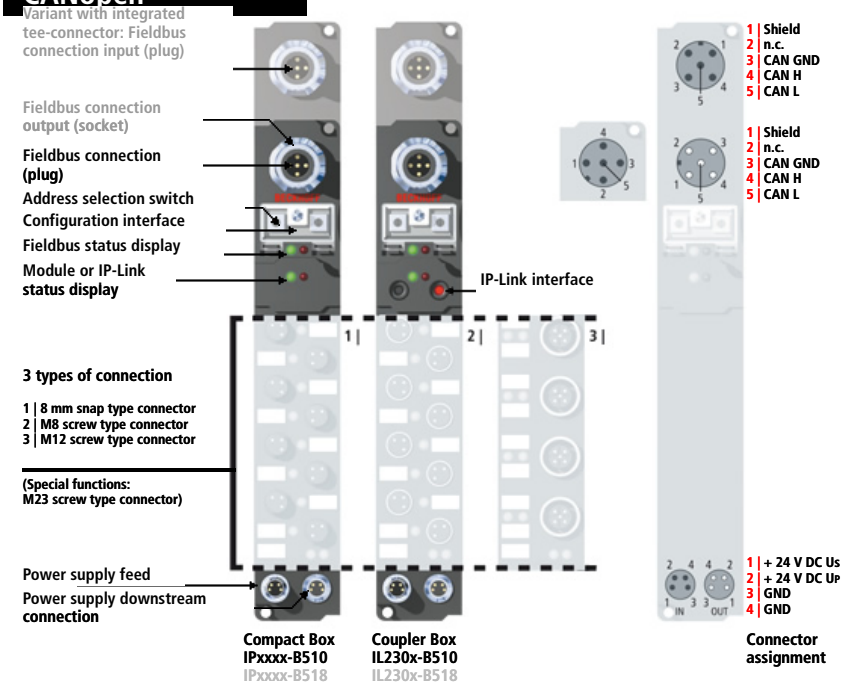


# IPxxxx-, IL230x-B51x | Fieldbus Box modules for CANopen

CANopen is a widely used standard for CAN systems. Input and output data (process data objects) can be communicated in several ways:

– Event driven: Telegrams are sent as soon as their contents have changed.
– Cyclic synchronous: A SYNC telegram causes the modules to accept the output data that was previously received, and to send new input data.
– Polled: A CAN Remote Frame causes the modules to send their input data.

The Beckhoff CANopen devices support all types of CANopen communication, and correspond to the device profile for digital and analog input/output modules (DS401).

Nine transmission rates from 10 kbaud up to 1 Mbaud are available for different bus lengths. The effective utilisation of the bus bandwidth allows CANopen to achieve short system reaction times at relatively low data rates. The Beckhoff CANopen devices have a powerful implementation of the protocol, and are certified by CiA, the CAN in Automation Association. Through active participation in the CiA's technical committees, Beckhoff is contributing to the further development of this bus system, and has in this way itself gathered profound CANopen expertise.

Apart from the standard variant (B510), the CANopen modules are also available with integrated tee-connector (B518). This makes the fieldbus wiring much easier. The tee-connector that used to be necessary is replaced by a second M12-type fieldbus input/output. This makes the cabling more compact. Straight or angled versions of pre-assembled plugs or field-assembled plugs can be used.

### Configuration

The node address is set in the range from 1 to 99 using two decimally coded rotary switches. The transmission rate set is detected automatically by the CANopen box (auto baud rate). "Electronic Data Sheets" (*.eds files) for CANopen configuration tools are available for download from the Beckhoff internet site www.beckhoff.com and on the Beckhoff product CDs. Special I/O parameters not covered by the CANopen standard can be set by means of the KS2000 software (serial connection to the configuration interface of the Fieldbus Box) or via service data object (SDOs).

### Diagnostics

The extensive diagnostic functions of the Beckhoff CANopen devices allow rapid fault localisation. The diagnostic messages (emergency messages) are transmitted over the bus and collated by the master. The status of the network connection, the device status, the status of the inputs and outputs and of the power supply are displayed by LEDs.

### Compact Box

Compact Box modules for CANopen are available for all relevant industrial signals. In addition to digital and analog input and output modules including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks.

### Coupler Box

The CANopen Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. The Coupler Box detects the connected modules and automatically allocates the input and output data to the process data objects. Both data consistency and a clear separation of input and output data are ensured. The Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box.

| System data | CANopen \| IPxxxx-B51x, IL230x-B51x | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Number of I/O stations | 63, with repeater: 99 | | | | | | | |
| Number of I/O points | depending on controller | | | | | | | |
| Data transfer medium | shielded copper cable, 2 x signal, 1 x CAN ground (recommended) | | | | | | | |
| Distance between stations | 5,000 m | 2,500 m | 1,000 m | 500 m | 250 m | 100 m | 50 m | 25 m |
| Data transfer rates | 10 kbaud | 20 kbaud | 50 kbaud | 125 kbaud | 250 kbaud | 500 kbaud | 800 kbaud | 1 Mbaud |
| I/O communication types | event driven, cyclic, synchron, polling | | | | | | | |

| Technical data | IPxxxx-B510 | IPxxxx-B518 | IL230x-B510 | IL230x-B518 |
|---|---|---|---|---|
| Extension modules | – | – | max. 120 with max. 128 byte input and 128 byte output data | max. 120 with max. 128 byte input and 128 byte output data |
| Digital peripheral signals | according to I/O type | according to I/O type | max. 960 inputs and 960 outputs | max. 960 inputs and 960 outputs |
| Analog peripheral signals | according to I/O type | according to I/O type | max. 60 inputs and 60 outputs | max. 60 inputs and 60 outputs |
| Number of PDOs (CANopen) | 16 send and 16 receive process data objects | | | |
| Additional CANopen features | life, node guarding, emergency object, variable mapping, store/restore | | | |
| Configuration possibility | through KS2000 or the controller (service data objects) | | | |
| Data transfer rates | automatic detection of 10 kbaud up to 1 Mbaud | | | |
| Bus interface | 1 x M12 plug, 5-pin | 1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated) | 1 x M12 plug, 5-pin | 1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated) |
| Power supply | control voltage: 24 V DC (-15 %/+20 %); load voltage: according to I/O type | | | |
| Power supply connection | feed: 1 x M8 male socket, 4-pin; downstream connection: 1 x M8 female socket, 4-pin | | | |
| Box supply current | 45 mA + current consumption of sensors, max. 0.5 A | | | |
| Auxiliary power current | according to I/O type | | | |
| Electrical isolation | control voltage/fieldbus: 500 V, control voltage/inputs or outputs: according to I/O type | | | |
| Weight | approx. 210 g | approx. 250 g | approx. 210 g | approx. 250 g |
| Operating/storage temperature | 0…+55 °C/-25…+85 °C | | | |
| 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 | | | |
| Protect. class/installation pos. | IP 65/66/67 (conforms to EN 60529)/variable | | | |
| Approvals | CE, UL | | | |

| Accessories | |
|---|---|
| KS2000 | configuration software for extended parameterisation |
| Cordsets | cordsets and connectors |

| System | |
|---|---|
| CANopen | For further CANopen products please see the system overview. |

# Compact Box

The Compact Box modules for CANopen offer a wide range of I/O functionality. All relevant industrial signals are supported. The digital inputs and outputs can be connected either with snap type 8 mm diameter plugs, screw type M8 connectors, or screw type M12 connectors. For analog signals the M12 version is used.

| IPxxxx-B510\|B518 | Compact Box for CANopen systems | Plug |
|---|---|---|
| **Digital input** | | |
| IP1000-B510\|B518 | Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter | 8 mm |
| IP1001-B510\|B518 | Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter | M8 |
| IP1002-B510\|B518 | Compact Box, 8 digital inputs 24 V DC, 3.0 ms filter | M12 |
| IP1010-B510\|B518 | Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter | 8 mm |
| IP1011-B510\|B518 | Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter | M8 |
| IP1012-B510\|B518 | Compact Box, 8 digital inputs 24 V DC, 0.2 ms filter | M12 |
| IP1502-B510\|B518 | Compact Box, 2 up/down counter, 24 V DC, 100 kHz | M12 |
| **Digital output** | | |
| IP2000-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | 8 mm |
| IP2001-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | M8 |
| IP2002-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | M12 |
| IP2020-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | 8 mm |
| IP2021-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | M8 |
| IP2022-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | M12 |
| IP2040-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 12 A) | 8 mm |
| IP2041-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 12 A) | M8 |
| IP2042-B510\|B518 | Compact Box, 8 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 12 A) | M12 |
| IP2512-B510\|B518 | Compact Box, 2 digital pulse width outputs 24 V DC, $I_{MAX}$ = 2.5 A | M12 |
| **Digital combi** | | |
| IP2300-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | 8 mm |
| IP2301-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | M8 |
| IP2302-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | M12 |
| IP2310-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | 8 mm |
| IP2311-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | M8 |
| IP2312-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 0.5 A | M12 |
| IP2320-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | 8 mm |
| IP2321-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | M8 |
| IP2322-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | M12 |
| IP2330-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | 8 mm |
| IP2331-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | M8 |
| IP2332-B510\|B518 | Compact Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, $I_{MAX}$ = 2 A ($\sum$ 4 A) | M12 |
| IP2400-B510\|B518 | Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX}$ = 0.5 A | 8 mm |
| IP2401-B510\|B518 | Compact Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, $I_{MAX}$ = 0.5 A | M8 |
| **Analog input** | | |
| IP3102-B510\|B518 | Compact Box, 4 differential analog inputs ±10 V, 16 bit | M12 |
| IP3112-B510\|B518 | Compact Box, 4 differential analog inputs 0/4…20 mA, 16 bit | M12 |
| IP3202-B510\|B518 | Compact Box, 4 analog inputs for resistance thermometer (RTD), PT100…1000, Ni100, 16 bit | M12 |
| IP3312-B510\|B518 | Compact Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit | M12 |
| **Analog output** | | |
| IP4112-B510\|B518 | Compact Box, 4 analog outputs 0/4…20 mA, 16 bit | M12 |
| IP4132-B510\|B518 | Compact Box, 4 analog outputs ±10 V, 16 bit | M12 |
| **Special functions** | | |
| IP5009-B510\|B518 | Compact Box, 1 SSI encoder interface | M23 |
| IP5109-B510\|B518 | Compact Box, 1 incremental encoder interface with complementary inputs, 1 MHz | M23 |
| IP5209-B510\|B518 | Compact Box, 1 SinCos encoder interface, 1 $V_{SS}$ | M23 |
| IP6002-B510\|B518 | Compact Box, 1 serial interface RS232C | M12 |
| IP6012-B510\|B518 | Compact Box, 1 serial interface, 0…20 mA (TTY) | M12 |
| IP6022-B510\|B518 | Compact Box, 1 serial interface, RS422, RS485 | M12 |

# Coupler Box

The Coupler Box for CANopen has four digital inputs and four digital outputs, optionally with snap type 8 mm diameter connectors, screw type M8 or M12 connectors. Up to 120 Extension Box modules can be connected via the IP-Link communication facility.

| IL230x-B510\|B518 | Coupler Box for CANopen systems | Plug |
|---|---|---|
| **Digital combi** | | |
| IL2300-B510\|B518 | Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A | 8 mm |
| IL2301-B510\|B518 | Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A | M8 |
| IL2302-B510\|B518 | Coupler Box, 4 digital inputs 24 V, 3 ms filter, 4 digital outputs 24 V, 0.5 A | M12 |

# System overview