

MANUFACTURER DOCUMENT PACKAGE

# Manufacturer's Manual

Reference package for procurement and maintenance review

BECKHOFF

## BK3120

PROFIBUS ECONOMY PLUS BUS COUPLER

Used with the applicable PROFIBUS BK3xx0 configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Beckhoff BK3xx0 and LC3100, Version 4.5.0, 2 June 2022, pp. 8 to 10, 41 and 50 to 51

## 2 Product overview

Bus Couplers for PROFIBUS DP

| Bus Coupler                                   | Description                                            | Bus interface           |
|-----------------------------------------------|--------------------------------------------------------|-------------------------|
| <a href="#">BK3000</a> <a href="#">[► 9]</a>  | Standard Bus Coupler                                   | D-Sub-Stecker           |
| <a href="#">BK3010</a> <a href="#">[► 9]</a>  | Economy Bus Coupler                                    | D-Sub-Stecker           |
| <a href="#">BK3100</a> <a href="#">[► 9]</a>  | Standard Bus Coupler                                   | D-Sub-Stecker           |
| <a href="#">BK3110</a> <a href="#">[► 9]</a>  | Economy Bus Coupler                                    | D-Sub-Stecker           |
| <a href="#">BK3120</a> <a href="#">[► 9]</a>  | Economy Plus Bus Coupler                               | D-Sub-Stecker           |
| <a href="#">BK3150</a> <a href="#">[► 11]</a> | Compact Bus Coupler                                    | D-Sub-Stecker           |
| <a href="#">BK3500</a> <a href="#">[► 12]</a> | Standard Bus Coupler with optical fiber connection     | HP Simplex connectors   |
| <a href="#">BK3520</a> <a href="#">[► 12]</a> | Economy Plus Bus Coupler with optical fiber connection | HP Simplex connectors   |
| <a href="#">LC3100</a> <a href="#">[► 9]</a>  | Low Cost Bus Coupler                                   | spring-loaded terminals |

## 2.1 BK3000, BK3010, BK3100, BK3110, BK3120, LC3100

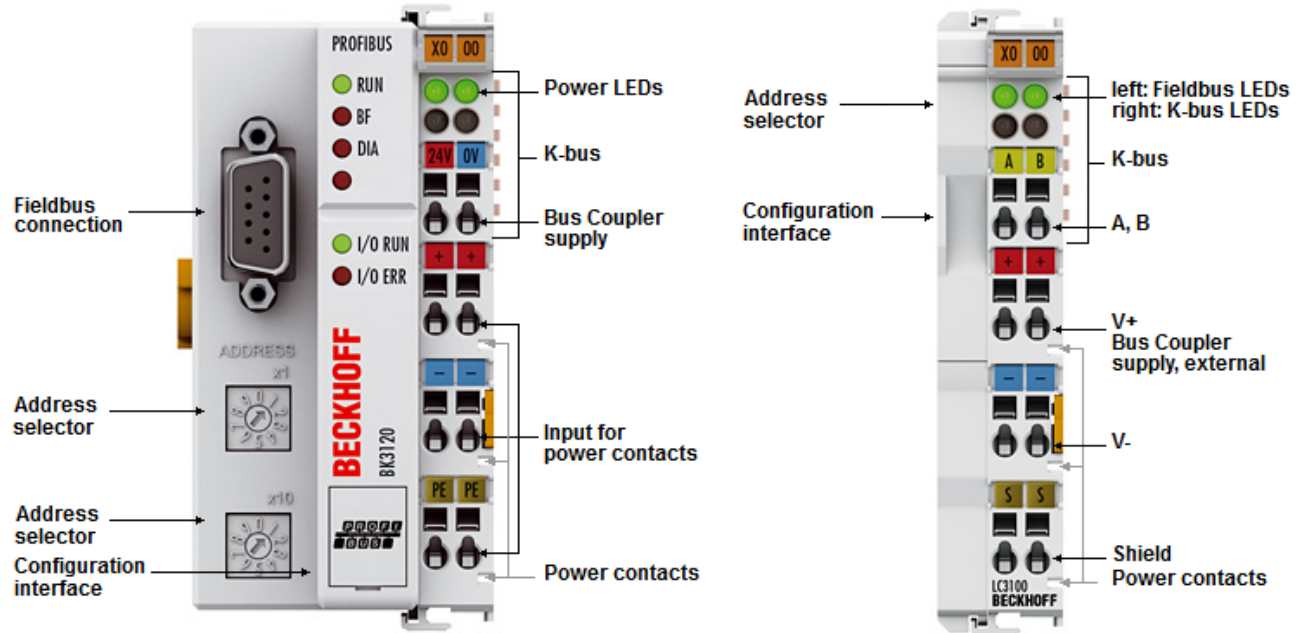


Fig. 1: BK3120 and LC3100 - Bus Couplers for PROFIBUS DP

### Technical data

| Type                                        | BK3120                                                                             |
|---------------------------------------------|------------------------------------------------------------------------------------|
| Number of Bus Terminals                     | 64 (255 with K-bus extension)                                                      |
| Digital peripheral signals                  | max. 1020 inputs/outputs                                                           |
| Analog peripheral signals                   | max. 64 inputs/outputs                                                             |
| Configuration possibility                   | Via the KS2000 configuration software or the controller                            |
| Max. number of bytes (inputs and outputs)   | 128 bytes                                                                          |
| Baud rate (automatic detection)             | up to max. 12 Mbaud                                                                |
| Bus connection                              | 1 x D-sub plug, 9-pin with shielding                                               |
| Power supply                                | 24 V <sub>DC</sub> (-15 % / +20 %)                                                 |
| Input current                               | 70 mA + (total K bus current)/4, max. 500 mA                                       |
| Starting current                            | 2.5 x continuous current                                                           |
| Recommended fuse                            | maximum 10 A                                                                       |
| K-bus current up to                         | 1750 mA                                                                            |
| Power contact voltage                       | maximum 24 V <sub>DC</sub>                                                         |
| Power contact current load                  | maximum 10 A                                                                       |
| Electrical isolation                        | Power contact / supply / fieldbus                                                  |
| Dielectric strength                         | 500 V (power contact / supply / fieldbus)                                          |
| Weight                                      | approx. 170 g                                                                      |
| Permissible ambient temperature (operation) | -25°C ... +60°C                                                                    |
| Permissible ambient temperature (storage)   | -25°C ... +85°C                                                                    |
| Permissible relative humidity               | 95% (no condensation)                                                              |
| Vibration/shock resistance                  | conforms to EN 60068-2-6 / EN 60068-2-27                                           |
| EMC immunity / emission                     | conforms to EN 61000-6-2 / EN 61000-6-4                                            |
| Protection class / Installation position    | IP20 / variable                                                                    |
| Approvals / markings                        | CE, UKCA, cULus, EAC, GL, ATEX [▶ 33], IECEx [▶ 34], cFMus [▶ 36]                  |
| Ex markings                                 | ATEX: II 3 G Ex nA IIC T4 Gc<br>II 3 D Ex tc IIIC T135 °C Dc                       |
|                                             | IECEX: Ex nA IIC T4 Gc<br>Ex tc IIIC T135 °C Dc                                    |
|                                             | cFMus: Class I, Division 2, Groups A, B, C, D<br>Class I, Zone 2, AEx ec IIC T4 Gc |

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

| Type                                             | BK3000, BK3010                                                                                                 | BK3100, BK3110                                                              | LC3100                                          |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------|
| Number of Bus Terminals                          | 64                                                                                                             |                                                                             | 64                                              |
| Digital peripheral signals                       | BK3000, BK3100: 512 inputs/outputs<br>BK3010, BK3110: 256 inputs/outputs                                       |                                                                             | 256 inputs/outputs                              |
| Analog peripheral signals                        | BK3000, BK3100: 128 inputs/outputs<br>BK3010, BK3110: -                                                        |                                                                             | -                                               |
| Configuration possibility                        | Via the KS2000 configuration software or the controller                                                        |                                                                             |                                                 |
| Max. number of bytes (inputs and outputs)        | BK3000: 244 bytes                                                                                              | BK3100:<br>64 bytes (DP and FMS operation)<br>128 bytes (DP operation only) | 32 bytes                                        |
|                                                  | BK3010: 32 bytes                                                                                               | BK3110: 32 bytes                                                            |                                                 |
| Baud rate (automatic de-<br>tection)             | up to max. 1.5 Mbaud                                                                                           | up to max. 12 Mbaud                                                         |                                                 |
| Bus connection                                   | 1 x D-sub plug, 9-pin with shielding                                                                           |                                                                             | spring-loaded terminals                         |
| Power supply                                     | 24 V <sub>DC</sub> (-15 % /+20 %)                                                                              |                                                                             |                                                 |
| Input current                                    | 70 mA + (total K-bus current)/4, 500 mA max. (BK3x00)<br>70 mA + (total K-bus current)/4, 200 mA max. (BK3x10) |                                                                             | 70 mA + (total K bus current)/4,<br>max. 200 mA |
| Starting current                                 | 2.5 x continuous current                                                                                       |                                                                             |                                                 |
| Recommended fuse                                 | maximum 10 A                                                                                                   |                                                                             |                                                 |
| K-bus current up to                              | 1750 mA (BK3x00)<br>500 mA (BK3x10)                                                                            |                                                                             | 500 mA                                          |
| Power contact voltage                            | maximum 24 V <sub>DC</sub>                                                                                     |                                                                             |                                                 |
| Power contact current<br>load                    | maximum 10 A                                                                                                   |                                                                             |                                                 |
| Electrical isolation                             | Power contact / supply / fieldbus                                                                              |                                                                             | Power supply / fieldbus                         |
| Dielectric strength                              | 500 V (power contact / supply / fieldbus)                                                                      |                                                                             | 500 V (supply / fieldbus)                       |
| Weight                                           | approx. 170 g                                                                                                  | approx. 150 g                                                               | approx. 100 g                                   |
| Permissible ambient tem-<br>perature (operation) | 0°C ... +55°C                                                                                                  |                                                                             | 0°C ... +55°C                                   |
| Permissible ambient tem-<br>perature (storage)   | -25°C ... +85°C                                                                                                |                                                                             |                                                 |
| Permissible relative hu-<br>midity               | 95% (no condensation)                                                                                          |                                                                             |                                                 |
| Vibration/shock resis-<br>tance                  | conforms to EN 60068-2-6 / EN 60068-2-27                                                                       |                                                                             |                                                 |
| EMC immunity / emission                          | conforms to EN 61000-6-2 / EN 61000-6-4                                                                        |                                                                             |                                                 |
| Protection class                                 | IP20                                                                                                           |                                                                             |                                                 |
| Installation position                            | variable                                                                                                       |                                                                             |                                                 |
| Approvals / markings*                            | CE, UKCA, cULus, EAC, GL,<br>ATEX [► 32]                                                                       |                                                                             | CE, UKCA, cULus, EAC,<br>ATEX [► 32]            |
| Ex marking                                       | ATEX: II 3 G Ex nA IIC T4 Gc                                                                                   |                                                                             |                                                 |

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

## 4.3 Technical data - overview

| Description                 | BK3010 | BK3110 | BK3120 | BK3150 | BK3500         | BK3520         | LC3100 | BC3100 |
|-----------------------------|--------|--------|--------|--------|----------------|----------------|--------|--------|
| Number of Bus Terminals     | 64     | 64     | 255    | 255    | 64             | 255            | 64     | 64     |
| Baud rate [Mbaud]           | 1,5    | 12     | 12     | 12     | 1,5            | 12             | 12     | 12     |
| Physical basis              | RS 485 | RS 485 | RS 485 | RS 485 | Optical fibers | Optical fibers | RS 485 | RS 485 |
| UserPrm Data                |        |        |        |        |                |                |        |        |
| DPV1 Services               | x      | x      | x      | x      | x              | x              | x      | x      |
| Multi-configuration mode    | x      | x      | x      | x      | x              | x              | x      |        |
| Word Align                  |        |        | x      | x      | x              | x              |        |        |
| Byte oriented Bus Terminals |        |        | x      | x      | x              | x              |        | x      |
| Distributed control         |        |        |        |        |                |                |        |        |
| PLC IEC 6 1131-3            |        |        |        |        |                |                |        | x      |

## 4.4 Configuration

### 4.4.1 Configuration - CfgData

The CfgData is generated from the modules inserted in the DP configuration tool. When modules are added, the following rules are to be observed:

| Sequence of DP modules to be added in the DP configuration tool |
|-----------------------------------------------------------------|
| Modules for the coupler's functions <a href="#">[► 41]</a>      |
| Complex function modules <a href="#">[► 42]</a>                 |
| Digital function modules <a href="#">[► 44]</a>                 |

For TwinCAT applications, these rules are followed by the TwinCAT system manager. It adds the terminals or IE modules in the sequence in which they are plugged in, and the modules for functions are added automatically if the corresponding function is activated in the [UserPrmData \[► 38\]](#).

### 4.4.2 Configuration of the Coupler Modules

The DP modules for the following Bus Coupler functions are to be added first in the DP configuration tool if the associated function is activated (if the function is not activated, the corresponding DP module is not to be added):

| Function module      | Activation of the function                                                                                                                           |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2-byte PLC Interface | The 2-byte PLC interface is activated via the <a href="#">UserPrmData [► 38]</a> (byte 5, bit 0). By default it is not active.                       |
| K-bus cycle counter  | The <a href="#">K-bus cycle counter [► 57]</a> is activated via the <a href="#">UserPrmData [► 38]</a> (byte 3, bit 3). By default it is not active. |
| Dummy output byte    | The <a href="#">dummy output byte [► 57]</a> is activated via the <a href="#">UserPrmData [► 38]</a> (byte 3, bit 5). By default it is not active.   |

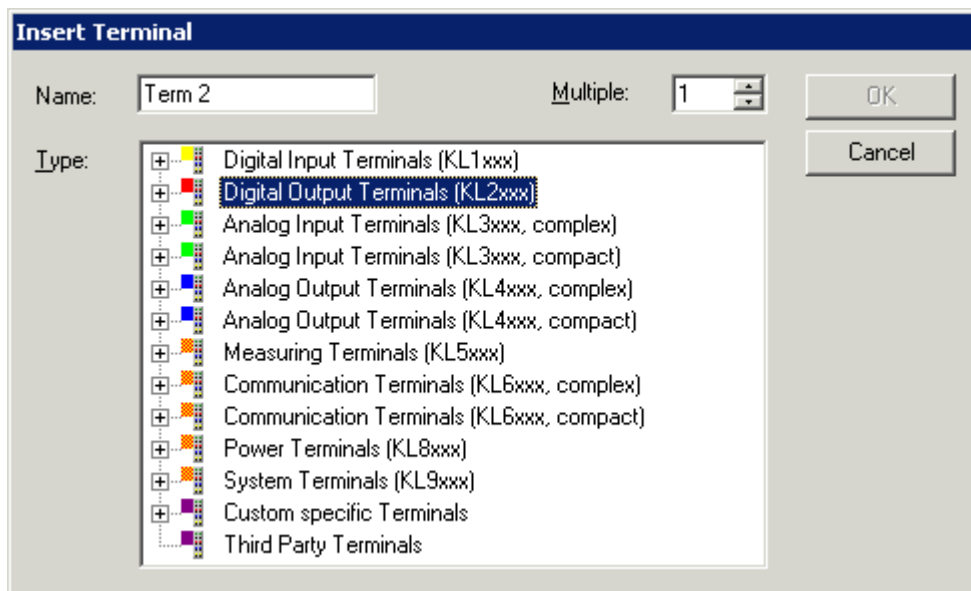


Fig. 28: Configuration of the PROFIBUS DP I/O modules - appending the Bus Terminals

## 4.4.9 Configuration with Siemens S7 controller

### 4.4.9.1 Configuration: Siemens S7 Controller

#### Inserting the images

In order to assign an image to the devices in the Siemens software, they must be copied into the *Step7 \ S7Data \ NcBmp* directory.

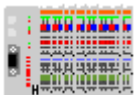


Fig. 29: Busklemn.bmp

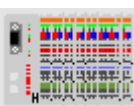


Fig. 30: Busklems.bmp

#### Inserting the GSD files

- Go to *Extras \ Install new GSD* in the hardware catalog for your Step7.
- Select the directory in which the Beckhoff GSD is located, and import the files.
- It can then be found in the hardware catalogue under *PROFIBUS DP \ Further field devices \ I/O*.

### 4.4.9.2 Configuration: Siemens S7 Controller BK3120

#### Parameter data for the BK3120

##### Settings

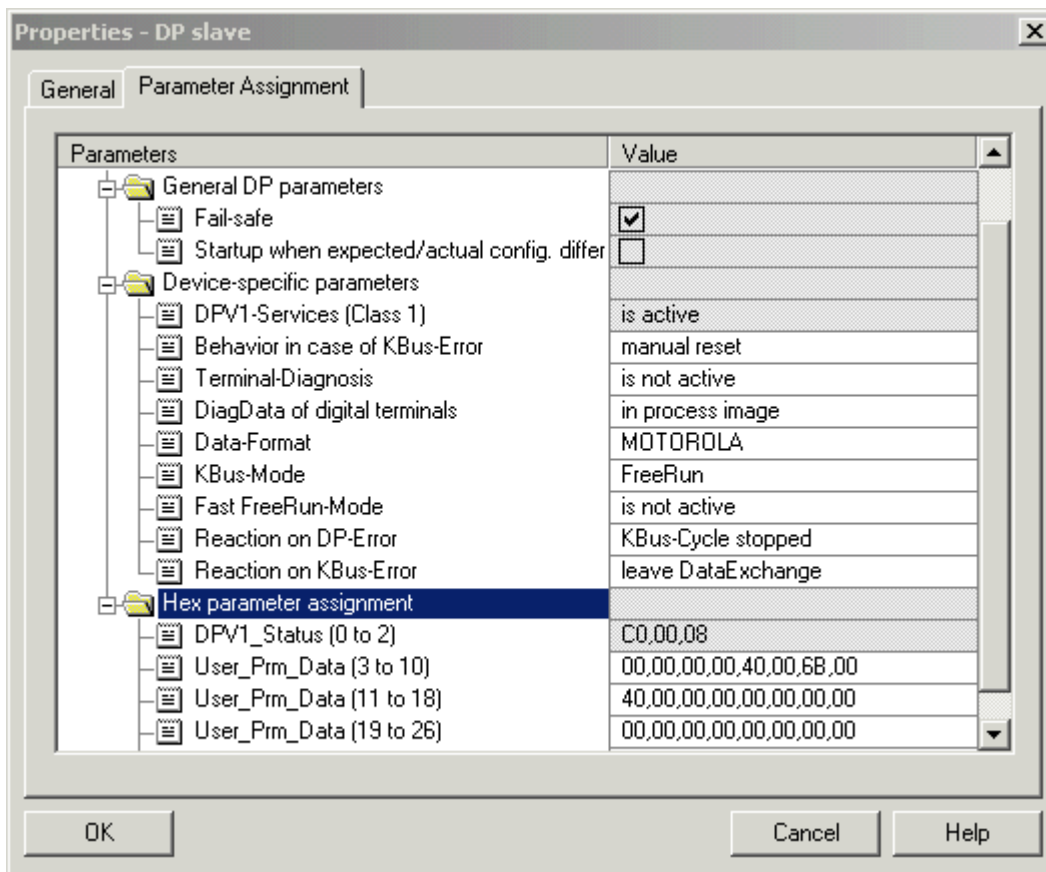


Fig. 31: Parameter data for the BK3120

| Parameter data                   | Name                                                      |
|----------------------------------|-----------------------------------------------------------|
| DPV1 service (class 1)           | DPV1 Services [ <a href="#">▶ 60</a> ]                    |
| Reaction to Bus Terminal error   | Reaction to Bus Terminal error [ <a href="#">▶ 73</a> ]   |
| Terminal bus diagnostics         | PROFIBUS diagnosis [ <a href="#">▶ 74</a> ]               |
| Digital terminal diagnostic data | Digital Bus Terminal diagnostics [ <a href="#">▶ 74</a> ] |
| Data format                      | Data format [ <a href="#">▶ 38</a> ]                      |
| K-Bus mode                       | K-bus update [ <a href="#">▶ 57</a> ]                     |
| Fast FreeRun mode                | Fast FreeRun mode [ <a href="#">▶ 57</a> ]                |
| Reaction to DP errors            | Reaction to fieldbus error [ <a href="#">▶ 38</a> ]       |
| Reaction to K-bus errors         | Reaction to K-bus errors [ <a href="#">▶ 38</a> ]         |

### Configuration of the BK3120 module with digital inputs/outputs only

Sample 1:

1 x BK3120

10 x KL1xx4

1 x KL9100 (is not entered, as this Bus Terminal is entirely passive)

11 x KL2xx4

1 x KL9010 (is not entered, as this Bus Terminal is entirely passive)

The sum total of digital bytes must be added together and entered.

Digital inputs

10 x KL1xx4, i.e. 10 x 4 bits = 40 bits

40 bit / 8 = 5 bytes, i.e. enter 5 x 8 bit or 1 x 40 bit or 1 x 8 bit + 1 x 32 bit, etc. (see Fig. *Example for entering individual bytes* and Fig. *Example for entering contiguous bytes*)