

	Stepper motor terminal 24 V DC, 1.5 A	Stepper motor terminal 50 V DC, 5 A, with incremental encoder
<b>Technical data</b>	KL2531   KS2531	KL2541   KS2541
<b>Connection technology</b>	direct motor connection	
<b>Load type</b>	uni- or bipolar stepper motors	
<b>Max. output current</b>	1.5 A (overload- and short-circuit-proof)	5 A (overload- and short-circuit-proof)
<b>Number of outputs</b>	1 stepper motor	1 stepper motor, encoder input
<b>Nominal voltage</b>	24 V (-15 %/+20 %)	8...50 V DC
<b>Current consumption power contacts</b>	only load	typ. 35 mA
<b>Current consumpt. K-bus</b>	typ. 60 mA	typ. 100 mA
<b>Number of inputs</b>	2	2 for limit position, 4 for an encoder system
<b>Maximum step frequency</b>	125,000 steps/s	125,000 steps/s
<b>Step pattern</b>	full step, half step, up to 64-fold micro stepping	full step, half step, up to 64-fold micro stepping
<b>Current controller frequency</b>	approx. 25 kHz	approx. 25 kHz
<b>Resolution</b>	approx. 5,000 positions in typ. applications (per revolution)	approx. 5,000 positions in typ. applications (per revolution)
<b>Encoder signal</b>	–	5...24 V, 5 mA, single-ended
<b>Pulse frequency</b>	–	max. 400,000 increments/s (with 4-fold evaluation)
<b>Special features</b>	travel distance control	travel distance control, encoder input
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE
<b>Weight</b>	approx. 50 g	approx. 100 g
<b>Further information</b>	www.beckhoff.com/KL2531	www.beckhoff.com/KL2541
<b>Special terminals</b>		KL2541-0006
<b>Distinguishing features</b>		stepper motor terminal 50 V DC, 5 A, 5 V encoder supply

## Digital output | 24/50 V DC, DC motor output stages

DC motors can replace the servomotors in many applications if they are operated with an intelligent controller. A DC motor can be integrated very simply into the control system using the KS2532 and KL2552 Bus Terminals. All parameters are adjustable via the field-bus. The small, compact design and DIN rail mounting make the DC motor output stages suitable for a wide range of applications. The output stages are protected against overload and short circuit and offer an integrated feedback system for incremental encoders on a case-by-case basis.

Through integration into TwinCAT NC, the DC motor can be used in combination with the DC motor output stage – like a servo-axis – for the application without any modifications.

Compared to other motors a DC motor is easier to adjust. The speed of rotation is proportional to the voltage. With the KS2532 Bus Terminal the rotation speed can easily be set through the process data. The integrated

compensation of the internal resistance keeps the motor at the desired speed for load changes. A simple drive task can be performed by a simple controller.

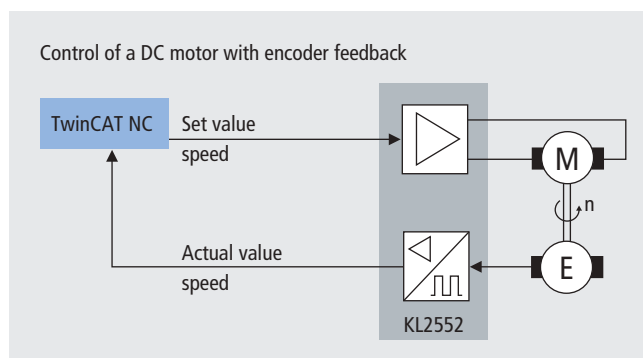
For demanding positioning tasks a closed speed control loop with a feedback system is needed. The KL2552 allows connection of an incremental encoder. The control loop can be closed by the higher-level controller.

The peak current may briefly significantly exceed the rated current and in this way makes the whole drive system very dynamic. In such dynamic applications, negative acceleration causes the feedback of energy, which leads to voltage peaks at the power supply unit. A KL9570 buffer capacitor terminal protects from the effects of overvoltage, in that it absorbs some of the energy. If the voltage exceeds a threshold, the terminal dissipates the excess energy via an external resistance.

The KL2284 output terminal is sufficient for applications with start/stop or right/left running functions without controllers.

It switches loads in selectable polarity. This means that DC motors can be used in both directions of rotation. A polarity is switched with two output bits per channel. An interlock prevents simultaneous switching of both directions. Advanced power semiconductors enable safe and wear-free switching with minimum dimensions. The high starting and short-circuit currents of the KL2284 are comparable with a robust relay. The number of switching cycles is almost unlimited.

KL9570 | Buffer capacitor terminal  
see page [684](#)



Realising demanding positioning tasks by closed speed control loop

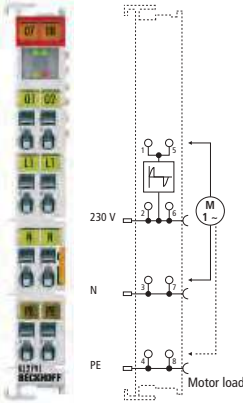
	2-channel DC motor output stage, 24 V DC, 1 A	2-channel DC motor output stage, 50 V DC, 5 A	4-channel digital output terminal, 24 V DC, 2-wire
<b>Technical data</b>	<b>KL2532   KS2532</b>	<b>KL2552   KS2552</b>	<b>KL2284   KS2284</b>
<b>Connection technology</b>	direct motor connection		2-wire
<b>Load type</b>	DC brush motors, inductive		AC/DC loads
<b>Max. output current</b>	2 x 1 A (short-circuit-proof, thermal over-load-proof for both channels together)	2 x 5 A (short-circuit-proof, thermal over-load-proof for both channels together)	2 A
<b>Number of outputs</b>	2 DC motors	2 DC motors, encoder input	4 x H-bridge circuit
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	8...50 V DC	0...24 V AC/DC
<b>Current consumption power contacts</b>	typ. 30 mA + load	typ. 50 mA	only load
<b>Current consumpt. K-bus</b>	typ. 50 mA	typ. 100 mA	100 mA
<b>Current limitation/short circuit current</b>	controlled, adjustable	controlled, adjustable	90 A
<b>Peak current</b>	–	–	5 A (100 ms), < 50 A (10 ms)
<b>On-resistance</b>	–	–	typ. 0.03 Ω
<b>PWM clock frequency</b>	30 kHz with 180° phase shift each	30 kHz with 180° phase shift each	–
<b>Duty factor</b>	0...100 % (voltage-controlled)	0...100 % (voltage-controlled)	–
<b>Resolution</b>	max. 10 bits current, 16 bits speed	max. 10 bits current, 16 bits speed	–
<b>Encoder signal</b>	–	5...24 V, 5 mA, single-ended	–
<b>Pulse frequency</b>	–	max. 400,000 increments/s (with 4-fold evaluation)	–
<b>Switching on speed</b>	–	–	typ. 235 ms, max. 300 ms
<b>Switching off speed</b>	–	–	typ. 30 ms, max. 50 ms
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE	CE
<b>Weight</b>	approx. 55 g	approx. 100 g	approx. 70 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2532">www.beckhoff.com/KL2532</a>	<a href="http://www.beckhoff.com/KL2552">www.beckhoff.com/KL2552</a>	<a href="http://www.beckhoff.com/KL2284">www.beckhoff.com/KL2284</a>

# Digital output | 230 V AC, AC motor speed controller

When driving working machines whose production or conveying performance can be influenced via the drive speed of the motor, energy can be saved by means of variable speed. This particularly applies if the change in the motor speed is also linked with large changes in the emitted mechanical output. Increase the speed – higher load, decrease – lower load. This procedure is particularly suitable for uncontrolled units with a square load characteristic, because regulating the speed just a little brings about a large change in energy consumption due to its square influence.

Using the KL2791 single-phase AC motor terminal, a single-phase AC motor with a maximum power consumption of 0.2 KW can be operated with speed control depending on the process data. L1 and N of the motor are wired directly to the terminal; this is in turn integrated in the control environment via a Bus Coupler or connected directly to an embedded device. The controller specifies the set value for the motor speed in the form of a 16-bit word; the speed is regulated internally in the terminal. The motor is switched on and off with a practice-proven mains-synchronous pattern, so that the motor consumes less power and the speed falls significantly. This method is well suited to motors with fixed loads, such as pumps and fans, in order to achieve a control range for the flow rate from 10 to 100 %.

1-channel AC motor speed controller, 230 V AC, 200 VA

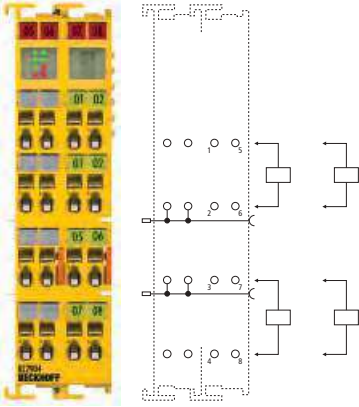
<b>Technical data</b>	KL2791   KS2791	
<b>Connection technology</b>	direct motor connection	
<b>Load type</b>	1-phase AC motors	
<b>Max. output current</b>	0.9 A	
<b>Number of outputs</b>	1 motor	
		
<b>Nominal voltage</b>	230 V AC	
<b>Current consumption power contacts</b>	only load	
<b>Current consumpt. K-bus</b>	typ. 65 mA	
<b>Reverse voltage protection</b>	no	
<b>Rated output</b>	≤ 200 VA	
<b>Control type</b>	phase/full wave control	
<b>Resolution</b>	1 %	
<b>Leakage current</b>	< 1 mA (OFF state)	
<b>Operating temperature</b>	0...+55 °C	
<b>Approvals</b>	CE	
<b>Weight</b>	approx. 60 g	
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2791">www.beckhoff.com/KL2791</a>	
<b>Special terminals</b>	KL2791-0011	KL2791-1200
<b>Distinguishing features</b>	230 V AC, 200 VA, max. 0.9 A, without power contacts	120 V AC, 100 VA

# Digital output | TwinSAFE

The KL2904 safety Bus Terminal is a digital output terminal. It switches 24 V DC actuators with up to 0.5 A current per channel. The KL2904 meets the requirements of DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3). If the Bus Terminal detects a fault, it switches off automatically (fail stop).

For further information on TwinSAFE and the TwinSAFE products see page **966**

4-channel digital output terminal, TwinSAFE, 24 V DC

<b>Technical data</b>	<b>KL2904</b>
<b>Connection technology</b>	2-wire
<b>Safety standard</b>	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
<b>Max. output current</b>	0.5 A/20 mA min. (per channel)
<b>Number of outputs</b>	4
	 <p>The KL2904 Safety Bus Terminal has four outputs.</p>
<b>Protocol</b>	TwinSAFE/Safety over EtherCAT
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Current consumption power contacts</b>	load-dependent
<b>Current consumpt. K-bus</b>	250 mA
<b>Fault response time</b>	≤ watchdog time (parameterisable)
<b>Permitted degree of contamination</b>	2
<b>Climate class EN 60721-3-3</b>	3K3
<b>Installation position</b>	horizontal
<b>Special features</b>	4 safe outputs
<b>Operating/storage temperature</b>	0...+55 °C/-25...+70 °C
<b>EMC immunity/emission</b>	conforms to EN 61000-6-2/EN 61000-6-4
<b>Vibration/shock resistance</b>	conforms to EN 60068-2-6/EN 60068-2-27
<b>Approvals</b>	CE, UL, Ex, TÜV SÜD
<b>Weight</b>	approx. 100 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL2904">www.beckhoff.com/KL2904</a>

# Analog input | -10...+10 V

The KL3xxx Bus Terminals read analog signal voltages in the common standard signal range of -10 to +10 V, 0 to 10 V, 0 to 20 mA and 4 to 20 mA. Inside the terminal the field side of the K-bus is electrically isolated and enables the interconnection to desired potential groups. The 1-channel terminals are available for applications in which each signal must be completely isolated. An additional electrically isolated 24 V DC supply can be created by the application of the KL9560 power supply terminal (24 V DC/24 V DC).

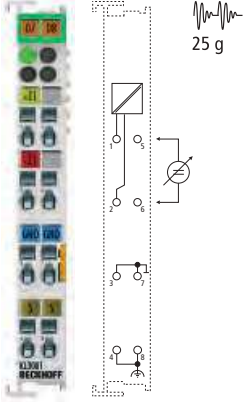
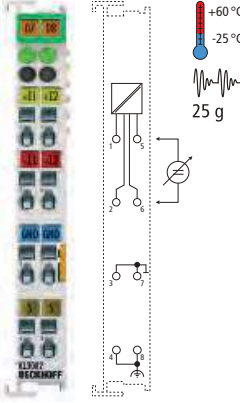
The analog input Bus Terminals differ in their different resolutions of the analog/digital conversion, conversion speed and accuracy. For 1- and 2-channel terminals 1-, 2-, 3- and 4-wire connections are available for the sensors. 4-channel Bus Terminals can only be used with 1- and 2-wire connections. The KL3454 is optimised for the use of 2-wire sensors with 24 V DC supply. The signal current is measured between ground and the input. The second connection point for the sensor is the 24 V supply from the terminal's power contact.

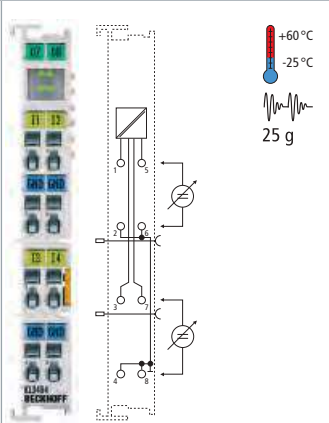
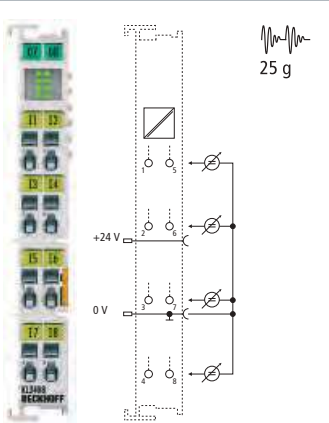
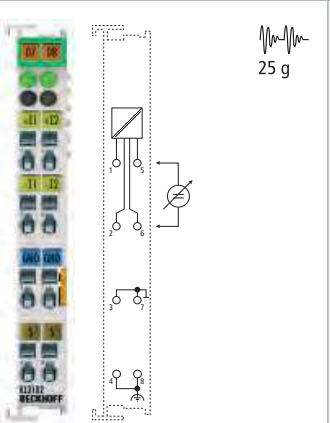
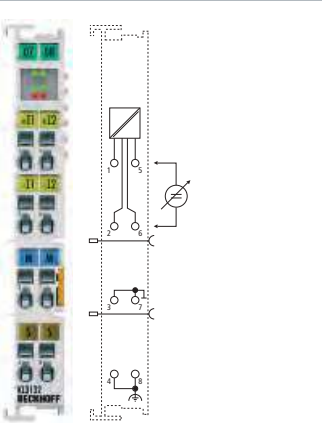
The input circuit of the terminals differs between single-ended and differential inputs. A single-ended input expects a signal with a fixed reference to ground. In practice, single-ended is easily to be wired using single-wire connection. The differential input only measures the difference between both inputs +I and -I. An overlap within the common-mode area (common-mode voltage) has no effect on the result. For measurement two conductors should always be connected; in the case of single-wire connection input -I can be connected to ground.

The product range is rounded off by further special input voltages and covers a wide field of applications for the processing of analog signals. By the expansion of power supply terminals well-stabilised auxiliary voltages from 5 to 15 V can be generated.

1-channel analog input terminal, -10...+10 V, 12 bit, differential input

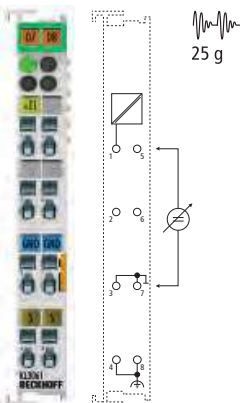
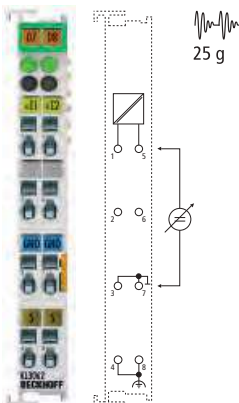
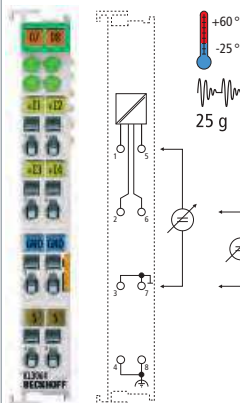
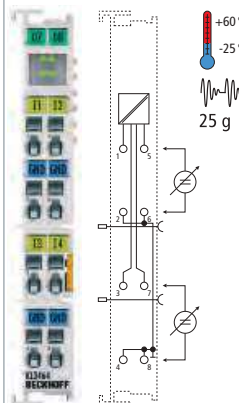
2-channel analog input terminal, -10...+10 V, 12 bit, differential input

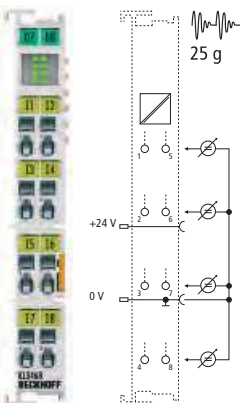
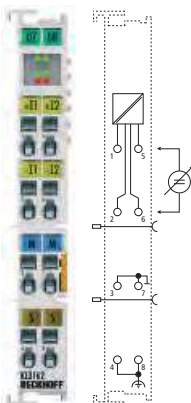
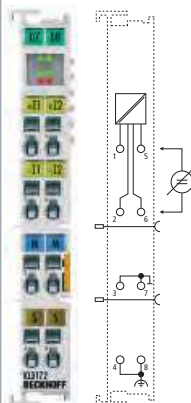
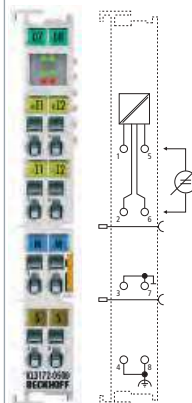
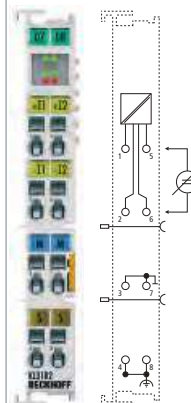
Technical data	KL3001   KS3001	KL3002   KS3002
Signal voltage	-10...+10 V	
Resolution	12 bit (for 0...10 V range: resolution 11 bit)	
Technology	differential input	differential input
Conversion time	~ 1 ms	~ 2 ms
Number of inputs	1	2
	 <p>The KL3001 analog input terminal is characterised by its electrical isolation.</p>	 <p>The KL3002 analog input terminal combines two differential inputs with a common internal ground potential in one housing.</p>
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumpt. K-bus	typ. 65 mA	typ. 65 mA
Internal resistance	> 200 kΩ	> 200 kΩ
Common-mode voltage $U_{CM}$	35 V max.	35 V max.
Special features	–	–
Operating temperature	0...+55 °C	-25...+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 70 g	approx. 70 g
Further information	<a href="http://www.beckhoff.com/KL3001">www.beckhoff.com/KL3001</a>	<a href="http://www.beckhoff.com/KL3002">www.beckhoff.com/KL3002</a>
Special terminals		KL3002-00xx
Distinguishing features		special terminals see 685

<p>4-channel analog input terminal, -10...+10 V, 12 bit, single-ended</p>	<p>8-channel analog input terminal, -10...+10 V, 12 bit, single-ended</p>	<p>2-channel analog input terminal, -10...+10 V, 16 bit, differential input</p>	<p>2-channel analog input terminal, -10...+10 V, 16 bit, differential input</p>
<p>KL3404   KS3404</p>	<p>KL3408   KS3408</p>	<p>KL3102   KS3102</p>	<p>KL3132   KS3132</p>
		<p>16 bit (for 0...10 V range: resolution 15 bit)</p>	
<p>single-ended</p>	<p>single-ended</p>	<p>differential input</p>	<p>differential input</p>
<p>~ 2 ms</p>	<p>~ 4 ms</p>	<p>~ 140 ms, configurable to 2 ms</p>	<p>~ 140 ms, configurable</p>
<p>4</p>	<p>8</p>	<p>2</p>	<p>2</p>
			
<p>The KL3404 analog input terminal has four inputs, which are implemented in 2-wire technique. The common reference ground of the inputs is the internal ground.</p>	<p>The KL3408 analog input terminal combines eight inputs in one housing. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact.</p>	<p>The KL3102 analog input terminal combines two differential inputs with a common internal ground potential in one housing.</p>	<p>The KL3132 analog input terminal is optimised for highly accurate control processes due to its low measuring error of <math>\pm 0.05\%</math> (in relation to the full scale value). The differential inputs have a common, internal ground potential.</p>
<p>&lt; <math>\pm 0.3\%</math> (relative to full scale value)</p>	<p>&lt; <math>\pm 0.3\%</math> (relative to full scale value)</p>	<p>&lt; <math>\pm 0.3\%</math> (relative to full scale value)</p>	<p>&lt; <math>\pm 0.05\%</math> (relative to full scale value)</p>
<p>–</p>	<p>–</p>	<p>– (no power contacts)</p>	<p>–</p>
<p>typ. 100 mA</p>	<p>typ. 140 mA</p>	<p>typ. 65 mA</p>	<p>typ. 85 mA</p>
<p>&gt; 130 k<math>\Omega</math></p>	<p>&gt; 130 k<math>\Omega</math></p>	<p>&gt; 200 k<math>\Omega</math></p>	<p>&gt; 200 k<math>\Omega</math></p>
<p>–</p>	<p>–</p>	<p>35 V max.</p>	<p>35 V max.</p>
<p>–</p>	<p>high packing density</p>	<p>–</p>	<p>increased measuring accuracy</p>
<p>-25...+60 °C</p>	<p>0...+55 °C</p>	<p>0...+55 °C</p>	<p>0...+55 °C</p>
<p>CE, UL, Ex, GL</p>	<p>CE, UL, Ex, GL</p>	<p>CE, UL, Ex</p>	<p>CE, UL, Ex</p>
<p>approx. 75 g</p>	<p>approx. 75 g</p>	<p>approx. 70 g</p>	<p>approx. 70 g</p>
<p>www.beckhoff.com/KL3404</p>	<p>www.beckhoff.com/KL3408</p>	<p>www.beckhoff.com/KL3102</p>	<p>www.beckhoff.com/KL3132</p>
		<p>KL3102-0050</p>	
		<p>Siemens S7 format</p>	

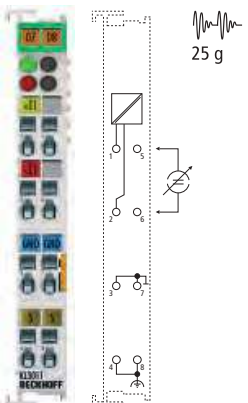
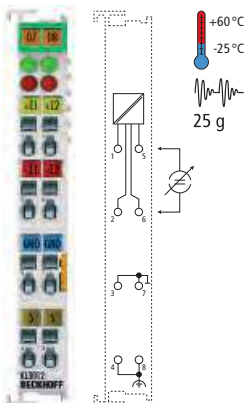
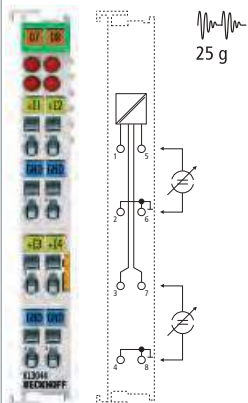
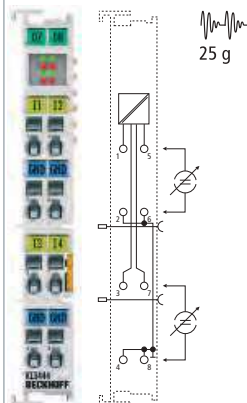


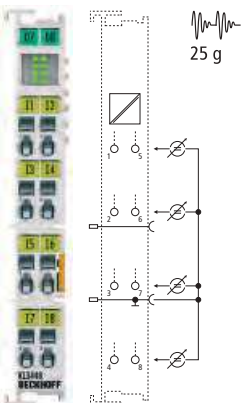
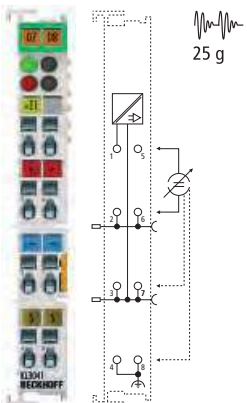
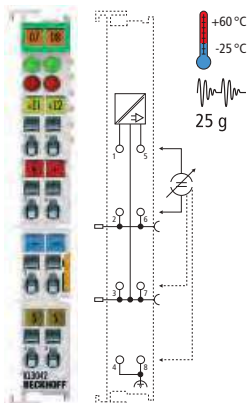
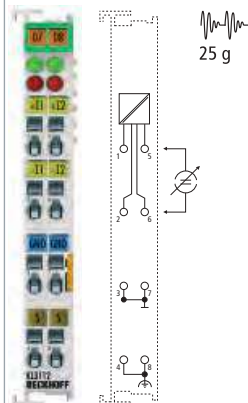
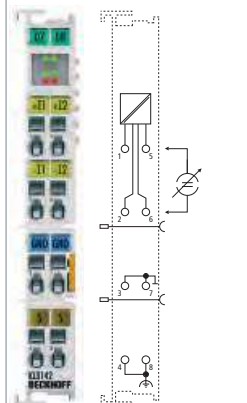
# Analog input | 0...10 V, 0...2 V, 0...500 mV, ±2 V

	1-channel analog input terminal, 0...10 V, 12 bit, single-ended	2-channel analog input terminal, 0...10 V, 12 bit, single-ended	4-channel analog input terminal, 0...10 V, 12 bit, single-ended	4-channel analog input terminal, 0...10 V, 12 bit, single-ended
<b>Technical data</b>	<b>KL3061   KS3061</b>	<b>KL3062   KS3062</b>	<b>KL3064   KS3064</b>	<b>KL3464   KS3464</b>
Signal voltage	0...10 V			
Resolution	12 bit			
Technology	single-ended	single-ended	single-ended	single-ended
Conversion time	~ 1 ms	~ 2 ms	~ 4 ms	~ 2 ms
Number of inputs	1	2	4	4
	 <p>The KL3061 analog input terminal is characterised by its fine granularity and electrical isolation.</p>	 <p>The KL3062 analog input terminal combines two single-ended inputs with a common internal ground potential in one housing.</p>	 <p>The KL3064 analog input terminal contains four single-ended inputs with a common internal ground potential.</p>	 <p>The KL3464 analog input terminal combines four single-ended inputs with a common internal ground potential in one housing.</p>
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)	– (no power contacts)	–
Current consumpt. K-bus	typ. 60 mA	typ. 60 mA	typ. 85 mA	typ. 100 mA
Internal resistance	> 130 kΩ	> 130 kΩ	> 130 kΩ	> 130 kΩ
Common-mode voltage U <sub>CM</sub>	–	–	–	–
Special features	–	–	–	–
Operating temperature	0...+55 °C	0...+55 °C	-25...+60 °C	-25...+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 60 g	approx. 60 g	approx. 80 g	approx. 75 g
Further information	<a href="http://www.beckhoff.com/KL3061">www.beckhoff.com/KL3061</a>	<a href="http://www.beckhoff.com/KL3062">www.beckhoff.com/KL3062</a>	<a href="http://www.beckhoff.com/KL3064">www.beckhoff.com/KL3064</a>	<a href="http://www.beckhoff.com/KL3464">www.beckhoff.com/KL3464</a>
Special terminals		<b>KL3062-00xx</b>	<b>KL3064-00xx</b>	
Distinguishing features		special terminals see <b>685</b>	special terminals see <b>685</b>	

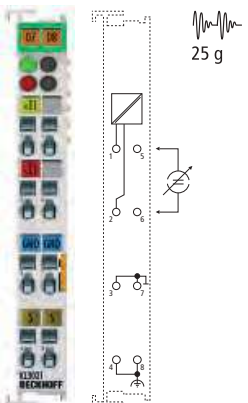
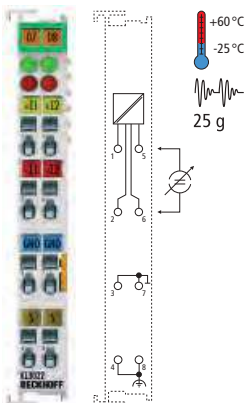
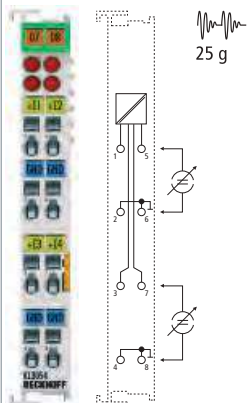
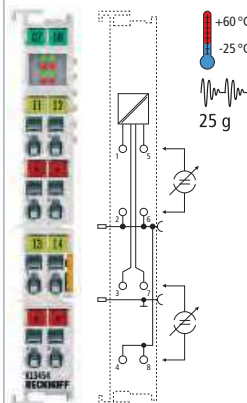
	8-channel analog input terminal, 0...10 V, 12 bit, single-ended	2-channel analog input terminal, 0...10 V, 16 bit, differential input	2-channel analog input terminal, 0...2 V, 16 bit, differential input	2-channel analog input terminal, 0...500 mV, 16 bit, differential input	2-channel analog input terminal, -2...+2 V, 16 bit, differential input
	<b>KL3468   KS3468</b>	<b>KL3162   KS3162</b>	<b>KL3172   KS3172</b>	<b>KL3172-0500</b>	<b>KL3182   KS3182</b>
			0...2 V	0...500 mV	-2...+2 V
		16 bit			
	single-ended	differential input	differential input	differential input	differential input
	~ 4 ms	140 ms, configurable	140 ms, configurable	140 ms, configurable	140 ms, configurable
	8	2	2	2	2
	 <p>The KL3468 analog input terminal combines eight inputs in one housing. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact.</p>	 <p>The KL3162 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.</p>	 <p>The KL3172 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.</p>	 <p>The KL3172-0500 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.</p>	 <p>The KL3182 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.</p>
	< ±0.3 % (relative to full scale value)	< ±0.05 % (relative to full scale value)	< ±0.05 % (relative to full scale value)	< ±0.05 % (relative to full scale value)	< ±0.05 % (relative to full scale value)
	–	–	–	–	–
	typ. 140 mA	typ. 85 mA	typ. 85 mA	typ. 85 mA	typ. 85 mA
	> 130 kΩ	> 200 kΩ	> 200 kΩ	> 200 kΩ	> 200 kΩ
	–	35 V max.	35 V max.	35 V max.	35 V max.
	high packing density	increased measuring accuracy	increased measuring accuracy	increased measuring accuracy	increased measuring accuracy
	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 75 g	approx. 70 g	approx. 70 g	approx. 70 g	approx. 70 g
	<a href="http://www.beckhoff.com/KL3468">www.beckhoff.com/KL3468</a>	<a href="http://www.beckhoff.com/KL3162">www.beckhoff.com/KL3162</a>	<a href="http://www.beckhoff.com/KL3172">www.beckhoff.com/KL3172</a>	<a href="http://www.beckhoff.com/KL3172">www.beckhoff.com/KL3172</a>	<a href="http://www.beckhoff.com/KL3182">www.beckhoff.com/KL3182</a>

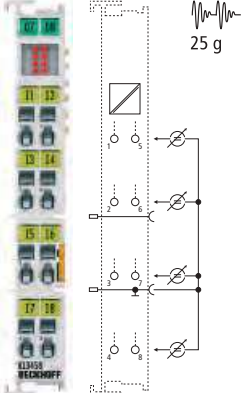
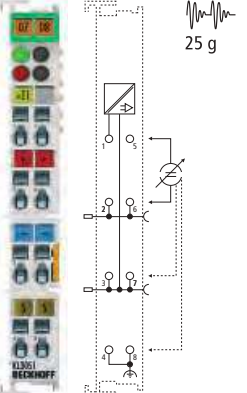
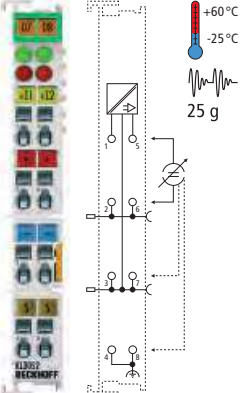
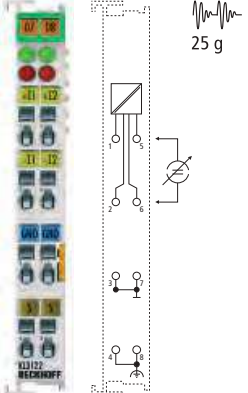
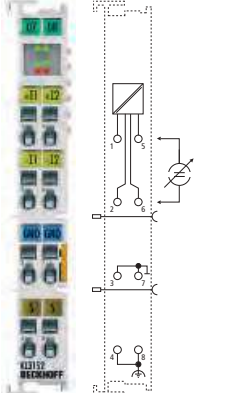
## Analog input | 0...20 mA

	1-channel analog input terminal, 0...20 mA, 12 bit, differential input	2-channel analog input terminal, 0...20 mA, 12 bit, differential input	4-channel analog input terminal, 0...20 mA, 12 bit, single-ended	4-channel analog input terminal, 0...20 mA, 12 bit, single-ended
<b>Technical data</b>	<b>KL3011   KS3011</b>	<b>KL3012   KS3012</b>	<b>KL3044   KS3044</b>	<b>KL3444   KS3444</b>
<b>Signal current</b>	0...20 mA			
<b>Resolution</b>	12 bit			
<b>Technology</b>	differential input	differential input	single-ended	single-ended
<b>Conversion time</b>	~ 1 ms	~ 2 ms	~ 4 ms	~ 2 ms
<b>Number of inputs</b>	1	2	4	4
	 <p>The KL3011 analog input terminal is characterised by its electrical isolation. The input channels of the Bus Terminal have differential inputs and possess a common, internal ground potential.</p>	 <p>The KL3012 analog input terminal combines two differential inputs with a common internal ground potential in one housing.</p>	 <p>The KL3044 analog input terminal has four inputs, which are implemented in 2-wire technique. The common reference ground of the inputs is the internal ground.</p>	 <p>The KL3444 analog input terminal has four inputs, which are implemented in 2-wire technique. The common reference ground of the inputs is the internal ground.</p>
<b>Measuring error</b>	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
<b>Current consum. pow. cont.</b>	– (no power contacts)	– (no power contacts)	– (no power contacts)	–
<b>Current consumpt. K-bus</b>	typ. 60 mA	typ. 60 mA	typ. 65 mA	typ. 85 mA
<b>Internal resistance</b>	80 Ω + 0.7 V	80 Ω + 0.7 V	80 Ω + 0.7 V	< 85 Ω
<b>Common-mode voltage U<sub>CM</sub></b>	35 V max.	35 V max.	–	–
<b>Surge voltage resistance</b>	35 V DC	35 V DC	35 V max.	30 V DC
<b>Special features</b>	–	–	–	–
<b>Operating temperature</b>	0...+55 °C	-25...+60 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
<b>Weight</b>	approx. 70 g	approx. 70 g	approx. 70 g	approx. 75 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL3011">www.beckhoff.com/KL3011</a>	<a href="http://www.beckhoff.com/KL3012">www.beckhoff.com/KL3012</a>	<a href="http://www.beckhoff.com/KL3044">www.beckhoff.com/KL3044</a>	<a href="http://www.beckhoff.com/KL3444">www.beckhoff.com/KL3444</a>
<b>Special terminals</b>		<b>KL3012-00xx</b>		
<b>Distinguishing features</b>		special terminals see 685		

	8-channel analog input terminal, 0...20 mA, 12 bit, single-ended	1-channel analog input terminal, 0...20 mA, 12 bit, with sensor supply	2-channel analog input terminal, 0...20 mA, 12 bit, with sensor supply	2-channel analog input terminal, 0...20 mA, 15/16 bit, differential input	2-channel analog input terminal, 0...20 mA, 16 bit, differential input
	<b>KL3448   KS3448</b>	<b>KL3041   KS3041</b>	<b>KL3042   KS3042</b>	<b>KL3112   KS3112</b>	<b>KL3142   KS3142</b>
	single-ended	single-ended	single-ended	differential input	differential input
	~ 4 ms	~ 1 ms	~ 2 ms	140 ms, configurable to 2 ms	140 ms, configurable
	8	1	2	2	2
	 <p>The KL3448 analog input terminal combines eight inputs in one housing. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact.</p>	 <p>The job of the KL3041 and KL3042 analog input terminals is to supply power to measuring transducers located in the field and to transmit analog measurement signals with electrical isolation to the automation device. The voltage for the sensors is supplied to the terminals via the power contacts. The power contacts can optionally be supplied with operating voltage in the standard way or via a supply terminal (KL9560) with electrical isolation. The 0 V power contact is the reference potential for the inputs.</p>		 <p>The KL3112 analog input terminal combines two differential inputs with a common internal ground potential in one housing.</p>	 <p>The KL3142 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05% (in relation to the full scale value). The differential inputs have a common, internal ground potential.</p>
	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.05 % (relative to full scale value)
	–	only load	only load	– (no power contacts)	–
	typ. 105 mA	typ. 65 mA	typ. 65 mA	typ. 60 mA	typ. 85 mA
	< 85 Ω	80 Ω + 0.7 V	80 Ω + 0.7 V	50 Ω typ. shunt, load: 60 Ω + diode voltage	100 Ω typ. shunt
	–	–	–	35 V max.	±10 V max.
	30 V DC	35 V max.	35 V max.	35 V DC	35 V DC
	high packing density	with sensor supply	with sensor supply	–	increased measuring accuracy
	0...+55 °C	0...+55 °C	-25...+60 °C	0...+55 °C	0...+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
	approx. 75 g	approx. 70 g	approx. 70 g	approx. 70 g	approx. 70 g
	www.beckhoff.com/KL3448	www.beckhoff.com/KL3041	www.beckhoff.com/KL3042	www.beckhoff.com/KL3112	www.beckhoff.com/KL3142
			<b>KL3042-00xx</b>	<b>KL3112-0050</b>	
			special terminals see 685	Siemens S7 format	

## Analog input | 4...20 mA

	1-channel analog input terminal, 4...20 mA, 12 bit, differential input	2-channel analog input terminal, 4...20 mA, 12 bit, differential input	4-channel analog input terminal, 4...20 mA, 12 bit, single-ended	4-channel analog input terminal, 4...20 mA, 12 bit, single-ended
<b>Technical data</b>	<b>KL3021   KS3021</b>	<b>KL3022   KS3022</b>	<b>KL3054   KS3054</b>	<b>KL3454   KS3454</b>
<b>Signal current</b>	4...20 mA			
<b>Resolution</b>	12 bit			
<b>Technology</b>	differential input	differential input	single-ended	single-ended
<b>Conversion time</b>	~ 1 ms	~ 2 ms	~ 4 ms	~ 2 ms
<b>Number of inputs</b>	1	2	4	4
	 <p>The KL3021 analog input terminal is characterised by its fine granularity and electrical isolation. The input channels of the Bus Terminal have differential inputs and possess a common, internal ground potential.</p>	 <p>The KL3022 analog input terminal combines two differential inputs with a common internal ground potential in one housing.</p>	 <p>The KL3054 analog input terminal has four inputs, which are implemented in 2-wire technique. The common reference ground of the inputs is the internal ground.</p>	 <p>In the KL3454 Bus Terminal, the four inputs are 2-wire versions and have a common ground potential. The 24 V power contact is connected to the terminal in order to enable the connection of 2-wire sensors.</p>
<b>Measuring error</b>	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
<b>Current consum. pow. cont.</b>	– (no power contacts)	– (no power contacts)	– (no power contacts)	only load
<b>Current consumpt. K-bus</b>	typ. 60 mA	typ. 60 mA	typ. 75 mA	typ. 85 mA
<b>Internal resistance</b>	80 Ω + 0.7 V	80 Ω + 0.7 V	80 Ω + 0.7 V	< 85 Ω
<b>Common-mode voltage U<sub>CM</sub></b>	35 V max.	35 V max.	–	–
<b>Surge voltage resistance</b>	35 V DC	35 V DC	35 V max.	30 V DC
<b>Special features</b>	–	–	for 2-wire sensors	–
<b>Operating temperature</b>	0...+55 °C	-25...+60 °C	0...+55 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
<b>Weight</b>	approx. 70 g	approx. 70 g	approx. 70 g	approx. 75 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL3021">www.beckhoff.com/KL3021</a>	<a href="http://www.beckhoff.com/KL3022">www.beckhoff.com/KL3022</a>	<a href="http://www.beckhoff.com/KL3054">www.beckhoff.com/KL3054</a>	<a href="http://www.beckhoff.com/KL3454">www.beckhoff.com/KL3454</a>
<b>Special terminals</b>		<b>KL3022-00xx</b>	<b>KL3054-0050</b>	
<b>Distinguishing features</b>		special terminals see 685	Siemens S7 format	

8-channel analog input terminal, 4...20 mA, 12 bit, single-ended	1-channel analog input terminal, 4...20 mA, 12 bit, with sensor supply	2-channel analog input terminal, 4...20 mA, 12 bit, with sensor supply	2-channel analog input terminal, 4...20 mA, 15/16 bit, differential input	2-channel analog input terminal, 4...20 mA, 16 bit, differential input
KL3458   KS3458	KL3051   KS3051	KL3052   KS3052	KL3122   KS3122	KL3152   KS3152
single-ended	single-ended	single-ended	15 bit, configurable to 16 bit	16 bit
~ 4 ms	~ 1 ms	~ 2 ms	differential input	differential input
8	1	2	140 ms, configurable to 2 ms	140 ms, configurable
 <p>The KL3458 analog input terminal combines eight inputs in one housing. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact.</p>	 <p>The job of the KL3051 and KL3052 analog input terminals is to supply power to measuring transducers located in the field and to transmit analog measurement signals with electrical isolation to the automation device. The voltage for the sensors is supplied to the terminals via the power contacts. The power contacts can optionally be supplied with operating voltage in the standard way or via a power feed terminal (KL9xxx) with electrical isolation. The 0 V power contact is the reference potential for the inputs.</p>	 <p>The KL3122 analog input terminal combines two differential inputs with a common internal ground potential in one housing.</p>	 <p>The KL3152 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.</p>	
< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.05 % (relative to full scale value)
–	only load	only load	– (no power contacts)	–
typ. 105 mA	typ. 65 mA	typ. 65 mA	typ. 60 mA	typ. 85 mA
< 85 Ω	80 Ω + 0.7 V	80 Ω + 0.7 V	50 Ω typ. shunt, load: 60 Ω + diode voltage	100 Ω typ. shunt
–	–	–	35 V max.	±10 V max.
30 V DC	35 V max.	35 V max.	35 V DC	35 V DC
high packing density	with sensor supply	with sensor supply	–	increased measuring accuracy
0...+55 °C	0...+55 °C	-25...+60 °C	0...+55 °C	0...+55 °C
CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
approx. 75 g	approx. 70 g	approx. 70 g	approx. 70 g	approx. 70 g
www.beckhoff.com/KL3458	www.beckhoff.com/KL3051	www.beckhoff.com/KL3052	www.beckhoff.com/KL3122	www.beckhoff.com/KL3152
		KL3052-00xx	KL3122-0050	
		special terminals see 685	Siemens S7 format	

# Analog input | Resistance thermometers (RTD, PT100, PT1000)

The KL32xx Bus Terminals are intended for direct connection of resistance thermometers. The resistance is measured with a small measurement current and the temperature value is calculated by a linearisation corresponding to the sensor type which has been implemented.

In practice, platinum and nickel sensors with different resistance values are used. The resistance value of the sensor is always defined at 0 °C:

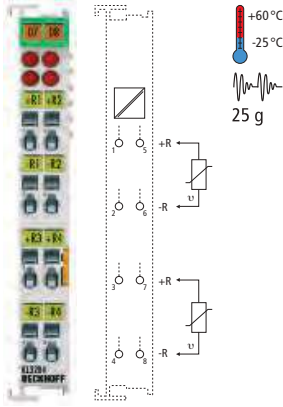
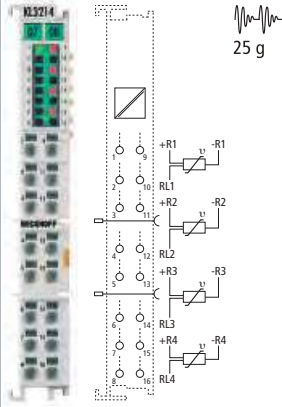
- PT100 = 100 Ω at 0 °C
- PT1000 = 1000 Ω at 0 °C
- Ni100 = 100 Ω at 0 °C
- ...

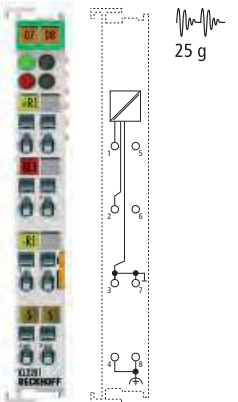
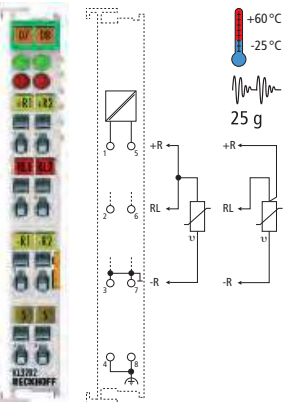
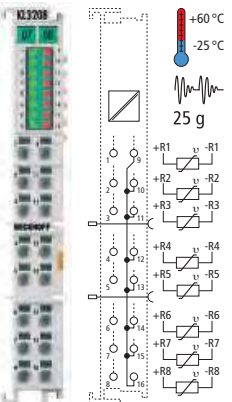
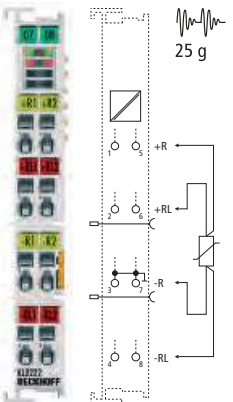
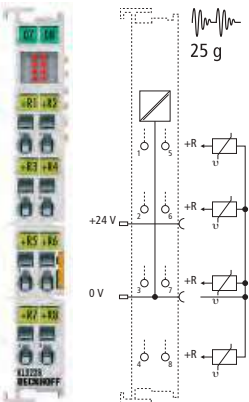
The Bus Terminals support 2-, 3- or 4-wire measurement. The measurement and the sensor can be used in any combination, depending on the type of application. For 2-wire measurement 1000 Ω sensors are recommended to reduce the influence of the conductor resistance.

The KL32xx series indicates sensor faults, e.g. a broken wire, via error LEDs. In addition, the KL3208-0010 offers a cable resistance calibration and is particularly suitable for building automation.

4-channel analog input terminal, PT100 (RTD)

4-channel analog input terminal, PT100 (RTD), 16 bit

Technical data	KL3204   KS3204	KL3214
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω...1.2/5 kΩ)	PT100/200/500/1000, Ni100/120/1000, potentiometer: 10 Ω...1.2/4 kΩ, KTY sensors (types see documentation)
Resolution	0.1 °C per digit	
Technology	2-wire	3-wire
Conversion time	~ 250 ms	approx. 170 ms default setting
Number of inputs	4	4
	 <p>Standard setting: resolution 0.1 °C in the temperature range of PT100 sensors</p>	 <p>Standard setting: resolution 0.1 °C</p>
Measuring error	< ±1 °C	< ±0.5 °C for PT sensors
Measuring range	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)
Current consum. pow. cont.	– (no power contacts)	–
Current consumpt. K-bus	typ. 60 mA	typ. 120 mA
Measuring current	typ. 0.5 mA	< 0.5 mA (load-dependent)
Operating temperature	-25...+60 °C	0...+55 °C
Approvals	CE, UL, Ex, GL	CE
Weight	approx. 70 g	approx. 60 g
Further information	<a href="http://www.beckhoff.com/KL3204">www.beckhoff.com/KL3204</a>	<a href="http://www.beckhoff.com/KL3214">www.beckhoff.com/KL3214</a>
Special terminals	KL3204-0030	
Distinguishing features	NTC (10 kΩ)	

1-channel analog input terminal, PT100 (RTD)	2-channel analog input terminal, PT100 (RTD)	8-channel analog input terminal, PT1000, Ni1000 (RTD), NTC 1.8...100 k, potentiometer 1, 5, 10 k $\Omega$	2-channel analog input terminal, PT100 (RTD), KTY, high-precision	8-channel analog input terminal, PT1000, Ni1000 (RTD)
<b>KL3201   KS3201</b>	<b>KL3202   KS3202</b>	<b>KL3208-0010</b>	<b>KL3222   KS3222</b>	<b>KL3228   KS3228</b>
PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 $\Omega$ ...1.2/5 k $\Omega$ )		PT1000 (default), Ni1000, potentiometer 1/5/10 k $\Omega$ , NTC 1.8 k/2.2 k/3 k/5 k/10 k/20 k/100 k		PT1000, Ni1000
		0.01 °C per digit		0.1 °C per digit
2-/3-wire ~ 200 ms	2-/3-wire ~ 250 ms	2-wire ~ 1 s	4-wire typ. 50 ms	1-wire ~ 1 s
1	2	8	2	8
				
Standard setting: resolution 0.1 °C in the temperature range of PT100 sensors in 3-wire connection	Standard setting: resolution 0.1 °C in the temperature range of PT100 sensors in 3-wire connection	Standard setting: resolution 0.01 °C in the temperature range of PT/Ni1000 sensors; particularly suitable for building automation	Standard setting: resolution 0.01 °C in the temperature range of PT100 sensors in 4-wire connection	Standard setting: resolution 0.1 °C in the temperature range of Ni1000 sensors, inputs with common, internal ground potential
< $\pm 1$ °C	< $\pm 1$ °C	-20...+60 °C: $\pm 0.25$ °C at 25 °C ambient temperature; -50...+150 °C: $\pm 1.5$ °C (for PT/Ni sensors)	0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors and 50 Hz filter	~ $\pm 1$ °C, depending on wiring
-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors)	-50...+150 °C (depending on sensor type)	-200...+850 °C (PT sensors); -60...+250 °C (Ni sensors); -200...+320 °C (high-precision)	-50...+150 °C (PT sensors); -50...+150 °C (Ni sensors)
– (no power contacts)	– (no power contacts)	–	–	–
typ. 60 mA	typ. 60 mA	typ. 85 mA	typ. 60 mA	typ. 85 mA
typ. 0.5 mA	typ. 0.5 mA	< 0.5 mA typ.	typ. 0.5 mA	~ 0.5 mA typ.
0...+55 °C	-25...+60 °C	-25...+60 °C	0...+55 °C	0...+55 °C
CE, UL, Ex, GL	CE, UL, Ex, GL	CE, Ex	CE, UL, Ex	CE, UL, Ex
approx. 70 g	approx. 70 g	approx. 75 g	approx. 70 g	approx. 75 g
www.beckhoff.com/KL3201	www.beckhoff.com/KL3202	www.beckhoff.com/KL3208	www.beckhoff.com/KL3222	www.beckhoff.com/KL3228
<b>KL3202-00xx</b>		special terminals see page 685		

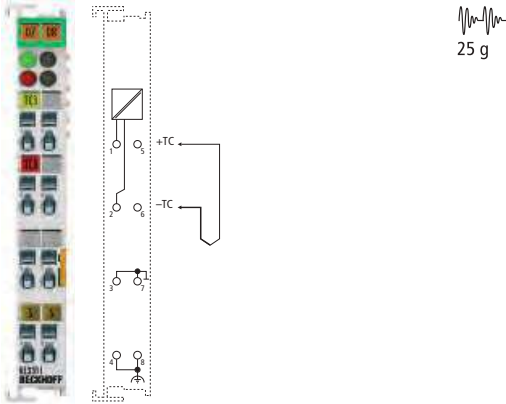


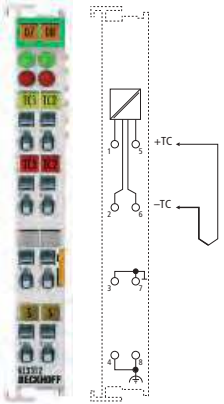

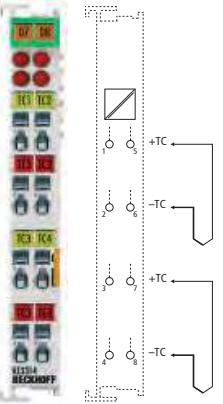

# Analog input | Thermocouples

Thermocouples can be classified as active transducers. They exploit the thermo-electric effect (Seebeck, Peltier, Thomson). Where two electrical conductors of different materials (e.g. iron and constantan) make contact, a contact voltage occurs at the contact points, which is clearly a function of temperature and so is called thermovoltage. Due to changes in the material during the implementation of a thermocouple, at least two of such material pairings occur. One is placed at the measurement location, the other is the so-called comparison point, which is normally located in the measurement device. In order to compensate for the reference point effect, the temperature at the reference point must be known. For the KL331x this is the connection point of the thermocouple to the terminal contacts, which is why the terminal contact temperature is specially measured here.

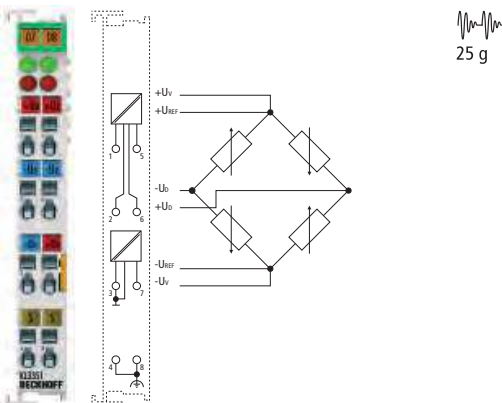
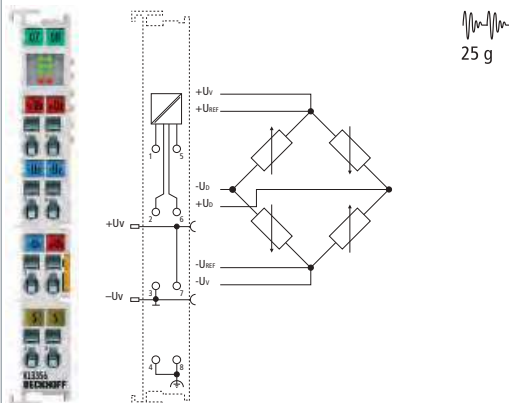
Thermocouples represent economical and easy to install sensors for temperature measurement with reduced need for accuracy. Depending on the type of thermocouple, temperatures from -200 to +2,300 °C can be measured. The linearisation and cold junction compensation is carried out by a characteristic curve on a microprocessor. The directions in the documentation, concerning earthing and thermocouples which are not potential-free, must be observed. An error LED indicates a broken wire.

1-channel analog input terminal,  
thermocouple with open-circuit recognition

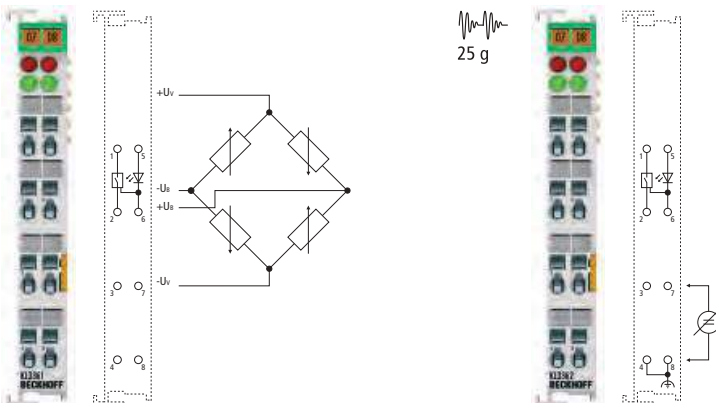
Technical data	KL3311
Thermocouple sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
Resolution	0.1 °C per digit
Technology	2-wire
Conversion time	~ 200 ms
Number of inputs	1
	 <p>The analog input terminal KL3311 enables direct connection of a thermocouple. The circuit of the Bus Terminal can operate thermocouples using 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. Compensation for the cold junction is made through an internal temperature measurement at the terminal. The KL3311 can also be used for mV measurement.</p>
Measuring error	< ±0.5 % (relative to full scale value)
Measuring range	in the range defined in each case for the sensor (default setting: type K; -100...+1,370 °C); mV measurement: ±30 mV...±120 mV
Current consumption power contacts	– (no power contacts)
Current consumpt. K-bus	typ. 65 mA
Special features	electrically isolated
Operating temperature	0...+55 °C
Approvals	CE, UL, Ex
Weight	approx. 70 g
Further information	<a href="http://www.beckhoff.com/KL3311">www.beckhoff.com/KL3311</a>
Special terminals	
Distinguishing features	

<p>2-channel analog input terminal, thermocouple with open-circuit recognition</p>	<p>4-channel analog input terminal, thermocouple with open-circuit recognition</p>
<p><b>KL3312</b></p>	<p><b>KL3314</b></p>
<p>2-wire</p>	<p>2-wire</p>
<p>~ 250 ms</p>	<p>~ 250 ms</p>
<p>2</p>	<p>4</p>
<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;">  <p>25 g</p> </div> </div> <p>The KL3312 analog input terminal allows two thermocouples to be connected directly. The circuit of the Bus Terminal can operate thermocouples using 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. Compensation for the cold junction is made through an internal temperature measurement at the terminals. The KL3312 can also be used for mV measurement.</p>	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;">  <p>25 g</p> </div> </div> <p>The KL3314 analog input terminal allows four thermocouples to be connected directly. The circuit of the Bus Terminals can operate thermocouples using 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. Compensation for the cold junction is made through an internal temperature measurement at the terminals. The KL3314 can also be used for mV measurement.</p>
<p>&lt; ±0.5 % (relative to full scale value)</p>	<p>&lt; ±0.5 % (relative to full scale value)</p>
<p>in the range defined in each case for the sensor (default setting: type K; -100...+1,370 °C); mV measurement: ±30 mV...±120 mV</p>	<p>in the range defined in each case for the sensor (default setting: type K; -100...+1,370 °C); mV measurement: ±30 mV...±120 mV</p>
<p>– (no power contacts)</p>	<p>– (no power contacts)</p>
<p>typ. 65 mA</p>	<p>typ. 75 mA</p>
<p>–</p>	<p>–</p>
<p>0...+55 °C</p>	<p>0...+55 °C</p>
<p>CE, UL, Ex</p>	<p>CE, UL, Ex, GL</p>
<p>approx. 70 g</p>	<p>approx. 75 g</p>
<p><a href="http://www.beckhoff.com/KL3312">www.beckhoff.com/KL3312</a></p>	<p><a href="http://www.beckhoff.com/KL3314">www.beckhoff.com/KL3314</a></p>
<p><b>KL3312-xxxx</b></p>	<p><b>KL3314-xxxx</b></p>
<p>special terminals see page</p>	<p>685</p>

## Analog input | Resistor bridges

	1-channel analog input terminal, resistor bridge (strain gauge)	1-channel analog input terminal, accurate resistor bridge evaluation
<b>Technical data</b>	<b>KL3351   KS3351</b>	<b>KL3356   KS3356</b>
<b>Signal voltage</b>	$U_D: -16 \dots +16 \text{ mV}$ $U_{REF}: -10 \dots +10 \text{ V}$	$U_D: -20 \dots +20 \text{ mV}$ $U_{REF}: -12 \dots +12 \text{ V}$
<b>Resolution</b>	16 bit	
<b>Technology</b>	DMS connection	DMS connection
<b>Conversion time</b>	< 250 ms, configurable	< 250 ms, configurable
<b>Number of inputs</b>	2, for one resistor bridge	2, for one resistor bridge
	 <p>The KL3351 analog input terminal permits direct connection of a resistor bridge. The bridge voltage, <math>U_D</math>, and the supply voltage, <math>U_{REF}</math>, to the bridge are digitised with 16 bit resolution, and are retransmitted along an electrically isolated channel to the supervising automation system. The input channels are available in the form of two 16 bit values for further processing. The resulting measurement can be calculated from the formula: measurement = <math>U_D/U_{REF}</math>. Precise acquisition of the supply voltage along with the bridge voltage compensates for long-term and temperature drift.</p>	 <p>The KL3356 analog input terminal permits direct connection of a resistor bridge. Its improved input circuit makes the KL3356 significantly more accurate than the KL3351. The ratio between the bridge voltage <math>U_D</math> and the supply voltage <math>U_{REF}</math> is determined in the input circuit. In order to achieve good long-term stability, the complete circuit is re-calibrated at least every three minutes. This procedure can be synchronised by the control in order to prevent the calibration leading to a delay in the production process.</p>
<b>Measuring error</b>	< $\pm 0.1 \%$ (relative to full scale value)	< $\pm 0.01 \%$ (relative to full scale value)
<b>Current consumption power contacts</b>	– (no power contacts)	only load
<b>Current consumpt. K-bus</b>	typ. 65 mA	typ. 85 mA
<b>Internal resistance</b>	> 200 k $\Omega$ ( $U_{REF}$ ), > 1 M $\Omega$ ( $U_D$ )	> 200 k $\Omega$ ( $U_{REF}$ ), > 1 M $\Omega$ ( $U_D$ )
<b>Power supply <math>U_V</math></b>	5 V DC, max. 20 mA	via power contacts
<b>Filter</b>	50 Hz, configurable	50 Hz, configurable
<b>Special features</b>	with internal bridge supply	increased measuring accuracy, self-calibration
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex
<b>Weight</b>	approx. 70 g	approx. 75 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL3351">www.beckhoff.com/KL3351</a>	<a href="http://www.beckhoff.com/KL3356">www.beckhoff.com/KL3356</a>
<b>Special terminals</b>	<b>KL3351-0001</b>	
<b>Distinguishing features</b>	with faster measurement time approx. 10 ms	

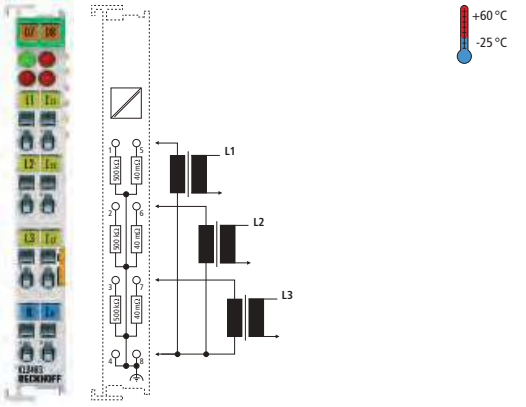
# Analog input | Oscilloscopes

	1-channel analog input terminal, oscilloscope, -16...+16 mV	2-channel analog input terminal, oscilloscope, -10...+10 mV
<b>Technical data</b>	<b>KL3361   KS3361</b>	<b>KL3362   KS3362</b>
<b>Signal voltage</b>	$U_{in}$ : -16...+16 mV	-10...+10 V
<b>Resolution</b>	14 bit + sign	
<b>Technology</b>	high-speed data logger	high-speed data logger
<b>Conversion time</b>	< 100 $\mu$ s, configurable (10 $\mu$ s with fast sampling mode)	
<b>Number of inputs</b>	1 analog, 1 trigger	2 analog, 1 trigger
	 <p>The KL3361 and KL3362 analog input terminals make it possible to perform non-central preliminary processing of analog values. The input values are digitised with a 14-bit resolution and written into an internal memory. An efficient processor can pre-process the values. Limit values, maximum and minimum values will be determined or monitored. The Bus Terminals can also carry out envelope curve monitoring. A trigger starts cyclical processes. The result or all the measured values are transported to the higher-level automation unit.</p>	
<b>Measuring error</b>	< $\pm 1$ % (relative to full scale value)	< $\pm 0.5$ % (relative to full scale value)
<b>Current consumption power contacts</b>	– (no power contacts)	– (no power contacts)
<b>Current consumption K-bus</b>	typ. 120 mA with external DMS power supply, typ. 140 mA with internal DMS power supply from terminal (4 x 350 $\Omega$ )	typ. 120 mA
<b>Internal resistance</b>	> 1 M $\Omega$ ( $U_b$ )	> 500 k $\Omega$
<b>Supply voltage</b>	5 V DC, max. 20 mA	–
<b>Power supply</b>	via the K-bus	via the K-bus
<b>Internal memory</b>	32 kbytes	32 kbytes
<b>Special features</b>	high-speed strain gauge analysis (for all fieldbuses)	high-speed analog analysis
<b>Operating temperature</b>	0...+55 $^{\circ}$ C	0...+55 $^{\circ}$ C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex
<b>Weight</b>	approx. 55 g	approx. 55 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL3361">www.beckhoff.com/KL3361</a>	<a href="http://www.beckhoff.com/KL3362">www.beckhoff.com/KL3362</a>

# Analog input | Power measurement

The KL3403 Bus Terminal enables the measurement of all relevant electrical data of the supply network. The voltage is measured via the direct connection of L1, L2, L3 and N. The current of the three phases L1, L2 and L3 is fed via simple current transformers. All measured currents and voltages are available as root-mean-square values. In the KL3403 version, the effective power and the energy consumption for each phase are calculated. Through the relationship of the root-mean-square values of voltage and current all other information, such as effective power  $P$ , apparent power  $S$  or phase shift angle  $\cos \varphi$  can be derived. For each fieldbus, KL3403 provides a comprehensive network analysis and an energy management option.

## 3-phase power measurement terminal

Technical data	KL3403   KS3403	KL3403-0010
Measuring voltage	max. 500 V AC 3~ (ULx-N: max. 288 V AC)	
Resolution	16 bit (21 bit, internal)	
Technology	3-phase connection technique	
Update time	50 ms per measured value preset, free configurable	
Number of inputs	3 phases + N	
		
Measuring error	0.5 % relative to full scale value (U, I), 1 % calculated value	
Current consumption power contacts	– (no power contacts)	
Current consumpt. K-bus	typ. 115 mA	
Measuring procedure	true RMS with 64,000 samples/s	
Measured values	current, voltage, effective power, energy, $\cos \varphi$ , peak values U, I and P, frequency	
Measuring current	max. 1 A, via measuring transformers x A/1 A	max. 5 A (AC/DC), via measuring transformers x A/5 A
Electrical isolation	1,500 V (K-bus/field potential)	
Special features	energy meter, power measurement, True RMS	
Operating temperature	-25...+60 °C	
Approvals	CE, UL	
Weight	approx. 75 g	
Further information	<a href="http://www.beckhoff.com/KL3403">www.beckhoff.com/KL3403</a>	
Special terminals	KL3403-0020	KL3403-0022
Distinguishing features	current path designed for 20 mA, optimised for electronic current transformer, operating temperature 0...+55 °C	current path and voltage input designed for 20 mA, operating temperature 0...+55 °C

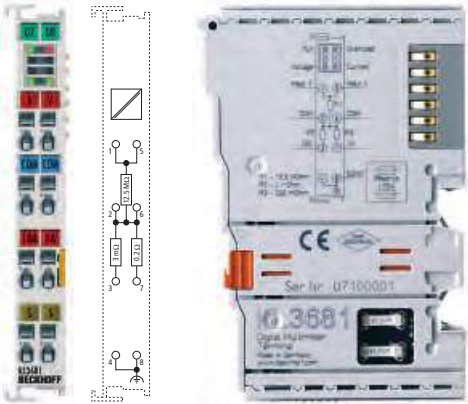
# Analog input | Digital multimeter

The KL3681 Bus Terminal enables measurement of currents and voltages in a wide input range. The measuring ranges are switched automatically, as usual in advanced digital multimeters. There are two current paths available for current measurement. One of them is a high current path for up to 10 A. The current and the voltage measurement facility can be used for DC and AC. The alternating parameters are output as true RMS values. The measurement readings can be read and processed with commercially available fieldbuses. At the same time the KL3681 enables the measuring type and range to be set via the bus.

Excellent interference immunity is achieved through the fully electrically isolated design of the electronic measuring system and the dual slope conversion system. High precision and simple, high impedance measurement from 300 mV to 300 V allow the Bus Terminal to be used like a modern digital multimeter.

In measuring applications in particular, the voltage to be expected is often not yet known during the planning phase. Automatic adjustment of the measurement range simplifies use and reduces stock levels. The selected measuring type and overload are indicated by LEDs.

Digital multimeter terminal

Technical data	KL3681   KS3681
Measuring voltage	300 mV, 3 V, 30 V, 300 V
Resolution	18 bit + sign in each measurement range
Technology	digital multimeter with automatic range selection
Update time	0.5 s, 1 s for measuring range selection
Number of inputs	1 voltage or 1 current (10 A/1 A)
	
Measuring error	0.01 % DC voltage measurement at 25 °C
Current consumption power contacts	– (no power contacts)
Current consumpt. K-bus	typ. 100 mA
Measuring procedure	DC with arithmetic averaging, AC with true RMS value calculation
Measured values	current, voltage
Measuring current	100 mA, 1 A and 10 A via high-current path
Electrical isolation	1,500 V (K-bus/field potential)
Special features	automatic or manual range selection, 1.25 A fuse installed + spare fuse, filter deactivatable
Operating temperature	0...+55 °C
Approvals	CE
Weight	approx. 70 g
Further information	<a href="http://www.beckhoff.com/KL3681">www.beckhoff.com/KL3681</a>
Accessories	ZB8000-0001
Spare fuse	10 pieces, 1.25 A

# Analog input | Pressure measuring

The pressure measuring terminals are divided into two groups: differential pressure measurement with the measurement between two connections and relative pressure measurement with duplicate measurement against ambient.

The Bus Terminal can be used for measurement of the pressure or also as a replacement for a pressure switch. Through the pressure value in the control unit the switching threshold for a logical linking can be stored as a parameter. Manual setting of the pressure switch in the practice is no longer necessary.

The measuring hoses can simply be connected by plugging them into a quick coupling. Normal 4 mm compressed air hoses are used.

With the direct integration of the pressure measurement into the Bus Terminal system the installation of a pressure measurement unit including its wiring can be omitted.

The pressure measurement terminals are suitable for the measurement of non-aggressive gases. Water or gases which encourage oxidation should not be allowed to get into the Bus Terminal.



1-channel differential pressure measuring terminal -100...+100 hPa

Technical data	KM3701	KM3701-0340
Technology	differential pressure measurement	
Resolution	0.1 hPa (0.1 mbar) per digit	
Number of inputs	1 (differential pressure)	
Measuring error	3 % (relative to full scale value)	
Measuring range	-100...+100 hPa (-100...+100 mbar)	up to 340 hPa (340 mbar)
Current consumption power contacts	– (no power contacts)	
Current consumpt. K-bus	typ. 15 mA	
Max. overload	500 hPa (500 mbar) differential, 5,000 hPa (5 bar) to ambient	
Medium	non-aggressive gases	
Special features	–	
Operating temperature	0...+55 °C	
Approvals	CE, UL	
Weight	approx. 95 g	
Further information	<a href="http://www.beckhoff.com/KM3701">www.beckhoff.com/KM3701</a>	



The KM3701 pressure measuring terminal enables direct measurement of pressure differences between two hose connections. The pressure difference is available in the fieldbus as a 16 bit value and can be measured between any points up to an ambient pressure of 10 bar. The status LEDs indicate proper function or errors such as over-range.



	2-channel relative pressure measuring terminal 7,500 hPa	2-channel relative pressure measuring terminal -1,000...+1,000 hPa
	<b>KM3702</b>	<b>KM3712</b>
	relative pressure measurement	
	2	2
	 <p>The KM3702 pressure measuring terminal enables direct measurement of two pressure values at the hose connections. The pressure is determined as a pressure difference to the ambiance of the KM3702 and is available in the fieldbus as a 16 bit value. The status LEDs indicate proper function or errors such as over-range.</p>	 <p>The KM3712 pressure measuring terminal enables direct measurement of two negative pressure values at the hose connections. The pressure is determined as a pressure difference to the ambiance of the KM3712 and is available in the fieldbus as a 16 bit value. The status LEDs indicate proper function or errors such as over-range.</p>
	3 % (relative to full scale value)	3 % (relative to full scale value)
	0...7,500 hPa (7.5 bar)	-1,000...+1,000 hPa (-1...+1 bar)
	– (no power contacts)	– (no power contacts)
	typ. 15 mA	typ. 15 mA
	10,000 hPa (10 bar)	5,000 hPa (5 bar)
	non-aggressive gases	non-aggressive gases
	–	–
	0...+55 °C	0...+55 °C
	CE, UL	CE, UL
	approx. 95 g	approx. 95 g
	<a href="http://www.beckhoff.com/KM3702">www.beckhoff.com/KM3702</a>	<a href="http://www.beckhoff.com/KM3712">www.beckhoff.com/KM3712</a>



# Analog output | -10...+10 V

The KL4xxx Bus Terminals provide analog signal voltages in the common standard signal range of -10 to +10 V, 0 to 10 V, 0 to 20 mA and 4 to 20 mA. Inside the terminal the field side is electrically isolated from the K-bus and enables the interconnection to the desired potential groups. The 1-channel Bus Terminals are available for application instances, in which each signal must be completely electrically isolated. An additional electrically isolated 24 V DC supply can be created by the introduction of the KL9560 power supply terminal.

The Bus Terminals of this group differ in their different resolutions of the analog/digital conversion, conversion speed and accuracy. For 1- and 2-channel Bus Terminals 1-, 2-, 3- and 4-wire sensor connections are available. 4-channel Bus Terminals can only be used with 1- and 2-wire connections.

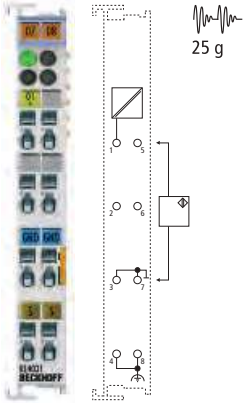
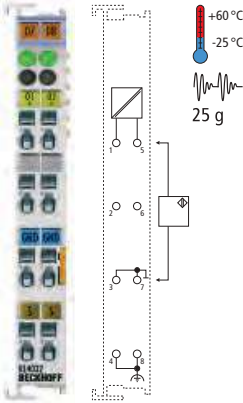
The current output terminals 0 to 20 mA and 4 to 20 mA are fed from the 24 V DC supply and are electrically connected with it. The signal current flows from the output to ground.

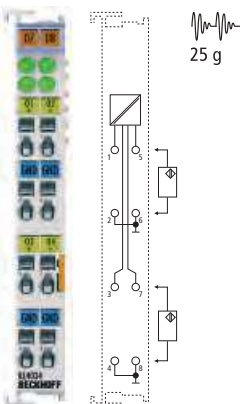
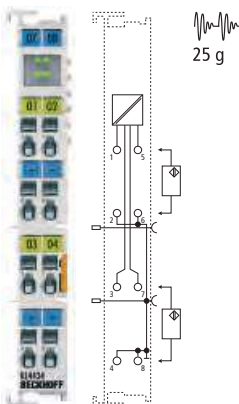
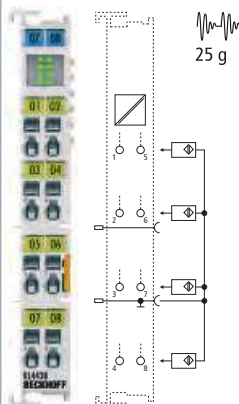
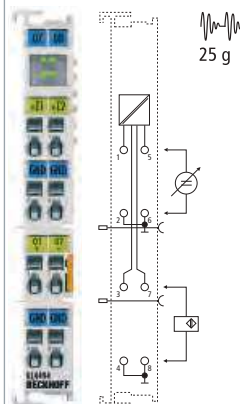
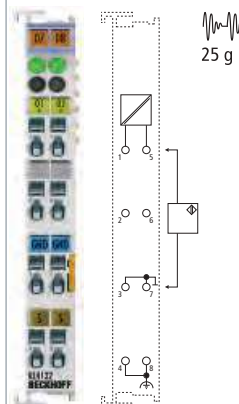
Most Bus Terminals with voltage outputs are supplied from the internal K-bus. These Bus Terminals are potential-free and must be connected with the actuator through an additional ground wire. In contrast, the KL4404/08 and KL4434/38 Bus Terminals are supplied by the 24 V from the power contacts and use a power contact as a reference ground.

KL9570 | Power supply terminal  
see page [681](#)

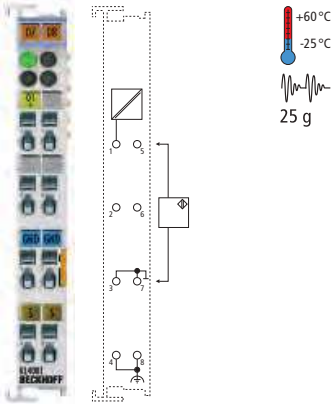
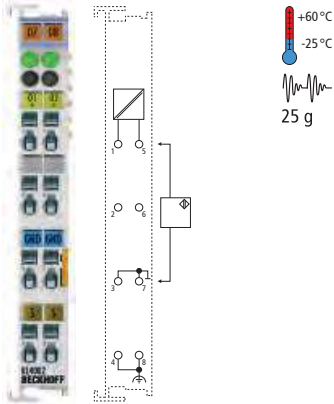
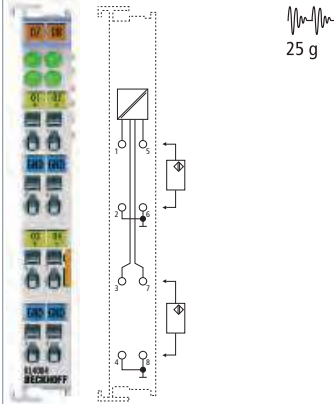
1-channel analog output terminal, -10...+10 V, 12 bit

2-channel analog output terminal, -10...+10 V, 12 bit

Technical data	KL4031   KS4031	KL4032   KS4032
Signal voltage	-10...+10 V	
Resolution	12 bit	
Technology	–	single-ended
Conversion time	~ 1.5 ms	~ 1.5 ms
Number of outputs	1	2
	 <p>The KL4031 analog output terminal generates signals in the range from -10 to +10 V. It combines two output channels, which have a common ground potential in one housing.</p>	 <p>The KL4032 analog output terminal generates signals in the range from -10 to +10 V. It combines two output channels, which have a common ground potential in one housing.</p>
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumpt. K-bus	typ. 75 mA	typ. 75 mA
Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Special features	potential-free output	–
Operating temperature	0...+55 °C	-25...+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 85 g	approx. 85 g
Further information	<a href="http://www.beckhoff.com/KL4031">www.beckhoff.com/KL4031</a>	<a href="http://www.beckhoff.com/KL4032">www.beckhoff.com/KL4032</a>
Special terminals		KL4032-00xx
Distinguishing features		special terminals see page <a href="#">685</a>

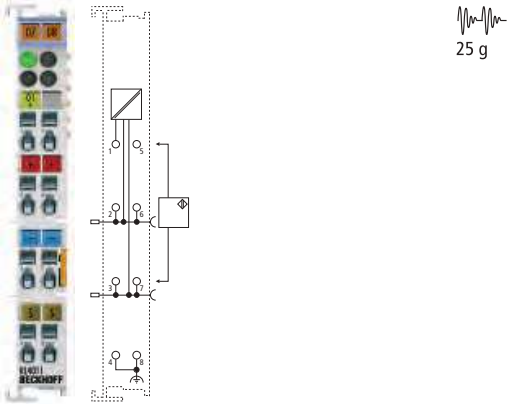
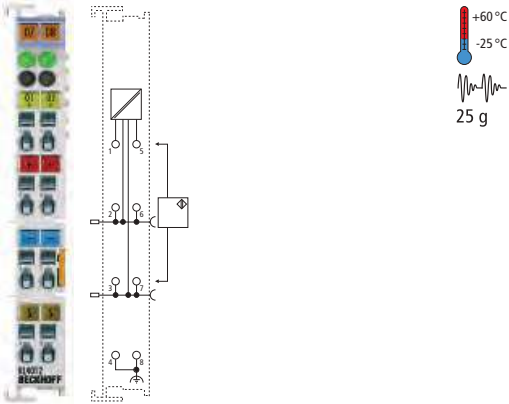
4-channel analog output terminal, -10...+10 V, 12 bit	4-channel analog output terminal, -10...+10 V, 12 bit	8-channel analog output terminal, -10...+10 V, 12 bit	2-channel analog input, 2-channel analog output terminal, -10...+10 V, 12 bit	2-channel analog output terminal, -10...+10 V, 16 bit
<b>KL4034   KS4034</b>	<b>KL4434   KS4434</b>	<b>KL4438   KS4438</b>	<b>KL4494   KS4494</b>	<b>KL4132   KS4132</b>
				16 bit
single-ended	single-ended	single-ended	single-ended	single-ended
~ 2 ms	~ 4 ms	~ 8 ms	< 2 ms	~ 1.5 ms
4	4	8	2 outputs + 2 inputs	2
 <p>The KL4034 analog output terminal generates signals in the range from -10 to +10 V. It combines four output channels, which have a common ground potential in one housing.</p>	 <p>The KL4434 analog output terminal generates signals in the range from -10 to +10 V. It combines four output channels, which have a common ground potential in one housing.</p>	 <p>The KL4438 analog output terminal generates signals in the range from -10 to +10 V. It combines eight output channels in one housing and is thus particularly suited for space-saving use in the control cabinet. The 0 V power contact serves as the common ground potential.</p>	 <p>The KL4494 analog output terminal combines two analog inputs and two analog outputs. The input and output channels of the Bus Terminal have a common ground potential.</p> <p>– input internal resistance: &gt; 130 kΩ</p>	 <p>The KL4132 analog output terminal generates signals in the range from -10 to +10 V. It combines two output channels, which have a common ground potential in one housing.</p>
< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)	< ±0.2 % (relative to end value)	< ±0.3 % (relative to end value)	< ±0.1 % (relative to end value)
– (no power contacts)	only load	only load	only load	– (no power contacts)
typ. 85 mA	typ. 20 mA	typ. 20 mA	typ. 70 mA	typ. 75 mA
> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
–	–	high packing density	input/output terminal	increased resolution
0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
approx. 85 g	approx. 75 g	approx. 75 g	approx. 55 g	approx. 85 g
<a href="http://www.beckhoff.com/KL4034">www.beckhoff.com/KL4034</a>	<a href="http://www.beckhoff.com/KL4434">www.beckhoff.com/KL4434</a>	<a href="http://www.beckhoff.com/KL4438">www.beckhoff.com/KL4438</a>	<a href="http://www.beckhoff.com/KL4494">www.beckhoff.com/KL4494</a>	<a href="http://www.beckhoff.com/KL4132">www.beckhoff.com/KL4132</a>
<b>KL4034-0010</b>				<b>KL4132-00xx</b>
Siemens S5 format				special terminals see page

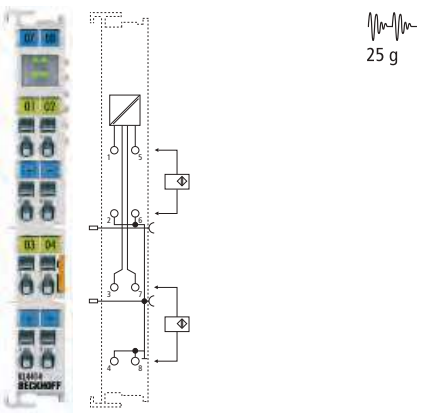
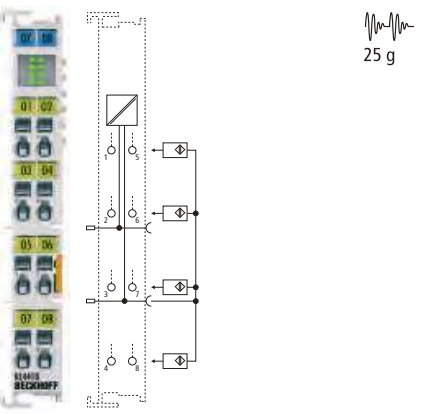
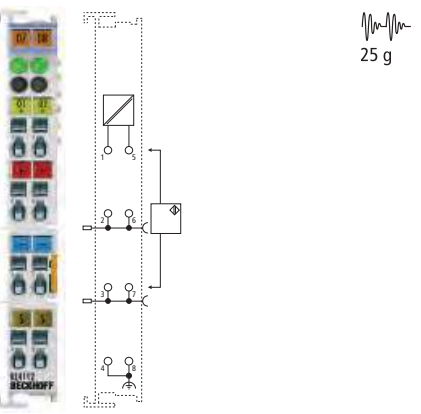
# Analog output | 0...10 V

	1-channel analog output terminal, 0...10 V, 12 bit	2-channel analog output terminal, 0...10 V, 12 bit	4-channel analog output terminal, 0...10 V, 12 bit
<b>Technical data</b>	<b>KL4001   KS4001</b>	<b>KL4002   KS4002</b>	<b>KL4004   KS4004</b>
Signal voltage	0...10 V		
Resolution	12 bit		
Technology	–	single-ended	single-ended
Conversion time	~ 1.5 ms	~ 1.5 ms	~ 2 ms
Number of outputs	1	2	4
	 <p>The KL4001 analog output terminal generates signals in the range from 0 to +10 V. It combines two output channels, which have a common ground potential in one housing.</p>	 <p>The KL4002 analog output terminal generates signals in the range from 0 to +10 V. It combines two output channels, which have a common ground potential in one housing.</p>	 <p>The KL4004 analog output terminal generates signals in the range from 0 to +10 V. It combines four output channels, which have a common ground potential in one housing.</p>
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)	– (no power contacts)
Current consumpt. K-bus	typ. 75 mA	typ. 75 mA	typ. 85 mA
Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Special features	potential-free output	–	–
Operating temperature	-25...+60 °C	-25...+60 °C	0...+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 85 g	approx. 85 g	approx. 85 g
Further information	<a href="http://www.beckhoff.com/KL4001">www.beckhoff.com/KL4001</a>	<a href="http://www.beckhoff.com/KL4002">www.beckhoff.com/KL4002</a>	<a href="http://www.beckhoff.com/KL4004">www.beckhoff.com/KL4004</a>
Special terminals		<b>KL4002-00xx</b>	<b>KL4004-0050</b>
Distinguishing features		special terminals see page <b>685</b>	Siemens S7 format

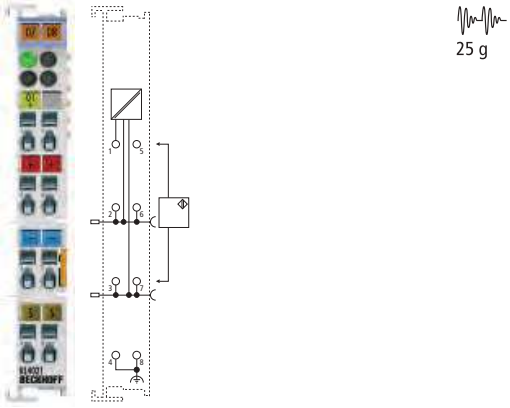
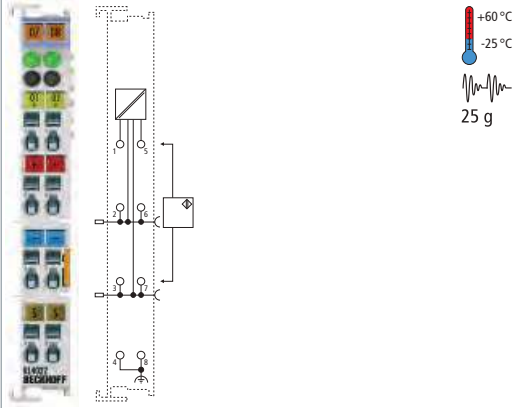
<p>4-channel analog output terminal, 0...10 V, 12 bit</p>	<p>8-channel analog output terminal, 0...10 V, 12 bit</p>	<p>2-channel analog output terminal, 0...10 V, 12 bit, manual/automatic operation</p>
<p>KL4404   KS4404</p>	<p>KL4408   KS4408</p>	<p>KM4602</p>
<p> </p>		
<p>single-ended</p>	<p>single-ended</p>	<p>single-ended</p>
<p>~ 4 ms</p>	<p>~ 8 ms</p>	<p>~ 1.5 ms</p>
<p>4</p>	<p>8</p>	<p>2</p>
<div> </div> <p>The KL4404 analog output terminal generates signals in the range from 0 to +10 V. It combines four output channels, which have a common ground potential in one housing.</p>	<div> </div> <p>The KL4408 analog output terminal generates signals in the range from 0 to +10 V. It combines eight output channels in one housing and is thus particularly suited to space-saving use in the control cabinet. The 0 V power contact serves as the common ground potential.</p>	<div> </div> <p>The analog KM4602 output terminal has two potential-free analog 0 to +10 V outputs. Both are connected internally to common ground. For each channel a switch enables selection of automatic or manual mode. In automatic mode, an analog value is issued depending on the process data. With the manual switch settings, the value set via the potentiometer is applied to the output. For manual mode a 24 V supply is required for the Bus Coupler. The switch state can be read by the controller.</p>
<p>&lt; ±0.1 % (relative to end value) only load</p>	<p>&lt; ±0.2 % (relative to end value) only load</p>	<p>&lt; ±0.1 % (relative to end value) – (no power contacts)</p>
<p>typ. 20 mA &gt; 5 kΩ (short-circuit-proof)</p>	<p>typ. 20 mA &gt; 5 kΩ (short-circuit-proof)</p>	<p>typ. 175 mA &gt; 5 kΩ (short-circuit-proof)</p>
<p>– 0...+55 °C</p>	<p>high packing density 0...+55 °C</p>	<p>manual/automatic operation 0...+55 °C</p>
<p>CE, UL, Ex, GL approx. 75 g</p>	<p>CE, UL, Ex, GL approx. 75 g</p>	<p>CE approx. 85 g</p>
<p>www.beckhoff.com/KL4404</p>	<p>www.beckhoff.com/KL4408</p>	<p>www.beckhoff.com/KM4602</p>

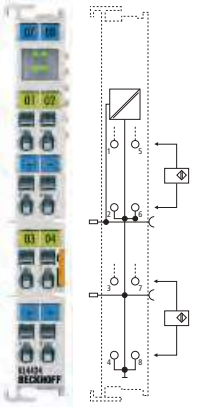

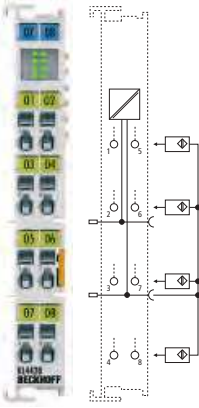

## Analog output | 0...20 mA

	1-channel analog output terminal, 0...20 mA, 12 bit	2-channel analog output terminal, 0...20 mA, 12 bit
<b>Technical data</b>	<b>KL4011   KS4011</b>	<b>KL4012   KS4012</b>
Signal current	0...20 mA	
Resolution	12 bit	
Technology	single-ended	single-ended
Conversion time	~ 1.5 ms	~ 1.5 ms
Number of outputs	1	2
	 <p>The KL4011 analog output terminal generates analog output signals in the range from 0 to 20 mA.</p>	 <p>The KL4012 analog output terminal generates signals in the range from 0 to 20 mA. It combines two output channels, which have a common ground potential with the 24 V DC supply, in one housing. The output stages are powered by the 24 V DC supply.</p>
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Current consumption power contacts	typ. 30 mA + load	typ. 50 mA + load
Current consumpt. K-bus	typ. 60 mA	typ. 60 mA
Load	< 500 Ω	< 500 Ω
Power supply	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)
Special features	–	–
Operating temperature	0...+55 °C	-25...+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 80 g	approx. 80 g
Further information	<a href="http://www.beckhoff.com/KL4011">www.beckhoff.com/KL4011</a>	<a href="http://www.beckhoff.com/KL4012">www.beckhoff.com/KL4012</a>
<b>Special terminals</b>	<b>KL4012-00xx</b>	
Distinguishing features	special terminals see page <b>685</b>	

<p>4-channel analog output terminal, 0...20 mA, 12 bit</p>	<p>8-channel analog output terminal, 0...20 mA, 12 bit</p>	<p>2-channel analog output terminal, 0...20 mA, 15/16 bit</p>
<p>KL4414   KS4414</p>	<p>KL4418   KS4418</p>	<p>KL4112   KS4112</p>
		<p>15 bit, configurable to 16 bit</p>
<p>single-ended</p>	<p>single-ended</p>	<p>single-ended</p>
<p>~ 4 ms</p>	<p>~ 8 ms</p>	<p>~ 3.5 ms</p>
<p>4</p>	<p>8</p>	<p>2</p>
 <p>The KL4414 analog output terminal generates signals in the range from 0 to 20 mA. It combines four channels, which have a common ground potential in one housing. The output stages are powered by the 24 V DC supply.</p>	 <p>The KL4418 analog output terminal generates signals in the range from 0 to 20 mA. It combines eight output channels in one housing and is thus particularly suited to space-saving use in the control cabinet. The 0 V power contact serves as the common ground potential.</p>	 <p>The KL4112 analog output terminal generates signals in the range from 0 to 20 mA. It combines two output channels, which have a common ground potential with the 24 V DC supply, in one housing. The output stages are powered by the 24 V DC supply.</p>
<p>&lt; ±0.1 % (relative to end value)</p>	<p>&lt; ±0.2 % (relative to end value)</p>	<p>&lt; ±0.1 % (relative to end value)</p>
<p>typ. 60 mA + load</p>	<p>typ. 60 mA + load</p>	<p>typ. 50 mA + load</p>
<p>typ. 20 mA</p>	<p>typ. 20 mA</p>	<p>typ. 60 mA</p>
<p>&lt; 350 Ω (short-circuit-proof)</p>	<p>&lt; 150 Ω (short-circuit-proof)</p>	<p>&lt; 500 Ω</p>
<p>24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)</p>	<p>24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)</p>	<p>24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)</p>
<p>–</p>	<p>high packing density</p>	<p>increased resolution</p>
<p>0...+55 °C</p>	<p>0...+55 °C</p>	<p>0...+55 °C</p>
<p>CE, UL, Ex, GL</p>	<p>CE, UL, Ex, GL</p>	<p>CE, UL, Ex</p>
<p>approx. 75 g</p>	<p>approx. 75 g</p>	<p>approx. 80 g</p>
<p>www.beckhoff.com/KL4414</p>	<p>www.beckhoff.com/KL4418</p>	<p>www.beckhoff.com/KL4112</p>
		<p>KL4112-00xx</p>
		<p>special terminals see page 685</p>

## Analog output | 4...20 mA

	1-channel analog output terminal, 4...20 mA, 12 bit	2-channel analog output terminal, 4...20 mA, 12 bit
<b>Technical data</b>	<b>KL4021   KS4021</b>	<b>KL4022   KS4022</b>
<b>Signal current</b>	4...20 mA	
<b>Resolution</b>	12 bit	
<b>Technology</b>	single-ended	single-ended
<b>Conversion time</b>	~ 1.5 ms	~ 1.5 ms
<b>Number of outputs</b>	1	2
	 <p>The KL4021 analog output terminal generates analog output signals in the range from 4 to 20 mA.</p>	 <p>The KL4022 analog output terminal generates signals in the range from 4 to 20 mA. It combines two output channels, which have a common ground potential with the 24 V DC supply, in one housing. The output stages are powered by the 24 V DC supply.</p>
<b>Output error</b>	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
<b>Current consumption power contacts</b>	typ. 30 mA + load	typ. 50 mA + load
<b>Current consumpt. K-bus</b>	typ. 60 mA	typ. 60 mA
<b>Load</b>	< 500 Ω	< 500 Ω
<b>Power supply</b>	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)
<b>Special features</b>	–	–
<b>Operating temperature</b>	0...+55 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex, GL	CE, UL, Ex, GL
<b>Weight</b>	approx. 80 g	approx. 80 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL4021">www.beckhoff.com/KL4021</a>	<a href="http://www.beckhoff.com/KL4022">www.beckhoff.com/KL4022</a>
<b>Special terminals</b>		<b>KL4022-00xx</b>
<b>Distinguishing features</b>		special terminals see page <b>685</b>

<p>4-channel analog output terminal, 4...20 mA, 12 bit</p>	<p>8-channel analog output terminal, 4...20 mA, 12 bit</p>
<p>KL4424   KS4424</p>	<p>KL4428   KS4428</p>
<p>single-ended</p>	<p>single-ended</p>
<p>~ 4 ms</p>	<p>~ 8 ms</p>
<p>4</p>	<p>8</p>
<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;">  <p>25 g</p> </div> </div> <p>The KL4424 analog output terminal generates signals in the range from 4 to 20 mA. It combines four channels, which have a common ground potential in one housing. The output stages are powered by the 24 V DC supply.</p>	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;">  <p>25 g</p> </div> </div> <p>The KL4428 analog output terminal generates signals in the range from 4 to 20 mA. It combines eight output channels in one housing and is thus particularly suited to space-saving use in the control cabinet. The 0 V power contact serves as the common ground potential.</p>
<p>&lt; ±0.1 % (relative to end value) typ. 60 mA + load</p>	<p>&lt; ±0.2 % (relative to end value) typ. 60 mA + load</p>
<p>typ. 20 mA &lt; 350 Ω (short-circuit-proof)</p>	<p>typ. 20 mA &lt; 150 Ω (short-circuit-proof)</p>
<p>24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)</p>	<p>24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)</p>
<p>–</p>	<p>increased packing density</p>
<p>0...+55 °C</p>	<p>0...+55 °C</p>
<p>CE, UL, Ex, GL</p>	<p>CE, UL, Ex, GL</p>
<p>approx. 75 g</p>	<p>approx. 75 g</p>
<p><a href="http://www.beckhoff.com/KL4424">www.beckhoff.com/KL4424</a></p>	<p><a href="http://www.beckhoff.com/KL4428">www.beckhoff.com/KL4428</a></p>



# Position measurement | SSI encoder interfaces

The KL5001 SSI interface terminal enables the direct connection of an SSI encoder that is powered via the SSI interface. The interface circuit generates a pulse for reading the encoder and makes the incoming data stream available to the controller as a data word in the process image. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register. A screen can be connected via the KL9195 shield terminal.

The KL5051 bidirectional SSI interface terminal enables the connection of digital servo drives. The encoder is powered via the SSI interface, which consists of two logic channels. The first channel is used for the positioning of the drive, while the second channel is used to set releases, to transmit parameter data and to read status information and parameter values. The 5 V DC supply voltage can be generated with the KL9505 power supply terminal and fed into the power contacts.

KL9195 | Shield terminal  
see page [673](#)

KL9505 | Power supply terminal  
see page [680](#)

SSI encoder interface

Bidirectional  
SSI encoder interface

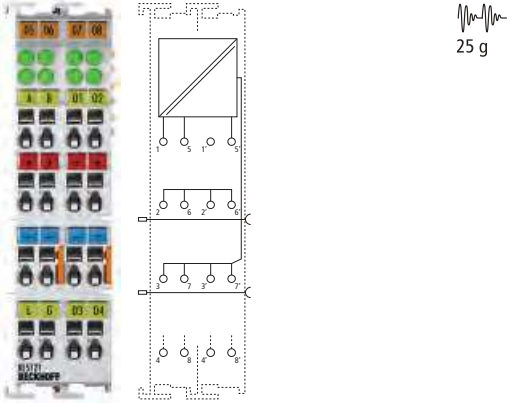
Technical data	KL5001   KS5001	KL5051   KS5051
Technology	SSI encoder interface	
Data direction	read	bidirectional
Number of channels	1 encoder interface	1 encoder interface
Encoder connection	binary input: D+, D-, binary output: Cl+, Cl-	binary input: D+, D-, binary output: Cl+, Cl-
Power supply	24 V DC via power contacts	5 V DC via power contacts (KL9505)
Current consumption power contacts	typ. 20 mA + load	no data
Current consumpt. K-bus	typ. 25 mA	typ. 75 mA
Signal input	difference signal (RS422)	difference signal (RS422)
Signal output	difference signal (RS422)	difference signal (RS422)
Encoder supply	24 V DC via power contacts	5 V DC
Data transfer rates	variable up to 1 MHz, 250 kHz default	1 MHz
Special features	–	bidirectional
Operating temperature	-25...+60 °C	0...+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 80 g
Further information	<a href="http://www.beckhoff.com/KL5001">www.beckhoff.com/KL5001</a>	<a href="http://www.beckhoff.com/KL5051">www.beckhoff.com/KL5051</a>

# Position measurement | Incremental encoder interface

The KL5121 Bus Terminal can be used to implement a linear path control. The terminal reads an incremental signal supplied by an incremental encoder or a pulse generator and switches the outputs at predefined counter states. The counter states can be transmitted to the terminal by the higher-level automation device in the form of a table. The position is registered with the latch input, which is activated/deactivated by the gate input. Up to four 24 V outputs can be switched. The LEDs indicate the states of the signals at the various inputs and outputs.

The KL5121 is particularly suitable for applications that are dependent on a short response time. The K-Bus cycle time, the field-bus runtime and the processing speed of the controller are of no importance for the fast and accurate processing of positional data, since the Bus Terminal always switches the outputs with a constant time delay, irrespective of the control environment.

Incremental encoder interface  
with programmable outputs

<b>Technical data</b>	KL5121   KS5121
<b>Technology</b>	incremental encoder interface with programmable outputs
<b>Number of channels</b>	1 incremental encoder + 4 outputs
<b>Encoder connection</b>	A, B, latch, gate
	
<b>Power supply</b>	24 V DC (-15 %/+20 %)
<b>Current consumption power contacts</b>	typ. 30 mA + load
<b>Current consumpt. K-bus</b>	typ. 30 mA
<b>Encoder operating voltage</b>	24 V DC
<b>Counter</b>	16 bit, binary
<b>Limit frequency</b>	1 million increments/s (with 4-fold evaluation)
<b>Output voltage</b>	24 V
<b>Output current</b>	0.5 A
<b>Switching times</b>	< 100 µs
<b>Special features</b>	electronic camshaft controller
<b>Operating temperature</b>	0...+55 °C
<b>Approvals</b>	CE, UL, Ex
<b>Weight</b>	approx. 60 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL5121">www.beckhoff.com/KL5121</a>

# Position measurement | Incremental encoder interfaces

The KL5101 Bus Terminal processes differential signals according to the RS422/RS485 standard. This transmission type is particularly resistant to interference and is suitable for high transmission frequencies. The KL5111, KL5151 and KL5152 Bus Terminals have a single-ended input and are simple to wire up. The signal frequencies from less time-critical applications can be processed using these terminals.

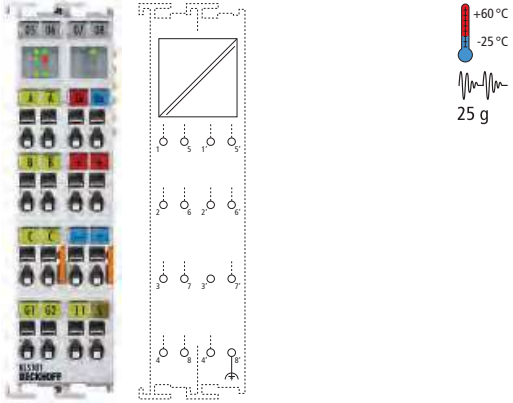
All incremental encoder terminals use a quadrature decoder. Gate and latch inputs enable pre-processing in the Bus Terminal in order to be able to transfer positional values to the controller exactly upon an external event and thus support the referencing of a drive.

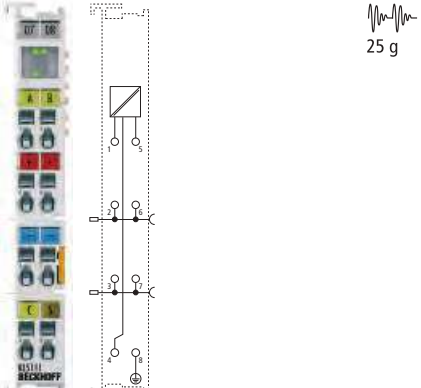
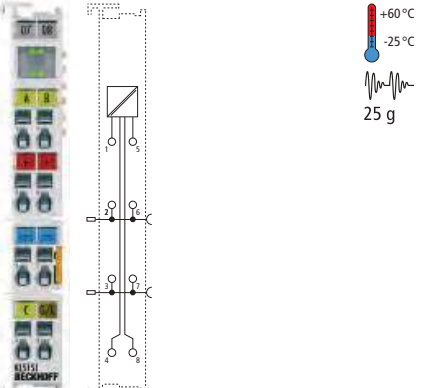
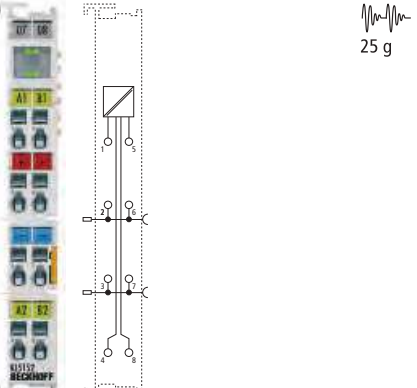
The KL5101 and KL5111 make a period duration measurement available with a resolution of 200 ns. Rotary speeds can thus be determined directly, since a calculation of the speed by means of position differences in the controller is in many cases not accurate enough due to jitter.

The KL5152 contains two encoders and provides a particularly inexpensive solution for a large number of channels if gate and latch functions are not needed.

The LEDs on the Bus Terminals indicate the states of the input signals for better diagnosis.

1-channel incremental encoder interface,  
16 bit, differential inputs, RS485

Technical data	KL5101   KS5101
Technology	incremental encoder interface (RS485)
Number of channels	1 incremental encoder + 1 input
Encoder connection	A, A (inv), B, B (inv), zero, zero (inv), difference signal (RS485); status input
	 <p>The KL5101 terminal is an interface for the direct connection of incremental encoders with difference signal (RS485) or with single inputs. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. Interval measurement with a resolution of 200 ns is possible. The G2 input allows the counter to be halted (high = stop). The value is read with a rising edge at G1.</p>
Power supply	24 V DC (-15 %/+20 %)
Current consum. pow. cont.	– (no power contacts)
Current consumpt. K-bus	typ. 60 mA
Encoder operating voltage	5 V DC
Encoder output current	0.5 A
Counter	16 bit, binary
Limit frequency	4 million increments/s (with 4-fold evaluation)
Quadrature decoder	1-, 2-, or 4-fold evaluation
Zero-pulse latch	16 bit
Commands	read, set, enable
Special features	–
Operating temperature	-25...+60 °C
Approvals	CE, UL, Ex
Weight	approx. 85 g
Further information	<a href="http://www.beckhoff.com/KL5101">www.beckhoff.com/KL5101</a>
Special terminals	
Distinguishing features	

<p>1-channel incremental encoder interface, 16 bit, single-ended, 24 V DC</p>	<p>1-channel incremental encoder interface, 32 bit, single-ended, 24 V DC</p>	<p>2-channel incremental encoder interface, 32 bit, single-ended, 24 V DC</p>
<p>KL5111   KS5111</p>	<p>KL5151   KS5151</p>	<p>KL5152   KS5152</p>
<p>incremental encoder interface 24 V DC, EN 61131-2, type 1, "0": &lt; 5 V DC, "1": &gt; 15 V DC, typ. 5 mA</p>		
<p>1 incremental encoder</p>		<p>2 incremental encoders</p>
<p>A, B, C; 24 V (low: &lt; 3 V, high: &gt; 18 V)</p>	<p>A, B, C, gate/latch, 24 V</p>	<p>A1, B1, A2, B2, 24 V</p>
		
<p>The KL5111 Bus Terminal is an interface for the direct connection of 24 V incremental encoders. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. The state of the counter is transmitted quickly and securely to the PC, PLC or CNC over the fieldbus. Interval measurement with a resolution of 200 ns is possible.</p>	<p>The KL5151 Bus Terminal is an interface with 24 V inputs for the direct connection of incremental encoders. A 32 bit counter with a quadrature decoder and a 32 bit latch for the zero pulse can be read, set or enabled. The KL5151 inputs can optionally be used as single or two-counter inputs.</p>	<p>The KL5152 Bus Terminal is an interface with 24 V inputs for the direct connection of incremental encoders. Two 32 bit counters with quadrature decoders can be read or set.</p>
<p>24 V DC (-15 %/+20 %)</p>	<p>24 V DC (-15 %/+20 %)</p>	<p>24 V DC (-15 %/+20 %)</p>
<p>–</p>	<p>–</p>	<p>–</p>
<p>typ. 40 mA</p>	<p>typ. 40 mA</p>	<p>typ. 40 mA</p>
<p>24 V DC</p>	<p>24 V DC</p>	<p>24 V DC</p>
<p>–</p>	<p>–</p>	<p>–</p>
<p>16 bit, binary</p>	<p>32 bit, binary</p>	<p>32 bit, binary</p>
<p>1 million increments/s (with 4-fold evaluation)</p>	<p>400,000 increments/s (with 4-fold evaluation)</p>	<p>400,000 increments/s (with 4-fold evaluation)</p>
<p>4-fold evaluation</p>	<p>4-fold evaluation</p>	<p>4-fold evaluation</p>
<p>16 bit</p>	<p>32 bit</p>	<p>–</p>
<p>read, set, enable</p>	<p>read, set, enable</p>	<p>read</p>
<p>–</p>	<p>–</p>	<p>–</p>
<p>0...+55 °C</p>	<p>-25...+60 °C</p>	<p>0...+55 °C</p>
<p>CE, UL, Ex</p>	<p>CE, UL, Ex</p>	<p>CE, UL, Ex</p>
<p>approx. 60 g</p>	<p>approx. 50 g</p>	<p>approx. 50 g</p>
<p>www.beckhoff.com/KL5111</p>	<p>www.beckhoff.com/KL5151</p>	<p>www.beckhoff.com/KL5152</p>
<p>KL5111-00xx</p>	<p>KL5151-0021</p>	
<p>special terminals see page 685</p>	<p>incremental encoder 1 x 32 bit A, B, capture input and 1 driver output 24 V, 0.5 A</p>	

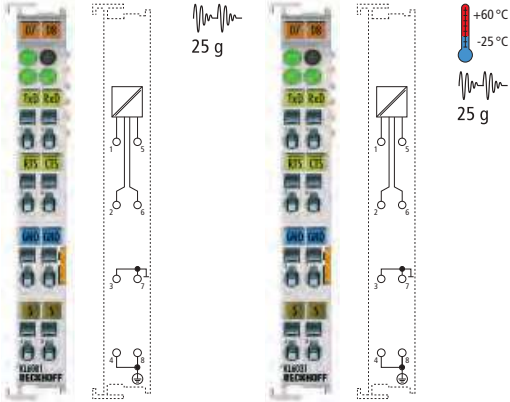
# Communication | Serial interfaces

The KL60xx serial interfaces enable the connection of devices with RS232 or RS422/RS485 interfaces to the control level. The devices connected to the Bus Terminals communicate via the coupler and the network with the automation device. The active communication channel operates independently of the higher-level bus system in full duplex mode at up to 115.2 kbaud. This way, any desired number of serial interfaces can be used in the application without having to consider structural restrictions in the control device. The serial interface can be positioned close to the place of use, this way reducing the necessary cable lengths.

The RS232 interface enables high resistance to interference by means of electrically isolated signals, which in the case of the KL6021 is additionally supported by differential signal transmission according to RS422.

Serial interface RS232,  
up to 19,200 baud

Serial interface RS232,  
up to 115.2 kbaud

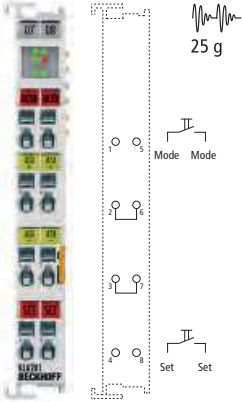
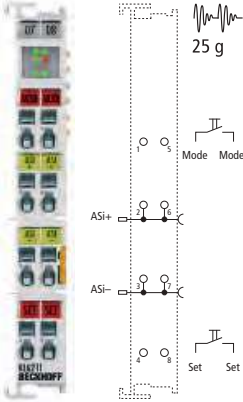
Technical data	KL6001   KS6001	KL6031   KS6031
Technology	RS232	
Data transfer rates	1,200...19,200 baud; default: 9,600 baud, 8 data bits, no parity and one stop bit	4,800...115,200 baud; default: 9,600 baud, 8 data bits, no parity and one stop bit
Data transfer channels	2 (1/1), TxD and RxD, full duplex	2 (1/1), TxD and RxD, full duplex
		
	<p>The KL6001 and KL6031 serial interfaces allow devices with an RS232 interface to be connected. The interface operates in conformity with the CCITT V.28/DIN 66 259-1 standards. The active communication channel operates independently of the higher-level bus system in full duplex mode at up to 19,200 baud (KL6001) or 115.2 kbaud (KL6031). The RS232 interface guarantees high immunity to interference through electrically isolated signals.</p>	
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer	1024 bytes receive buffer, 128 bytes transmit buffer
Current consumption power contacts	– (no power contacts)	
Current consumpt. K-bus	typ. 55 mA	typ. 55 mA
Cable length	max. 15 m	max. 15 m
Line impedance	–	
Special features	high interference immunity, electrically isolated signals	high interference immunity, electrically isolated signals
Operating temperature	0...+55 °C	-25...+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL
Weight	approx. 80 g	approx. 80 g
Further information	<a href="http://www.beckhoff.com/KL6001">www.beckhoff.com/KL6001</a>	<a href="http://www.beckhoff.com/KL6031">www.beckhoff.com/KL6031</a>
Special terminals	KL6001-0020	
Distinguishing features	standard format 5 bytes of user data	

Serial interface RS422/RS485, up to 19,200 baud	Serial interface RS422/RS485, up to 115.2 kbaud	Serial interface TTY, 20 mA current loop	Data exchange terminal with serial interface
<b>KL6021</b>   KS6021	<b>KL6041</b>   KS6041	<b>KL6011</b>   KS6011	<b>KL6051</b>   KS6051
RS422/RS485	RS422/RS485	TTY	2 x RS422
1,200...19,200 baud; default: 9,600 baud, 8 data bits, no parity and one stop bit	4,800...115,200 baud; default: 9,600 baud, 8 data bits, no parity and one stop bit	1,200...19,200 baud; default: 9,600 baud, 8 data bits, no parity and one stop bit	62,500 baud, 32 bit bidirectional data exchange between two KL6051
TxD and RxD, full/half duplex	TxD and RxD, full/half duplex	2 (1/1), TxD and RxD, full duplex	TxD and RxD, full duplex
<p>The KL6021 and KL6041 serial interfaces allow devices with an RS422 or RS485 interface to be connected. The active communication channel operates independently of the higher-level bus system in full or half duplex mode at up to 19,200 baud (KL6021) or 115.2 kbaud (KL6041). The transmission of differential signals conforms to RS422 and guarantees high immunity to interference through electrically isolated signals.</p>		<p>The KL6011 serial interface allows devices with a 20 mA current loop interface to be connected. The interface operates passively. The current interface (TTY) guarantees high immunity to interference through electrically isolated signals with injected current.</p> <p>Under the terminal's default setting, 32 inputs and 32 outputs are transferred between the fieldbus systems. The time to exchange the data is about 5 ms for 32 bits of I/O. The exchange of data with the Bus Coupler is indicated by the run LED. The TxD and RxD LEDs indicate the state of the signal transmission.</p>	
128 bytes receive buffer, 16 bytes transmit buffer – (no power contacts)	1024 bytes receive buffer, 128 bytes transmit buffer – (no power contacts)	128 bytes receive buffer, 16 bytes transmit buffer – (no power contacts)	32 bit bidirectional – (no power contacts)
typ. 65 mA	typ. 65 mA	typ. 55 mA	typ. 65 mA
approx. 1,000 m twisted pair	approx. 1,000 m twisted pair	max. 1,000 m twisted pair	approx. 1,000 m twisted pair
120 Ω	120 Ω	–	120 Ω
high interference immunity, electrically isolated signals	high interference immunity, electrically isolated signals	2 x 20 mA bit transfer	automatic data exchange
0...+55 °C	-25...+60 °C	0...+55 °C	0...+55 °C
CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
www.beckhoff.com/KL6021	www.beckhoff.com/KL6041	www.beckhoff.com/KL6011	www.beckhoff.com/KL6051
<b>KL6021-002x</b> special terminals see page 685		<b>KL6011-0020</b> standard format 5 bytes of user data	

# Communication | AS-Interface

The AS-Interface master terminal is an extended master according to the M3 profile and enables the direct connection of AS-Interface slaves. The AS-compliant interface supports digital and analog slaves with the versions 2.0 and 2.1, safety slaves and slaves with Combined Transaction Type 1 (profile S-7.3 and 7.4). Process data exchange, parameterisation and the diagnosis are fieldbus-independent. Together with the various Bus Couplers, the KL6201 or the KL6211 represents a universal AS-Interface/fieldbus gateway. Together with the BK3120, the PROFIBUS DP V1 services can be used for communication with the KL6201 or the KL6211. Unlike the KL6201 AS-Interface master terminal, the KL6211 features power contacts. This enables direct connection to the AS-Interface supply via the KL9520 AS-Interface potential feed terminal or the KL9528 power supply terminal.

KL9520, KL9528 | AS-Interface system terminals see page [682](#)

	AS-Interface master terminal	AS-Interface master terminal with power contacts
<b>Technical data</b>	KL6201   KS6201	KL6211   KS6211
<b>Technology</b>	AS-Interface	
<b>Cycle time</b>	max. 5 ms (31 devices)	
<b>Number of channels</b>	1	1
		
<b>Specification version</b>	AS-Interface V 2.0, V 2.1	AS-Interface V 2.0, V 2.1
<b>Current consumption power contacts</b>	– (no power contacts)	typ. 60 mA + load
<b>Current consumption K-bus</b>	typ. 55 mA (K-bus), approx. 60 mA (AS-Interface)	typ. 55 mA (K-bus), approx. 60 mA (AS-Interface)
<b>Number of slaves</b>	31 for V 2.0, 62 for V 2.1	31 for V 2.0, 62 for V 2.1
<b>Slave types</b>	digital and analog	
<b>AS-Interface address assignment</b>	via configuration or automatic	
<b>Diagnostics</b>	power failure, slave failure, parameterisation fault	
<b>Connection</b>	2 lines via spring force technology	
<b>Operating temperature</b>	0...+55 °C	
<b>Approvals</b>	CE, UL, Ex	
<b>Weight</b>	approx. 55 g	
<b>Further information</b>	<a href="http://www.beckhoff.com/KL6201">www.beckhoff.com/KL6201</a>	
<b>Special terminals</b>	KL6201-001x	KL6211-0011
<b>Distinguishing features</b>	special terminals see page <a href="#">685</a>	preset to 38 bytes K-bus interface (4 K-bus cycles 62 AS-Interface slaves)

# Communication | Wireless data exchange

The KM6551 terminal module is a data exchange unit for radio technology. The KM module is based on the IEEE802.15.4 standard. Data are exchanged or transferred via radio between two stand-alone control units, independent of the higher-level fieldbus. The outdoor range between two KM6551 units can be up to 300 m.

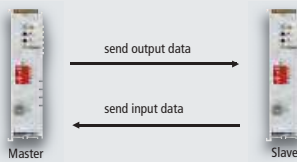
The data exchange module has a reverse SMA plug (Straight Medium Adapter) for connection of various radio antennas. The free choice of antenna enables adaptation to the respective environment. Status and data exchange are displayed via LEDs, thereby offering fast and simple diagnostics. A library is available for using the KM6551 module with TwinCAT.

Wireless data exchange terminal

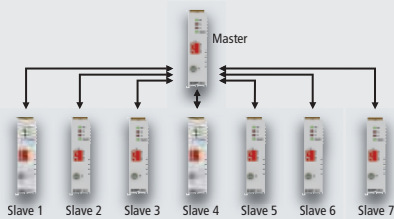
<b>Technical data</b>	KM6551	
<b>Technology</b>	wireless data exchange	
<b>Data transfer rates</b>	250 kbit	
<b>Number of channels</b>	1 radio connection	
<b>Protocol</b>	IEEE 802.15.4	
<b>Current consumption power contacts</b>	– (no power contacts)	
<b>Current consumpt. K-bus</b>	typ. 135 mA	
<b>Frequency band</b>	2.4 GHz	
<b>Antenna connection</b>	reverse SMA plug (RP-SMA)	
<b>Operating temperature</b>	0...+55 °C	
<b>Approvals</b>	CE, UL	
<b>Weight</b>	approx. 85 g	
<b>Further information</b>	<a href="http://www.beckhoff.com/KM6551">www.beckhoff.com/KM6551</a>	
<b>Accessories</b>		
ZS6200-0400	omni-directional antenna 4 dBi	694
ZS6100-0900	directional antenna 9 dBi	694
ZS6201-0410	rod antenna 4 dBi	694
ZS6201-0500	rod antenna 5 dBi	695
ZS6100-1800	directional antenna 18 dBi	695
ZK6000-0102-0020	coaxial cable, 50 Ω impedance, 2 m	695
ZK6000-0102-0040	coaxial cable, 50 Ω impedance, 4 m	695



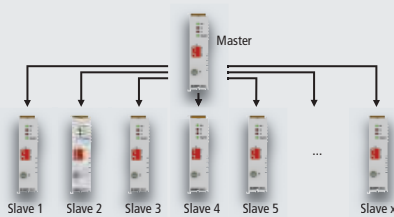
Option 1 | Data exchange peer-to-peer



Option 2 | Data exchange up to max. 7 devices



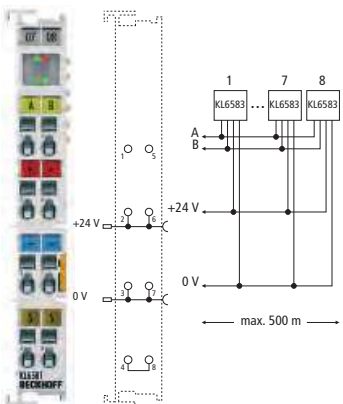


Option 3 | Broadcast up to x devices





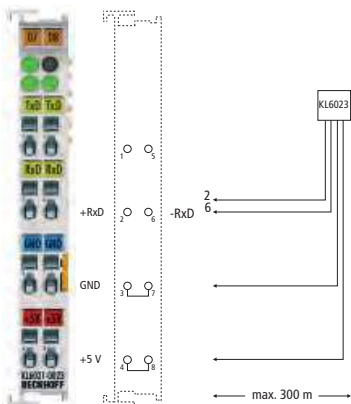

# Communication | EnOcean, bidirectional



	EnOcean master terminal	EnOcean transmitter and receiver, 868.35 MHz	EnOcean transmitter and receiver, 315 MHz
<b>Technical data</b>	<b>KL6581</b>	<b>KL6583</b>	<b>KL6583-0100</b>
<b>Technology</b>	EnOcean		
<b>Data transfer rates</b>	125 kbaud	–	–
<b>Number of channels</b>	1	–	–
	 <p>The bidirectional EnOcean technology receives signals from battery-less sensors or transmits data to actuators. With a radio signal range of 30 m, the wiring of buildings can be simplified significantly. The KL6581 EnOcean master terminal is the link between up to eight KL6583 EnOcean transmitter and receiver modules and the application.</p>	 <p>The KL6583 EnOcean module enables EnOcean data to be transmitted and received. An antenna is integrated in the device. The KL6583 module is supplied with 24 V and offers a bus connection to the KL6581 EnOcean master terminal. The KL6583 is addressed via an address selection switch. Up to eight KL6583 modules can be connected to a KL6581.</p>	 <p>The KL6583-0100 EnOcean module enables EnOcean data to be transmitted and received. An antenna is integrated in the device. The KL6583-0100 module is supplied with 24 V and offers a bus connection to the KL6581 EnOcean master terminal. The KL6583-0100 is addressed via an address selection switch. Up to eight KL6583-0100 modules can be connected to a KL6581.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (via KL6581)	24 V DC (via KL6581)
<b>Current consum. pow. cont.</b>	typ. 20 mA + load	typ. 20 mA (24 V DC)	typ. 20 mA (24 V DC)
<b>Current consumpt. K-bus</b>	typ. 60 mA	–	–
<b>Cable length</b>	max. 500 m	max. 500 m	max. 500 m
<b>Connection</b>	2 x 2-wires directly at the KL6583 (connection of max. 8 KL6583)	2 x 2-wires directly at the KL6581 Bus Terminal	2 x 2-wires directly at the KL6581 Bus Terminal
<b>Data transfer standard</b>	–	bidirectional	bidirectional
<b>Frequency band</b>	–	868.35 MHz (CE)	315 MHz (FCC)
<b>Data transfer range</b>	–	300 m in the free field, 30 m within buildings	300 m in the free field, 30 m within buildings
<b>Special features</b>	up to 8 KL6583 EnOcean transmitter and receiver modules	connection to KL6581 EnOcean master	connection to KL6581 EnOcean master
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C
<b>Weight</b>	approx. 85 g	approx. 90 g	approx. 90 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL6581">www.beckhoff.com/KL6581</a>	<a href="http://www.beckhoff.com/KL6583">www.beckhoff.com/KL6583</a>	<a href="http://www.beckhoff.com/KL6583-0100">www.beckhoff.com/KL6583-0100</a>

# Communication | EnOcean, unidirectional

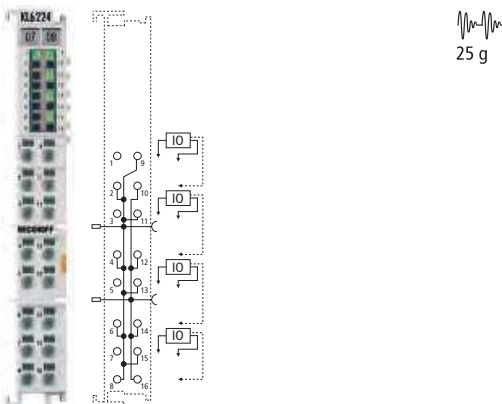
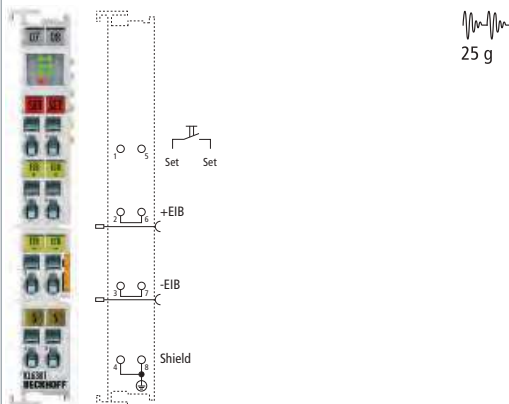


	Serial interface for processing signals from the KL6023 wireless adapter with EnOcean radio technology	Wireless adapter for EnOcean radio technology
<b>Technical data</b>	<b>KL6021-0023</b>	<b>KL6023</b>
<b>Technology</b>	EnOcean	
<b>Data transfer rates</b>	9,600 baud	–
<b>Number of channels</b>	1	–
	 <p>The KL6021-0023 serial interface enables connection of a KL6023 wireless adapter. It processes the RS485 signals of the wireless adapter.</p>	 <p>The KL6023 Wireless Adapter receives signals from battery-less sensors with EnOcean technology. These signals are converted by the Wireless Adapter to a RS485 signal and directly processed further by the KL6021-0023 serial Bus Terminal. The system does not limit the number of transmitters per receiver unit. In practice, between 25 and 100 transmitters per receiver are used.</p>
<b>Nominal voltage</b>	–	via KL6021-0023
<b>Current consumption power contacts</b>	– (no power contacts)	–
<b>Current consumpt. K-bus</b>	typ. 65 mA	–
<b>Cable length</b>	max. 300 m	max. 300 m
<b>Connection</b>	2 x 2-wires directly at the KL6023 EnOcean module	2 x 2-wires directly at the KL6021-0023 Bus Terminal
<b>Data transfer standard</b>	–	unidirectional
<b>Frequency band</b>	–	868.35 MHz
<b>Data transfer range</b>	–	300 m in the free field, 30 m within buildings
<b>Special features</b>	high interference immunity, electrically isolated signals	connection to KL6021-0023 serial interface
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Weight</b>	approx. 60 g	approx. 55 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL6021">www.beckhoff.com/KL6021</a>	<a href="http://www.beckhoff.com/KL6023">www.beckhoff.com/KL6023</a>

# Communication | IO-Link, EIB/KNX, LON, MP-Bus, M-Bus



## EIB/KNX

	IO-Link master terminal	EIB/KNX Bus Terminal
<b>Technical data</b>	<b>KL6224</b>	<b>KL6301</b>
<b>Technology</b>	IO-Link	EIB/KNX
<b>Data transfer rates</b>	4.8 kbaud, 38.4 kbaud and 230.4 kbaud	9,600 baud
<b>Number of channels</b>	4	1
	 <p>The KL6224 IO-Link terminal enables connection of up to four IO-Link devices, e.g. actuators, sensors or combinations of both. A point-to-point connection is used between the terminal and the device. The terminal is parameterised via the master. 2-wire and 3-wire connections are supported. IO-Link is designed as an intelligent link between the fieldbus level and the sensor, wherein parameterisation information can be exchanged bidirectionally via the IO-Link connection. The parameterisation of the IO-Link devices with service data can be done from TwinCAT via register communication.</p> <p>In the standard setting, the KL6224 functions as a 4-channel input terminal, 24 V DC, which communicates with connected IO-Link devices, parameterises them and, if necessary, changes their operating mode.</p>	 <p>The KL6301 EIB/KNX Bus Terminal is integrated in an EIB/KNX network and can receive/transmit data from/to other EIB/KNX devices. The Bus Terminal is commissioned or configured via TwinCAT function blocks. Several KL6301 can be used with a single Bus Coupler or a Bus Terminal Controller. Up to 256 group addresses can be received; sending is only limited by the application.</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Current consumption power contacts</b>	no data	–
<b>Current consumpt. K-bus</b>	typ. 85 mA	typ. 55 mA
<b>Data transfer standard</b>	–	twisted pair (TP)
<b>Bus access</b>	–	CSMA/CA
<b>Special features</b>	–	TwinCAT library: TwinCAT PLC EIB
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE, UL, Ex
<b>Weight</b>	approx. 60 g	approx. 85 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL6224">www.beckhoff.com/KL6224</a>	<a href="http://www.beckhoff.com/KL6301">www.beckhoff.com/KL6301</a>

# LON



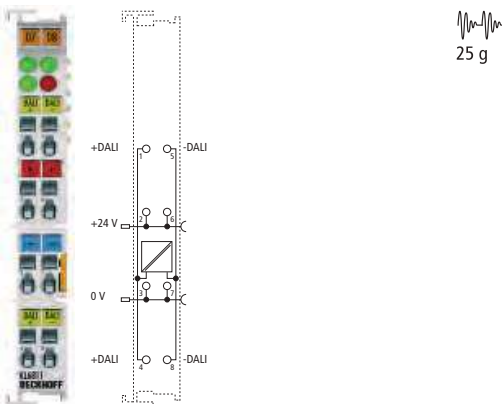
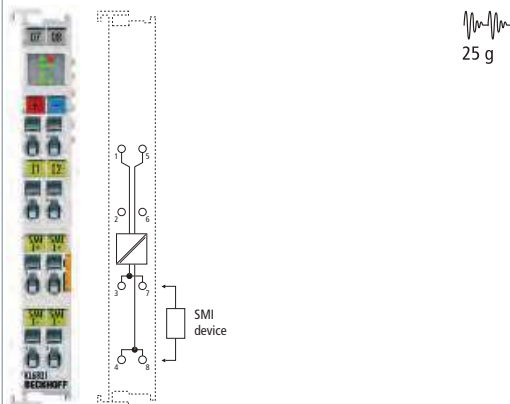
# M-Bus

	LON Bus Terminal	MP-Bus master terminal	M-Bus master terminal
	<b>KL6401</b>	<b>KL6771   KS6771</b>	<b>KL6781</b>
	LON	MP-Bus	M-Bus
	78 kbit/s	1,200 baud	300...9,600 baud (default 2,400 baud)
	1	1	1
	<p>The KL6401 LON Bus Terminal enables direct connection of LON devices. Several KL6401 can be used with a single Bus Coupler or a Bus Terminal Controller. The KL6401 supports 62 SNVTs. All SNVT types can be configured as input or output variable via the KS2000 software. The KS2000 software generates an XIF file that is integrated in an LON tool.</p>	<p>The MP-Bus master terminal enables direct connection of MP-Bus slave devices. Up to sixteen field devices, eight drives and eight sensors can be connected to the KL6771. The Bus Terminal is configured and commissioned via TwinCAT function blocks. Several KL6771 terminals can be connected to the same Bus Coupler or Bus Terminal Controller.</p>	<p>The KL6781 M-Bus master terminal enables the direct connection of M-Bus devices. The M-Bus (Meter Bus) is a fieldbus for the acquisition of consumption data from electricity, water, gas or energy meters. The KL6781 does not contain the M-Bus protocol; instead, it converts the data present on the terminal bus into M-Bus compliant physics. 24 byte data are available on the K-bus for this. In conjunction with the TwinCAT M-Bus library, it is possible to work without an external M-Bus gateway, i.e. the M-Bus devices can be connected directly to the KL6781. With a total cable length of 300 m, up to 40 M-Bus devices (each with a current consumption of 1.5 mA) can be connected.</p>
	24 V DC (-15 %/+20 %) only load	24 V DC (-15 %/+20 %) typ. 10 mA + load	24 V DC (-15 %/+20 %) max. 250 mA
	typ. 55 mA	typ. 55 mA	typ. 65 mA
	FTT-10, LPT	MP-Bus	M-Bus physics
	CSMA	polling	master-slave mode (polling)
	15 devices; TwinCAT library: TwinCAT PLC LON	8 drives/sensors; TwinCAT library: TwinCAT PLC MP-Bus	connection of up to 40 M-Bus devices; TwinCAT library: TwinCAT PLC M-Bus
	0...+55 °C	0...+55 °C	0...+55 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL
	approx. 85 g	approx. 85 g	approx. 60 g
	<a href="http://www.beckhoff.com/KL6401">www.beckhoff.com/KL6401</a>	<a href="http://www.beckhoff.com/KL6771">www.beckhoff.com/KL6771</a>	<a href="http://www.beckhoff.com/KL6781">www.beckhoff.com/KL6781</a>

# Communication | DALI, SMI

## DALI



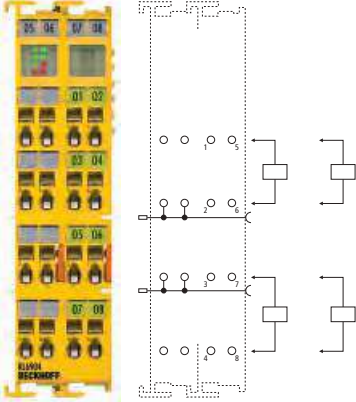
	DALI/DSI master and power supply terminal	SMI terminal	
<b>Technical data</b>	KL6811   KS6811	KL6831	KL6841
<b>Technology</b>	DALI/DSI	SMI	
<b>Data transfer rates</b>	1,200 baud	2,400 baud	
<b>Number of channels</b>	1	1	
	 <p>The KL6811 enables the connection of up to 64 DALI slaves. The KS2000 software enables simple configuration via a PC that is directly coupled with the Bus Coupler via an RS232 interface or via the fieldbus. The integrated power supply unit generates an electrically isolated 24 V DC output voltage. No further components are required for the operation of the DALI slaves. The KL6811 operates fieldbus-independent.</p>	 <p>The KL6831 and KL6841 Bus Terminals connect the Bus Terminal system with the SMI bus system. SMI (Standard Motor Interface) is used for controlling and exact positioning of roller shutter and sun protection device drives. In conjunction with intelligent energy and lighting management the blades can be positioned and moved according to the sun's position. Up to 16 drives can be connected via an SMI terminal. The KL6831 is suitable for LoVo SMI devices, the KL6841 is used for interfacing of 230 V AC SMI devices.</p>	
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	LoVo	230 V AC
<b>Current consumption power contacts</b>	typ. 30 mA + load	-	
<b>Current consumpt. K-bus</b>	typ. 55 mA	typ. 55 mA	
<b>Data transfer standard</b>	DALI	SMI	
<b>Special features</b>	connection of up to 64 DALI slaves; TwinCAT library: TwinCAT PLC DALI	2 digital inputs for simplified commissioning, TwinCAT library: TwinCAT PLC SMI, only for Beckhoff controllers	
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	
<b>Approvals</b>	CE, UL, Ex	CE	
<b>Weight</b>	approx. 80 g	approx. 80 g	
<b>Further information</b>	<a href="http://www.beckhoff.com/KL6811">www.beckhoff.com/KL6811</a>	<a href="http://www.beckhoff.com/KL6831">www.beckhoff.com/KL6831</a>	

# Communication | TwinSAFE

TwinSAFE enables networks with up to 1,024 TwinSAFE devices. The KL6904 Bus Terminal features certified safety function blocks, which are configured according to the application to be realised. Functions such as emergency stop, safety door monitoring etc. can thus easily be selected and linked. All blocks can be freely connected among each other and are complemented by operators such as AND, OR, etc. The necessary functions are configured using the TwinCAT System Manager and loaded into the terminal via the fieldbus.

For further information on TwinSAFE and the TwinSAFE products see page [966](#)

TwinSAFE Logic Bus Terminal,  
4 safe outputs

<b>Technical data</b>	<b>KL6904</b>
<b>Technology</b>	TwinSAFE Logic
<b>Safety standard</b>	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
<b>Number of outputs</b>	4
<b>Protocol</b>	TwinSAFE/Safety over EtherCAT
	 <p>The KL6904 TwinSAFE Logic Bus Terminal can establish 15 connections (TwinSAFE connections). The TwinSAFE logic terminal has four safe, local outputs, so that safety applications can be realised with only two components (KL1904 and KL6904).</p>
<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)
<b>Current consum. pow. cont.</b>	load-dependent
<b>Current consumpt. K-bus</b>	250 mA
<b>Cycle time</b>	4...100 ms
<b>Fault response time</b>	≤ watchdog time (parameterisable)
<b>Output current</b>	0.5 A max./20 mA min. (per channel)
<b>Permitted degree of contamination</b>	2
<b>Climate class EN 60721-3-3</b>	3K3
<b>Installation position</b>	horizontal
<b>Special features</b>	4 safe outputs
<b>Operating temperature</b>	0...+55 °C
<b>EMC immunity/emission</b>	conforms to EN 61000-6-2/EN 61000-6-4
<b>Vibration/shock resistance</b>	conforms to EN 60068-2-6/EN 60068-2-27
<b>Approvals</b>	CE, UL, Ex, TÜV SÜD
<b>Weight</b>	approx. 90 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL6904">www.beckhoff.com/KL6904</a>
<b>Special terminals</b>	<b>KL6904-0001</b>
<b>Distinguishing features</b>	pre-configured ex factory to 15 TwinSAFE connections

# Manual operating modules with K-bus interface

The manual operating modules have been developed for the switching, controlling and observation of digital and analog signals. They enable the setting and reading of data and values in the case of failure of a controller, without having to open the control cabinet.

The manual operating modules can be installed in the control cabinet door using a snap-in technique; they are wired inside the control cabinet. Up to 31 modules can be inserted via the K-bus interface with K-bus extension. Connection to the KL9309 signal-independent transfer terminal takes place via the 20-pin shielded signal cable ZK8500-8282-70x0. Connection to the Bus Terminal strand takes place via the KL9020 end terminal for bus extension. The signals are electrically isolated. Power and error LEDs indicate the status of the modules.

The electrically functionless KL8500 placeholder module covers the cut-out in the control cabinet in such a way that functional units can be retrofitted simply by exchanging the module.

KL9309 | Adapter terminal for manual operating modules see page [678](#)

KL9020 | End terminal for bus extension see page [678](#)

ZK8500-8282-70x0 | Signal cable for manual operating modules see page [690](#)

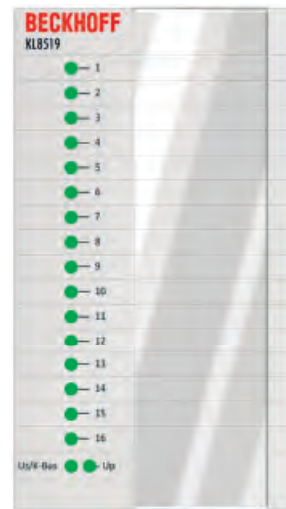
ZK1090-0101-1xxx | K-bus extension cable see page [689](#)

Additional information

► [www.beckhoff.com/KL85xx](http://www.beckhoff.com/KL85xx)

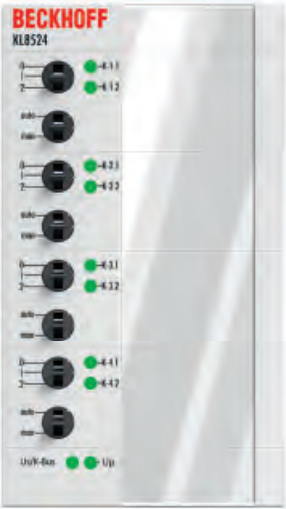


16-channel digital input signal module

Technical data	KL8519
Number of inputs	16
Number of outputs	–
Input filter	3.0 ms
Output current	–
Resolution	–



The KL8519 is a 16-channel digital input signal module. 16 digital inputs can be connected, which indicate their status via LEDs and transmit the data to the controller. The LEDs are bicolor LEDs in the colours red and green and can be parameterised individually to suit the needs of the plant. The LEDs can also be addressed by the controller.

Nominal voltage	24 V DC (-15 %/+20 %)
Current consumpt. K-bus	50 mA
Switch settings	–
Diagnostics LED	bicolor LEDs, green and red
Bus interface	K-bus connection IN/OUT
Special features	–
Weight	approx. 150 g
Operating temperature	0...+55 °C
Approvals	CE
Further information	<a href="http://www.beckhoff.com/KL8519">www.beckhoff.com/KL8519</a>

4 x 2-channel digital output module	8-channel digital output module	8-channel analog output module 0...10 V
KL8524	KL8528	KL8548
-	-	8 (potentiometer)
2 x 4	8	8 (0...10 V)
-	-	-
0.5 A	0.5 A	-
-	-	12 bit
		
<p>The KL8524 is a 4 x 2-channel digital output module, each equipped with two switches. The first is for switching between manual and automatic operation, while the second is used to set a 2-stage output. It is possible to specify when and how the two outputs are switched. The status is indicated by a bicolour LED in green and yellow. The switching positions are readable via the PLC.</p>	<p>The KL8528 is an 8-channel digital output module. The outputs can be switched via a switch or specified by the controller. The status is indicated by a bicolour LED in green and yellow. The switching positions are readable via the PLC.</p>	<p>The KL8548 is an 8-channel analog output module for 0 to 10 V. The analog values must be specified individually for each channel via the controller or via a potentiometer. The actual output value is indicated by a bar graph. The position of the potentiometer is readable by the controller in each mode of operation.</p>
24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
40 mA	40 mA	50 mA in ECO mode, 95 mA in full scale mode
auto/manual, mode 0/1/2	auto/off/on	auto/manual, potentiometer
bicolor LEDs, green and yellow	bicolor LEDs, green and yellow	yellow
K-bus connection IN/OUT	K-bus connection IN/OUT	K-bus connection IN/OUT
State of the switch can be read by the controller.	State of the switch can be read by the controller.	Potentiometers and switches can be read via the PLC. Analog values are displayed in the form of bar charts.
approx. 160 g	approx. 160 g	approx. 215 g
0...+55 °C	0...+55 °C	0...+55 °C
CE	CE	CE
www.beckhoff.com/KL8524	www.beckhoff.com/KL8528	www.beckhoff.com/KL8548




# Power terminals | Siemens contactor, series Sirius 3R

The KL8001 power terminal, together with a power contactor, forms a complete distributed motor starter with any fieldbus connection. Apart from all the protective functions of a motor protection relay, the power terminal contains comprehensive diagnostics. By means of values such as current, voltage, active-power input and apparent power consumption or load condition, the control programmer is able to regulate the drive or a machine component in the best possible way and to protect them from damage and failure. The Bus Terminal block is fitted with a KL9060 adapter terminal instead of a KL9010 end terminal. The KL9060 is connected to a power terminal using a simple ribbon cable. Up to ten power terminals can be driven by one KL9060. No other wiring is necessary apart from a ground cable.

The power terminal switches the installed contactor and takes over all the functions of the motor protection relay. Apart from its purely protective function of switching off the motor when overloaded, the power terminal can carry out numerous diagnostic functions on the motor and make the information available to the controller via the fieldbus.

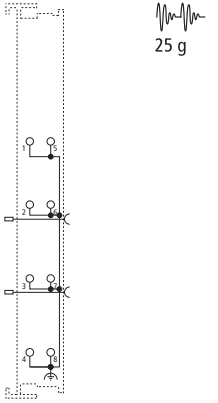
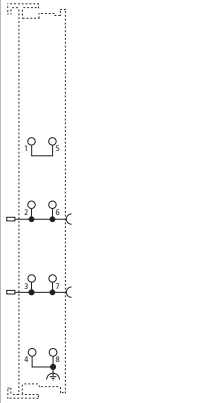
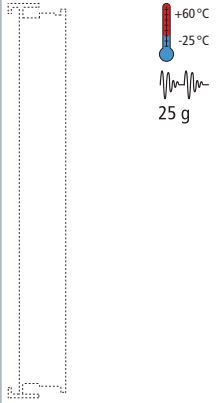
KL9060 | End terminal with adapter connection for KL8001 power terminals  
see page **678**

Power terminal for Siemens contactor, series Sirius 3R

Technical data	KL8001
Contactor	connection mechanism for Siemens contactor series Sirius 3R (switch size S00, Typ 3RT 10 1)
Measured values	current, voltage, power
Number of power terminals	up to 10 (at 140 mA typ. current consumption per contactor)
	 <p>Like a standard motor protection relay the KL8001 power terminal is fitted to a power contactor up to a switching capacity of 5.5 kW.</p>
Measuring accuracy	0.1 A AC
Current consumption power contacts	typ. 7 mA + load
Current consumpt. K-bus	typ. 150 mA
Measuring voltage	500 V AC
Power contacts	24 V DC (-15 %/+20 %)/1.4 A max., short-circuit-proof
Setting range of nominal current	0.9...9.9 A
Current load	max. 25 A (fuse)
Short-circuit-proof	up to 5 kA
Internal resistance	< 1 mΩ
Tripping classes	class 5, 10, 15, 20, 25, 30 selectable
Type of connection power path	screw terminals up to 2 x 2.5 mm <sup>2</sup>
Type of K-bus connection	2 x flat plug socket, 10-pin
Adapter terminal	KL9060
Short circuit behaviour	conforms to EN 60947-4-1 (assignment type 2)/VDE 102
Triggering tolerance	conforms to IEC 947, as well as UL and CSA
Operating temperature	0...+55 °C
Approvals	CE
Weight	approx. 90 g
Further information	<a href="http://www.beckhoff.com/KL8001">www.beckhoff.com/KL8001</a>

# System terminals | Function terminals

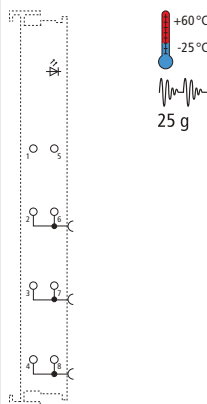
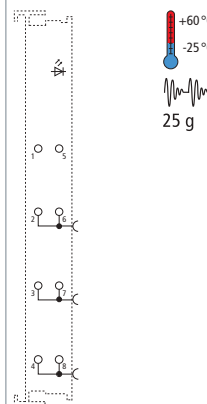
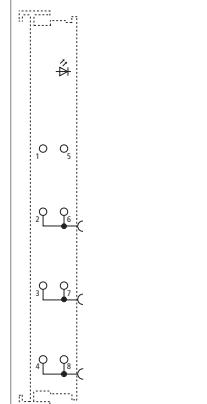
The KL9195 Bus Terminal can be used for the connection of screens. The KL9195 connects the spring force contacts directly to the DIN rail, and can optimally ground incoming electromagnetic radiation. The two power contacts are looped through by the KL9195, allowing two wires to be connected to each power contact. The KL9010 bus end terminal is necessary for data exchange between the Bus Coupler and the Bus Terminals. Each assembly must be terminated at the right hand end with a KL9010 bus end terminal. The bus end terminal does not have any other function or connection facility. The KL9080 is used to identify potential groups (e.g. 230 V AC/24 V DC). It is inserted between two potential groups, and indicates the separation through an orange coloured cover.

	Shield terminal	Shield terminal	Separation terminal
<b>Technical data</b>	<b>KL9070</b>	<b>KL9195   KS9195</b>	<b>KL9080</b>
<b>Technology</b>	shield terminal		separation terminal
<b>Diagnostics in the process image</b>	–		
			
<b>Nominal voltage</b>	≤ 60 V	arbitrary up to 230 V AC	separation terminal
<b>Current load</b>	≤ 10 A	≤ 10 A	–
<b>Integrated fine-wire fuse</b>	–	–	–
<b>Power LED</b>	–	–	–
<b>Defect LED</b>	–	–	–
<b>PE contact</b>	–	–	–
<b>Shield connection</b>	8 x	2 x	–
<b>Current consumption K-bus</b>	–	–	–
<b>Electrical isolation</b>	yes	–	–
<b>Connection to DIN rail</b>	yes	yes	–
<b>Special features</b>	dissipation of EMC interference via large copper surfaces on the DIN rail	–	placeholder terminal with K-bus transmission
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex, GL
<b>Weight</b>	approx. 50 g	approx. 50 g	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL9070">www.beckhoff.com/ KL9070</a>	<a href="http://www.beckhoff.com/ KL9195">www.beckhoff.com/ KL9195</a>	<a href="http://www.beckhoff.com/ KL9080">www.beckhoff.com/ KL9080</a>

# System terminals | Function terminals

The power feed terminals make it possible to set up various potential groups with any desired voltages (KL9190) or with the standard voltages of 24 V DC or 230 V AC (120 V AC). The power feed terminals are available with or without fine-wire fuse. In order to monitor the supply voltage, the terminals with diagnostics report the status of the power feed terminal to the Bus Coupler through two input bits. It is thus possible for the controller to check the distributed peripheral voltage over the fieldbus. The operating point performance conforms to the input terminals KL1002 (24 V) and KL1702 (230 V).

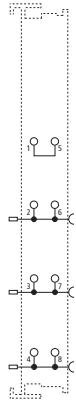
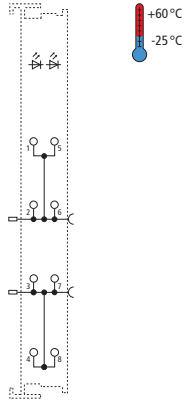
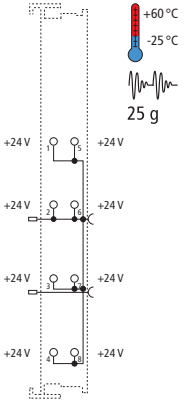
The KL9180, KL9185 and KL9195 Bus Terminals allow the supply voltage to be accessed a number of times via spring force terminals. These Bus Terminals make it unnecessary to use additional terminal blocks on the terminal strip.

	Potential supply terminal, 24 V DC	Potential supply terminal, 24 V DC, with diagnostics	Potential supply terminal, 120...230 V AC
<b>Technical data</b>	<b>KL9100   KS9100</b>	<b>KL9110   KS9110</b>	<b>KL9150   KS9150</b>
<b>Technology</b>	potential supply terminal		
<b>Diagnostics in the process image</b>	–	yes	–
			
<b>Nominal voltage</b>	24 V DC	24 V DC	120 V AC/ 230 V AC
<b>Current load</b>	≤ 10 A	≤ 10 A	≤ 10 A
<b>Integrated fine-wire fuse</b>	–	–	–
<b>Power LED</b>	green	green	green
<b>Defect LED</b>	–	–	–
<b>PE contact</b>	yes	yes	yes
<b>Shield connection</b>	–	–	–
<b>Current consumption K-bus</b>	–	typ. 10 mA	–
<b>Electrical isolation</b>	yes	yes	yes
<b>Connection to DIN rail</b>	–	–	–
<b>Special features</b>	–	–	–
<b>Operating temperature</b>	-25...+60 °C	-25...+60 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
<b>Weight</b>	approx. 50 g	approx. 50 g	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/ KL9100">www.beckhoff.com/ KL9100</a>	<a href="http://www.beckhoff.com/ KL9110">www.beckhoff.com/ KL9110</a>	<a href="http://www.beckhoff.com/ KL9150">www.beckhoff.com/ KL9150</a>

	Potential supply terminal, 120...230 V AC, with diagnostics	Potential supply terminal, any voltage up to 230 V AC	Potential supply terminal, 24 V DC, with fuse	Potential supply terminal, 24 V DC, with diagnostics and fuse	Potential supply terminal, 120...230 V AC, with fuse	Potential supply terminal, 120...230 V AC, with diagnostics and fuse	Potential supply terminal, arbitrary, with fuse
	<b>KL9160</b>   KS9160	<b>KL9190</b>   KS9190	<b>KL9200</b>	<b>KL9210</b>	<b>KL9250</b>	<b>KL9260</b>	<b>KL9290</b>
	yes	–		yes	–	yes	–
	120 V AC/ 230 V AC	arbitrary	24 V DC	24 V DC	120 V AC/ 230 V AC	120 V AC/ 230 V AC	arbitrary up to 230 V AC/DC
	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A
	–	–	...6.3 A	...6.3 A	...6.3 A	...6.3 A	...6.3 A
	green	–	green	green	green	green	–
	–	–	red	red	red	red	–
	yes	yes	yes	yes	yes	yes	yes
	–	–	–	–	–	–	–
	typ. 10 mA	–	–	typ. 10 mA	–	typ. 10 mA	–
	yes	yes	yes	yes	yes	yes	yes
	–	–	–	–	–	–	–
	–	–	integrated fuse	integrated fuse	integrated fuse	integrated fuse	integrated fuse
	0...+55 °C	0...+55 °C	0...+55 °C	-25...+60 °C	0...+55 °C	0...+55 °C	0...+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
	approx. 50 g	approx. 50 g	approx. 50 g	approx. 55 g	approx. 55 g	approx. 55 g	approx. 50 g
	<a href="http://www.beckhoff.com/KL9160">www.beckhoff.com/ KL9160</a>	<a href="http://www.beckhoff.com/KL9190">www.beckhoff.com/ KL9190</a>	<a href="http://www.beckhoff.com/KL9200">www.beckhoff.com/ KL9200</a>	<a href="http://www.beckhoff.com/KL9210">www.beckhoff.com/ KL9210</a>	<a href="http://www.beckhoff.com/KL9250">www.beckhoff.com/ KL9250</a>	<a href="http://www.beckhoff.com/KL9260">www.beckhoff.com/ KL9260</a>	<a href="http://www.beckhoff.com/KL9290">www.beckhoff.com/ KL9290</a>






# System terminals | Potential distribution

The KL918x potential distribution terminals enable – depending upon the type – the distribution of ground or supply potentials to external devices. Wiring work and separate potential distributors are saved. Eight ground points are required for the ground connection of 8-channel output terminals in 2-wire operating mode, e.g. KL2008, for which the KL9187 can be used. The KL9184 and KL9188 HD Bus Terminals (High Density) even make 16 connection points available in a compact housing.

	Potential distribution terminal, 2 terminal points per power contact	Potential distribution terminal, 4 terminal points at 2 power contacts	Potential distribution terminal, 8 x 24 V
<b>Technical data</b>	<b>KL9180   KS9180</b>	<b>KL9185   KS9185</b>	<b>KL9186   KS9186</b>
<b>Technology</b>	potential distribution terminal		
<b>Diagnostics in the process image</b>	–		
			
<b>Nominal voltage</b>	arbitrary up to 230 V AC	arbitrary up to 230 V AC	≤ 60 V DC
<b>Current load</b>	≤ 10 A	≤ 10 A	≤ 10 A
<b>Integrated fine-wire fuse</b>	–	–	–
<b>Power LED</b>	–	–	–
<b>Defect LED</b>	–	–	–
<b>PE contact</b>	yes	–	–
<b>Shield connection</b>	–	–	–
<b>Current consumption K-bus</b>	–	–	–
<b>Electrical isolation</b>	–	–	yes
<b>Connection to DIN rail</b>	–	–	–
<b>Special features</b>	–	–	8 x 24 V connection
<b>Operating temperature</b>	0...+55 °C	-25...+60 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
<b>Weight</b>	approx. 50 g	approx. 50 g	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL9180">www.beckhoff.com/KL9180</a>	<a href="http://www.beckhoff.com/KL9185">www.beckhoff.com/KL9185</a>	<a href="http://www.beckhoff.com/KL9186">www.beckhoff.com/KL9186</a>

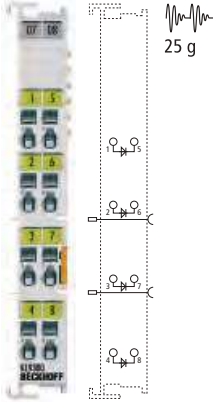
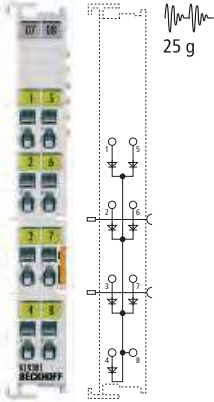
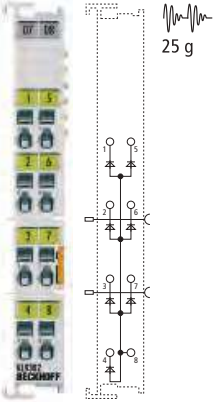
Potential distribution terminal, 8 x 0 V	Potential distribution terminal, 2 x 8 connected terminal points	Potential distribution terminal, 8 x 2 connected terminal points	Potential distribution terminal, 1 x 16 connected terminal points	Potential distribution terminal, 8 x 24 V, 8 x 0 V	Potential distribution terminal, 16 x 24 V	Potential distribution terminal, 16 x 0 V
KL9187   KS9187	KL9181	KL9182	KL9183	KL9184	KL9188	KL9189
≤ 60 V DC	≤ 60 V AC/DC	≤ 60 V AC/DC	≤ 60 V AC/DC	≤ 60 V DC	≤ 60 V DC	≤ 60 V DC
≤ 10 A	max. 10 A (per terminal point)	max. 10 A (per terminal point)	max. 10 A (per terminal point)	≤ 10 A	≤ 10 A	≤ 10 A
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–
–	–	–	–	–	–	–
yes	500 V (K-bus/field potential)	500 V (K-bus/field potential)	500 V (K-bus/field potential)	yes	yes	yes
–	–	–	–	–	–	–
8 x 0 V connection	2 x 8-way bridges	8 x 2-way bridges	16-way bridge	8 x 24 V and 8 x 0 V connection	16 x 24 V connection	16 x 0 V connection
-25...+60 °C	0...+55 °C	0...+55 °C	0...+55 °C	-25...+60 °C	-25...+60 °C	-25...+60 °C
CE, UL, Ex, GL	CE	CE	CE	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
approx. 50 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
<a href="http://www.beckhoff.com/KL9187">www.beckhoff.com/KL9187</a>	<a href="http://www.beckhoff.com/KL9181">www.beckhoff.com/KL9181</a>	<a href="http://www.beckhoff.com/KL9182">www.beckhoff.com/KL9182</a>	<a href="http://www.beckhoff.com/KL9183">www.beckhoff.com/KL9183</a>	<a href="http://www.beckhoff.com/KL9184">www.beckhoff.com/KL9184</a>	<a href="http://www.beckhoff.com/KL9188">www.beckhoff.com/KL9188</a>	<a href="http://www.beckhoff.com/KL9189">www.beckhoff.com/KL9189</a>

## System terminals | Function terminals

	End terminal	End terminal with adapter for KL8001 power terminals	End terminal for bus extension	Coupler terminal for bus extension	Adapter terminal for manual operating modules
Technical data	KL9010	KL9060	KL9020	KL9050	KL9309
Technology	end terminal			coupler terminal	adapter terminal
	 <p>+60 °C -25 °C 25 g</p>				
	Each assembly must be terminated at the right hand end with a KL9010 bus end terminal.	The KL9060 Bus Terminal enables a connection to the KL8001. For further information see page <a href="#">672</a>	The KL9020 forms a properly working unit together with a KL9050 or a KL85xx. No further parameterisation or configuration work is necessary.	The KL9050 coupler terminal is the complement to a KL9020. The second RJ45 socket allows the whole system to be extended by 31 stations.	The KL9309 adapter terminal is connected via shielded ZK8500-8282-70x0 signal cable with the KL85xx manual operation modules. Further information see page <a href="#">670</a>
Nominal voltage	–	24 V DC (-15 %/+20 %)	–	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current load	–	≤ 10 A	–	≤ 10 A	≤ 10 A
Power LED	–	–	–	green	green
Current consumption	–	–	typ. 70 mA (K-bus)	typ. 70 mA (24 V K-bus) + (total K-bus current)/4, max. 200 mA	–
Distance between stations	–	–	max. 5 m between KL9020 and KL9050	max. 5 m between KL9050 and KL9050	–
Starting current	–	–	–	2.5 x continuous current	–
Current supply K-bus	–	–	–	up to 400 mA	–
Electrical isolation	–	500 V (power contact/ supply voltage/K-bus)	500 V (power contact/ supply voltage/K-bus)	500 V (power contact/ supply voltage/fieldbus)	500 V (power contact/ supply voltage/fieldbus)
Special features	end terminal for bus communication	connection to KL8001 via 20-pin flat ribbon plug	end terminal for K-bus extension	coupler terminal for K-bus extension (max. 64 Bus Terminals)	passive Bus Terminal for the connection of KL85xx manual operating modules
Operating temperature	-25...+60 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
Approvals	CE, UL, Ex, GL	CE	CE, UL, Ex, GL	CE, Ex, GL	CE
Weight	approx. 50 g	approx. 65 g	approx. 45 g	approx. 75 g	approx. 85 g
Further information	<a href="http://www.beckhoff.com/ KL9010">www.beckhoff.com/ KL9010</a>	<a href="http://www.beckhoff.com/ KL9060">www.beckhoff.com/ KL9060</a>	<a href="http://www.beckhoff.com/ KL9020">www.beckhoff.com/ KL9020</a>	<a href="http://www.beckhoff.com/ KL9050">www.beckhoff.com/ KL9050</a>	<a href="http://www.beckhoff.com/ KL9309">www.beckhoff.com/ KL9309</a>

# System terminals | Diode array Bus Terminals

Diodes perform different tasks in control circuits. They decouple, rectify or provide for the free-running of a coil. The Bus Terminals unite diodes in different circuits and simplify integration into the control cabinet by their compact design. The circuits offered, with common anode or cathode and the individual diodes, minimise the wiring effort in the control cabinet.

	Diode array terminal, 4 potential-free diodes	Diode array terminal, 7 diodes (with a common cathode)	Diode array terminal, 7 diodes (with a common anode)
<b>Technical data</b>	KL9300   KS9300	KL9301   KS9301	KL9302   KS9302
<b>Technology</b>	free-wheeling or decoupling diodes		
<b>Number of diodes</b>	4	7	
<b>Interconnection</b>	potential-free	common cathode	common anode
			
<b>Nominal cut-off voltage</b>	1,000 V (diodes)	1,000 V (diodes)	1,000 V (diodes)
<b>Output current</b>	1 A on each diode	1 A on each diode	1 A on each diode
<b>Peak current</b>	2.5 A (100 ms)	2.5 A (100 ms)	2.5 A (100 ms)
<b>Voltage drop</b>	0.7 V typ.	0.7 V typ.	0.7 V typ.
<b>Current consumption K-bus</b>	–	–	–
<b>Isolation voltage (channel/channel)</b>	< 200 V	< 200 V	< 200 V
<b>Electrical isolation</b>	1,500 V (K-bus/field)	1,500 V (K-bus/field)	1,500 V (K-bus/field)
<b>Operating temperature</b>	0...+55 °C	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
<b>Weight</b>	approx. 50 g	approx. 55 g	approx. 55 g
<b>Further information</b>	<a href="http://www.beckhoff.com/">www.beckhoff.com/</a> KL9300	<a href="http://www.beckhoff.com/">www.beckhoff.com/</a> KL9301	<a href="http://www.beckhoff.com/">www.beckhoff.com/</a> KL9302



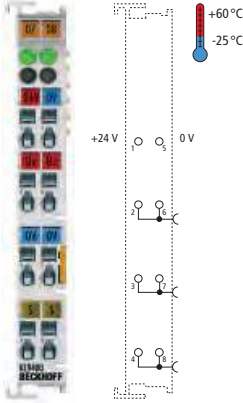
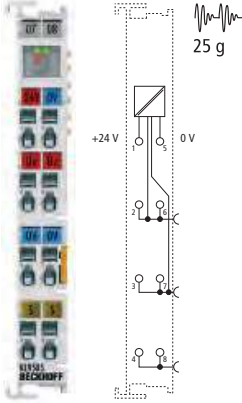
# System terminals | Power supply terminals

The KL94xx and KL95xx terminal series are designed for the modified feeding of the operating voltage into the terminal strand. The KL9400 power supply terminal enables the refreshment of the K-bus, via which data exchange takes place between Bus Couplers and Bus Terminals. Each Bus Terminal requires a certain amount of current from the K-bus (see technical data: "Current consumption K-bus"). This current is fed into the K-bus by the relevant Bus Coupler's power supply unit. When configuring a large number of Bus Terminals, the 5 V power supply to the K-bus can be increased by 2 A via the KL9400.

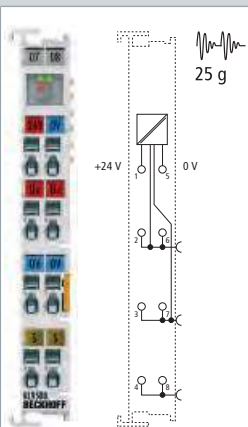
The KL95xx power supply terminals produce different output voltages from the input voltage (24 V DC) that can be accessed at the terminals. The following Bus Terminals are also supplied with this voltage via the power contacts. The power LEDs indicate the operating states of the terminals; short-circuits or overloads are indicated by the overcurrent LEDs. There is no electrical isolation of the input and output voltage.

Power supply terminal  
for refreshing the K-bus

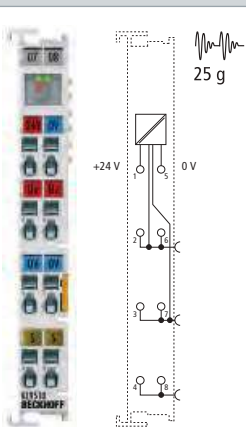
Power supply terminal,  
5 V DC

Technical data	KL9400   KS9400	KL9505   KS9505
Technology	power supply terminal	power supply terminal, 5 V DC, with diagnostics
Diagnostics	–	yes
	 <p>The diagram shows the KL9400 terminal with a temperature range of +60 °C to -25 °C. It features a +24 V input and a 0 V output. The terminal is designed for refreshing the K-bus.</p>	 <p>The diagram shows the KL9505 terminal with a weight of 25 g. It features a +24 V input and a 0 V output. The terminal generates 5 V from the fed-in 24 V without electrical isolation.</p>
Input voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Output voltage	5 V DC	5 V DC $\pm$ 1 %
Output current	2 A for K-bus supply	0.5 A
Short-circuit-proof	yes	yes
Residual ripple	–	< 5 mV
Current consumption K-bus	–	–
Electrical isolation	–	–
Special features	–	stabilised analog voltage
Operating temperature	-25...+60 °C	0...+55 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex
Weight	approx. 65 g	approx. 65 g
Further information	<a href="http://www.beckhoff.com/KL9400">www.beckhoff.com/KL9400</a>	<a href="http://www.beckhoff.com/KL9505">www.beckhoff.com/KL9505</a>

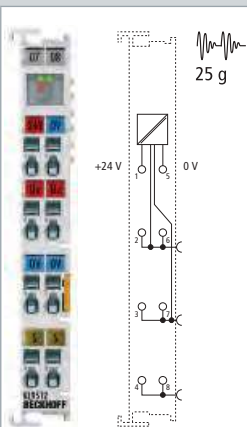
Power supply terminal, 8 V DC	Power supply terminal, 10 V DC	Power supply terminal, 12 V DC	Power supply terminal, 15 V DC	Power supply terminal, 24 V DC, electrical isolation
<b>KL9508</b>   KS9508	<b>KL9510</b>   KS9510	<b>KL9512</b>   KS9512	<b>KL9515</b>   KS9515	<b>KL9560</b>   KS9560
power supply terminal, 8 V DC, with diagnostics	power supply terminal, 10 V DC, with diagnostics	power supply terminal, 12 V DC, with diagnostics	power supply terminal, 15 V DC, with diagnostics	power supply terminal, 24 V DC



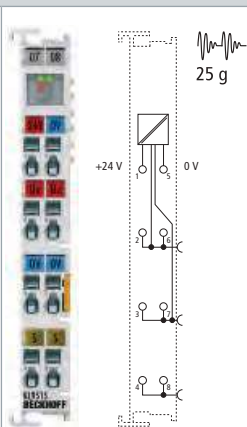
The KL9508 generates 8 V from the fed-in 24 V without electrical isolation.



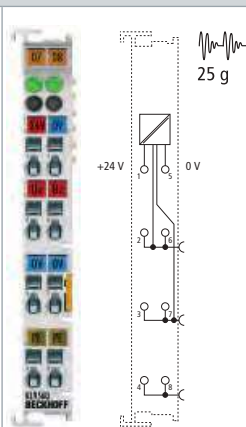
The KL9510 generates 10 V from the fed-in 24 V without electrical isolation.



The KL9512 generates 12 V from the fed-in 24 V without electrical isolation.



The KL9515 generates 15 V from the fed-in 24 V without electrical isolation.



The KL9560 generates potential-free 24 V from the fed-in 24 V with electrical isolation.

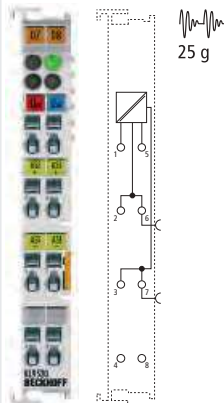
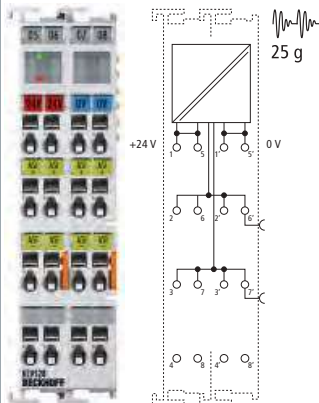
24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
8 V DC ±1 %	10 V DC ±1 %	12 V DC ±1 %	15 V DC ±1 %	24 V DC (-15 %/+5 %)
0.5 A	0.5 A	0.5 A	0.5 A	≤ 0.1 A
yes	yes	yes	yes	yes, automatic restart
< 5 mV	< 5 mV	< 5 mV	< 5 mV	no data
–	–	–	–	–
–	–	–	–	1,500 V AC constant load input/output voltage
stabilised analog voltage	stabilised analog voltage	stabilised analog voltage	stabilised analog voltage	analog voltage with electrical isolation
0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex, GL
approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g
<a href="http://www.beckhoff.com/KL9508">www.beckhoff.com/KL9508</a>	<a href="http://www.beckhoff.com/KL9510">www.beckhoff.com/KL9510</a>	<a href="http://www.beckhoff.com/KL9512">www.beckhoff.com/KL9512</a>	<a href="http://www.beckhoff.com/KL9515">www.beckhoff.com/KL9515</a>	<a href="http://www.beckhoff.com/KL9560">www.beckhoff.com/KL9560</a>

# System terminals | AS-Interface

An AS-Interface network consists of a special power supply unit, a master and a larger number of slaves. Each communication device is connected in parallel to the AS-Interface cable, and receives its supply voltage and also exchanges its data via this connection. The transmitter changes its current consumption according to its transmission bits. The AS-Interface power supply unit converts this current change into a voltage change, which can be measured by all devices.

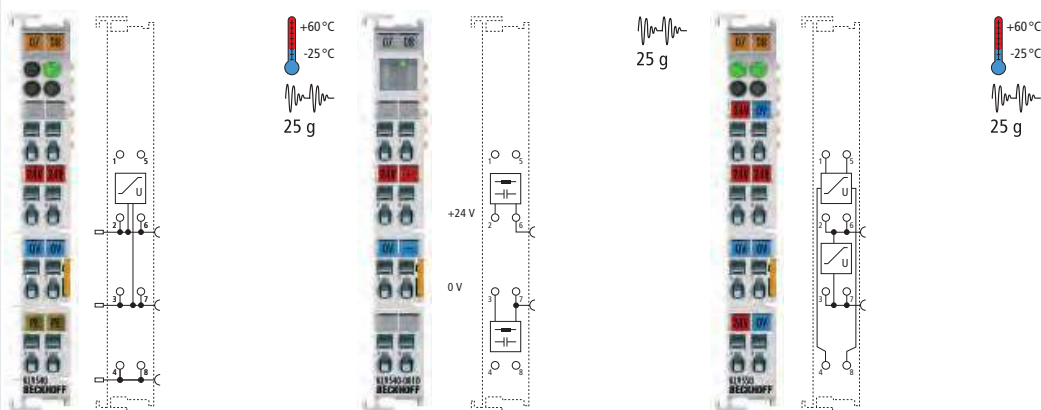
An AS-Interface power supply unit supplies the network with a voltage of 30 V DC in order to ensure that sufficient voltage is available to all devices with maximum cable length and maximum current consumption.

The KL9528 Bus Terminal is an AS-Interface power supply unit with an output current of up to 1.25 A. The AS-Interface supply voltage of 30 V DC is generated from the 24 V DC control voltage. The KL9520 Bus Terminal is intended for AS-Interface Power24V applications. Thanks to an internal circuit, the 24 V DC control voltage is usable for a simple AS-Interface network. An AS-Interface voltage of 24 V DC is sufficient in many small networks if the cable lengths and current consumption do not cause a large voltage drop.

	AS-Interface potential feed terminal with filter	AS-Interface power supply terminal 24 V DC/30 V DC, 1.25 A
<b>Technical data</b>	KL9520   KS9520	KL9528   KS9528
<b>Technology</b>	potential feed terminal	power supply terminal
<b>Diagnostics</b>	–	
	 <p>The KL9520 potential feed terminal uncouples the input and output signal through an integrated filter and enables the supply of AS-Interface networks from standard power supply units or another AS-Interface network.</p>	 <p>The KL9528 power supply terminal generates a 30 V DC output voltage from the 24 V DC control voltage with high-frequency decoupling for the operation of an AS-Interface network. The connection to the KL6201 AS-Interface master is established via plugs.</p>
<b>Input voltage</b>	up to 35 V DC	21...28.8 V DC
<b>Output voltage</b>	up to 35 V DC	30 V DC (+5 %/- 5 %)
<b>Output current</b>	–	max. 1.25 A
<b>Short circuit current</b>	–	max. 1.3 A
<b>Current load</b>	max. 2 A	–
<b>Current consumption K-bus</b>	–	typ. 10 mA
<b>Electrical isolation</b>	–	1,500 V AC constant load field side/K-bus
<b>Special features</b>	no electrical isolation	–
<b>Operating temperature</b>	0...+55 °C	0...+55 °C
<b>Approvals</b>	CE	CE
<b>Weight</b>	approx. 90 g	approx. 150 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL9520">www.beckhoff.com/KL9520</a>	<a href="http://www.beckhoff.com/KL9528">www.beckhoff.com/KL9528</a>

# System terminals | Surge filter system and field supply

	System terminal, surge filter field supply	System terminal, surge filter field supply for analog terminals	System terminal, surge filter system and field supply
<b>Technical data</b>	KL9540   KS9540	KL9540-0010	KL9550   KS9550
<b>Technology</b>	surge filter field supply		surge filter system and field supply
<b>Diagnostics</b>	-		



The KL9540 system terminal contains an overvoltage filter for the 24 V field supply, the KL9550 for the 24 V field and system supply. The filter protects the Bus Terminals from line-bound surge voltages that can occur due to high-energy disturbances such as switching overvoltages at inductive consumers or lightning strikes at the supply lines. The Bus Terminals KL9540 or KL9550 protect the Bus Terminal station from damage in particularly harsh environments. The use of such overvoltage filters is stipulated by the ship classification organisations in shipbuilding and on/offshore applications in which GL certification is required.

The KL9540-0010 is intended in particular for the protection of analog terminals; the standard variant KL9540 for digital terminals. The terminal does not transfer process data to the higher-level control system.

<b>Nominal voltage</b>	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
<b>Surge filter field supply</b>	yes	yes	yes
<b>Surge filter system supply</b>	-	-	yes
<b>Rated current field supply</b>	≤ 10 A	≤ 5 A	≤ 10 A
<b>Rated current system supply</b>	-	-	≤ 0.5 A
<b>PE connection</b>	yes	-	-
<b>Operating temperature</b>	-25...+60 °C	0...+55 °C	-25...+60 °C
<b>Approvals</b>	CE, UL, Ex, GL	CE, GL	CE, UL, Ex, GL
<b>Weight</b>	approx. 40 g	approx. 65 g	approx. 50 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL9540">www.beckhoff.com/KL9540</a>	<a href="http://www.beckhoff.com/KL9540-0010">www.beckhoff.com/KL9540-0010</a>	<a href="http://www.beckhoff.com/KL9550">www.beckhoff.com/KL9550</a>

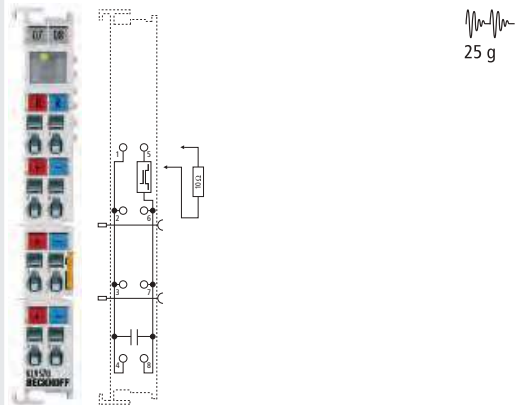
# System terminals | Buffer capacitor terminal

The KL9570 Bus Terminal contains high-performance capacitors for stabilising supply voltages. It can be used in connection with small drive terminals. Low internal resistance and high pulsed current capability enable good buffering in parallel with a power supply unit. Return currents are stored, particularly in the context of drive applications, thereby preventing overvoltages. If the fed back energy exceeds the capacity of the capacitors, the KL9570 switches the load voltage through to the terminal points 1 and 5. The energy is dissipated by the connection of an external ballast resistor.

KL25xx | Motion terminals see page [625](#)

## Buffer capacitor terminal

<b>Technical data</b>	KL9570   KS9570
<b>Technology</b>	buffer capacitor terminal
<b>Diagnostics</b>	–



The KL9570 buffers the connected voltage via its integrated capacitors and connects the external brake resistor if the internal voltage of approx. 56 V is exceeded.

<b>Nominal voltage</b>	50 V
<b>Capacity</b>	500 $\mu$ F
<b>Ripple current (max.)</b>	10 A @ 100 kHz
<b>Internal resistance</b>	< 20 m $\Omega$ @ 100 kHz
<b>Surge voltage protection</b>	> 56 V
<b>Recommended ballast resistor</b>	see documentation
<b>Overvoltage control range</b>	$\pm$ 2 V
<b>Ballast resistor clock rate</b>	load-dependent, 2-point control
<b>Electrical isolation</b>	1,500 V (K-bus/field potential)
<b>Operating temperature</b>	0...+55 $^{\circ}$ C
<b>Approvals</b>	CE, Ex
<b>Weight</b>	approx. 65 g
<b>Further information</b>	<a href="http://www.beckhoff.com/KL9570">www.beckhoff.com/KL9570</a>

## Ordering instructions for special terminals and couplers

All Bus Couplers and Bus Terminals are supplied with a standard configuration. The settings can be found on the relevant catalog pages. In addition to this standard configuration, specific coupler and terminal types with modified software or hardware are available. These variants have an order number with additional four figures. Therefore, if you do require a configuration other than standard, quote this extended number when you place your order. The following table provides a summary of the Bus Couplers and Bus Terminals that are available with modified default settings.

Ordering information	
<b>Bus Coupler</b>	
BK8100-0060	watchdog special setting 60 s
BK8100-1001	watchdog special setting 10 s
BK9055-1000	EtherNet/IP "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), default IP address: 192.168.1.xxx
BK9105-1000	EtherNet/IP Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), default IP address: 192.168.1.xxx
<b>Digital input</b>	
KL1052-0010	96 V DC positive and negative switching, not in accordance with the EN 61131-2 specifications: I high = 3 mA, I low = 0.5 mA
KL1232-0001	plus-switching, positive edge-triggered input, 10 ms pulse extension, input filter 0.2 ms
KL1232-0002	plus-switching, positive edge-triggered input, 20 ms pulse extension, input filter 0.2 ms
KL1232-0010	plus-switching, positive edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-0100	plus-switching, negative edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-0110	plus-switching, negative edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-1000	negative switching, positive edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-1001	5 V, negative switching, negative edge-triggered input, 20 ms pulse extension, input filter 0.2 ms
KL1232-1010	negative switching, positive edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-1100	negative switching, negative edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-1110	negative switching, negative edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-2000	plus switching, positive edge-triggered input, 200 ms pulse extension, input filter 0.2 ms
KL1501-0010	gate-counter with auto-reset and setting A0
KL1501-0011	up/down counter with 5 V inputs, 24 V DC outputs
KL1702-0010	230 V AC input circuit with type 2 characteristics
KL1712-0010	24 V AC/DC input circuit
<b>Digital output</b>	
KL2502-0012	time-delayed setting of the outputs
KL2502-3020	5 V output, 30 kHz limit frequency
KL2521-0010	with additional outputs (230 V AC/DC, 100 mA) instead of the additional inputs of the default variant
KL2521-0024	for 24 V signal level
KL2541-0006	stepper motor terminal 50 V DC, 5 A, 5 V encoder supply
KL2692-1001	2 digital inputs, 2 potential-free relays, end terminal variant
KL2702-0002	2-channel solid state load relay up to 230 V AC/DC, 2 A
KL2702-0020	2-channel solid state load relay up to 230 V AC/DC, 1.5 A
KL2722-0010	without reciprocal locking of the channels, total current 1 A
KL2732-0010	without reciprocal locking of the channels, total current 1 A
KL2751-0011	dimmer terminal without power contacts
KL2751-1200	dimmer terminal for 120 V AC
KL2761-0011	1-channel universal dimmer terminal, 230 V AC, 600 VA (W), 50 Hz, without power contacts
KL2791-0011	1-channel AC motor speed controller, 230 V AC, 200 VA, max. 0.9 A, without power contacts
KL2791-1200	1-channel AC motor speed controller, 120 V AC, 100 VA
<b>Analog input</b>	
KL3002-0010	Siemens S5 format
KL3002-0011	fast $\mu$ P, scan time approx. 0.5 ms
KL3002-0050	Siemens S7 format
KL3012-0011	altered range: 0...21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL3012-0012	fast $\mu$ P, scan time approx. 0.5 ms
KL3012-0050	Siemens S7 format
KL3022-0010	Siemens S5 format
KL3022-0011	fast $\mu$ P, scan time approx. 0.5 ms

KL3022-0050	Siemens S7 format
KL3042-0010	Siemens S5 format
KL3042-0011	fast $\mu$ P, scan time approx. 0.5 ms
KL3042-0012	altered range: 0...21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL3042-0050	Siemens S7 format
KL3052-0010	Siemens S5 format
KL3052-0011	fast $\mu$ P, scan time approx. 0.5 ms
KL3052-0012	changed diagnostic level (<3.5 mA or >21.5 mA)
KL3052-0050	Siemens S7 format
KL3054-0050	Siemens S7 format
KL3062-0010	Siemens S5 format
KL3062-0011	voltage level 0...20 V
KL3062-0012	fast $\mu$ P, scan time approx. 0.5 ms
KL3062-0013	voltage level 0...30 V
KL3062-0014	voltage level 0...50 V
KL3062-0050	Siemens S7 format
KL3064-0010	Siemens S5 format
KL3064-0011	voltage level 0...20 V
KL3064-0050	Siemens S7 format
KL3102-0050	Siemens S7 format
KL3112-0050	Siemens S7 format
KL3122-0050	Siemens S7 format
KL3172-0500	2-channel analog input terminal, 0...500 mV
KL3202-0010	PT200
KL3202-0011	PT200 in Siemens S5 format
KL3202-0012	PT500
KL3202-0013	PT500 in Siemens S5 format
KL3202-0014	PT1000
KL3202-0015	PT1000 in Siemens S5 format
KL3202-0016	Ni100
KL3202-0017	Ni100 in Siemens S5 format
KL3202-0020	resistance measurement 0...1.2 k $\Omega$
KL3202-0021	PT100 in Siemens S5 format
KL3202-0023	Ni120
KL3202-0024	Ni120 in Siemens S5 format
KL3202-0025	Ni1000
KL3202-0026	Ni1000 in Siemens S5 format
KL3202-0027	resistance measurement 10...10 k $\Omega$
KL3202-0028	Resolution increased to 0.01 °C; the measurement range is reduced to -40 °C to +128 °C. The absolute accuracy is 0.3 °C, differential error is 0.1 °C.
KL3202-0029	Ni1000 per Landis&Staeafa characteristic curve (Siemens, 100° corresponds to 1,500 $\Omega$ )
KL3204-0014	PT1000
KL3204-0021	PT100 in Siemens S5 format
KL3204-0025	Ni1000, 4-channel
KL3204-0029	Ni1000 per Landis&Staeafa characteristic curve (Siemens, 100° corresponds to 1,500 $\Omega$ )
KL3312-0010	type J
KL3312-0011	type J in Siemens S5 format
KL3312-0012	type L
KL3312-0013	type L in Siemens S5 format
KL3312-0014	type B
KL3312-0015	type B in Siemens S5 format
KL3312-0016	type E
KL3312-0017	type E in Siemens S5 format
KL3312-0018	type N
KL3312-0019	type N in Siemens S5 format
KL3312-0020	type R
KL3312-0021	type R in Siemens S5 format

KL3312-0022	type S
KL3312-0023	type S in Siemens S5 format
KL3312-0024	type T
KL3312-0025	type T in Siemens S5 format
KL3312-0026	type U
KL3312-0027	type U in Siemens S5 format
KL3312-0028	0...120 mV measurement
KL3312-0029	type K in Siemens S5 format
KL3312-0040	expanded temperature range for type S and L type S: -50...+1,700 °C (as supplied type L: -100...+900 °C)
KL3312-0110	type J, Fahrenheit scaling
KL3312-2000	setting of reference junction temperature via process image, unit 1/256° C in a 16 bit word
KL3312-2100	external reference point temperature specification via process image is possible, the unit is 1/256 °C in 16-bit format, fast conversion time 65 ms
KL3351-0001	1-channel resistor bridge terminal (strain gauge), with faster measurement time approx. 10 ms
KL3403-0010	3-phase power measurement terminal, current path designed for 5 A transducer (1 % measuring accuracy I)
KL3403-0020	3-phase power measurement terminal, current path designed for 20 mA, optimised for electronic current transformer
KL3403-0022	3-phase power measurement terminal, current path and voltage input designed for 20 mA
KL3403-0333	3-phase power measurement terminal, 500 V AC, 333 mV AC
KM3701-0340	differential pressure up to 340 hPa
<b>Analog output</b>	
KL4002-0010	Siemens S5 format
KL4002-0011	fast $\mu$ P, scan time approx. 0.15 ms
KL4002-0050	Siemens S7 format
KL4004-0050	Siemens S7 format
KL4012-0010	Siemens S5 format
KL4012-0011	altered range: 0...21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL4012-0050	Siemens S7 format
KL4022-0010	Siemens S5 format
KL4022-0050	Siemens S7 format
KL4032-0010	Siemens S5 format
KL4032-0011	fast $\mu$ P, scan time approx. 0.15 ms
KL4032-0050	Siemens S7 format
KL4034-0010	Siemens S5 format
KL4112-0010	Siemens S5 format
KL4112-0050	Siemens S7 format
KL4132-0010	Siemens S5 format
KL4132-0050	Siemens S7 format
<b>Special functions</b>	
KL5111-0010	A, B, C signals: 5 V inputs
KL5111-0011	special function: latch input sets counter to zero
KL5111-0012	latches on both edges, A, B, C inputs 24 V
KL5111-0013	latches on both edges, A, B, C inputs 5 V
KL5111-0015	frequency measurement over a selectable time window; 24 V inputs
KL5111-0016	frequency measurement over a selectable time window; 5 V inputs
KL5111-0020	12 V input circuit
KL5151-0021	incremental encoder 1 x 32 bit A, B, capture input and 1 driver output 24 V, 0.5 A
KL5151-0050	incremental encoder 2 x 32 bit A, B-track
KL6001-0020	standard format 5 bytes of user data
KL6011-0020	standard format 5 bytes of user data
KL6021-0020	standard format 5 bytes of user data (rest default)
KL6021-0021	standard format 5 bytes of user data (7 bits, even, 1 stop bit, 9,600 baud)
KL6201-0010	preset to 22 bytes K-bus interface (2 K-bus cycles 31 AS-Interface slaves)
KL6201-0011	preset to 38 bytes K-bus interface (4 K-bus cycles 62 AS-Interface slaves)
KL6211-0011	preset to 38 bytes K-bus interface (4 K-bus cycles 62 AS-Interface slaves)
KL6904-0001	TwinSAFE Logic Bus Terminal, pre-configured ex factory to 15 TwinSAFE connections
<b>System terminals</b>	
KL9210-0020	with 2 A fuse (slow-blow) and modified label



# Accessories Bus Terminals

## Connectors

Lightbus	
Z1000	standard connector for 1,000 µm plastic fibre
Z1010	standard connector for 200 µm PCS fibre
Z1020	coupling for Z1000

PROFIBUS		Pict.
ZB3100	9-pin D-sub connector for PROFIBUS (12 Mbaud) with switchable termination resistor	A
ZB3101	9-pin D-sub connector for PROFIBUS (12 Mbaud) with switchable termination resistor and programming interface	B
ZB3102	9-pin D-sub connector for PROFIBUS (12 Mbaud) (180° orientation) with switchable termination resistor	C
ZS1031-3000	9-pin D-sub connector for PROFIBUS (12 Mbaud) with integrated termination resistor	
ZS1031-3500	fibre optic connector for Bus Coupler BK3500 and BK3520	

CANopen/DeviceNet	
ZS1051-3000	9-pin D-sub connector for CANopen with integrated termination resistor
ZS1052-3000	5-pin open style connector for CANopen/DeviceNet with integrated termination resistor
ZS1052-5150	CAN diagnostic interface

Technical data	ZS1031-3000	ZS1052-3000
Fieldbus	PROFIBUS	CANopen/DeviceNet
Bus plug	D-sub, 9-pin	open style connector, 5-pin
Data transfer rates	up to 12 Mbaud	up to 1 Mbaud (CANopen) or 500 kbaud (DeviceNet)
Cable outgoing	downwards (where Bus Terminals are assembled horizontally)	
Cable diameter	4.5...8 mm	
Wire cross section	0.34 mm wire	0.2...0.5 mm litz wire or wire
Connection method	screw type terminal	
Wire	PROFIBUS, type A, ZB3200	e.g. CANopen cable ZB5100 or DeviceNet cable ZB5200
Termination resistor	network with 2 x 390 Ω, 1 x 220 Ω	120 Ω
Protection class	IP 40	
Temperature range	-20...+75 °C	
Dimensions (L x W x H)	approx. (65 x 50 x 16) mm	
Packaging	folding box with instructions	

SERCOS interface	
Z1003	FSMA plug with knurled nut for 1,000 µm plastic fibre
Z1100	plastic fibre optic, single core, 1,000 µm, 2.2 mm
Z1101	plastic fibre optic, single core, 1,000 µm with protective PU cladding and Kevlar strain relief, drag-chain suitable

Interbus	
Z1003	FSMA plug with knurled nut for 1,000 µm plastic fibre
ZB4100	9-pin D-sub socket for incoming remote bus
ZB4101	9-pin D-sub plug for outgoing remote bus

Ethernet/EtherCAT		Pict.
ZS1090-0003	RJ45 plug EtherCAT/Ethernet, IP 20, 4-pin, field assembly, AWG22-24, PU = 10	D
ZS1090-0005	RJ45 plug EtherCAT/Ethernet, IP 20, 8-pin, supports Gbit, field assembly, AWG22-26, PU = 10	E

RS232/RS485	
ZB3180	9-pin D-sub connector for CX8080 (RS232/RS485) with switchable termination resistor



## Cables for K-bus extension

Ordering information	
ZK1010-8080-3003	ribbon cable for bus connection between two power terminals KL8001, length 0.03 m, included in scope of supply of KL8001
ZK1010-8080-3005	ribbon cable for bus connection between two power terminals KL8001 for reversing contactor connection, length 0.05 m
ZK1010-8080-3010	ribbon cable for bus connection between the KL9060 and the KL8001, length 0.1 m, included in scope of supply of KL9060
ZS1010-1610	Plug for exposed bus connection of the KL8001, included in scope of supply of KL9060
ZK1090-0101-1002	K-bus extension cable, assembled at both ends with RJ45 plug, double-shielded, red, length 0.2 m
ZK1090-0101-1005	K-bus extension cable, assembled at both ends with RJ45 plug, double-shielded, red, length 0.5 m
ZK1090-0101-1010	K-bus extension cable, assembled at both ends with RJ45 plug, double-shielded, red, length 1 m
ZK1090-0101-1020	K-bus extension cable, assembled at both ends with RJ45 plug, double-shielded, red, length 2 m
ZK1090-0101-1030	K-bus extension cable, assembled at both ends with RJ45 plug, double-shielded, red, length 3 m
ZK1090-0101-1050	K-bus extension cable, assembled at both ends with RJ45 plug, double-shielded, red, length 5 m

## Cables

Lightbus	
Z1100	plastic fibre optic, single core, 1,000 µm, 2.2 mm
Z1101	plastic fibre optic, single core, 1,000 µm with protective PU cladding and Kevlar strain relief, drag-chain suitable
PROFIBUS	
ZB3200	PROFIBUS cable 12 Mbaud 1 x 2 x 0.64 mm <sup>2</sup>
Z1100	plastic fibre optic, single core, 1,000 µm, 2.2 mm
Z1101	plastic fibre optic, single core, 1,000 µm with protective PU cladding and Kevlar strain relief, drag-chain suitable
Interbus	
ZB4200	Interbus remote bus cable, certified 3 x 2 x 0.22 mm <sup>2</sup>
Z1120	Interbus plastic fibre optic, 2-core, 1,000 µm
Z1121	Interbus plastic fibre optic, 2-core, 1,000 µm with protective PU cladding

<b>CANopen</b>	
ZB5100	CAN cable, 4-core, fixed laying 2 x 2 x 0.25 mm <sup>2</sup>
<b>DeviceNet</b>	
ZB5200	DeviceNet cable, 4-core with shield, fixed laying 2 x 2/22 AWG
<b>Ethernet/EtherCAT</b>	
ZB9010	Industrial Ethernet/EtherCAT cable, fixed installation, CAT 5e, 4 wires
ZB9020	Industrial Ethernet/EtherCAT cable, drag-chain suitable, CAT 5e, 4 wires

## Patch cables

Ordering information	for pre-assembled EtherCAT/Ethernet patch cables depending on cable lengths					F
ZK1090-9191-0001	0.17 m	ZK1090-9191-0030	3.0 m	ZK1090-9191-0200	20.0 m	
ZK1090-9191-0002	0.26 m	ZK1090-9191-0050	5.0 m	ZK1090-9191-0250	25.0 m	
ZK1090-9191-0005	0.5 m	ZK1090-9191-0055	5.5 m	ZK1090-9191-0300	30.0 m	
ZK1090-9191-0010	1.0 m	ZK1090-9191-0060	6.0 m	ZK1090-9191-0350	35.0 m	
ZK1090-9191-0012	1.25 m	ZK1090-9191-0070	7.0 m	ZK1090-9191-0400	40.0 m	
ZK1090-9191-0015	1.5 m	ZK1090-9191-0080	8.0 m	ZK1090-9191-0450	45.0 m	
ZK1090-9191-0017	1.75 m	ZK1090-9191-0090	9.0 m	ZK1090-9191-0500	50.0 m	
ZK1090-9191-0020	2.0 m	ZK1090-9191-0100	10.0 m			
ZK1090-9191-0025	2.5 m	ZK1090-9191-0150	15.0 m			

Fur further information see page [446](#)

## Signal cables

Ordering information		G
ZK8500-8282-7030	signal cable for manual operating modules of the KL85xx series, 20 x 0.14 mm <sup>2</sup> , shielded, assembled at both ends with 20-pin plug, for terminals with ribbon cable connection, length 3 m	
ZK8500-8282-7040	signal cable for manual operating modules of the KL85xx series, 20 x 0.14 mm <sup>2</sup> , shielded, assembled at both ends with 20-pin plug, for terminals with ribbon cable connection, length 4 m	
ZK8500-8282-7050	signal cable for manual operating modules of the KL85xx series, 20 x 0.14 mm <sup>2</sup> , shielded, assembled at both ends with 20-pin plug, for terminals with ribbon cable connection, length 5 m	

## Connectors for KS Bus Terminals, ES EtherCAT Terminals

Ordering information	
ZS2010	10 connectors for KS and ES series, spare part (KS/ES terminals are supplied with connector.)



## Connectors for KM and EM modules

Ordering information	
ZS2001-0001	connector for KM/EM module, 1-pin, without LED; spare part (KM/EM terminals are supplied with connector.)
ZS2001-0002	connector for KM/EM module, 1-pin, with LED; spare part (KM/EM terminals are supplied with connector.)
ZS2001-0004	connector for KM/EM module, 3-pin, with LED; spare part (KM/EM terminals are supplied with connector.)

## Relays

Ordering information	
ZB2601	relay, 230 V AC, 16 A, coil 24 V, spare part KM2604
ZB2602	relay, manual operation, 230 V AC, 16 A, coil 24 V, spare part KM2614

## Assembly aids

Ordering information	
ZB8700	slot screwdriver assembly tool for pressing the spring force clamps on the coupler and the terminals

## Bus system housings

The BG1558 and BG1559 housings are especially suitable for the construction of compact I/O stations with a higher protection class (IP 65). The housings are supplied with mounting rails. If desired, the housings can be supplied fully fitted with Bus Couplers, Bus Terminals, flanges and PG threaded fittings. Further sizes are available on request.

Ordering information		Pict.
BG1558	bus system housing 400 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	H
BG1559	bus system housing 600 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	

## Marking material

The Buserminals can be individually labelled with standard contact signs. The marking material is not included in the delivery.

Further versions ► [www.beckhoff.com/labelling](http://www.beckhoff.com/labelling)

Ordering information	Contact labels, unprinted	I
BZ2000	100 unprinted contact labels, white	
BZ2002	100 unprinted contact labels, yellow	
BZ2005	100 unprinted contact labels, red	
BZ2006	100 unprinted contact labels, blue	
BZ2007	100 unprinted contact labels, orange	
BZ2008	100 unprinted contact labels, light green	
BZ3000	180 equipment identification labels 12 x 7 mm for Bus Terminals with removable identification section, blank	

Further marking material and pictures see next page

Ordering information	Contact labels, printed	I
BZ1100	100 contact labels, printed with: 0 V, blue	
BZ1102	100 contact labels, printed with: –, blue	
BZ1104	100 contact labels, printed with: 24 V, red	
BZ1106	100 contact labels, printed with: +, red	
BZ1107	100 contact labels, printed with: +, white	
BZ1108	100 contact labels, printed with: PE, light green	
BZ1300	100 contact labels, ten of each printed with: 0...7, 20 unprinted, white	
BZ1400	100 contact labels, two of each printed with: 00 01...48 49, white	
BZ3010	180 equipment identification labels 12 x 7 mm for Bus Terminals with removable identification section, printed (printed according to customer specification [in Excel file])	

Ordering information	Push-in strips
BZ5100	push-in strips for labels, A4 sheet, 160 pieces, pre-punched, packing unit = 10

## Slide-in label cover, transparent

The slide-in label covers BZ3200 enable clear labelling of the individual channels or text-based functional description of the EtherCAT Terminals. The labels are inserted in the designated slots. For connecting the individual channels the label cover can be tilted upwards.

Ordering information		Pict.
BZ3200	insertable label cover, transparent, pluggable, 11.5 mm x 104.5 mm, packing unit = 50	J
BZ5100	push-in strips for labels, A4 sheet, 160 pieces, pre-punched, packing unit = 10	

## Coding pins and sockets for KS and ES terminals

The coding pins and sockets for KS/ES terminals with pluggable wiring level enable coding between terminal and plug in order to prevent incorrect plug insertion.

Ordering information		K
ZS2010-0010	The set contains 100 sockets and 100 pins.	

## USB cable for KS2000

The KS2000 cable establishes a connection between the Bus Couplers or Bus Terminal Controllers and the PC. The USB cable features electrical isolation. Status LEDs indicate whether data are sent or received. On the connected PC the USB cable behaves like a COM port and can therefore be used for all Beckhoff tools using serial communication.

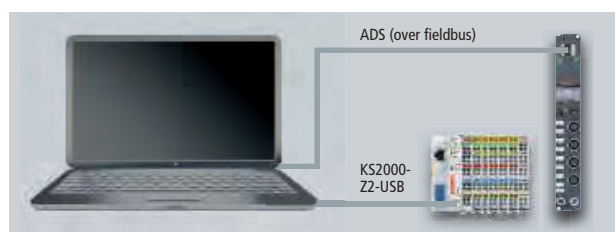
Ordering information		L
KS2000-Z2-USB	connection cable for KS2000 or TwinCAT for serial conversion from USB for Bus Couplers or Bus Terminal Controllers of the BK, BC or LC series, length 3 m	



## Configuration software KS2000

The KS2000 can be used for parametering modules, local diagnostics, forcing data, monitoring values, updating firmware and programming Beckhoff mini PLCs via TwinCAT. The connection between the fieldbus components and the PC is established via the serial or USB connection cable provided, or via the network and TCP/IP. The KS2000 configuration software for Windows NT/2000/XP/Vista or Windows 7 operating systems has a friendly user interface, making work comfortable and convenient.

Ordering information	
KS2000	configuration software for project design, commissioning and parameterisation of Beckhoff Fieldbus Box modules and Bus Terminals



## Demokit

The TC9910-B11x EtherCAT demokit offers a quick introduction into EtherCAT communication. It includes EtherCAT Terminals and a Coupler for testing simple I/O functions. The enclosed CD contains a step-by-step guide and a full version of TwinCAT 2 as programming environment for

the Beckhoff EtherCAT master. EtherCAT slaves of any type can be tested with this field-proven EtherCAT master. It also includes a comprehensive help collection that facilitates familiarisation with Beckhoff ADS communication and programming according to IEC 61131-3.

The demokit consists of:

- EK1100 EtherCAT Coupler
- 2 digital input terminals 24 V DC
- 2 digital output terminals 24 V DC
- Beckhoff product folder
- Beckhoff TwinCAT CD
- "TwinCAT Quickstart" documentation

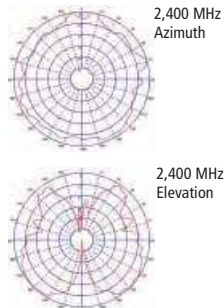
- documentation describing the EK1100
- a 25 cm section of 35 mm mounting rail for fitting the terminal system
- TwinCAT 2 PLC license (only TC9910-B110)
- EL9011 end cap
- Ethernet cable

Ordering information		M
TC9910-B110	EtherCAT demokit, with TwinCAT 2 PLC license	
TC9910-B111	EtherCAT demokit, without TwinCAT 2 PLC license	
TC9910-B112	EtherCAT demokit, without TwinCAT 2 PLC license (1 instead of 2 digital input terminals)	



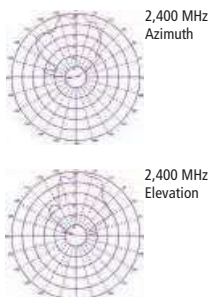
## Accessories radio technology

### Omni-directional antenna 4 dBi



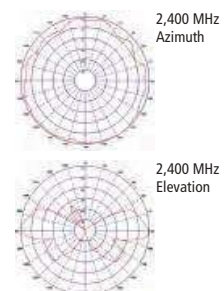
Technical data	ZS6200-0400
Frequency range	2,400...2,485 MHz
Gain	4 dBi
3 dB beamwidth, horizontal	360°
3 dB beamwidth, vertical	70°
Termination	SMA socket
Dimensions	height: 45 mm, diameter: 110 mm
Operating temperature	-40...+80 °C
Mounting	ceiling clip
Matching cables	ZK6000-0102-0020/-0040 (cable not included in the scope of supply of the antenna, only one cable per antenna possible)

### Directional antenna 9 dBi



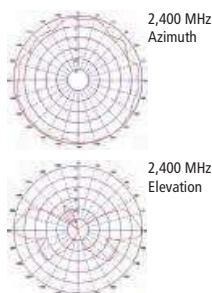
Technical data	ZS6100-0900
Frequency range	2,400...2,485 MHz
Gain	9 dBi
3 dB beamwidth, horizontal	65°
3 dB beamwidth, vertical	65°
Termination	SMA socket
Dimensions	93 mm x 93 mm x 25 mm (H x W x D)
Operating temperature	-40...+80 °C
Mounting	bracket mounting
Matching cables	ZK6000-0102-0020/-0040 (cable not included in the scope of supply of the antenna, only one cable per antenna possible)

### Rod antenna 4 dBi



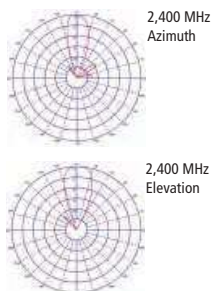
Technical data	ZS6201-0410
Frequency range	2,400...2,485 MHz
Gain	4 dBi
3 dB beamwidth, horizontal	360°
3 dB beamwidth, vertical	70°
Termination	reverse SMA socket
Dimensions	height: 202 mm, base diameter: 35 mm
Operating temperature	-40...+80 °C
Mounting	M14 connecting nut
Matching cables	1 m cable with reverse SMA socket (included in the scope of supply of the antenna, extension not possible)

## Rod antenna 5 dBi



Technical data	ZS6201-0500
Frequency range	2,400...2,485 MHz
Gain	5 dBi
3 dB beamwidth, horizontal	360°
3 dB beamwidth, vertical	70°
Termination	reverse SMA socket
Dimensions	height: 195 mm, base diameter: 12 mm
Operating temperature	-40...+80 °C
Mounting	direct connection, with angle joint
Matching cables	direct connection, reverse SMA socket (antenna cannot be combined with a cable)

## Directional antenna 18 dBi



Technical data	ZS6100-1800
Frequency range	2,400...2,485 MHz
Gain	18 dBi
3 dB beamwidth, horizontal	20°
3 dB beamwidth, vertical	20°
Termination	SMA socket
Dimensions	360 mm x 360 mm x 30 mm (H x W x D)
Operating temperature	-40...+80 °C
Mounting	bracket mounting
Matching cables	ZK6000-0102-0020/-0040 (cable not included in the scope of supply of the antenna, only one cable per antenna possible)

## Antenna cables

Ordering information	
ZK6000-0102-0020	coaxial cable, 50 Ω impedance, with attached connectors (SMA plug and reverse SMA socket), black, 200 cm
ZK6000-0102-0040	coaxial cable, 50 Ω impedance, with attached connectors (SMA plug and reverse SMA socket), black, 400 cm

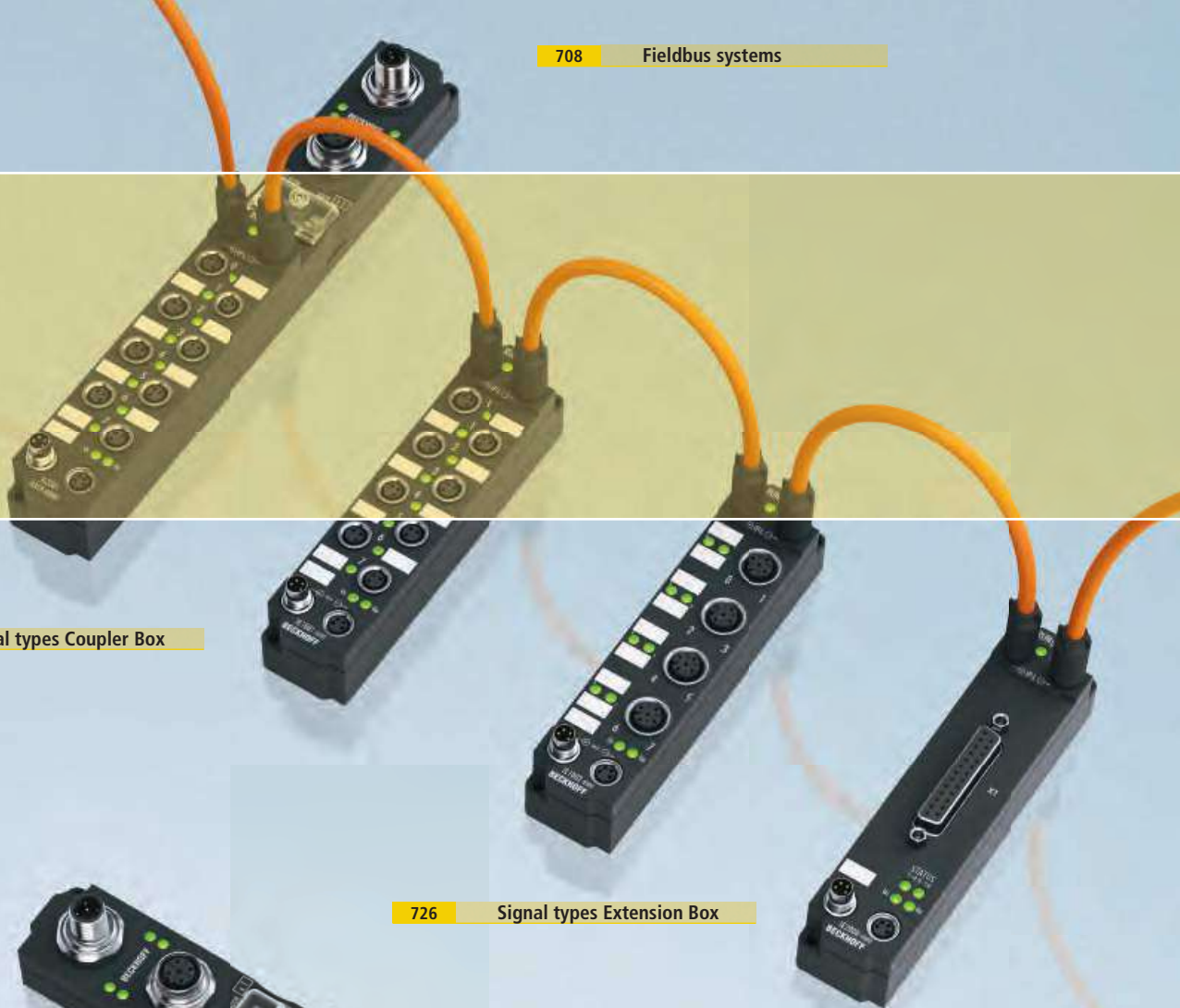
For further information on the KM6551 module see page **663**





# Fieldbus Box

The compact IP 67 modules



718 Signal types Coupler Box



726 Signal types Extension Box



724 Signal types Compact Box



762 Fieldbus Modules

746 IO-Link box

# Fieldbus Box

The watertight solution

- 700** Product overview
- 703** System description
- 704** Features
- 706** Technical data

## **708** Fieldbus systems

- 709** EtherCAT IL230x-B110
- 709** Lightbus IPxxxx-B200, IL230x-B200
- 710** PROFIBUS IPxxxx-B31x, IL230x-B31x, IL230x-C31x
- 711** Interbus IPxxxx-B400, IL230x-B400
- 712** CANopen IPxxxx-B51x, IL230x-B51x
- 713** DeviceNet IPxxxx-B52x, IL230x-B52x
- 714** Modbus IPxxxx-B730, IL230x-B730
- 714** RS485/RS232 IPxxxx-B8x0, IL230x-B8x0, IL230x-C810
- 716** Ethernet IL230x-B90x, IL230x-C900
- 717** PROFINET IL230x-B903
- 717** EtherNet/IP IL230x-B905

## **718** Signal types Coupler Box

- 720** Digital combi IL230x-Bxxx

## **718** Signal types PLC Box

- 722** Digital combi IL230x-Cxxx

## **724** Signal types Compact Box

- 728** Digital input IP1xxx-Bxxx
- 730** Digital output IP2xxx-Bxxx
- 734** Digital combi IP23xx-Bxxx, IP24xx-Bxxx
- 738** Analog input IP3xxx-Bxxx
- 740** Analog output IP4xxx-Bxxx
- 742** Special functions IP5xxx-Bxxx, IP6xxx-Bxxx

## **726** Signal types Extension Box

- 728** Digital input IE1xxx
- 730** Digital output IE2xxx
- 734** Digital combi IE23xx, IE24xx
- 738** Analog input IE3xxx
- 740** Analog output IE4xxx
- 742** Special functions IE5xxx, IE6xxx

## **746** IO-Link box (industrial housing)

- 748** Digital input EPI1xxx
- 750** Digital output EPI2xxx
- 752** Digital combi EPI23xx
- 754** Analog input EPI3xxx
- 755** Analog output EPI4xxx

## **746** IO-Link box (zinc die-cast housing)

- 748** Digital input ERI1xxx
- 750** Digital output ERI2xxx
- 752** Digital combi ERI23xx
- 754** Analog input ERI3xxx
- 755** Analog output ERI4xxx

## **756** Accessories

- 756** Fieldbus system accessories
- 514** Cable sets and connectors







## **761** Software

- 761** Configuration software KS2000
- 944** Programming system TwinCAT

## **762** Fieldbus Modules

- 762** EtherCAT Fieldbus Module, 12/32-channel thermocouple FM33xx-B110
- 764** PROFIBUS Fieldbus Module, 12/32-channel thermocouple FM33xx-B310

# Product overview Fieldbus Box

Fieldbus Box	Compact Box	Coupler Box	PLC Box
<b>Fieldbus</b>	Fieldbus Box without IP-Link interface	Fieldbus Box with IP-Link interface	Controller IEC 61131-3 with IP-Link interface
 EtherCAT		IL230x-B110 709	
 LIGHTBUS	IPxxxx-B200 709	IL230x-B200 709	
 PROFIBUS	IPxxxx-B310 710 IPxxxx-B318 710 with integrated tee-connector	IL230x-B310 710 IL230x-B318 710 with integrated tee-connector	IL230x-C310 711 IL230x-C318 711 with integrated tee-connector
 INTERBUS	IPxxxx-B400 711	IL230x-B400 711	
 CANopen	IPxxxx-B510 712 IPxxxx-B518 712 with integrated tee-connector	IL230x-B510 712 IL230x-B518 712 with integrated tee-connector	
<b>DeviceNet</b>	IPxxxx-B520 713 IPxxxx-B528 713 with integrated tee-connector	IL230x-B520 713 IL230x-B528 713 with integrated tee-connector	
<b>Modbus</b>	IPxxxx-B730 714	IL230x-B730 714	
<b>RS485</b>	IPxxxx-B800 714	IL230x-B800 715	
<b>RS232</b>	IPxxxx-B810 715	IL230x-B810 715	IL230x-C810 715
<b>Ethernet TCP/IP</b>		IL230x-B900 716 IL230x-B901 716	IL230x-C900 716
 PROFINET		IL230x-B903 717	
<b>EtherNet/IP</b>		IL230x-B905 717	

Fieldbus Box   Compact Box and Extension Box: Digital I/O							
Input		8 mm	M8	M12			
24 V DC	8-channel filter 3.0 ms	IP1000-Bxxx, IE1000	728	IP1001-Bxxx, IE1001	729	IP1002-Bxxx, IE1002	729
	8-channel filter 0.2 ms	IP1010-Bxxx, IE1010	728	IP1011-Bxxx, IE1011	729	IP1012-Bxxx, IE1012	729
Counter	2-channel					IP1502-Bxxx, IE1502	729
	up/down counter 24 V DC, 100 kHz						
Output		8 mm	M8	M12			
24 V DC	8-channel I <sub>max</sub> = 0,5 A	IP2000-Bxxx, IE2000	730	IP2001-Bxxx, IE2001	730	IP2002-Bxxx, IE2002	731
	8-channel I <sub>max</sub> = 2 A, ∑ 4 A	IP2020-Bxxx, IE2020	731	IP2021-Bxxx, IE2021	731	IP2022-Bxxx, IE2022	731
	8-channel I <sub>max</sub> = 2 A, ∑ 12 A	IP2040-Bxxx, IE2040	732	IP2041-Bxxx, IE2041	732	IP2042-Bxxx, IE2042	732
	16-channel					IE2808	733
	I <sub>max</sub> = 0.5 A, ∑ 4 A, D-sub socket					IE2808-0001	733
PWM	2-channel PWM, 24 V DC, I <sub>max</sub> = 2.5 A					IP2512-Bxxx, IE2512	733

## Fieldbus Box | Compact Box, Coupler Box, PLC Box and Extension Box: Digital I/O

Combi		8 mm	M8	M12			
24 V DC	<b>8-channel</b> 4 input + 4 output, filter 3.0 ms, I <sub>max</sub> = 0.5 A	IL2300-Bxxx	720	IL2301-Bxxx	720	IL2302-Bxxx	720
		IL2300-Cxxx	722	IL2301-Cxxx	722	IL2302-Cxxx	722
		IP2300-Bxxx, IE2300	734	IP2301-Bxxx, IE2301	735	IP2302-Bxxx, IE2302	735
	<b>8-channel</b> 4 input + 4 output, filter 0.2 ms, I <sub>max</sub> = 0.5 A	IP2310-Bxxx	734	IP2311-Bxxx	735	IP2312-Bxxx	735
		IE2310	734	IE2311	735	IE2312	735
	<b>8-channel</b> 4 input + 4 output, filter 3.0 ms, I <sub>max</sub> = 2 A, Σ 4 A	IP2320-Bxxx	736	IP2321-Bxxx	736	IP2322-Bxxx	737
		IE2320	736	IE2321	736	IE2322	737
<b>8-channel</b> 4 input + 4 output, filter 0.2 ms, I <sub>max</sub> = 2 A, Σ 4 A	IP2330-Bxxx	736	IP2331-Bxxx	736	IP2332-Bxxx	737	
	IE2330	736	IE2331	736	IE2332	737	
<b>16-channel</b> combi input/output, filter 3.0 ms, I <sub>max</sub> = 0.5 A	IP2400-Bxxx	737	IP2401-Bxxx	737			
	IE2400	737	IE2401	737			
<b>16-channel</b> combi input/output, filter 3.0 ms, I <sub>max</sub> = 0.5 A, IP 20 connector	IE2403	735					

## Fieldbus Box | Compact Box and Extension Box: Analog I/O

Input		M12	
± 10 V	4-channel differential inputs, 16 bit	IP3102-Bxxx, IE3102	738
0/4...20 mA	4-channel differential inputs, 16 bit	IP3112-Bxxx, IE3112	739
Resistance thermometer	4-channel resistance thermometer (RTD), PT100, PT200, PT500, PT1000, Ni100, 16 bit	IP3202-Bxxx, IE3202	739
Thermocouple/mV	4-channel thermocouple, type J, K, L, B, E, N, R, S, T, U, 16 bit	IP3312-Bxxx, IE3312	739
Output		M12	
± 10 V	4-channel 16 bit	IP4132-Bxxx, IE4132	740
0/4...20 mA	4-channel 16 bit	IP4112-Bxxx, IE4112	740

## Fieldbus Box | Compact Box and Extension Box: Special functions

Function		M12	M23	
Position measurement	1-channel SSI encoder interface		IP5009-Bxxx, IE5009	742
	1-channel incremental encoder interface, 1 MHz		IP5109-Bxxx, IE5109	743
	1-channel SinCos encoder interface		IP5209-Bxxx (1 V <sub>pp</sub> )	743
			IP5209-Bxxx-1000 (11 μA <sub>pp</sub> )	
Communication	1-channel serial interface, RS232	IP6002-Bxxx, IE6002	744	
	1-channel serial interface, 0...20 mA (TTY)	IP6012-Bxxx, IE6012	745	
	1-channel serial interface, RS422/RS485	IP6022-Bxxx, IE6022	745	

## Fieldbus Box | IO-Link box: Digital I/O

Input		8 x M8	16 x M8	4 x M12	8 x M12
24 V DC	8-channel filter 3.0 ms	EPI1008-0001 748 ERI1008-0001 748		EPI1008-0002 748 ERI1008-0002 748	
	16-channel filter 3.0 ms		EPI1809-0021 749 ERI1809-0021 749		EPI1809-0022 749 ERI1809-0022 749
Output		8 x M8	16 x M8	4 x M12	8 x M12
24 V DC	8-channel $I_{\text{MAX}} = 0.5 \text{ A}$	EPI2008-0001 750 ERI2008-0001 750		EPI2008-0002 750 ERI2008-0002 750	
	16-channel $I_{\text{MAX}} = 0.5 \text{ A}, \Sigma 4 \text{ A}$		EPI2809-0021 751 ERI2809-0021 751		EPI2809-0022 751 ERI2809-0022 751
Combi		8 x M8	16 x M8	4 x M12	8 x M12
24 V DC	8-channel 8 input/output, filter 3.0 ms, $I_{\text{MAX}} = 0.5 \text{ A}$	EPI2338-0001 752 ERI2338-0001 752		EPI2338-0002 752 ERI2338-0002 752	
	16-channel 16 input/output, filter 3.0 ms, $I_{\text{MAX}} = 0.5 \text{ A}, \Sigma 4 \text{ A}$		EPI2339-0021 753 ERI2339-0021 753		EPI2339-0022 753 ERI2339-0022 753

## Fieldbus Box | IO-Link box: Analog I/O

Input		M12
$\pm 10 \text{ V},$ 0/4...20 mA	4-channel parameterisable, differential input, 16 bit	EPI3174-0002 754 ERI3174-0002 754
	Output	M12
$\pm 10 \text{ V},$ 0/4...20 mA	4-channel 2 input + 2 output, parameterisable, 16 bit	EPI4374-0002 755 ERI4374-0002 755

EPIxxxx: industrial housing in IP 67, ERIxxxx: zinc die-cast housing in IP 67



# The Fieldbus Box

**The Beckhoff Fieldbus Box system is the culmination of the fieldbus concept:**

## Robust

Robust construction allows fieldbus modules to be fitted directly to machines. Control cabinets and terminal boxes are now no longer required.

## Sealed

The modules meet the protection class IP 65, IP 66 and IP 67, are fully casted and thus ideally prepared for use in wet, dirty and dusty working environments.

## Small

The modules are extremely small and are thus suitable for use in applications where there is very little space available. The low weight of the Fieldbus Box modules makes them useful in applications where the I/O interface is in motion (e.g. on a robot arm).

## Open

All the most important fieldbus systems are supported. This substantially frees electrical design from the particular bus system in use. Fast, flexible reactions to customers' requirements are possible. The Fieldbus Box modules are, of course, certified by the respective fieldbus user organisations, and can be combined with Beckhoff Bus Terminals and with devices from third-party manufacturers.

## Modular

Conventional fieldbuses such as PROFIBUS or CANopen are connected via Coupler Box modules. These are modularly extendable through cost-effective extension modules.

## Quickly wired

The wiring of the fieldbus and of signals is significantly simplified through the use of pre-assembled cables. Wiring errors are minimised and the system setup is finished quickly.

## Flexible

In addition to the pre-assembled cables, field wireable connectors and cables are also available for maximum flexibility.

## Economical

Combined I/O modules and fine signal granularity lead to low system costs – you only have to buy what you really need.

## Intelligent

Even the standard modules are intelligent fieldbus devices – with self-diagnosis and versatile functions. The Fieldbus Box is furthermore available as a small local controller – the PLC Box: programmable in all five languages in accordance with IEC 61131-3, with floating point arithmetic and with sufficient performance and memory for the majority of decentralised control and regulation tasks.

## Complete

The wide variety of signal types allows the connection of almost any kind of sensor. The communication modules enable decentralised connection of, e.g., label printers, identification systems or special equipment. The Fieldbus Box range also includes encoder interfaces for displacement and angle measurement.

## Fitting

Sensors and actuators are connected through 8 mm diameter snap type or through screw type connectors (M8 or M12). The snap type connectors lock in place positively, forming a vibration-proof connection, while the screw type connectors offer the advantage of high resistance to being pulled out.

## Compatible

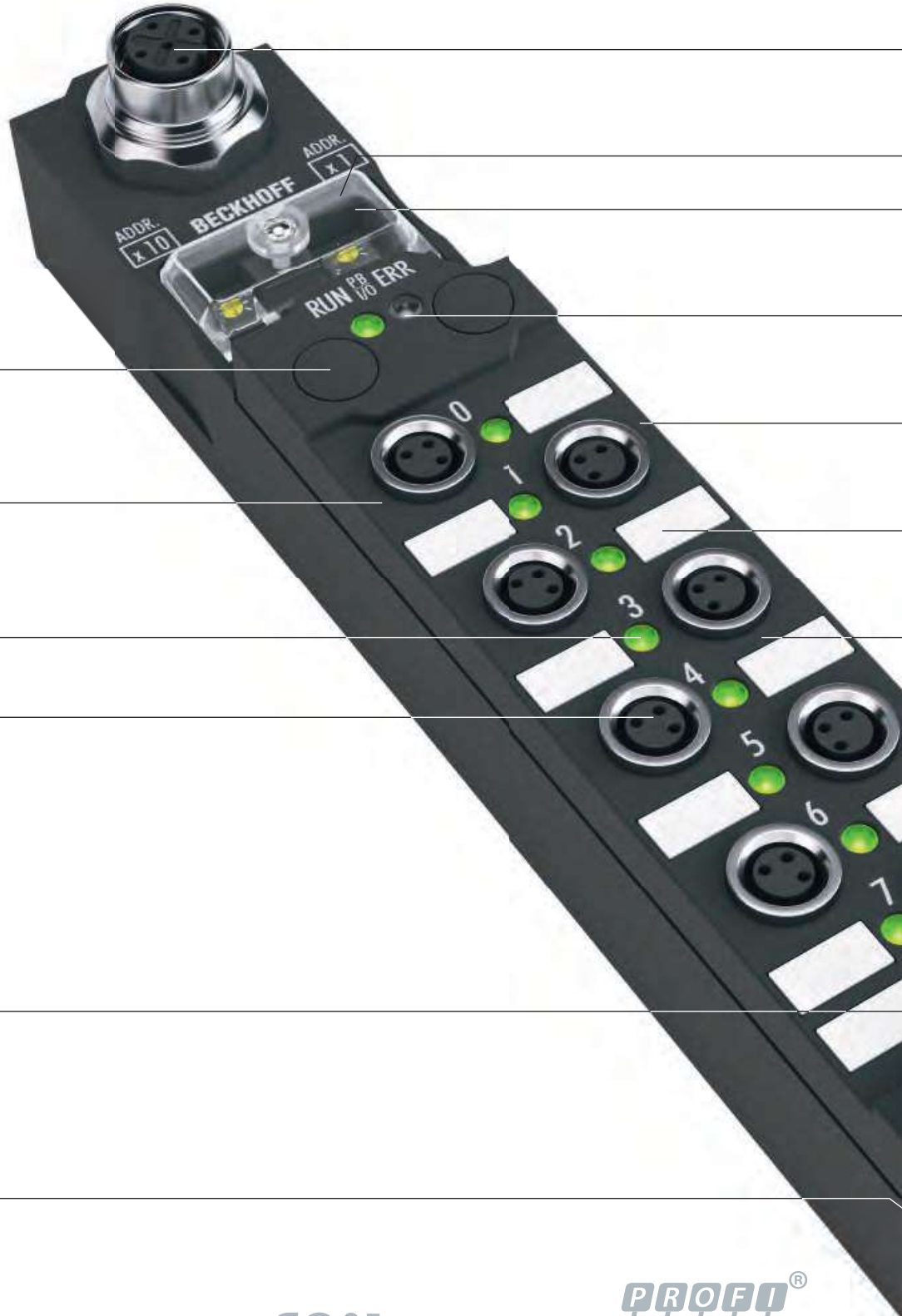
The Fieldbus Box devices behave very much like the Beckhoff Bus Terminals – this means that the ideal distributed peripheral device can be used, whatever the particular application.

## IO-Link

The Fieldbus Box modules with IO-Link interface complement the connection possibilities at the sensor/actuator level. This way, IO-Link and standard sensors can be acquired with one IO-Link master.



# Fieldbus Box features



IP-Link interface on the Coupler Box and PLC Box for the connection of extension modules

Watertight and dust-proof, due to protection class IP 65/66/67 (fully potted)

Signal status display

Connection of sensors/actuators via connector:

- M8, screw type
- M12, screw type
- 8 mm, snap type

Power supply input

- box supply
- auxiliary voltage

Mounting holes

Modbus

EtherNet/IP™

CANopen

PROFI<sup>®</sup>  
NET

INTERBUS

PROFI<sup>®</sup>  
BUS

LIGHTBUS

RS232  
↔  
RS485



Fieldbus interface  
(connection depends on  
the particular fieldbus)

Hinged inspection window

Address selection switch  
and diagnostic interface

Fieldbus status display  
Module or IP-Link  
status display

Robust housing for  
industrial application



Standard labels

Ultra compact dimensions  
175 x 30 x 26.5 mm (H x W x D)

Power supply status display:  
box supply and auxiliary  
voltage

Power supply downstream  
connection

M8 screw type connector

M12 screw type connector

8 mm snap type connector



EtherCAT®

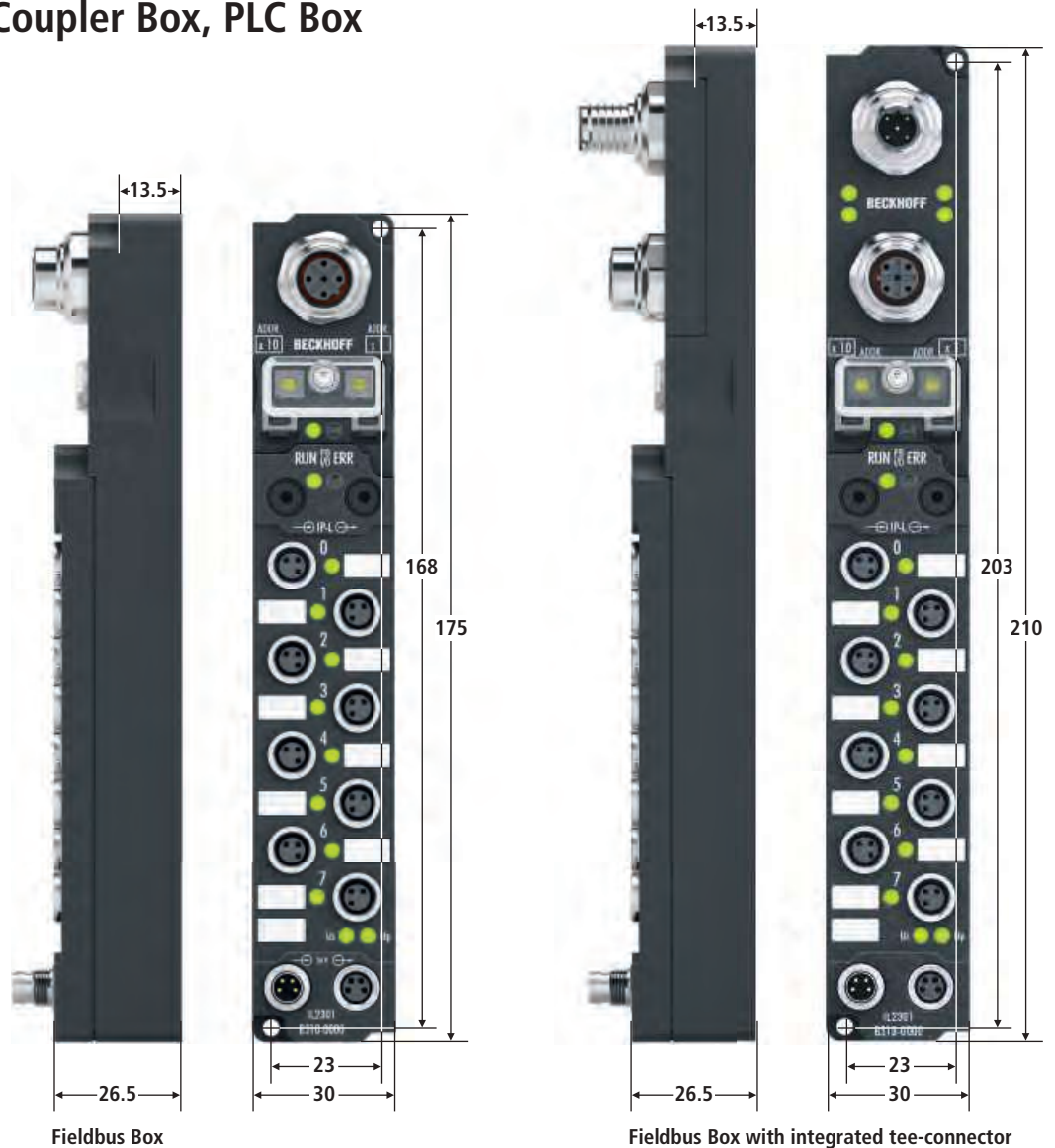
IO-Link

Ethernet TCP/IP

DeviceNet™

# Technical data

## Compact Box, Coupler Box, PLC Box



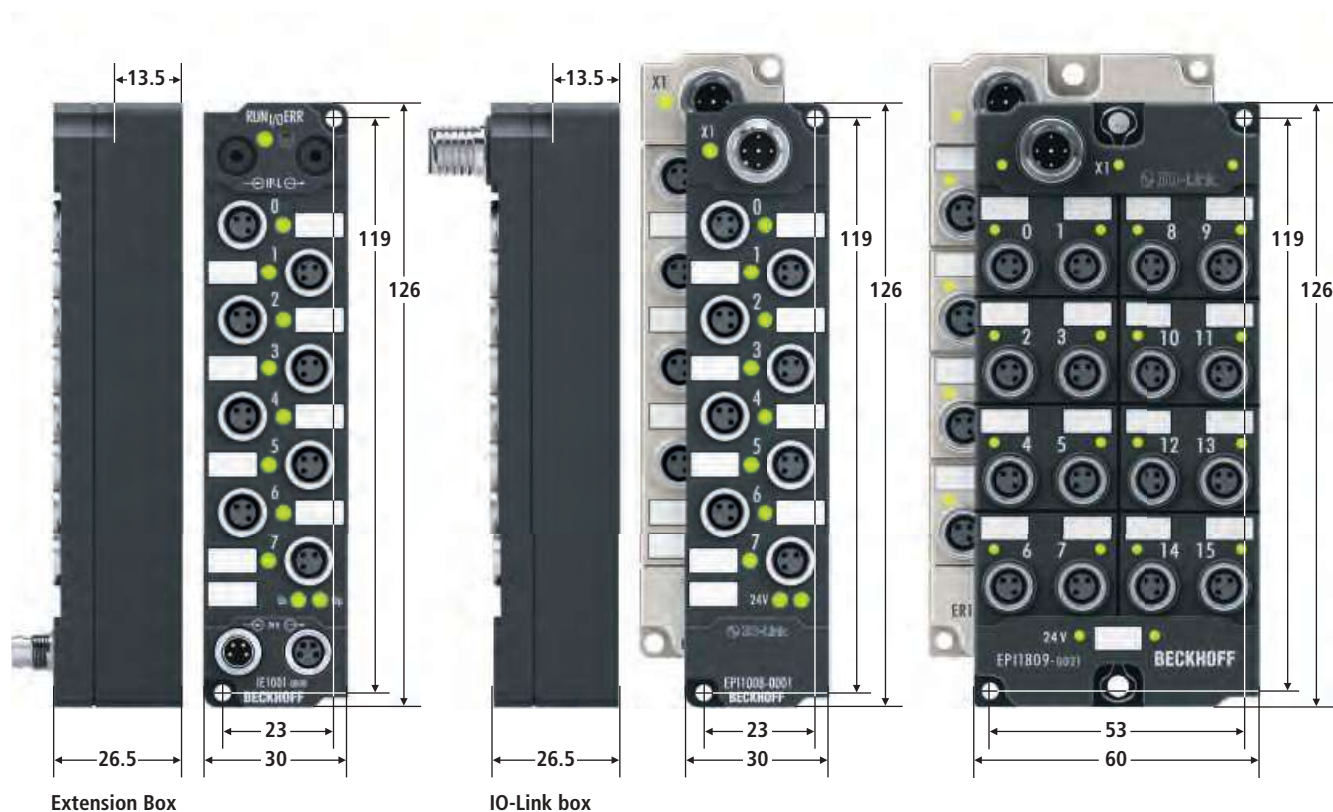
Fieldbus Box

Fieldbus Box with integrated tee-connector

Technical data	Fieldbus Box	Fieldbus Box with integrated tee-connector
Dimensions (W x H x D)	30 mm x 175 mm x 26.5 mm	30 mm x 210 mm x 26.5 mm
Weight	depending on device	
Material	PA6 (polyamide)	
Installation	2 fixing holes 3 mm diameter for M3	
Operating/storage temperature	0...+55 °C/-25...+85 °C	
Vibration resistance	conforms to EN 60068-2-6	
Shock resistance	conforms to EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Approval	UL E172151, CE	
Power feed through	I <sub>MAX</sub> = 4 A	

# Technical data

## Extension Box, IO-Link box



Technical data	Extension Box	IO-Link box (8 x M8, 4 x M12)	IO-Link box (16 x M8, 8 x M12)
Dimensions (W x H x D)	30 mm x 126 mm x 26.5 mm	30 mm x 126 mm x 26.5 mm	60 mm x 126 mm x 26.5 mm
Weight	depending on device (typ. 150 g)	depending on device (typ. 150 g)	depending on device (typ. 310 g)
Material	PA6 (polyamide)	PA6 (polyamide) for EPIxxxx or zinc die-cast for ERIxxxx	PA6 (polyamide) for EPIxxxx or zinc die-cast for ERIxxxx
Installation	2 fixing holes 3 mm diameter for M3	2 fixing holes 3 mm diameter for M3	2 fixing holes 3 mm diameter for M3; 2 fixing holes 4.5 mm diameter for M4
Operating/storage temperature	0...+55 °C/-25...+85 °C	-25...+60 °C/-40...+85 °C	-25...+60 °C/-40...+85 °C
Vibration resistance	conforms to EN 60068-2-6	conforms to EN 60068-2-6: 1 g (extended range: 5 g)	conforms to EN 60068-2-6: 1 g (extended range: 5 g)
Shock resistance	conforms to EN 60068-2-27	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 35 g, 11 ms); 1000 shocks per direction, 3 axes	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 35 g, 11 ms); 1000 shocks per direction, 3 axes
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Approval	UL E172151, CE	CE, UL in preparation	CE, UL in preparation
Power feed through	I <sub>MAX</sub> = 4 A	–	–

# Fieldbus systems

The Beckhoff Fieldbus Box modules are available for various fieldbuses. The Compact Box serves as a fieldbus station – without expansion options – with a wide variety of I/O functions.

The Coupler Box and PLC Box can be extended by the Extension Box modules. Communication takes place via IP-Link. IP-Link is a fibre optic communication link with a transmission rate of 2 Mbits/s which is capable of transmitting 1,000 items of binary I/O data in approx. 1 ms, rapidly and securely. Smaller configurations are corre-

spondingly faster. Because of the high usable data rate, the IP-Link coupling does not reduce the performance of the fieldbus at all.

The Coupler Box gathers the I/O data and corresponds to the Bus Coupler from the Beckhoff Bus Terminal system.

The PLC Box is an intelligent fieldbus module for local pre-processing of the I/O signals and thus corresponds to the Bus Terminal Controller in the Bus Terminal system. This is a way of removing parts of the application out of the central control system

to relieve the CPU and the fieldbus. Decentralised counting, control or switching are typical applications for the Fieldbus Box with integrated small controller. The reaction times are independent of the bus communication and of the supervising controller. In the event of a bus or controller failure, maintenance of function (e.g. bringing the process to a safe state in an orderly manner) is possible.

For further information on the individual fieldbuses see page **262**



IPxxx-Bzzz | Compact Box



IL230y-Bzzz | Coupler Box



IL230y-Czzz | PLC Box

► [www.beckhoff.com/Fieldbus-systems](http://www.beckhoff.com/Fieldbus-systems)

Beckhoff **Минск** т.80447584780 Viber email [minsk17@tut.by](mailto:minsk17@tut.by)  
[www.fotorele.net](http://www.fotorele.net) [www.tiristor.by](http://www.tiristor.by) радиодетали, электронные компоненты  
tel.+375 29 758 47 80 МТС

[каталог](#), [описание](#), [технические](#), [характеристики](#), [datasheet](#), [параметры](#), [маркировка](#), [габариты](#), [фото](#), [даташит](#), Beckhoff

### [где и как купить в Минске?](#)

Сделать заявку или запрос можно по телефону факсу или по электронной почте

Просим Вас указывать в заявке:

- название предприятия, факс, контактный телефон, контактное лицо;
- полное наименование и количество товара;
- возможность замены или аналоги;

## Каталог Beckhoff

Автоматизация