

B~IO

K-DP16DO, K-DP32DI, K-DP16DI/16DO Module Description



Version

101

B~IO

K-DP16DO, K-DP32DI, K-DP16DI/16DO Module Description

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Safety Instructions

Before you start working with the B-IO K-DP compact module, we recommend that you thoroughly familiarize yourself with the contents of this manual. Keep this manual in a place where it is always accessible to all users.

Standard operation

This instruction manual presents a comprehensive set of instructions and information required for the standard operation of the described products. The products described hereunder serve as decentralized input / output modules on the PROFIBUS-DP field bus.

The products described hereunder

- were developed, manufactured, tested and documented in accordance with the relevant safety standards. In standard operation, and provided that the specifications and safety instructions relating to the project phase, installation and correct operation of the product are followed, there should arise no risk of danger to personnel or property.
- are certified to be in full compliance with the following standards:
 - EMC Directives (89/336/EEC, 93/68/EEC and 93/44/EEC)
 - Low-voltage Directive (73/23/EEC)
 - EMC product standard EN 61800-3
- are designed for operation in an industrial environment. Prior to the intended installation and/or operation within a private residence or business area, on retail premises or in a small-industry setting, the user will be required to obtain a single operating license issued by the appropriate national authority or approval body. In Germany, this is the Federal Institute for Posts and Telecommunications, and/or its local branch offices.

Proper and safe operation of subject product is contingent upon its proper shipping and storage, placement and installation, as well as judicious operation.

Qualified personnel

The requirements for qualified personnel are based upon the job specifications as outlined by the ZVEI and VDMA professional associations in Germany. Please refer to the following German-language publication:

Weiterbildung in der Automatisierungstechnik

Hrsg.: ZVEI und VDMA

MaschinenbauVerlag

Postfach 71 08 64

60498 Frankfurt

This instruction manual is specifically designed for trained electricians who are familiar with the maintenance, service and repair of machines and systems utilizing programmable logic controllers (PLC). They will not require special skills in handling the PLC controllers.

Chapter 8 of this manual contains supplementary information for design engineers and project designers concerned with PLC system design, and electricians responsible for installation and commissioning. These persons require familiarity with PLC systems, and with the PROFIBUS-DP field bus.

Interventions in the hardware and software of our products not described in this instruction manual may only be performed by our skilled personnel.

Unqualified interventions in the hardware or software or non-compliance with the warnings listed in this instruction manual or indicated on the product may result in serious personal injury or damage to property.

Installation and maintenance of the products described hereunder is the exclusive domain of **trained electricians** as per VDE 1000-10 who are familiar with the contents of this manual. Relevant procedures must be performed in compliance with applicable accident prevention regulations (in Germany, these are UVV VBG4, VDE 100, VDE 105) and installation instructions (EN 60204 part 1, EN 50178).

Trained electricians are persons of whom the following is true:

- They are capable, due to their professional training skills and expertise, and based upon their knowledge and familiarity with applicable technical standards, of assessing the work to be carried out, and of recognizing possible hazards.
- They possess, subsequent to several years' experience in a comparable field of endeavour, a level of knowledge and skills that may be deemed commensurate with the level attainable in the course of a formal professional education..

Intervention by insufficiently trained or unskilled personnel may cause severe damage to machine and drive components, loss of software or even personal injury.

Programming, start-up and operation, as well as the modification of program parameters must be performed only by appropriately trained personnel! The referred persons must be capable of recognizing possible hazards that may arise from programming and program changes, and that may be generally produced by mechanical, electrical or electronic devices.

With regard to the foregoing, please read the information about our comprehensive training program. You'll find a listing of our seminars on the front inside cover of this manual.

The professional staff at our training centre will be pleased to provide more information. You may contact the centre by telephone at (+49) 6062 78–258.

Safety instructions on the control components

The following warnings and notices may be affixed to the control components themselves and have the following meaning:



DANGER: High voltage!



DANGER: Battery acid!



Electrostatically sensitive components!



Disconnect at mains before opening!



PE conductor



Functional earthing / low-noise earth



GND / Earth conductor

Safety instructions in this manual



DANGEROUS ELECTRICAL VOLTAGE

This symbol is used to warn of the presence of **dangerous electrical voltage**. Insufficient or lacking compliance with these instructions can result in **personal injury**.




DANGER

This symbol is used wherever an insufficient or lacking compliance with instructions can result in **personal injury**.



CAUTION

This symbol is used wherever an insufficient or lacking compliance with instructions can result in **damage to equipment or data files**.

-  This symbol is used to alert the user to an item of special interest.
- ★ This asterisk symbol shows that the manual is describing an activity which you will be required to perform.

Safety Instructions

**DANGER**

Danger to persons and equipment!
Test every new program before operating the system!

**DANGER**

Fatal injury hazard through ineffective Emergency-OFF devices!
Emergency-OFF safety devices must remain effective and accessible during all operating modes of the system. The release of functional locks imposed by Emergency-OFF devices must never cause an uncontrolled system restart! Before restoring power to the system, test the Emergency-OFF sequence!

**DANGER**

Retrofits or modifications may interfere with the safety of the products described hereunder!
The consequences may be severe personal injury, or damage to equipment or the environment. Therefore, any system retrofitting or modification utilizing equipment components from other manufacturers will require express approval by Bosch.

**DANGEROUS ELECTRICAL VOLTAGE**

Unless otherwise indicated, maintenance procedures must always be carried out with the system switched OFF! The system must be protected and secured against inadvertent restart.

In the event that measuring and testing procedures on the live system are required, compliance with applicable safety and accident prevention regulations is mandatory. In any case, only approved electrical tools must be used!

**CAUTION**

Danger to the module!
Do not insert or remove the module while the controller is switched ON! This may destroy the module. Prior to inserting or removing the module, switch OFF or remove the power supply module of the controller, external power supply and signal voltage!

**CAUTION**

Service repairs and maintenance procedures are the exclusive domain of Bosch Service engineers or Bosch-licensed repair and service companies! Only spare parts or replacement components authorized by Bosch must be used!

**CAUTION**

Danger to the module!

All ESD protection measures must be observed when using the module! Prevent electrostatic discharges!

Observe the following protective measures for electrostatically endangered modules (EEM)!

- The employees responsible for the storage, transport and handling must be trained in ESD protection.
- EEMs must be stored and transported in the protective packaging specified.
- Out of principle, EEMs may only be handled at special ESD work stations equipped for this particular purpose.
- Employees, work surfaces and all devices and tools that could come into contact with EEMs must be on the same potential (e.g. earthed).
- An approved earthing wrist strap must be worn. It must be connected to the work surface via a cable with integrated 1 M Ω resistor.
- EEMs may under no circumstances come into contact with objects susceptible to accumulating an electrostatic charge. Most items made of plastics belong to this category.
- When installing EEMs in or removing them from an electronic device, the power supply of the device must be switched OFF.

Documentation and Software

The present manual provides the user with comprehensive information about operation and installation of the B~IO K-DP compact modules. However, generally accepted planning and installation methods for the PROFI-BUS-DP field bus have been excluded from this manual.:

Dokumentation	Order no.	
	German	English
B~IO K-DP16DO, K-DP32DI, K-DP16DI/16DO Module description	1070 072 410	1070 072 171
B~IO M-DP, 8DO, 8DI, 16DI Module description	1070 072 419	1070 072 172

The listed module descriptions contain the following:

- Several chapters describing module operation
- Specifications
- Accessories / Spare parts
- Project Design and Installation
- Appendix

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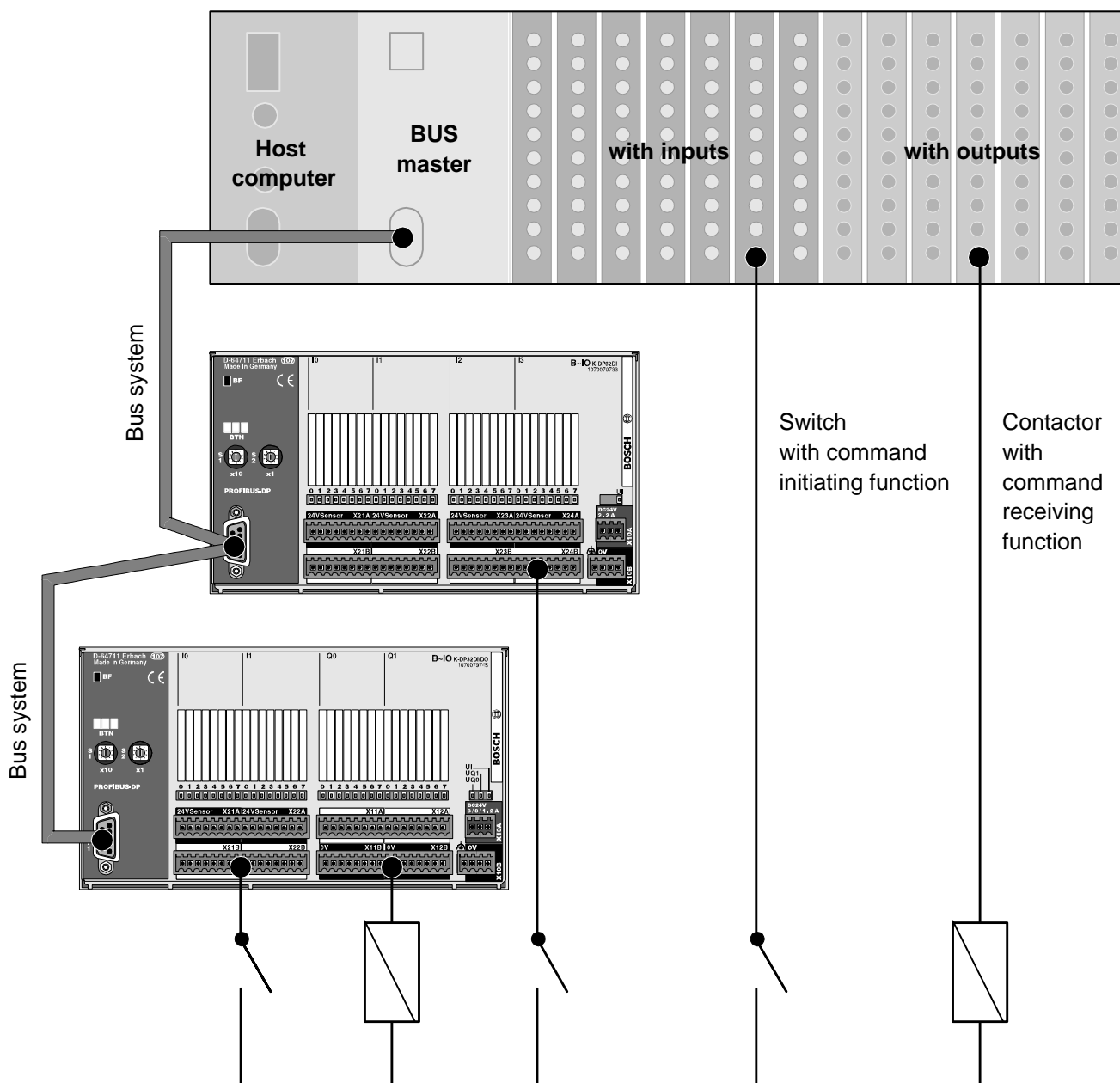
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1 System Overview

The B~IO K-DP bus input / output modules comprise decentralized terminal devices (slave devices) for programmable memory controllers (PLC) or for computers performing controller functions. The data transmission is handled via the PROFIBUS-DP field bus, as per DIN EN 50170. An application example appears below:



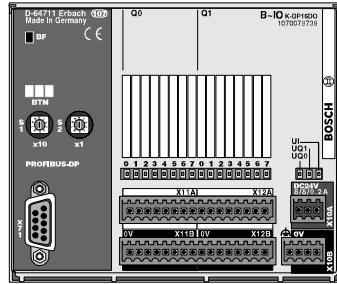
1.1 B~IO K-DP Type Variants

K-DP16DO

16-way output module, featuring

- 8 outputs, 0.5 A
- 4 outputs, 1 A
- 4 outputs, 2 A

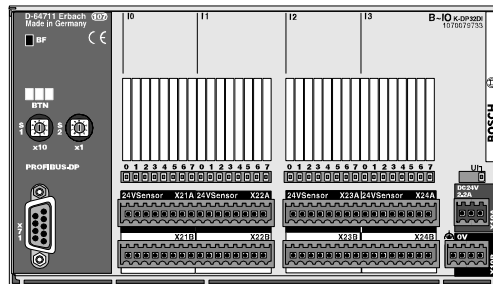
Order no.: 1070 079 739



K-DP32DI

32-way input module, featuring, 24 V

Order no.: 1070 079 733

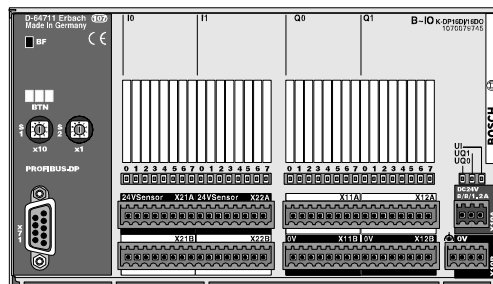


K-DP16DI/16DO

32-way input / output module, featuring

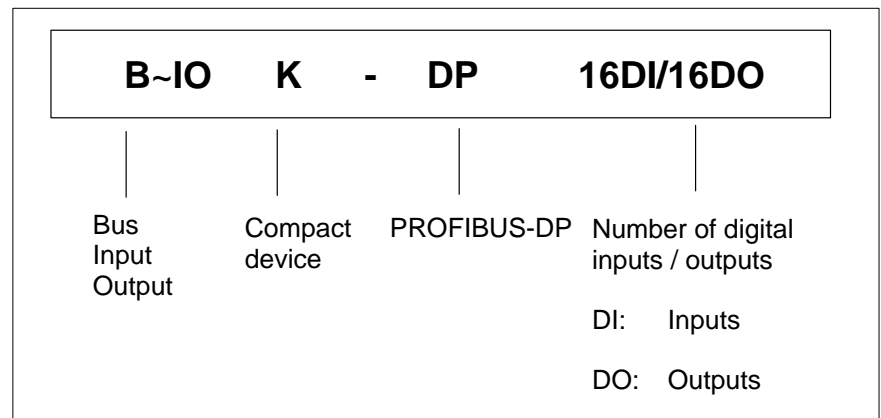
- 16 inputs, 24 V
- 8 outputs, 0.5 A
- 4 outputs, 1 A
- 4 outputs, 2 A

Order no.: 1070 079 745



1.2 Module Designations

The module designations are structured as follows:



1.3 Basic Functions

The controller – irrespective of the system being used – must be equipped with a connection for the PROFIBUS-DP in accordance with DIN EN 50170 Part 2.

Several B-IO K-DP modules can be connected via a screened 2-wire line. The inputs and outputs are directly connected to the B-IO K-DP module in close proximity to the machine. This provides the following advantages:

- Connectivity compatible with different controller systems
- Minimal wiring required between controller and machine
- Changeout of defective modules without rewiring
- Clearly structured system arrangement through spatial separation of controller and machine, and of machine modules
- Subsequent extensions are possible at minimal cost
- Space savings in control cabinet
- Reduced number of input and output modules in the controller
- Connectivity for large number of bus stations
- Simplified error diagnostics

Via the PROFIBUS-DP, the B-IO K-DP module remains in constant contact with the governing controller.

The input modules –

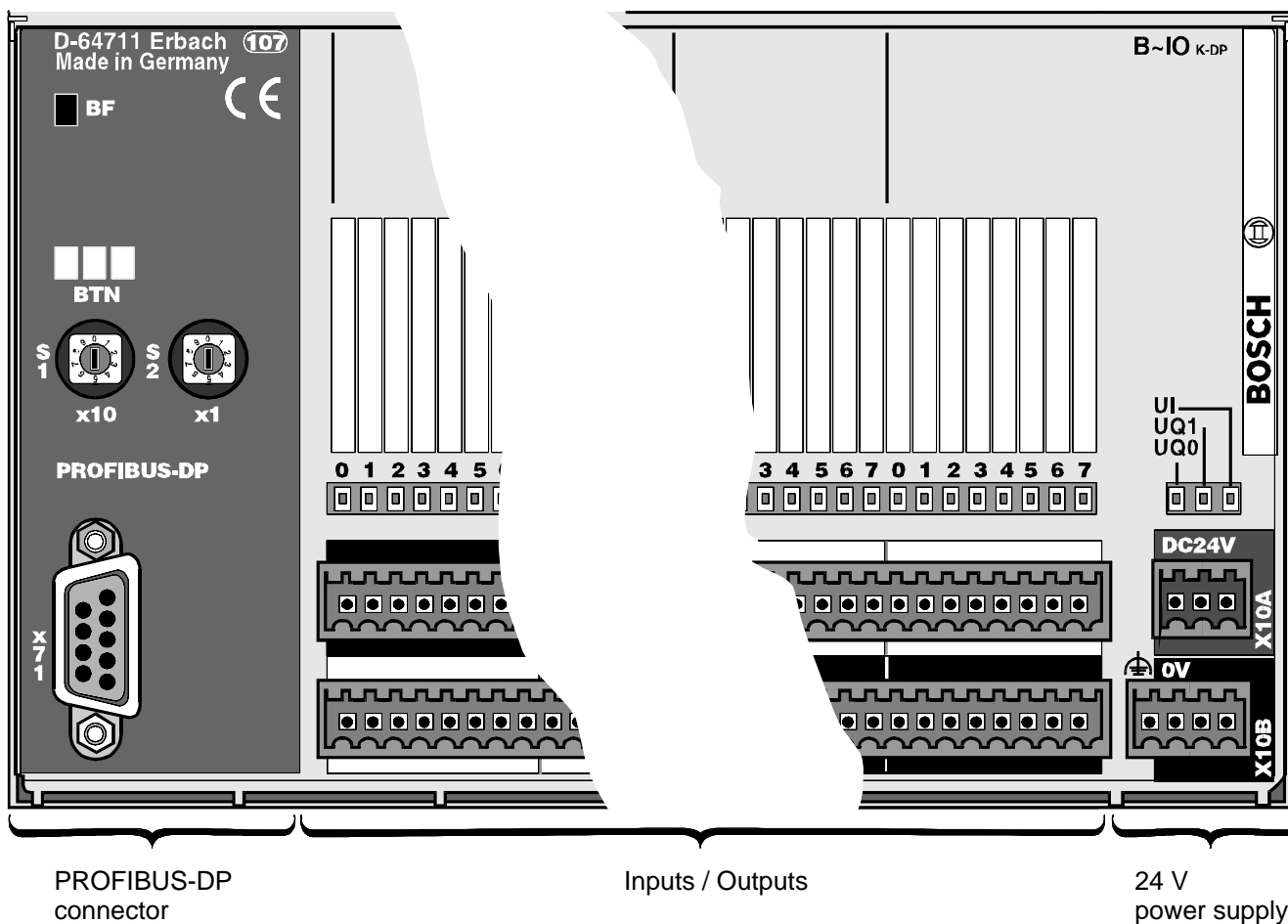
- provide a 24 V potential,
- process the input signals inbound from switches, light barriers, and sensors, and
- forward the respective signals to the controller via the bus.

The output modules –

- receive the controller output signals via the bus, and
- control the connected low-rating loads, such as valves, lamps, contactors, etc.

1.4 Hardware Configuration

Functional sections



The B~IO K-DP modules encompass three functional sections:

- PROFIBUS-DP connector
- Input / Output ranges
- 24 V power supply

The 24 V power supply is described in the corresponding sections.

Installation

The module is installed –

- either by placing it directly on a standard 35 x 7.5 mm support rail in the control cabinet as per EN 50022, or
- by snapping it onto the support rail adapter for back-panel installation. This adapter is available as an optional accessory.

Accessories

- Support rail adapter for back-panel installation
- Legend labels
- Bus cables and plug connectors
- Various connector plugs (threaded, spring-loaded and insulation-piercing connecting devices)
- Connector strip extractors
- Terminal blocks for connections of the 3 or 4-wire type

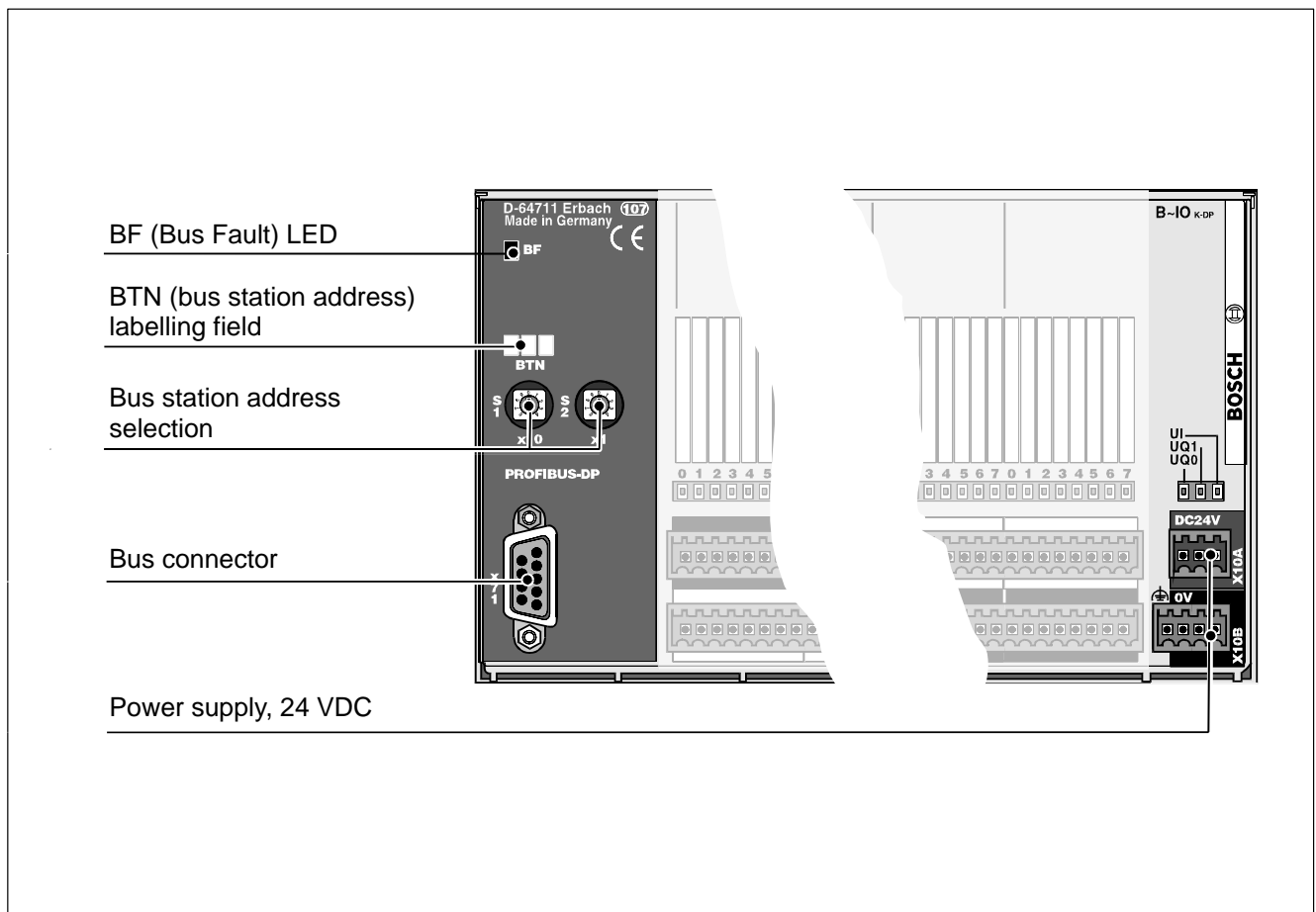
A complete list of spare parts and accessories appears in Chapter 7 of this manual.

2 PROFIBUS-DP Bus connection

2.1 Bus Configuration

The PROFIBUS-DP field bus provides a permanent connection between the B-IO K-DP bus input / output module and the governing control unit.

- Via the field bus, the module forwards the current switching signals received at the inputs to the governing control unit for further processing.
- From the control unit, the module also receives the output signals via the PROFIBUS-DP field bus, and directs the same to its outputs.

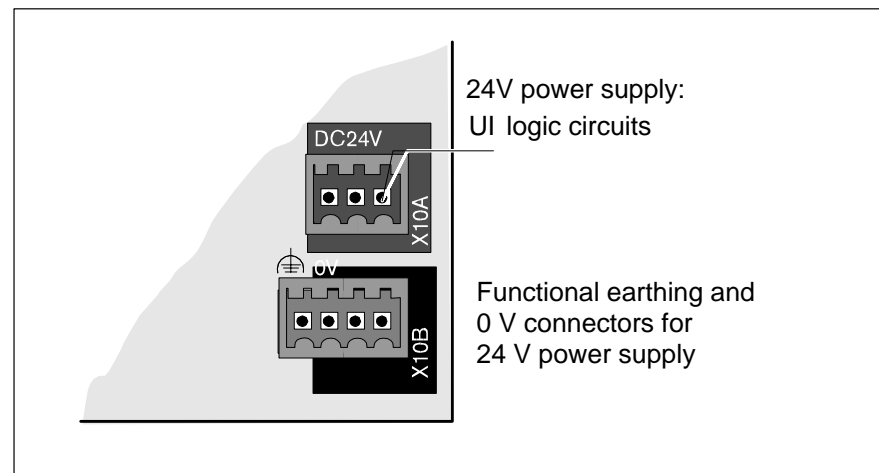


2.2 Connectors

2.2.1 24 V Power Supply

The module requires a 24 V power supply for –

- PROFIBUS-DP interface, and
- UI logic circuits



2.2.2 PROFIBUS-DP

The PROFIBUS-DP comprises a field bus conforming to EN 50170 part 2 (DP).

The PROFIBUS-DP connection features a male DB-9 connector that is attached and screw-mounted to the female DB-9 on the B-IO K-DP module.

Pin assignment

Pin no.	RS-485 ref.	Signal	Explanation
1	–	–	–
2	–	–	–
3	B/B'	RxD/TxD-P	Receive / Send data (positive)
4		CNTR_P	Repeater control signal
5	C/C'	DGND	Data reference potential (M5V)
6		VP	Power supply (positive) (P5V)
7	–	–	–
8	A/A'	RxD/TxD-N	Receive / Send data (negative)
9		DGND	Data reference potential (M5V)

Baud rates

The baud rate selected on the PROFIBUS-DP is automatically detected by the bus connection of the B-IO K-DP. The supported baud rates range from 9.6 kbaud to 12 Mbaud.

2.3 Operation

Power-up sequence

When switching on the control unit, an automatic comparison is made between the selected values and the conditions that actually exist. For this reason, the power supply to the B~IO K-DP module should be active already at this point.

Procedural sequence:

- Activate power for B~IO K-DP module.
- B~IO K-DP module maintains safe status for all outputs (disabled, logical 0).
- B~IO K-DP module waits for data exchange with governing control unit.

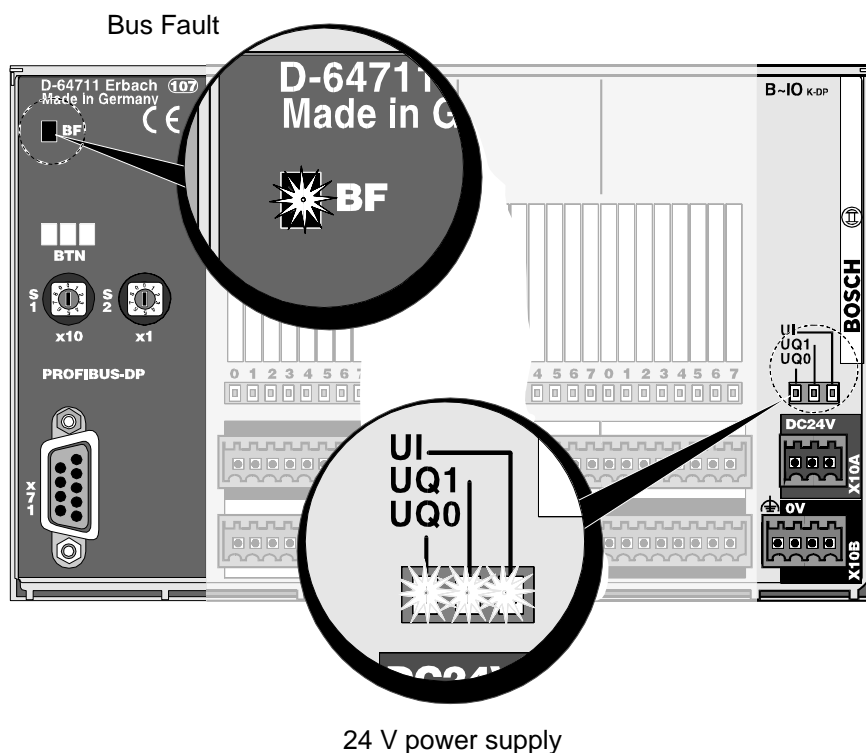
☞ **Observe the relevant information in the operating manual supplied with the governing control unit.**

Ongoing Operation

All aspects of the bus connection are handled by the governing control unit. Manual operation is neither required nor provided for.

The bus connection is active when

- the UI LED illuminates green, and
- the BF LED is extinguished.



2.4 Troubleshooting

2.4.1 Causes of Malfunctions

Generally, a differentiation is made between two types of malfunctions:

Malfunction	Indication	Cause	Remedial measures
Bus connection failure	UI LED remains dark	24 V power supply is missing	Check the function of 24 V power supply
Bus fault	BF LED is steady Red	Bus fault	<ul style="list-style-type: none"> • Check the selected bus station address on both the B-IO K-DP and the control unit • Check the fault/error messages of the governing control unit • Check and verify function of bus cabling

2.4.2 Summary of Malfunction Indications

General Malfunction Indications

Name	LED	Function
BF	OFF	Bus is fault-free
	Red	Bus fault (baud rate / bus station address) or initialization phase on DP bus
UI	OFF	24 V power supply to logic circuits is missing
	Green	24 V power supply to logics circuits is OK
	Red	For devices with inputs only: Max. total current of 24 V power supply to sensors has been exceeded.

Malfunction Indications on Devices with Outputs

Name	LED	Function
UQ0	OFF	24 V power supply output byte 0 is missing
	Green	24 V power supply to output byte 0 is OK
	Red	Overload on one or more outputs (output byte 0) This indication will occur only as long as the overloaded output is being activated.
UQ1	OFF	24 V power supply output byte 1 is missing
	Green	24 V power supply to output byte 1 is OK
	Red	Overload on one or more outputs (output byte 1) This indication will occur only as long as the overloaded output is being activated.

2.5 Maintenance / Inspection

The bus connection is maintenance-free. If cleaning of the module enclosure is required, no abrasive or solvent-based cleansers may be used.

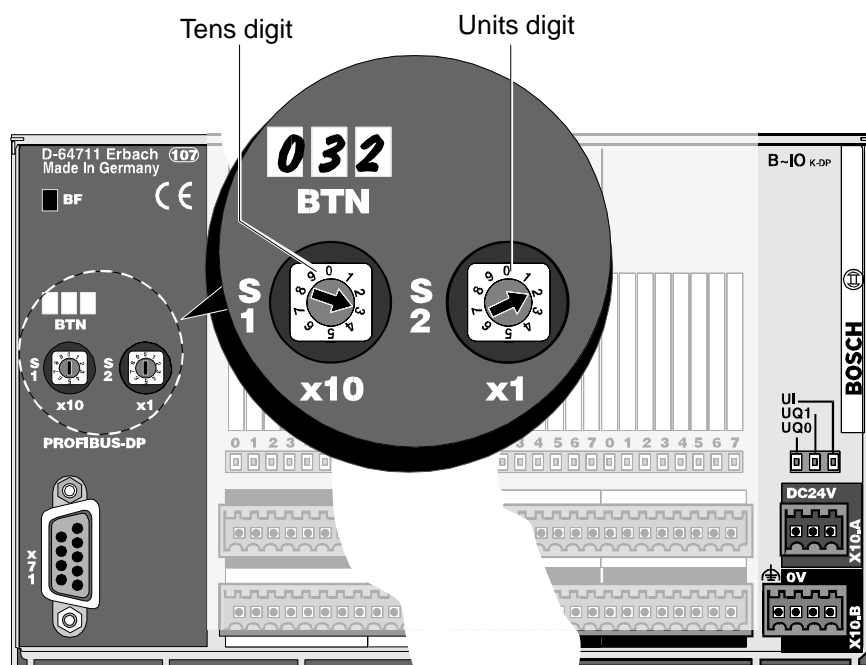
2.6 Installation

Initial Installation / Planning Phase

The present instruction manual is not intended for use by the design engineer or planner working on the detail of a given machine. Instead, the information contained herein is assembled with a view to ensuring trouble-free function and interaction of miscellaneous system components with the various B-IO K-DP modules.

- ☞ For more detailed information, refer to Chapter 6, “Specifications” and Chapter 8, “Project Planning & Installation.” The prerequisite for a thorough understanding of the information presented in the referred chapters are special skills with regard to PLC controllers and the PROFIBUS-DP field bus.

Bus Station Address



The bus station address for the B-IO K-DP is set in two digits with the use of two rotary switches. Addresses are available in the range between 0 and 99. For each PROFIBUS-DP, each address may be assigned only once.

- ☞ Use the BTN labelling field to record the selected address which, in the example shown, is 032.

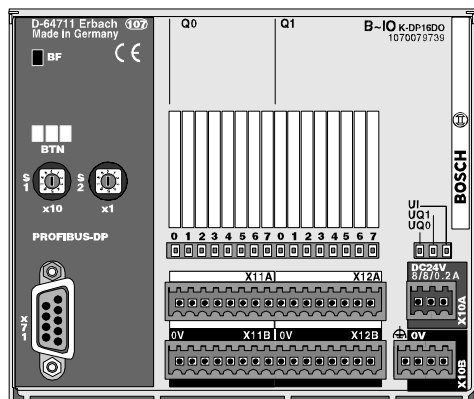
 **Please observe also the limitations and specifications of the governing control unit.**

At the time of activating the power supply, and during the subsequent module start-up, the B~IO K-DP module determines the selected address. In the event that the address setting is changed during ongoing operation, the change will come into effect only with the subsequent module start-up. This results in the following procedure for setting the bus station address:

- Record current address or determine an address that is still available.
- Switch off 24 V power supply and control unit power supply.
- Select bus station address on rotary switches.
- Switch on 24 V power supply for B~IO K-DP module.
- Switch on power supply for control unit.

The applicable baud rate is selected automatically.

3 K-DP16DO

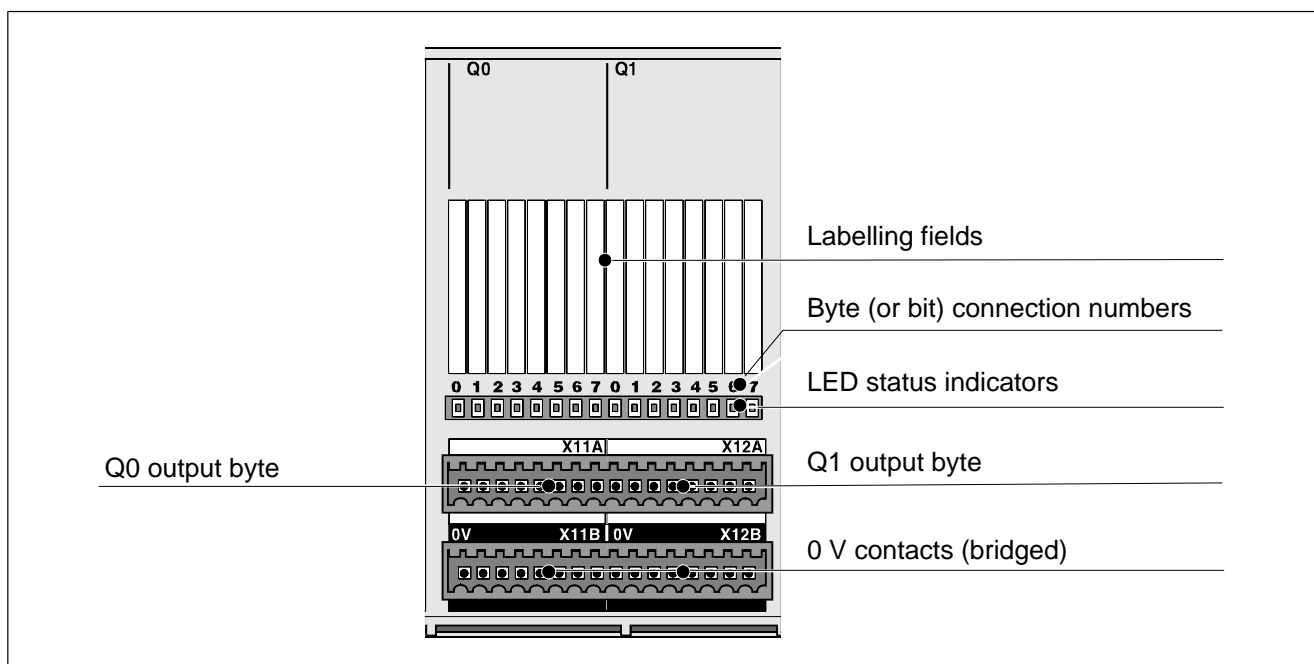


3.1 Hardware Configuration

The signals passed through the bus connection control the 16 digital semiconductor outputs. These 24 V outputs are non-latching, causing the signal to be reset by a power failure. During a restart, and dependent upon the incoming signals from the governing control unit, the outputs are again automatically set.

The following outputs are provided for actuators or small loads (such as valves, lamps, contactors, etc.):

- 8 outputs, 0.5 A
- 4 outputs, 1 A
- 4 outputs, 2 A

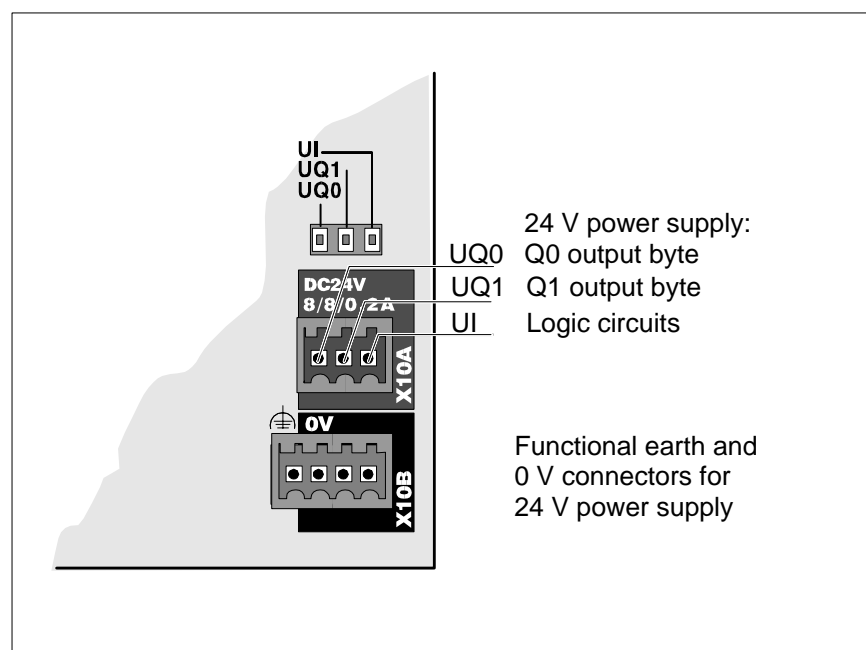


3.2 Connectors

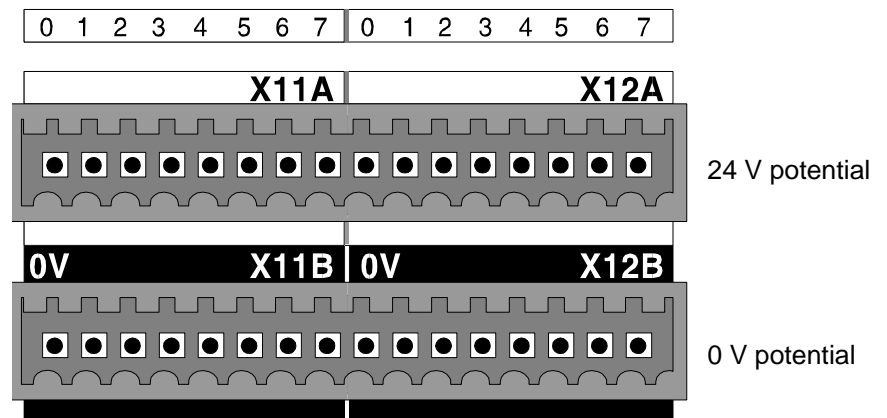
3.2.1 24 V Power Supply

The module requires a 24 V power supply for the following:

- UI Logic circuits
- UQ0 Q0 output byte
- UQ1 Q1 output byte



3.2.2 Outputs



The following applies to output bytes Q0 and Q1:

- 0.5 A outputs: bits 0 through 3
- 1 A outputs: bits 4 and 5
- 2 A outputs: bits 6 and 7

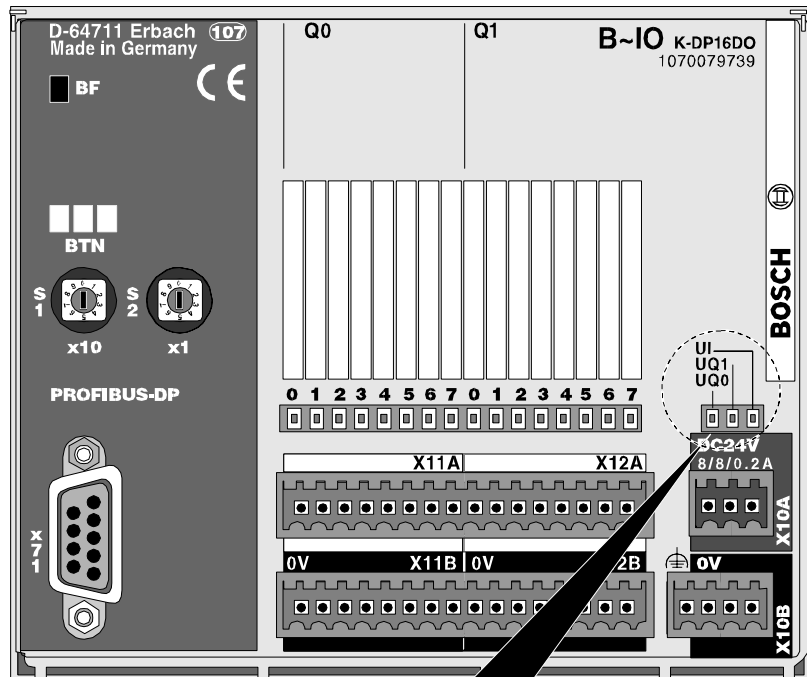
All 0 V potentials required for two-wire load connections are interconnected on the module.

The status LED illuminates green when the load side of the output is active.

3.3 Operation

The outputs are serviced through the PROFIBUS-DP field bus connection. Manual operation is neither required nor provided for.

The module is active when the UI, UQ0 and UQ1 LEDs illuminate green.



24 V power supply:
 UI Logic circuits
 UQ1 Q1 output byte
 UQ0 Q0 output byte

3.4 Troubleshooting

Generally, a differentiation is made between four types of malfunctions:

Malfunction	Indication	Cause	Remedial measures
Output module does not function	One of the UI, UQ0 and UQ1 LEDs fails to illuminate	24 V power supply is missing	Check function of 24 V power supply
Outputs receive incorrect signal from bus connection	One or more status indications indicate an incorrect signal level	The governing control unit or bus connection supplies a faulty signal	Check and verify the control unit's signal exchange and the bus connection indicators
Operation of output module is faulty	BF LED illuminates red	<ul style="list-style-type: none"> • Wrong bus station address • Baud rate of bus master is not supported 	<ul style="list-style-type: none"> • Set bus station address • Check and verify the configuration of the bus master
	One or more output status indicators show an incorrect signal level although the control unit sends the correct signal	Possible defect in output module	Replace the B~IO K-DP module
Overload condition on single output	UQ0 or UQ1 LED illuminates red	Overload in respective output byte	Investigate the cause

3.5 Maintenance / Inspection

The bus connection is maintenance-free. If cleaning of the module enclosure is required, no abrasive or solvent-based cleansers may be used.

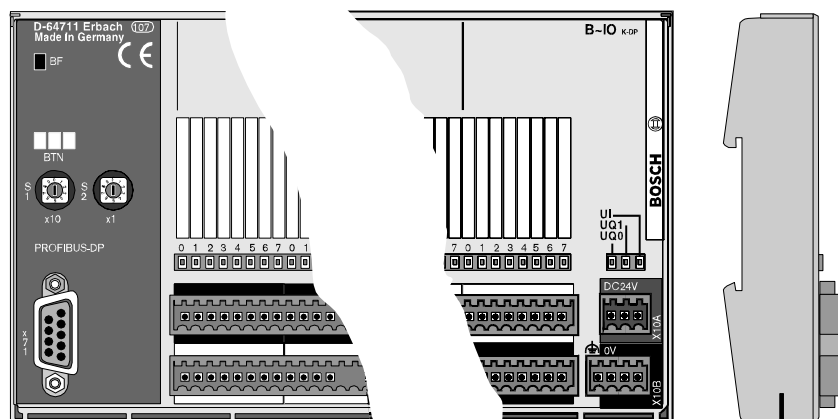
3.6 Installation

Initial Installation / Planning Phase

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☞ For more detailed information, refer to Chapter 6, “Specifications” and Chapter 8, “Project Planning & Installation.” The prerequisite for a thorough understanding of the information presented in the referred chapters are special skills with regard to PLC controllers and the PROFIBUS-DP field bus.

Attaching the Module



The modules are installed –

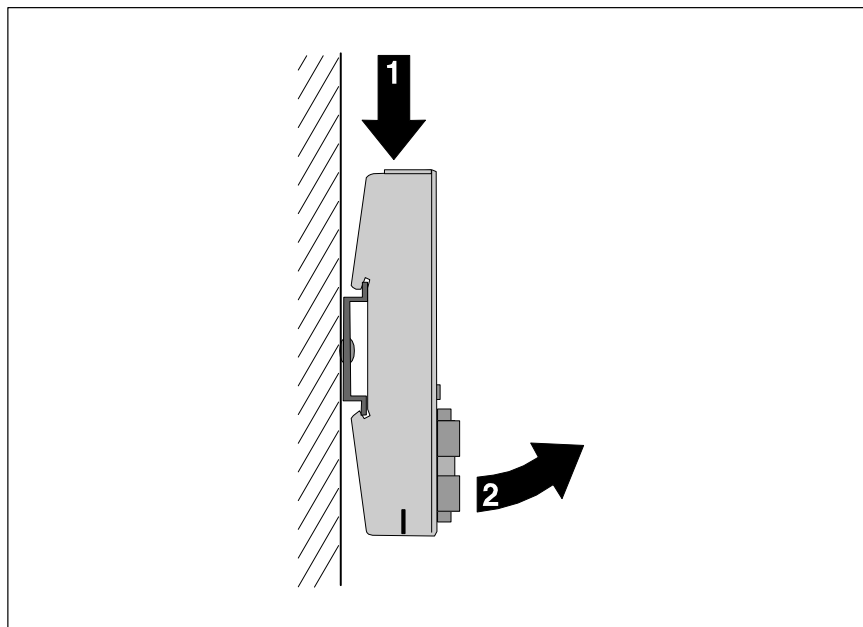
- either by direct placement on a standard 35 x 7.5 mm DIN rail (top-hat rail) in the control cabinet as per EN 50022, or
- by snapping them onto the support rail adapter for back-panel installation. This adapter is available as an optional accessory.

To facilitate installation and removal, a clearance of 20 mm should be maintained above and below the module.

Removing the Module

- ☞ **When removing the module, all connectors should be labelled. This will prevent accidental connector misplacement upon installation.**

To remove, the module must first be pressed downward to overcome the spring pressure (1). This facilitates unsnapping the lower enclosure claw, and subsequent removal of the module from the DIN rail by swinging the unit out at the bottom while lifting in an upward arc (2).



Installation

To install, the module is first hooked over the upper lip of the DIN rail, and then snapped into place while exerting downward pressure. The spring action at the rear of the module housing will exert slight upward pressure, causing the module to lock securely into place.

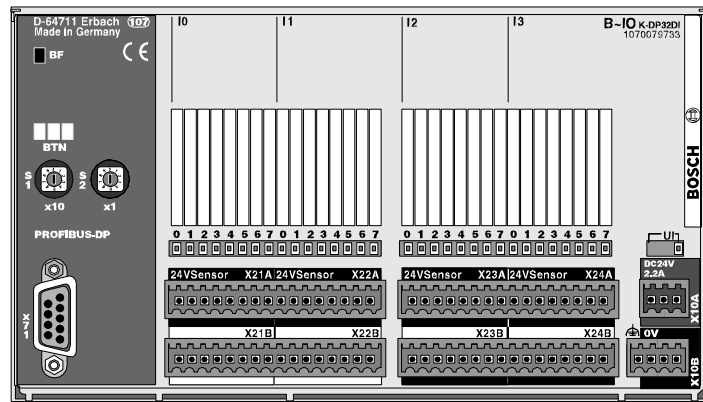
Accessories

- Identification labels
- Connector strip extractors
- Terminal blocks providing extensions for 3 or 4-wire type connections

A complete list of spare parts and accessories appears in Chapter 7 of this manual.

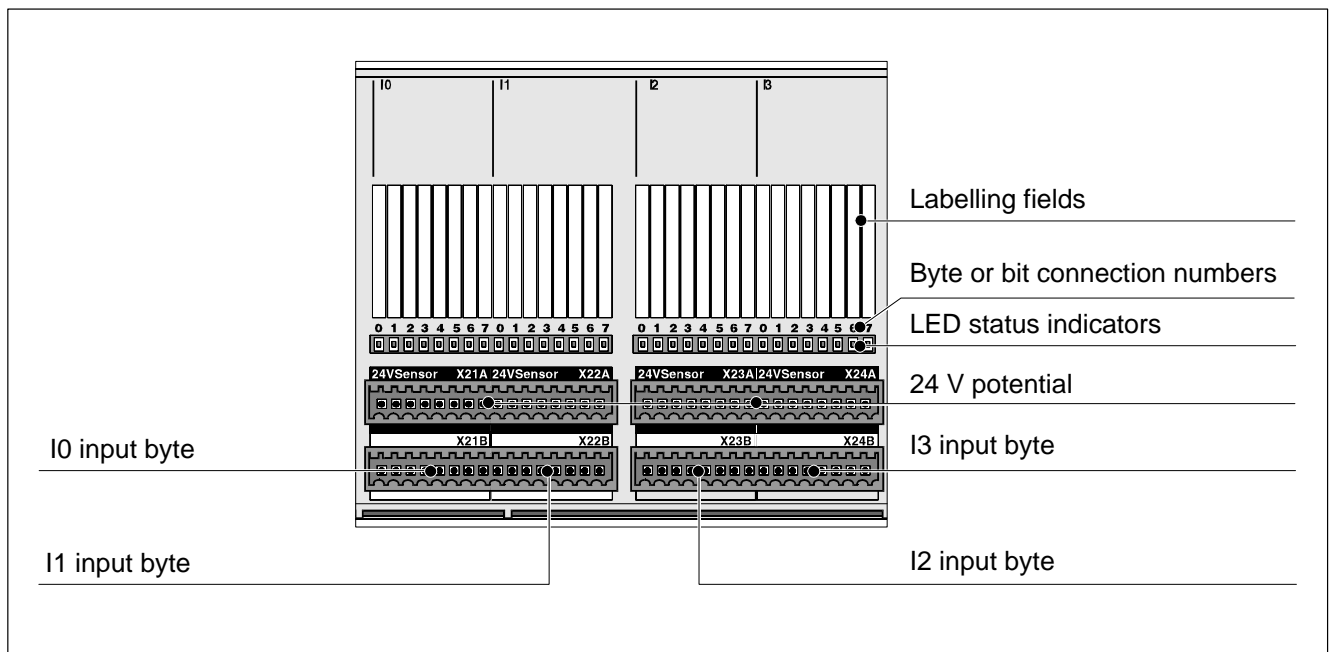
Notes:

4 K-DP32DI



4.1 Hardware Configuration

The module provides 32 inputs for signals (from sensors, switches, light barriers, induction-type pulse generators, etc.). The bus connection receives these signals from the referred semiconductor inputs, and directs them via the field bus to the governing control unit for further processing.

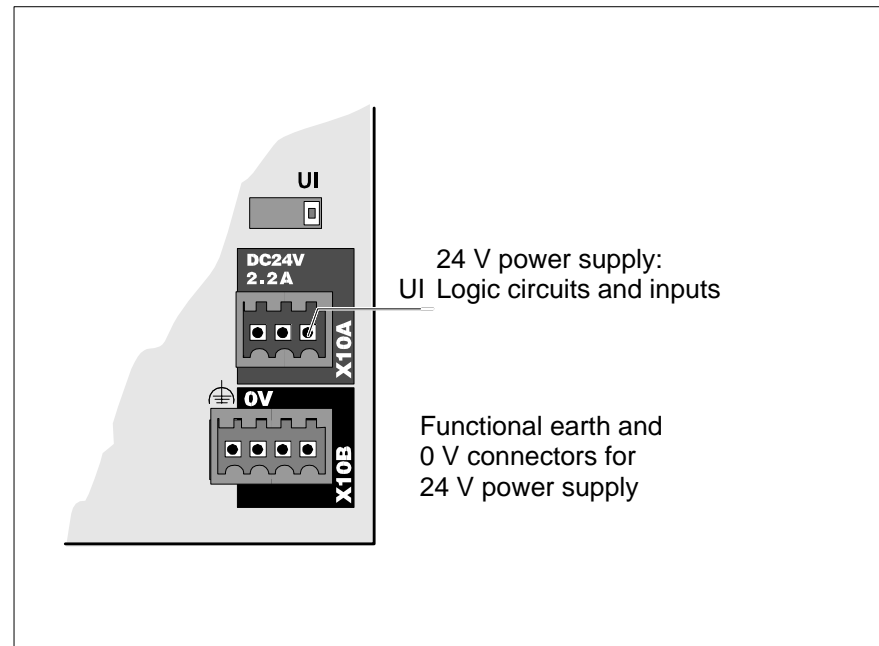


4.2 Connectors

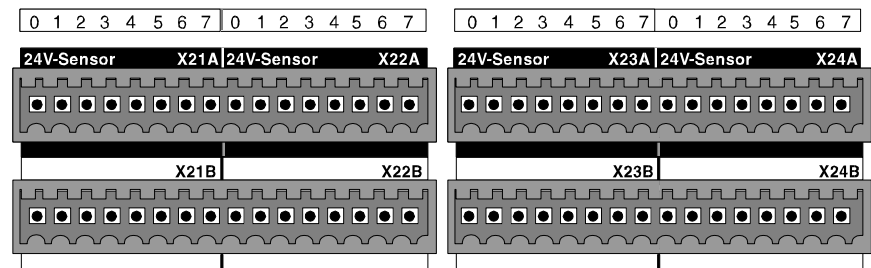
4.2.1 24 V Power Supply

The module requires a 24 V power supply for the following:

- UI Logic circuits and inputs



4.2.2 Inputs



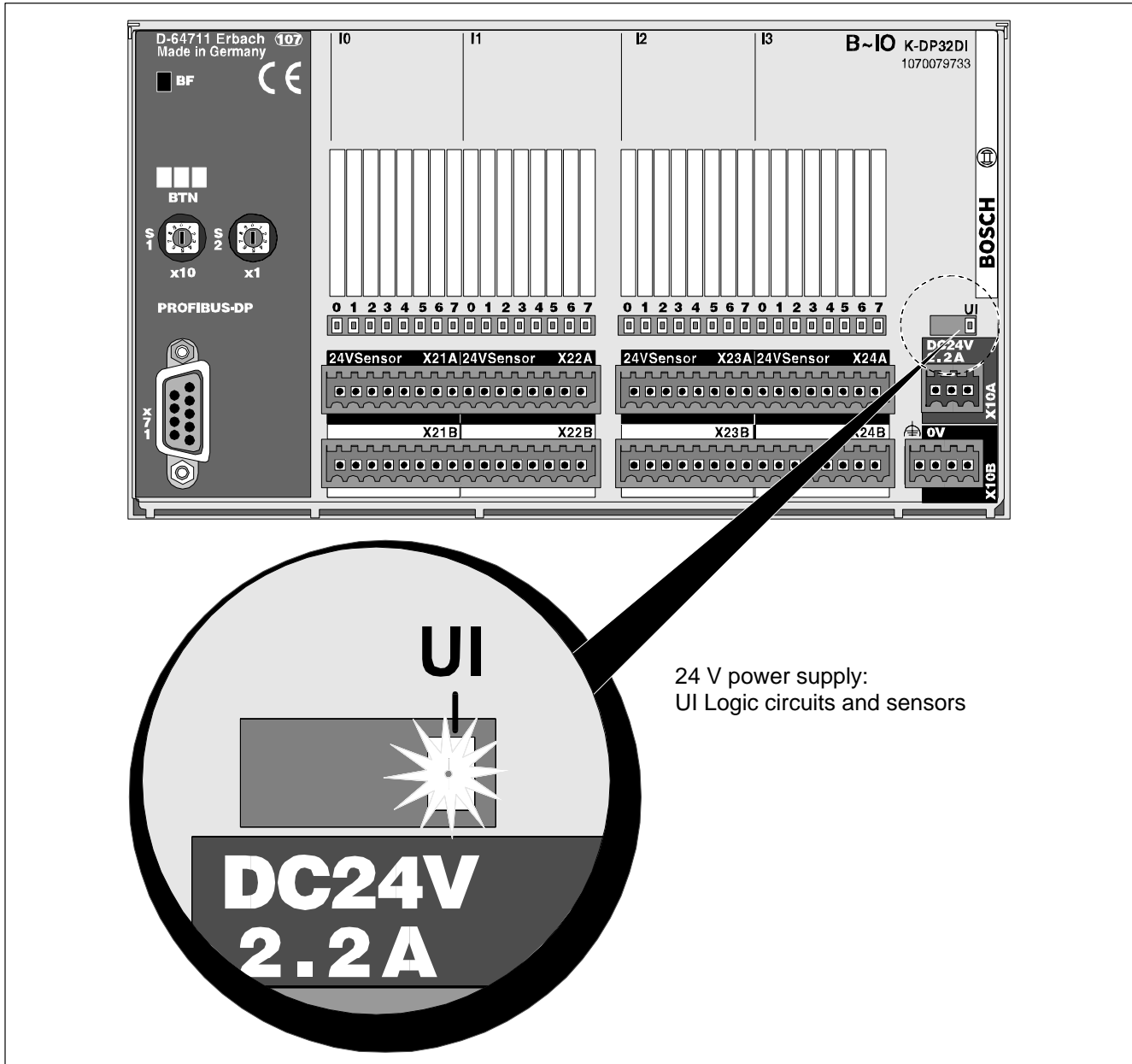
The following applies to input bytes I0 through I3:

- All 24 V potentials for sensor connections are interconnected on the module.
- All sensor connections are monitored for short-circuit and/or overload conditions (total current greater than 2 A).
- The UI LED indicates whether or not the power supply for the inputs is functioning properly.
- Inputs I0.0 through I3.7 comprise type 1 digital inputs as per DIN EN 61131-2.
- The LED status indicator illuminates green when the respective input I0.0 through I3.7 is HI on the logic side.

4.3 Operation

The inputs are queried by the PROFIBUS-DP field bus connection. Manual operation is neither required nor provided for.

The module is active when the UI LED illuminates green.



4.4 Troubleshooting

Generally, a differentiation is made between 4 types of malfunctions:

Malfunction	Indication	Cause	Remedial measures
Input module does not function	UI LED fails to illuminate	24 V power supply is missing	Check function of 24 V power supply
Control unit receives wrong signal from input module	Governing control unit recognizes faulty signal for one or more input signals. Input status indicators indicate correct signal level.	Input module or or bus connection supplies faulty signal	<ul style="list-style-type: none"> • Check bus cabling • Replace the B~IO K-DP module
Operation of input module is faulty	BF LED illuminates red	<ul style="list-style-type: none"> • Wrong bus station address • Baud rate of bus master is not supported 	<ul style="list-style-type: none"> • Set bus station address • Check and verify the configuration of the bus master
Overload condition	UI LED illuminates red	Overload condition in power supply to sensors (total current exceeds 2 A)	Investigate the cause

4.5 Maintenance / Inspection

The bus connection is maintenance-free. If cleaning of the module enclosure is required, no abrasive or solvent-based cleansers may be used.

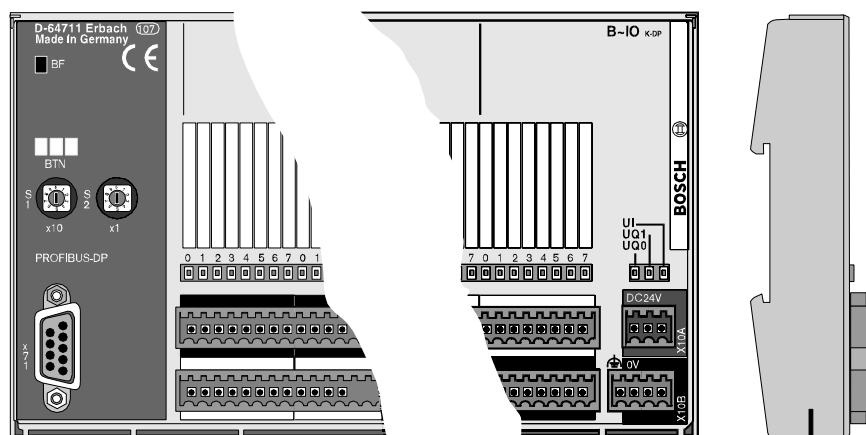
4.6 Installation

Initial Installation / Planning Phase

The present instruction manual is not intended for use by the design engineer or planner working on the detail of a given machine. Instead, the information contained herein is assembled with a view to ensuring trouble-free function and interaction of miscellaneous system components with the various B-IO K-DP modules.

☞ For more detailed information, refer to Chapter 6, “Specifications” and Chapter 8, “Project Planning & Installation.” The prerequisite for a thorough understanding of the information presented in the referred chapters are special skills with regard to PLC controllers and the PROFIBUS-DP field bus.

Attaching the Module



The modules are installed –

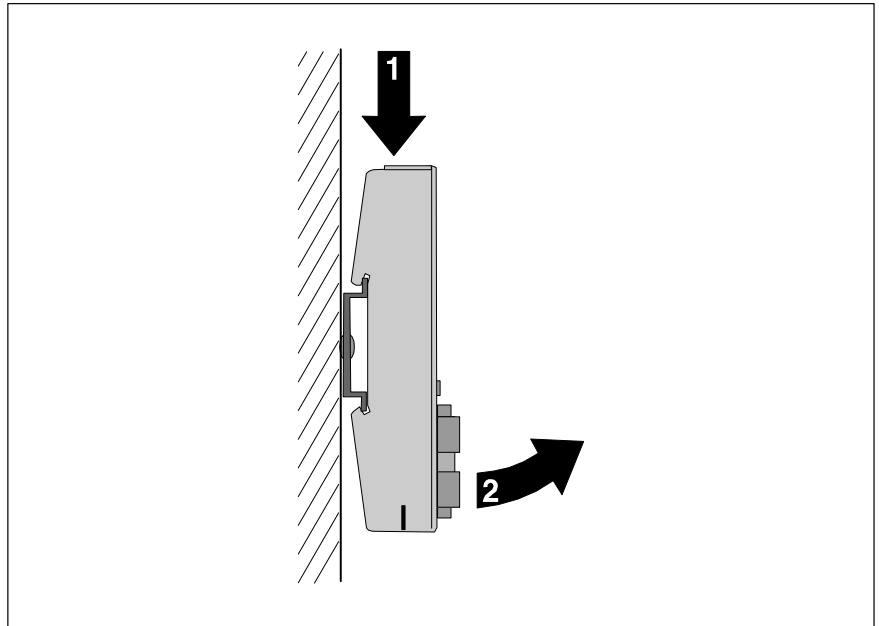
- either by direct placement on a standard 35 x 7.5 mm DIN rail (top-hat rail) in the control cabinet as per EN 50022, or
- by snapping them onto the support rail adapter for back-panel installation. This adapter is available as an optional accessory.

To facilitate installation and removal, a clearance of 20 mm should be maintained above and below the module.

Removing the Module

- ☞ **When removing the module, all connectors should be labelled. This will prevent accidental connector misplacement upon installation.**

To remove, the module must first be pressed downward to overcome the spring pressure (1). This facilitates unsnapping the lower enclosure claw, and subsequent removal of the module from the DIN rail by swinging the unit out at the bottom while lifting in an upward arc (2).

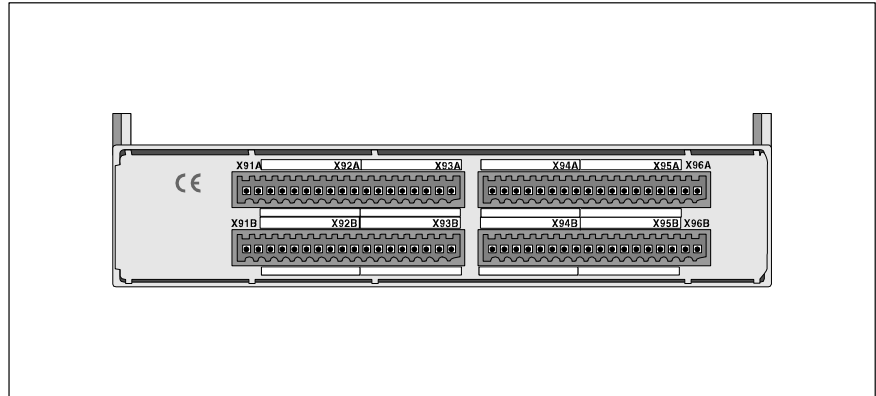


Installation

To install, the module is first hooked over the upper lip of the DIN rail, and then snapped into place while exerting downward pressure. The spring action at the rear of the module housing will exert slight upward pressure, causing the module to lock securely into place.

3 or 4-wire connection

To facilitate the connection of sensors and actuators using 3 or 4 wires, matching terminal blocks are available as optional accessories. These terminal blocks consist of a housing and 4 plug connectors, each of which features 18 bridged connectors. The terminal block is plugged into the B~IO K-DP module from below, extending the vertical module dimension downward by 40 mm. An additional earthing connection is not required.

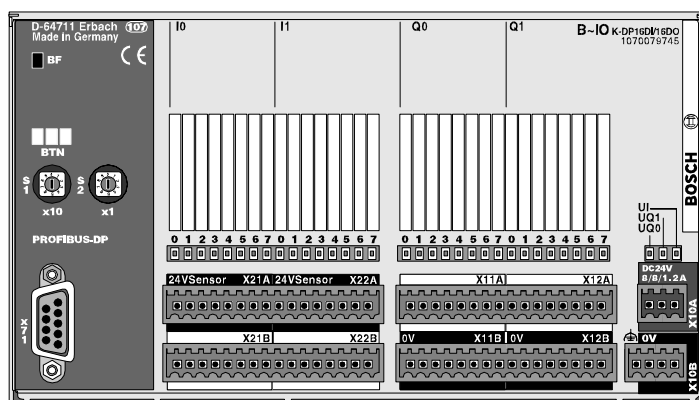


Accessories

- Identification labels
- Connector strip extractors
- Terminal blocks providing extensions for 3 or 4-wire type connections

A complete list of spare parts and accessories appears in Chapter 7 of this manual.

5 K-DP16DI/16DO



5.1 Hardware Configuration

The module provides –

- 16 inputs for sensors (switches, light barriers, induction-type pulse generators, etc.), and
- 16 outputs for actuators and small loads (such as valves, lamps and contactors, etc.).

Inputs

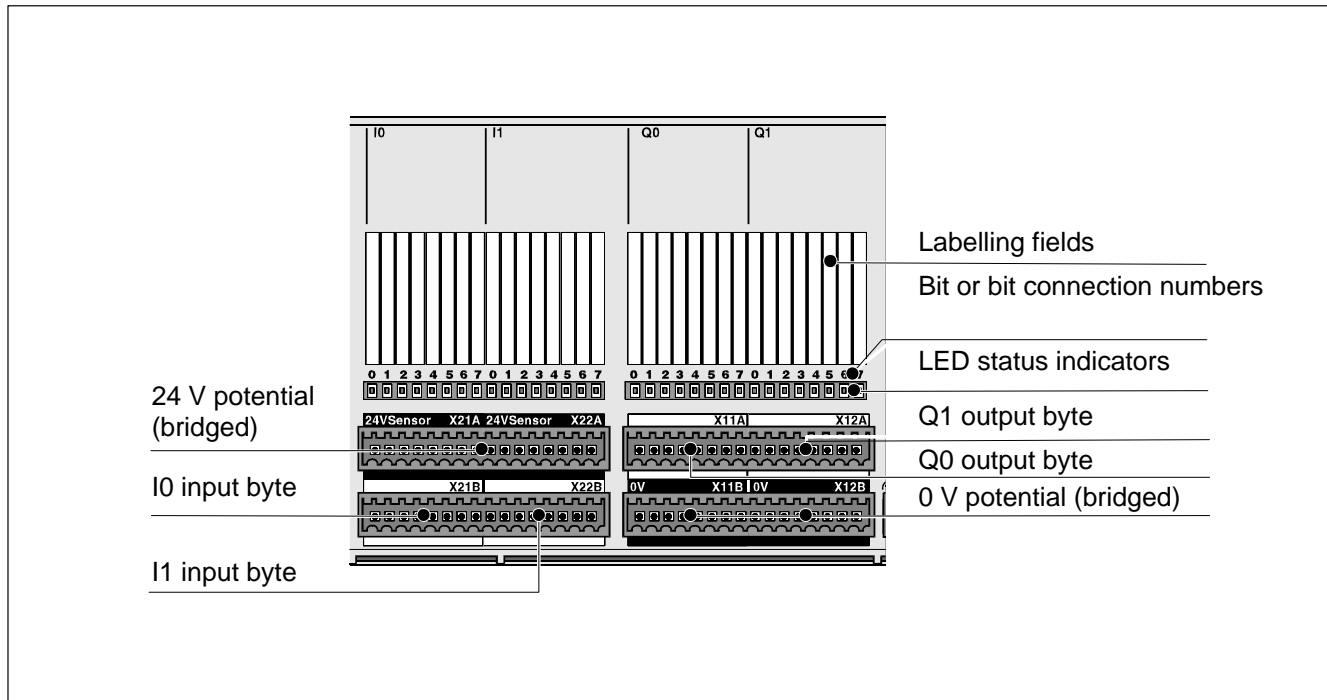
The bus connection receives the switching signals from the semiconductor inputs, and directs them via the field bus to the governing control unit for further processing.

Outputs

The signals passed through the bus connection control the 16 digital semiconductor outputs. These 24 V outputs are non-latching, causing the signal to be reset by a power failure. During a restart, and dependent upon the incoming signals from the governing control unit, the outputs are again automatically set.

The following outputs are provided:

- 8 outputs, 0.5 A
- 4 outputs, 1 A
- 4 outputs, 2 A

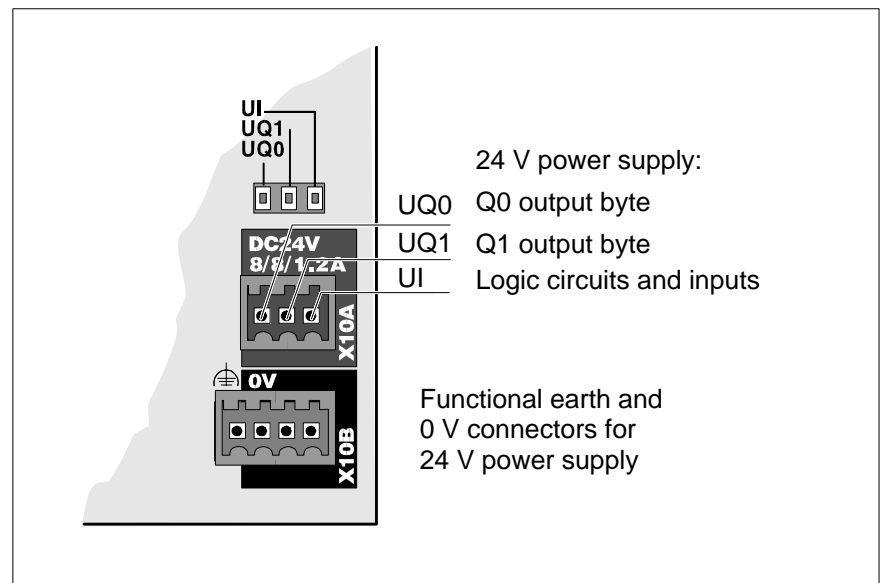


5.2 Connectors

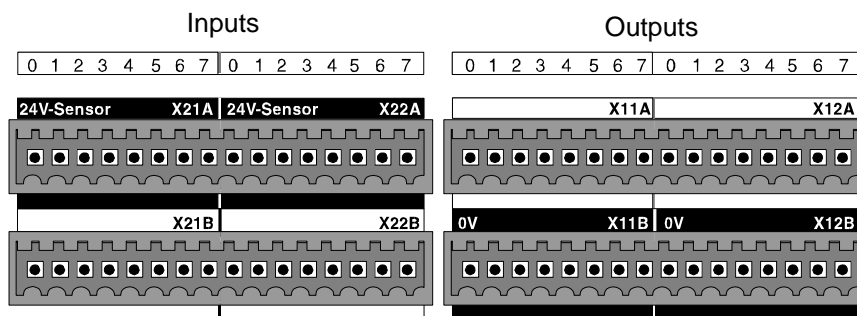
5.2.1 24 V Power Supply

The module requires a 24 V power supply for the following:

- UI Logic circuits and inputs
- UQ0 Q0 output byte
- UQ1 Q1 output byte



5.2.2 Inputs and Outputs



Inputs

The following applies to input bytes I0 and I1:

- All 24 V potentials for sensor connections are interconnected on the module.
- All sensor connections are monitored for short-circuit and/or overload conditions (total current greater than 2 A).
- The UI LED indicates whether or not the power supply for the sensors is functioning properly.
- inputs I0.0 through I1.7 comprise type 1 digital inputs as per DIN EN 61131-2.
- The LED status indicator illuminates green when the respective input I0.0 through I1.7 is HI on the logic side.

Outputs

The following applies to output bytes Q0 and Q1:

- 0.5 A outputs: bits 0 through 3
- 1 A outputs: bits 4 and 5
- 2 A outputs: bits 6 and 7

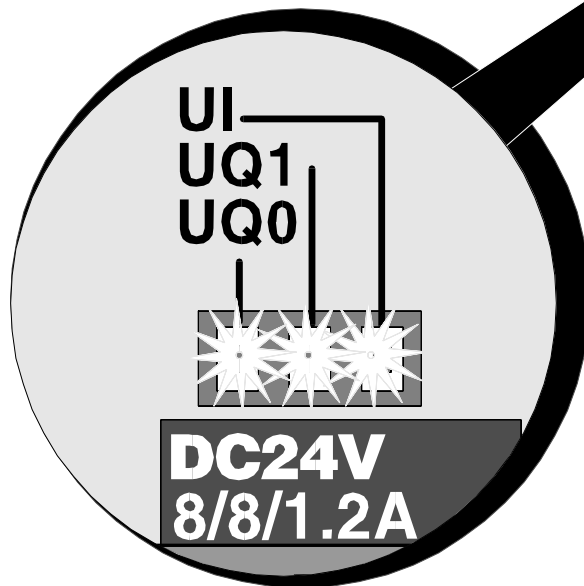
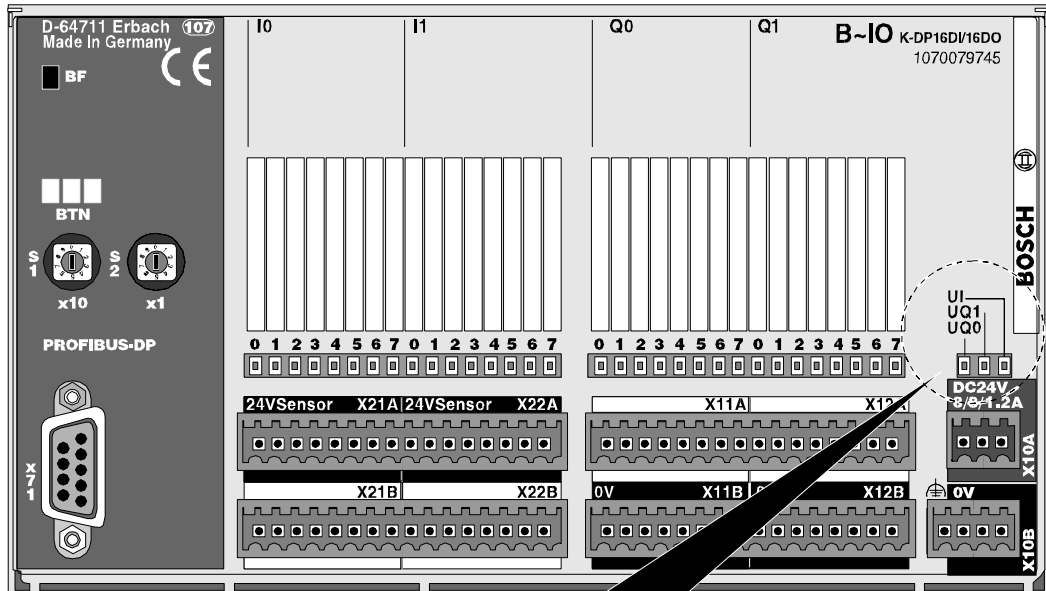
All 0 V potentials required for two-wire load connections are interconnected on the module.

The status LED illuminates green when the load side of the output is active.

5.3 Operation

The inputs are queried by the PROFIBUS-DP field bus connection. The outputs are serviced through the PROFIBUS-DP field bus connection. Manual operation is neither required nor provided for.

The module is active when the UI, UQ0 and UQ1 LEDs illuminate green.



24 V power supply:

- UI Logic circuits and sensors
- UQ1 Q1 output byte
- UQ0 Q0 output byte

5.4 Troubleshooting

Input Malfunctions

Generally, a differentiation is made between 4 types of malfunctions:

Malfunction	Indication	Cause	Remedial measures
Input module does not function	UI LED fails to illuminate	24 V power supply is missing	Check function of 24 V power supply
Control unit receives wrong signal from input module	Governing control unit recognizes faulty signal for one or more input signals. Input status indicators indicate correct signal level.	Input module or or bus connection supplies faulty signal	<ul style="list-style-type: none"> • Check bus cabling • Replace B~IO K-DP module
Operation of input module is faulty	BF LED illuminates red	<ul style="list-style-type: none"> • Wrong bus station address • Baud rate of bus master is not supported 	<ul style="list-style-type: none"> • Set bus station address • Check and verify the configuration of the bus master
Overload condition	UI LED illuminates red	Overload condition in power supply to sensors (total current exceeds 1 A)	Investigate the cause

Output Malfunctions

Generally, a differentiation is made between four types of malfunctions:

Malfunction	Indication	Cause	Remedial measures
Output module does not function	One of the UI, UQ0 and UQ1 LEDs fails to illuminate	24 V power supply is missing	Check function of 24 V power supply
Outputs receive incorrect signal from bus connection	One or more status indications indicate an incorrect signal level	The governing control unit or bus connection supplies a faulty signal	Check and verify the control unit's signal exchange and the bus connection indicators
Operation of output module is faulty	BF LED illuminates red	<ul style="list-style-type: none"> • Wrong bus station address • Baud rate of bus master is not supported 	<ul style="list-style-type: none"> • Set bus station address • Check and verify the configuration of the bus master
	One or more output status indicators show an incorrect signal level although the control unit sends the correct signal	Possible defect in output module	Replace the B~IO K-DP module
Overload condition on single output	UQ0 or UQ1 LED illuminates red	Overload in respective output byte	Investigate the cause

5.5 Maintenance / Inspection

The bus connection is maintenance-free. If cleaning of the module enclosure is required, no abrasive or solvent-based cleansers may be used.

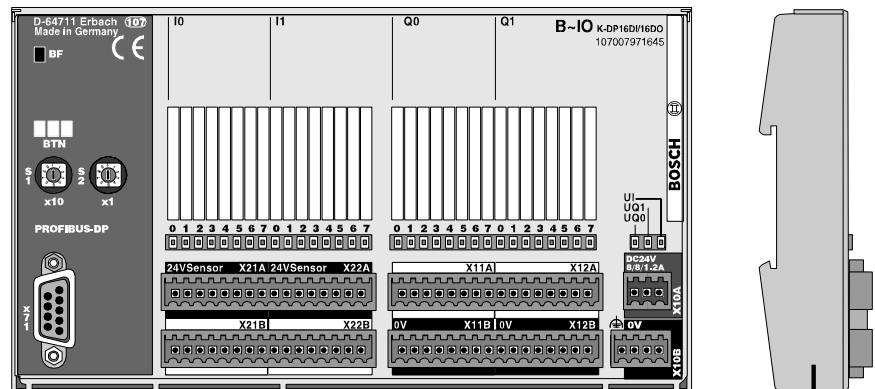
5.6 Installation

Initial Installation / Planning Phase

The present instruction manual is not intended for use by the design engineer or planner working on the detail of a given machine. Instead, the information contained herein is assembled with a view to ensuring trouble-free function and interaction of miscellaneous system components with the various B-IO K-DP modules.

- ☞ For more detailed information, refer to Chapter 6, “Specifications” and Chapter 8, “Project Planning & Installation.” The prerequisite for a thorough understanding of the information presented in the referred chapters are special skills with regard to PLC controllers and the PROFIBUS-DP field bus.

Attaching the Module



The modules are installed –

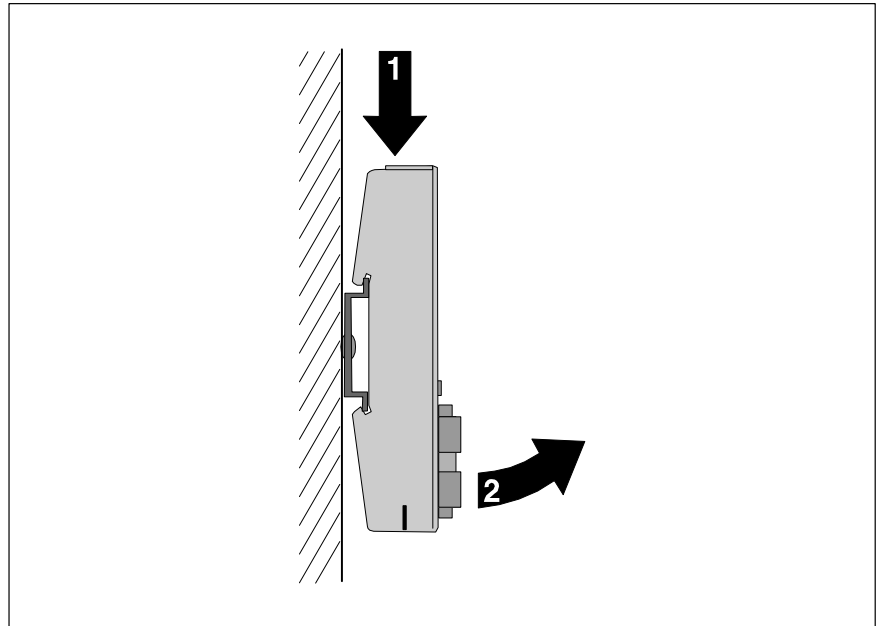
- either by direct placement on a standard 35 x 7.5 mm DIN rail (top-hat rail) in the control cabinet as per EN 50022, or
- by snapping them onto the support rail adapter for back-panel installation. This adapter is available as an optional accessory.

To facilitate installation and removal, a clearance of 20 mm should be maintained above and below the module.

Removing the Module

- ☞ **When removing the module, all connectors should be labelled. This will prevent accidental connector misplacement upon installation.**

To remove, the module must first be pressed downward to overcome the spring pressure (1). This facilitates unsnapping the lower enclosure claw, and subsequent removal of the module from the DIN rail by swinging the unit out at the bottom while lifting in an upward arc (2).

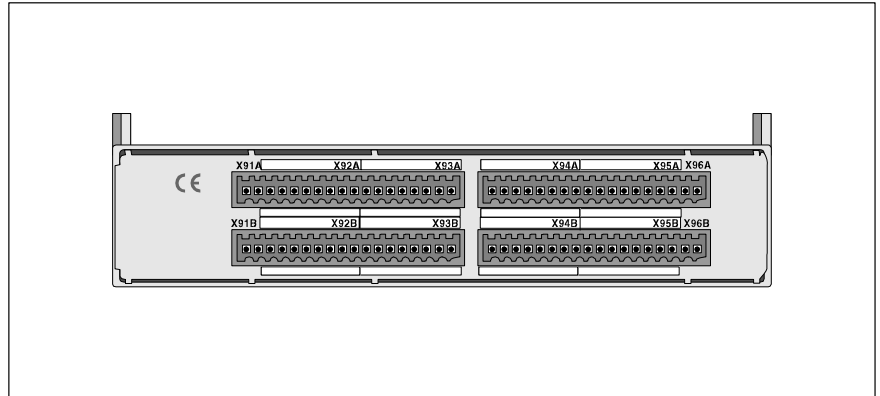


Installation

To install, the module is first hooked over the upper lip of the DIN rail, and then snapped into place while exerting downward pressure. The spring action at the rear of the module housing will exert slight upward pressure, causing the module to lock securely into place.

3 or 4-wire connection

To facilitate the connection of sensors and actuators using 3 or 4 wires, 2-tier terminal blocks are available as optional accessories. These terminal blocks consist of a housing and 4 plug connectors featuring 18 bridged connectors each. The terminal block is plugged into the B-IO K-DP module from below, extending the module dimension downward by 40 mm. An additional earthing connection is not required.



Accessories

- Identification labels
- Connector strip extractors
- Terminal blocks providing extensions for 3 or 4-wire type connections

A complete list of spare parts and accessories appears in Chapter 7 of this manual.

Notes:

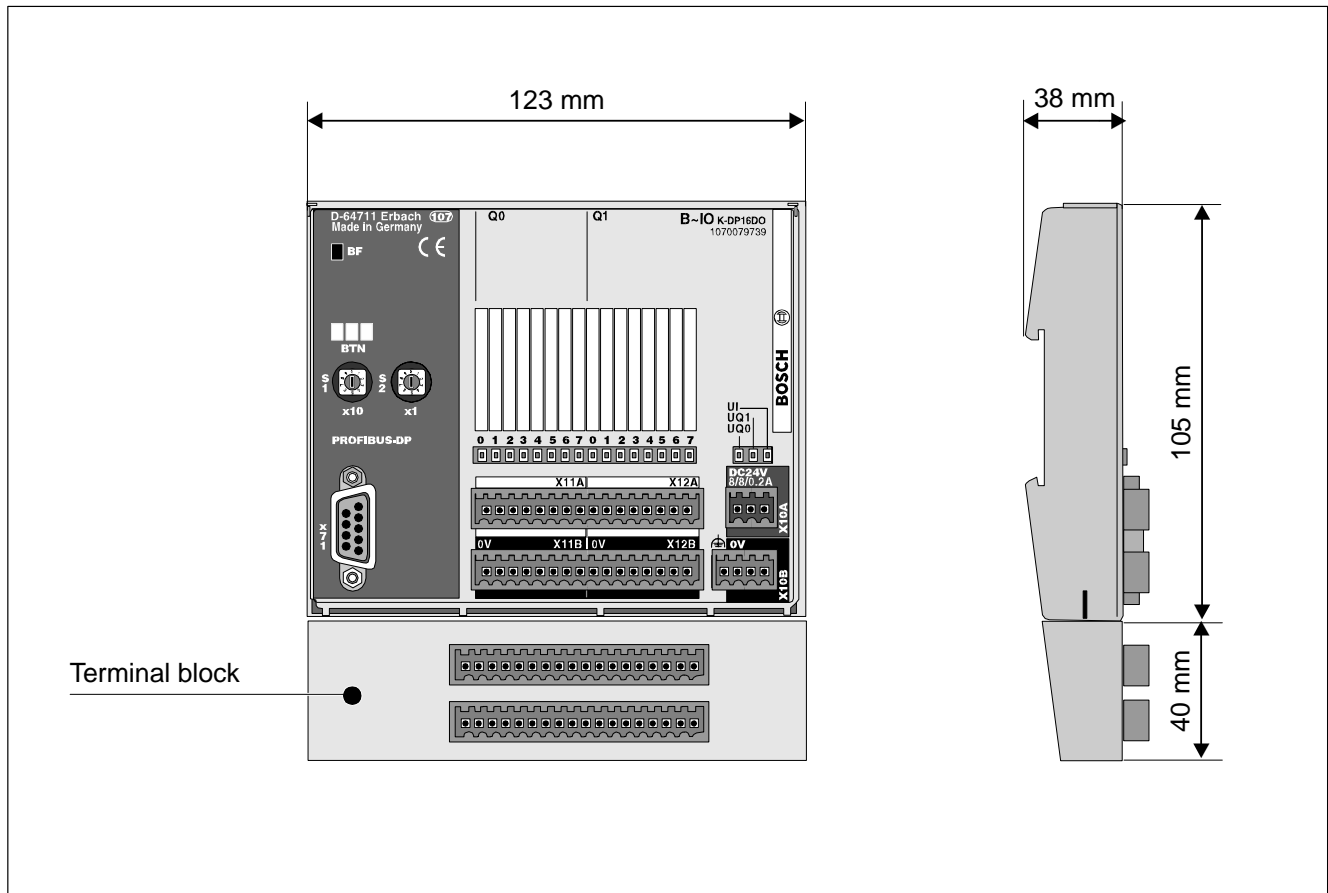
6 Module Specifications

6.1 B~IO K-DP

Specifications	B~IO K-DP
Conforms to the following standards:	<ul style="list-style-type: none"> ● DIN EN 61131-2 ● EN 50178 ● DIN VDE 0110 ● DIN EN 60204-1 (corresponds to VDE 0113) ● EMC Directive 93/68/EEC and amending directives
Power supply as per DIN EN 61131-2	24 V (19.2 through 30 V)
Insulation test voltage	<ul style="list-style-type: none"> ● 350 VAC ● 500 VDC ● 500 V pulse 1.2/50 μs
Corrosion / chemical resistance	The ambient air must be free of elevated concentrations of acids, alkali, corrosive substances, salt, metallic vapours or other electrically conductive pollutants.
Shock and vibration resistance	<ul style="list-style-type: none"> ● 10 to 57 Hz <ul style="list-style-type: none"> ● 0,0375 mm constant amplitude ● 0,075 mm random amplitude ● 57 to 150 Hz <ul style="list-style-type: none"> ● 0,5 g constant ● 1 g random <p>11 ms semi-sinewave 15 g</p>
Degree of contamination, as per DIN EN 61131-2 and DIN VDE 0470-1	2 The ambient air for our built-in units must be dust-free. Enclosures must have at least protection type IP 54.
Protection type, to DIN VDE 0470-1	IP 20
Protection class, as per DIN EN 50178	1
Moisture class, to DIN EN 61131-2	RH-2; 5 through 95 %, condensation not permissible
Range of operating temperature	5 through 55 °C With a maximum average temperature of 50 °C over 24 hours.
Storage temperature range, as per DIN EN 61131-2	-25 through +70 °C
Atmospheric pressure, as per DIN EN 61131-2	Operation up to 2000 m above sea level

Specifications	B-IO K-DP
Transport resistance, as per DIN EN 61131-2	Drop height in package 1.0 m
PROFIBUS-DP interface power supply	P5VISO/GNDISO 5 V \pm 5 % / 100 mA, external RS-485, electrically isolated
Interference radiation <ul style="list-style-type: none"> • Harmful radiation • Radio interference suppression, enclosure, to DIN EN 50081-2 	None Class A DIN EN 55011 <ul style="list-style-type: none"> • Frequency 30 through 230 MHz limit value 40 dB (mV/m) at 10 m • Frequency 230 through 1000 MHz limit value 47 dB (mV/m) at 10 m
EMI resistance <ul style="list-style-type: none"> • High-frequency electromagnetic fields, as per DIN EN 61131-2, DIN EN 50082-2 and DIN EN 61000-4-3, criterion A • Electrostatic discharge on exposed enclosure components, as per DIN EN 50082-2, DIN EN 61131-2 and DIN EN 61000-4-2 	Test field strength, 10 V/m Frequency band, 27 through 1000 MHz AM, 80 % at 1 kHz sweep rate, 0.0015 dec./s <ul style="list-style-type: none"> • EMI resistance 4 for moisture class RH-2 • Test voltage: Air discharge 15 kV Contact discharge 4 kV
Line transient interference <ul style="list-style-type: none"> • 24 V power supply, as per DIN EN 61131-2 and EN 50082-2 • Digital inputs/outputs, as per DIN EN 61131-2 and EN 50082-2 	<ul style="list-style-type: none"> • HF interference, asymmetrical 10 V, 150 kHz through 80 MHz, 80 % AM, 1 kHz to EN 61000-4-6 • Rapid burst pulses, direct coupling 2 kV to EN 61000-4-4, criterion A • Dampened sinewave 1 MHz, symmetrical 1 kV, to EN 61000-4-12
Line transient interference PROFIBUS-DP data line, as per DIN EN 61131-2 and EN 50082-2	<ul style="list-style-type: none"> • HF interference, asymmetrical 10 V, 80 % AM, 1 kHz as per EN 61000-4-6 • Rapid burst pulses, direct coupling 2 kV to EN 61000-4-4, criterion A

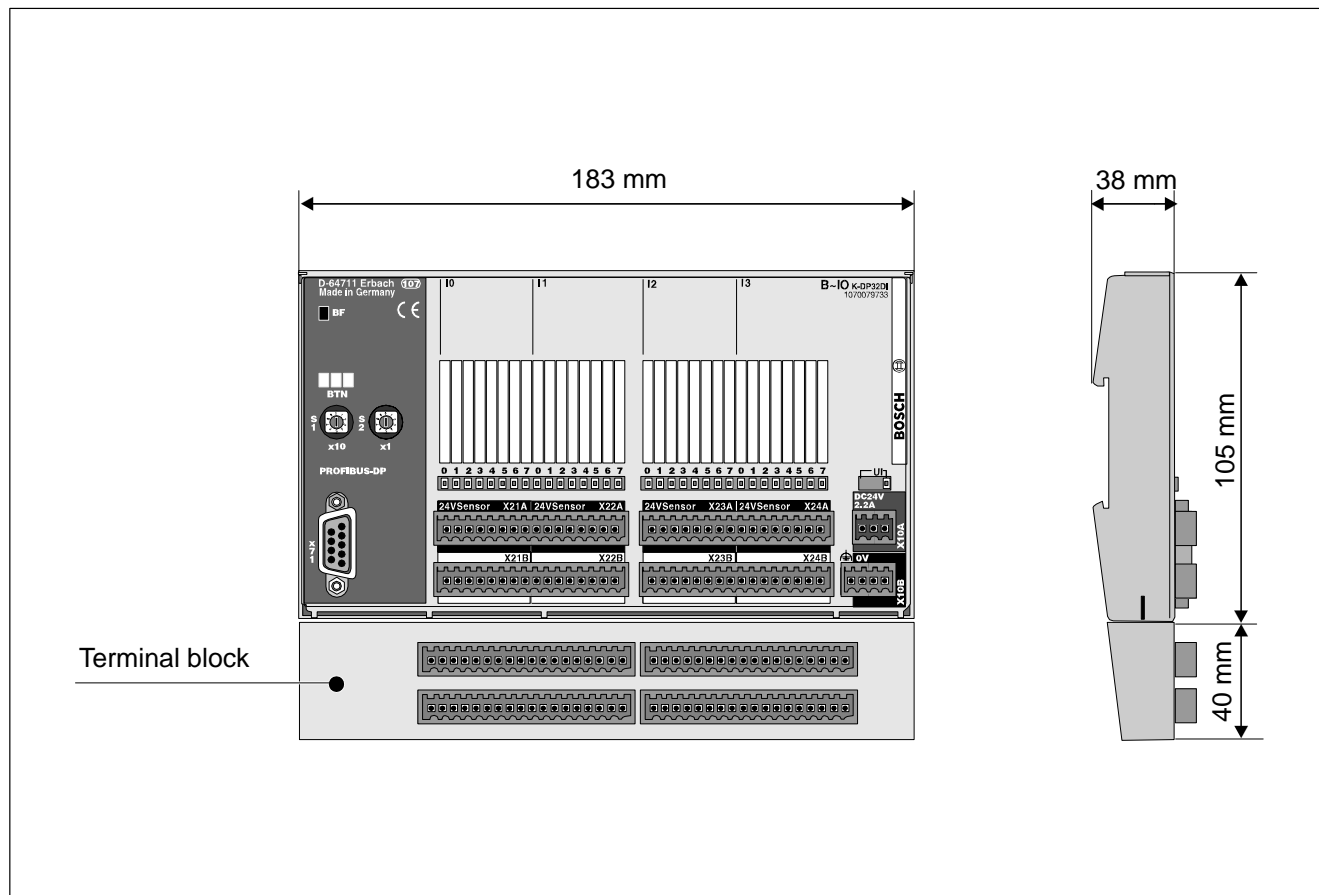
6.2 K-DP16DO Specifications



Specifications	K-DP16DO
Order no.	1070 079 739
Power supply, as per DIN EN 61131-2	3 x 24 V, 19.2 through 30 V
Current draw from 24 V power supply	
<ul style="list-style-type: none"> • UI, Logic circuits 	≤ 0.2 A
<ul style="list-style-type: none"> • UQ0, externally supplied power for output byte 0 	≤ 8 A
<ul style="list-style-type: none"> • UQ1, externally supplied power for output byte 1 	≤ 8 A
Electrical isolation	No
Potentials	Common 0 V potential
Positive polarity protection	Guaranteed only when external power supply not connected
Weight	Approx. 350 g

Specifications	Outputs		
	0.5 A Q0.0 through Q0.3 Q1.0 through Q1.3	1 A Q0.4, Q0.5 Q1.4, Q1.5	2 A Q0.6, Q0.7 Q1.6, Q1.7
Number of outputs	16 semiconductor outputs, non-latching, protected, with automatic restart, w/ power output		
Output voltage	Nominal 24 V, voltage drop with HIGH signal ≤ 1.5 V		
Rated current <ul style="list-style-type: none"> • Nominal value • Maximum value • HIGH signal • LOW signal, leakage current 	0.5 A 0.6 A 2 mA through 06 A ≤ 0.5 mA	1 A 1.2 A 2 mA through 1.2 A ≤ 0.5 mA	2 A 2 A 2 mA through 2 A ≤ 0.5 mA
Overload protection <ul style="list-style-type: none"> • Minimum cut-off level • Automatic restart interval with reduced load 	0.6 A, typ. 1.2 A	1.2 A, typ. 2.4 A Approx. 10 ms	2 A, typ. 2.4 A
Switching frequency <ul style="list-style-type: none"> • Resistive load • Inductive load 	100 Hz Dependent upon function (contactor)		
Status indication	Via LEDs, pick-off on load side		
Contact rating	Max. 8 A per contact / $T_U = 55$ °C		
Line length, unscreened	Max. 100 m		
Connector matrix	3.5 mm		
Simultaneity factor	Refer to "Derating Curve," section 6.5		
Inductive cut-off voltage	typ. -26 V		typ. -12 V
Parallel-switching of outputs	Yes, Q0.0 thru Q0.3, and Q1.0 thru Q1.3	Yes, Q0.4 with Q0.5, and Q1.4 with Q1.5	Yes, Q0.6 with Q0.7, and Q1.6 with Q1.7
Output delay intervals	< 500 μ s		
Contactor size at 1Hz	SG1, 6.2 W	SG2, 11.7 W	SG8, 30 W, NG6 Bosch hydraulic valve
Lamp load at 8 Hz	5 W	8 W	15 W

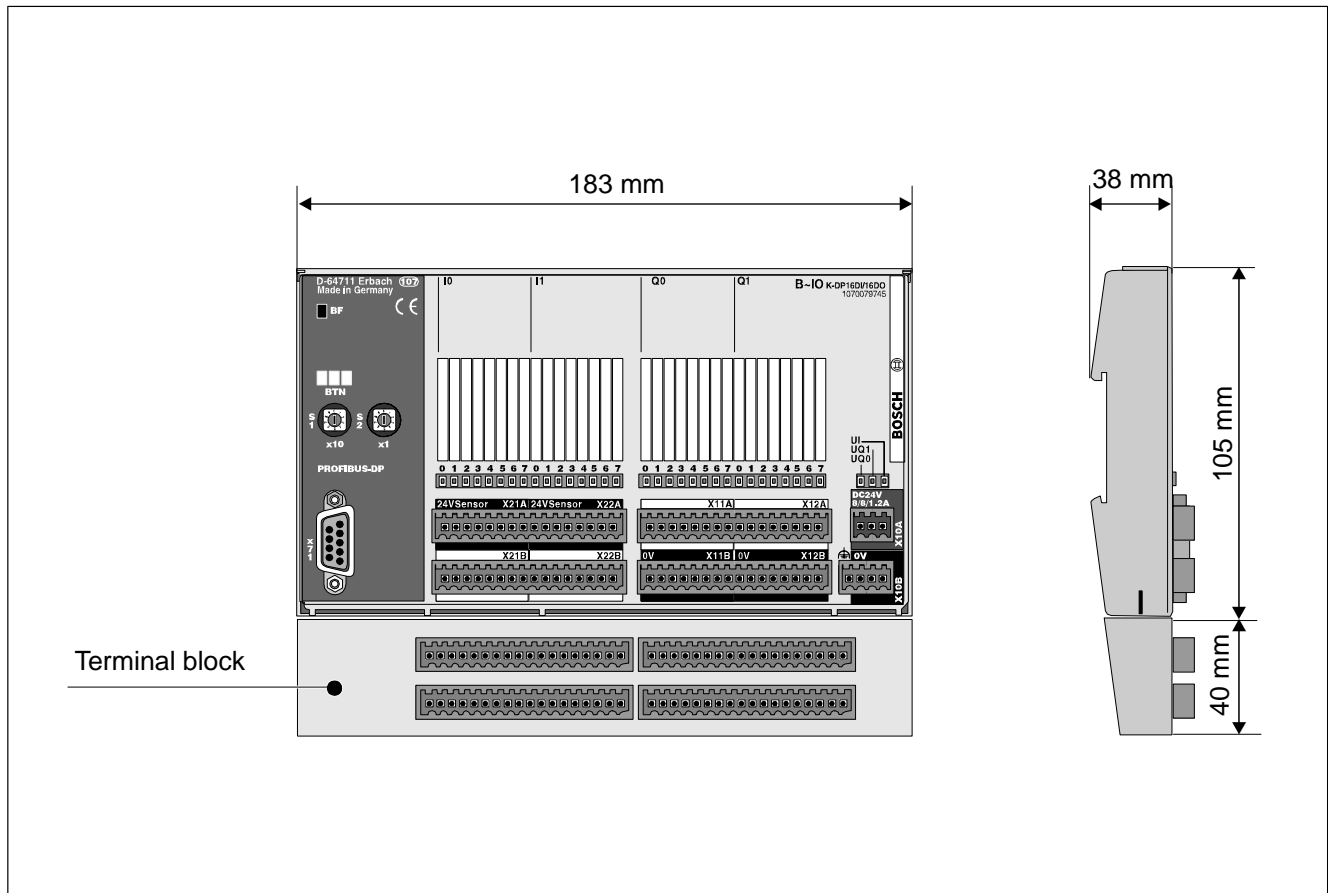
6.3 K-DP32DI Specifications



Specifications	K-DP32DI
Order no.	1070 079 733
Power supply, as per DIN EN 61131-2	24 V, 19.2 through 30 V
Current draw from 24 V power supply, incl. sensor power supply	≤ 2.2 A
Electrical isolation	No
Positive polarity protection	Yes
Weight	Approx. 500 g

Specifications	Inputs
Inputs, as per DIN EN61131-2	32 digital inputs, type 1
Input voltage <ul style="list-style-type: none"> Nominal voltage LOW signal HIGH signal 	24 V -3 through 5 V 11 through 30 V
Input current <ul style="list-style-type: none"> LOW signal HIGH signal 	≤ 2.5 mA 2.8 through 6 mA
Power supplied to sensors <ul style="list-style-type: none"> Output voltage Nominal output current (total) Short-circuit/overvoltage protection 	typ. $E_{ext} - 1$ V 2 A 2.8 through 5.6 A
Delay time <ul style="list-style-type: none"> LOW → HIGH HIGH → LOW 	3.5 ms 1.5 ms
Status indication	via LEDs, pick-off on load side
Contact rating	max. 8 A per contact / $T_U = 55$ °C
Line length, unshielded	max. 100 m
Connector matrix	3.5 mm
2-wire proximity switch <ul style="list-style-type: none"> Closed-circuit current Voltage drop 	≤ 2.5 mA ≤ 8 V

6.4 K-DP16DI/16DO Specifications

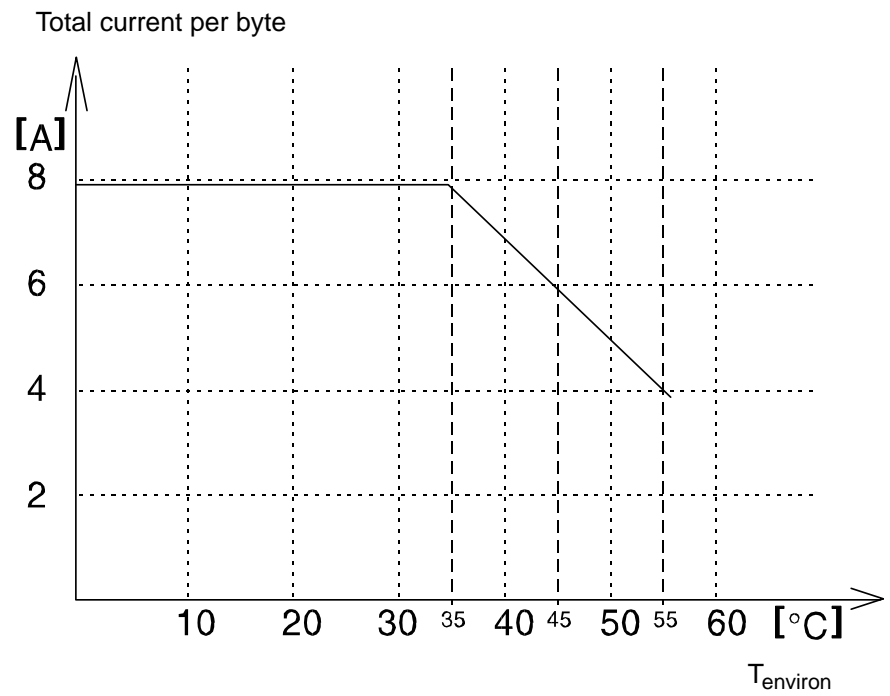


Specifications	K-DP16DI/16DO
Order no.	1070 079 745
Power supply, as per DIN EN 61131-2	3 x 24 V, 19.2 through 30 V
Current draw from 24 V power supply	
<ul style="list-style-type: none"> ● UI, logic circuits and sensor power ● UQ0, external power supply for output byte 0 ● UQ1, external power supply for output byte 1 	<ul style="list-style-type: none"> ≤ 1.2 A ≤ 8 A ≤ 8 A
Electrical isolation	No
Potentials	Common 0 V potential
Positive polarity protection	Guaranteed only when external power supply not connected
Weight	Approx. 500 g

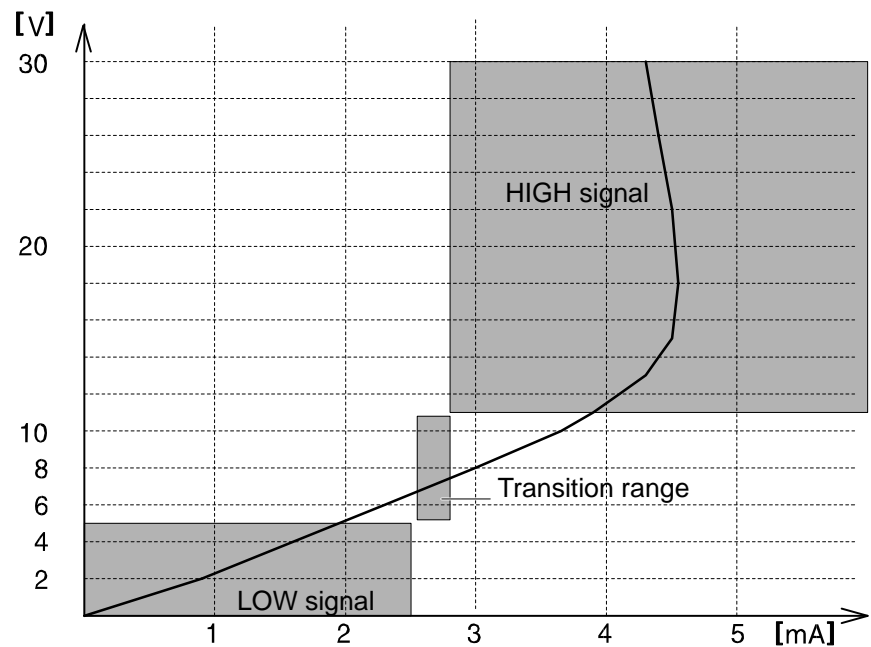
Specifications	Inputs
Inputs, as per DIN EN 61131-2	16 digital inputs, type 1
Input voltage <ul style="list-style-type: none"> • Nominal voltage • LOW signal • HIGH signal 	24 V -3 through 5 V 11 through 30 V
Input current <ul style="list-style-type: none"> • LOW signal • HIGH signal 	≤ 2.5 mA 2.8 through 6 mA
Power supplied to sensors <ul style="list-style-type: none"> • Output voltage • Nominal output current (total) • Short-circuit/overvoltage protection 	typ. $E_{ext} - 1$ V 1 A 1.4 through 2.8 A
Delay time <ul style="list-style-type: none"> • LOW → HIGH • HIGH → LOW 	3.5 ms 1.5 ms
Status indication	via LEDs, pick-off on load side
Contact rating	max. 8 A per contact / $T_U = 55$ °C
Line length, unscreened	max. 100 m
Connector matrix	3.5 mm
2-wire proximity switch <ul style="list-style-type: none"> • Closed-circuit current • Voltage drop 	≤ 2.5 mA ≤ 8 V

Specifications	Outputs		
	0.5 A	1 A	2 A
	Q0.0 through Q0.3 Q1.0 through Q1.3	Q0.4, Q0.5 Q1.4, Q1.5	Q0.6, Q0.7 Q1.6, Q1.7
Number of outputs	16 semiconductor outputs, non-latching, protected, with automatic restart, w/ power output		
Output voltage	Nominal 24 V, voltage drop with HIGH signal ≤ 1.5 V		
Rated current			
<ul style="list-style-type: none"> Nominal value Maximum value HIGH signal LOW signal, leakage current 	0.5 A 0.6 A 2 mA through 0.6 A ≤ 0.5 mA	1 A 1.2 A 2 mA through 1.2 A ≤ 0.5 mA	2 A 2 A 2 mA through 2 A ≤ 0.5 mA
Overload protection			
<ul style="list-style-type: none"> Minimum cut-off current Automatic restart interval with reduced load 	0.6 A, typ. 1.2 A	1.2 A, typ. 2.4 A Approx. 10 ms	2 A, typ. 2.4 A
Switching frequency			
<ul style="list-style-type: none"> Resistive load Inductive load 	100 Hz Dependent upon function (contactor)		
Status indication	Via LEDs, pick-off on load side		
Contact rating	Max. 8 A per contact / T _U = 55 °C		
Line length, unscreened	Max. 100 m		
Connector matrix	3.5 mm		
Simultaneity factor	Refer to "Derating Curve," Section 6.5		
Inductive cut-off voltage	Typ. -26 V		Typ. -12 V
Parallel-switching of outputs	Yes, Q0.0 thru Q0.3, and Q1.0 thru Q1.3	Yes, Q0.4 with Q0.5, and Q1.4 with Q1.5	Yes, Q0.6 with Q0.7, and Q1.6 with Q1.7
Output delay intervals	< 500 μs		
Contactor size at 1Hz	SG1, 6.2 W	SG2, 11.7 W	SG8, 30 W, NG6 Bosch hydraulic valve
Lamp load at 8 Hz	5 W	8 W	15 W

6.5 Derating Curve



6.6 Typical Input Characteristic



7 Spare Parts & Accessories

7.1 B~IO K-DP

Designation	Order no.	Application
B~IO K-DP16DO	1070 079 739	Compact module featuring 16 outputs
B~IO K-DP32DI	1070 079 733	Compact module featuring 32 inputs
B~IO K-DP16DI/16DO	1070 079 745	Compact module featuring 16 inputs and 16 outputs

7.2 Support Rail Adapters for Rear-panel Installation

Designation	Order no.	Application
K16 mounting panel	1070 080 369	<ul style="list-style-type: none">• K-DP16DO, Compact module featuring 16 outputs
K32 mounting panel	1070 080 368	<ul style="list-style-type: none">• K-DP32DI, Compact module featuring 32 inputs• K-DP16DI/16DO, Compact module featuring 16 inputs and 16 outputs

7.3 Connector Strip Assortments

The connector strip assortments serve to establish the connection between the machine wiring and the respective B-IO K-DP module. Using the extraction aids, they are easily removed. As a consequence, the removal or exchange of a B-IO K-DP module will not entail the disconnection of individual signal wires.

Four different types of connector strips are available:

- Threaded terminals
- Spring clamp terminals
- Insulation-piercing terminals (available 4th quarter, 1998)
- Top-screw terminals

The connector strip assortments consist of several single connector strips. Connector strip assortments for compact modules contain, besides the input and output connector strips, also the connector strips for the power supply.

The following conductors, with cross-sections as listed, can be connected:

- Threaded terminals and top-threaded terminals
 - "e" single-wire H05 (07) V-U 0.5 through 1.5 mm²
 - "f" filament wire H05 (07) V-K 0.5 through 1.5 mm²
 - "f" with wire-end ferrule, DIN 46228/1 0.5 through 1.5 mm²
 - AWG conductor sizes 28 through 16
- Spring clamp terminals
 - "e" single-wire H05 (07) V-U 0.08 through 1.5 mm²
 - "f" filament wire H05 (07) V-K 0.5 through 1.5 mm²
 - "f" with wire-end ferrule, DIN 46228/1 0.5 through 1.5 mm²
 - AWG conductor sizes 24 through 16
- Insulation-piercing terminals (available 4th quarter, 1998)

Connector strip assortment, threaded terminals (SA)

Designation	Order no.	Application
BL-SET-SA-K16	1070 080 342	<ul style="list-style-type: none"> ● K-DP16DO, Compact module featuring 16 outputs
BL-SET-SA-K32	1070 080 343	<ul style="list-style-type: none"> ● K-DP32DI, Compact module featuring 32 inputs ● K-DP16DI/16DO, Compact module featuring 16 inputs and 16 outputs
BL-SET-SA-RV2x18K	1070 080 345	<ul style="list-style-type: none"> ● RV2x18K, terminal block w/ 2 x 18 contacts, for K-DP16DO
BL-SET-SA-RV4x18K	1070 080 346	<ul style="list-style-type: none"> ● RV4x18K, terminal block w/ 4 x 18 contacts, for K-DP32DI or K-DP16DI/16DO

Connector strip assortment, spring clamp terminals (FK)

Designation	Order no.	Application
BL-SET-FK-K16	1070 080 349	<ul style="list-style-type: none"> • K-DP16DO, Compact module featuring 16 outputs
BL-SET-FK-K32	1070 080 350	<ul style="list-style-type: none"> • K-DP32DI, Compact module featuring 32 inputs • K-DP16DI/16DO, Compact module featuring 16 inputs and 16 outputs
BL-SET-FK-RV2x18K	1070 080 352	<ul style="list-style-type: none"> • RV2x18K, terminal block w/ 2 x 18 contacts, for K-DP16DO
BL-SET-FK-RV4x18K	1070 080 353	<ul style="list-style-type: none"> • RV4x18K, terminal block w/ 4 x 18 contacts, for K-DP32DI or K-DP16DI/16DO

Connector strip assortment, insulation-piercing terminals (SK)

Designation	Order no.	Application
BL-SET-SK-K16	1070 080 356	<ul style="list-style-type: none"> • K-DP16DO, Compact module featuring 16 outputs
BL-SET-SK-K32	1070 080 357	<ul style="list-style-type: none"> • K-DP32DI, Compact module featuring 32 inputs • K-DP16DI/16DO, Compact module featuring 16 inputs and 16 outputs
BL-SET-SK-RV2x18K	1070 080 359	<ul style="list-style-type: none"> • RV2x18K, terminal block w/ 2 x 18 contacts, for K-DP16DO
BL-SET-SK-RV4x18K	1070 080 360	<ul style="list-style-type: none"> • RV4x18K, terminal block w/ 4 x 18 contacts, for K-DP32DI or K-DP16DI/16DO

Connector strip assortment, top-screw terminals (TP)

Designation	Order no.	Application
BL-SET-TP-K16	1070 080 363	<ul style="list-style-type: none"> • K-DP16DO, Compact module featuring 16 outputs
BL-SET-TP-K32	1070 080 364	<ul style="list-style-type: none"> • K-DP32DI, Compact module featuring 32 inputs • K-DP16DI/16DO, Compact module featuring 16 inputs and 16 outputs
BL-SET-TP-RV2x18K	1070 080 366	<ul style="list-style-type: none"> • RV2x18K, terminal block w/ 2 x 18 contacts, for K-DP16DO
BL-SET-TP-RV4x18K	1070 080 367	<ul style="list-style-type: none"> • RV4x18K, terminal block w/ 4 x 18 contacts, for K-DP32DI or K-DP16DI/16DO

7.4 Connector Strip Extractor

Designation	Order no.	Application
Connector strip extractor, 3-wire	1070 919 512	suitable for any number of wires
Connector strip extractor, 8-wire	1070 919 513	suitable for connector strips w/ 8 and more wires

7.5 Terminal Blocks

Terminal blocks are designed for 4-wire connections. When attached to the bottom of a module, they add approx. 40 mm to its vertical dimension.

Designation	Order no.	Application
RV2x18K	1070 080 157	<ul style="list-style-type: none"> • K-DP16DO, Compact module featuring 16 outputs
RV4x18K	1070 080 155	<ul style="list-style-type: none"> • K-DP32DI, Compact module featuring 32 inputs • K-DP16DI/16DO, Compact module featuring 16 inputs and 16 outputs

7.6 Identification Labels

One set of labels contains 10 A4 size sheets.

The module labelling fields are designed for marking as follows:

- Manually, with a permanent marker.
- Via the supplied PC-based Word for Windows template named Biolabel.dot, and a laser printer.
- Using the WinDP program, version 1.6 and up, and a laser printer.

Designation	Order no.	Application
Identification labels	1070 080 309	suitable for all components
WinDP v. 1.6 for Windows 95 and Windows NT 4.0		suitable for all components
<ul style="list-style-type: none"> • 3¹/₂ in. diskette • CD-ROM 	1070 077 945 1070 073 774	

7.7 Device Specification File for PROFIBUS-DP

In accordance with DIN EN 50170 Part 2, the data file containing all major device specifications (GSD file) contains all information required to connect the modules to any desired DP master.

Designation	Order no.	Application
GSD diskette	1070 075 547	all PROFIBUS-DP modules

7.8 Bus Connector Accessories

Bus connector, PROFIBUS-DP

Designation	Order no.	Application
IP 20 bus connector	1070 918 538	suitable for all components
IP 20 bus connector w/ female DB-9	1070 918 539	suitable for all components

Bus cables, PROFIBUS-DP

Designation	Order no.	Application
COMNET-DP bus cable, drag link cable	1070 917 201	suitable for all components
COMNET-DP, bus cable, solid	1070 917 202	suitable for all components

Notes:

8 Project Planning & Installation

When designing and assembling a machine plant or system that will be subject to the deployment of electrical operating resources, such as control systems, etc., the regulations identified below – or similar or corresponding guidelines of the country in which the machine plant will be operating – must be observed without exception:

- DIN VDE 100
- DIN EN 60204-1 and/or VDE 0113
- VDE 0160 and/or EN 50178



DANGER!

Risk to personnel or property!

Hazardous system conditions that could cause personal injury or property damage must be prevented!

Strict adherence is required to the regulations governing the configuration and installation of Emergency-OFF devices, as stipulated in EN 60204-1!

Uncontrolled restart of machinery upon restoration of power, e.g. subsequent to an Emergency-OFF occurrence, must not be possible!

The protection of personnel against direct or indirect contact must be ensured through the introduction of suitable measures prescribed by pertinent regulations, directives and guidelines (connection to PE conductor, insulation, etc.)!

8.1 Mechanical Construction

Installation Method


The compact modules can be snapped onto a standard DIN rail (top-hat rail), or fastened by means of a special support rail adapter kit that is available as an optional accessory.

Installing the Compact Module

To install, the module is first hung over the upper lip of the DIN rail, and then snapped into place while exerting downward pressure. The spring action at the rear of the module housing will exert slight upward pressure, causing the module to lock securely into place.

Removing the Compact Module

To remove, the module must first be pressed downward to overcome the spring pressure. This facilitates unsnapping the lower enclosure claw, and subsequent removal of the module from the DIN rail by swinging the unit out at the bottom while lifting in an upward arc.

 **To facilitate module installation and removal, a clearance of 20 mm should be maintained above and below the module housing.**

Labelling Provisions

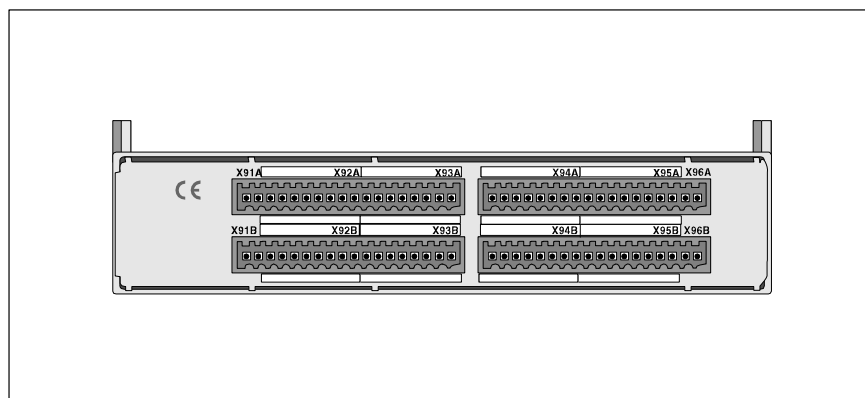
Labelling fields are provided on the module to record the bus station address, and to identify the various inputs and outputs. The labelling fields are designed to accept the ink of a permanent marker.

In addition, for printing labels with an ink jet or laser printer, adhesive-backed labelling strips are available as an optional accessory.

Connections of 2, 3 or 4-wire Type

For connecting sensors and actuators, the B-IO K-DP series modules provide standard 2-wire terminals.

The standard 2-wire terminals can be easily extended for 3 or 4-wire connections through the use of plug-on, two-tier terminal blocks. This arrangement will not require any further wiring subdistribution. The referred terminal blocks are available as optional accessories.



 **When plugged into the bottom of a module, terminal blocks add approx. 40 mm to its vertical dimension.**

Thermal Management and Mechanical Aspects

The service life of electronic devices, such as the B-IO series of modules, depends to a major extent upon the ambient temperature in which they are operating. As high temperatures will cause rapid aging of all electronic components, care must be taken to provide an ambient operating temperature that is as moderate as possible.

Installation Orientation

The following installation orientations are permitted:

- Vertical, e.g. on back panel of control cabinet; bus connector to be located at bottom left
- Horizontal

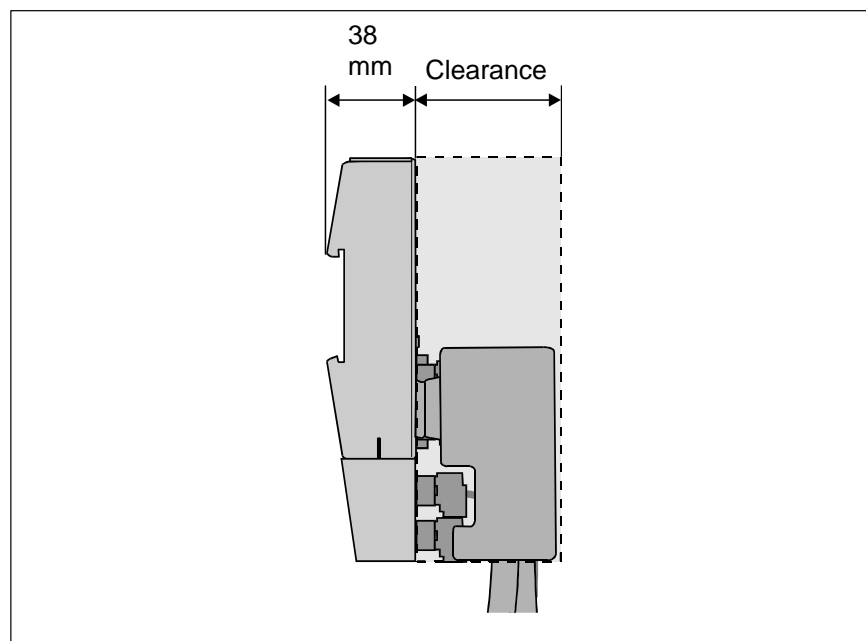
Minimum Clearances

Sufficient clearances must be provided for module installation, removal, and for cable ports. Unhindered circulation of ambient air must be ensured.

In the case of module installations forming multiple rows, the supply-air temperature must be measured and maintained below each row.

Front Panel Clearance

The required front panel clearances for B-IO series modules are in each case determined by the protrusion dimensions of the required plug connectors and cable ports.



8.2 Electrical Installation

All B-IO series modules are powered by a 24 V power supply.

B-IO K-DP16DO

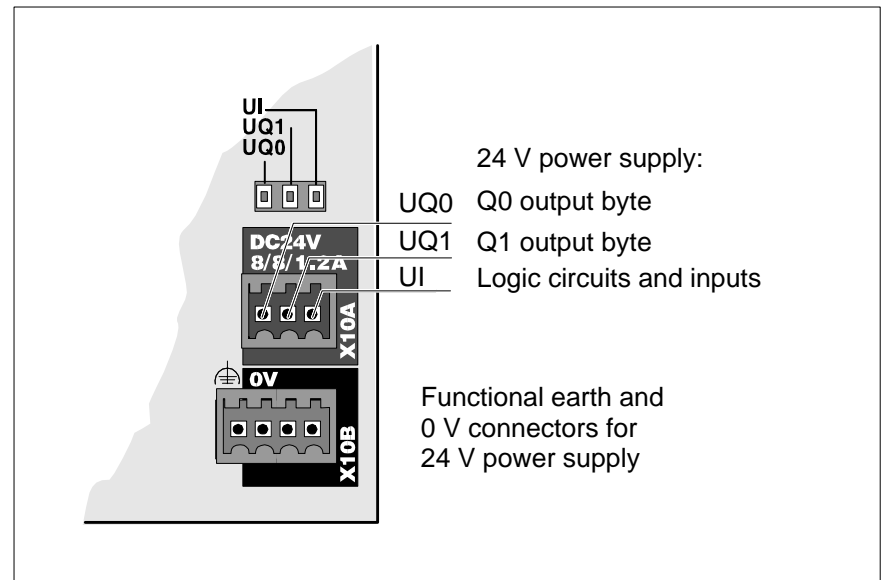
- UI Logic circuits
- UQ0 Output byte 0 power
- UQ1 Output byte 1 power

B-IO K-DP16DI/16DO

- UI Logic circuits and sensor power
- UQ0 Output byte 0 power
- UQ1 Output byte 1 power

B-IO K-DP32DI

- UI Logic circuits and sensor power



8.2.1 Power Supply

The power supply must feature secure electrical isolation, as per DIN VDE 0551.


A 3-phase power supply with single full-bridge rectification is adequate. The offset AC voltage components must not exceed 5 per cent.

Provided that the foregoing is applicable, the 24 V power supply will be acceptable as a supply of functional DC voltage in compliance with DIN VDE 0100 part 410, section 4.2, and/or EN 60 204.

All lines connected to the 24 V power supply are required –

- to be installed separate from high-voltage lines, OR
- to be protected by special insulation, with insulation rating to be suitable for the highest voltage occurring in the system (refer to DIN EN 60204).

The separate feeds of output power facilitate the bitwise disabling of outputs in the event of an Emergency-OFF condition. This arrangement ensures that both the inputs and the outputs not assigned to the Emergency-OFF circuit will remain functional.

 **Although all 0 V connectors are bridged on the modules, in order not to exceed the maximum permitted current per contact, they must be separately connected especially in the case of the two output modules.**

 **The various 24 V power supply contacts on the module are not bridged.**

8.2.2 Connecting Peripherals

Without exception, all peripheral devices, such as sensors and actuators, that are connected to any interfaces of the B-IO series modules, must meet all electrical isolation criteria.

The 24 V power supply provides two connection options:

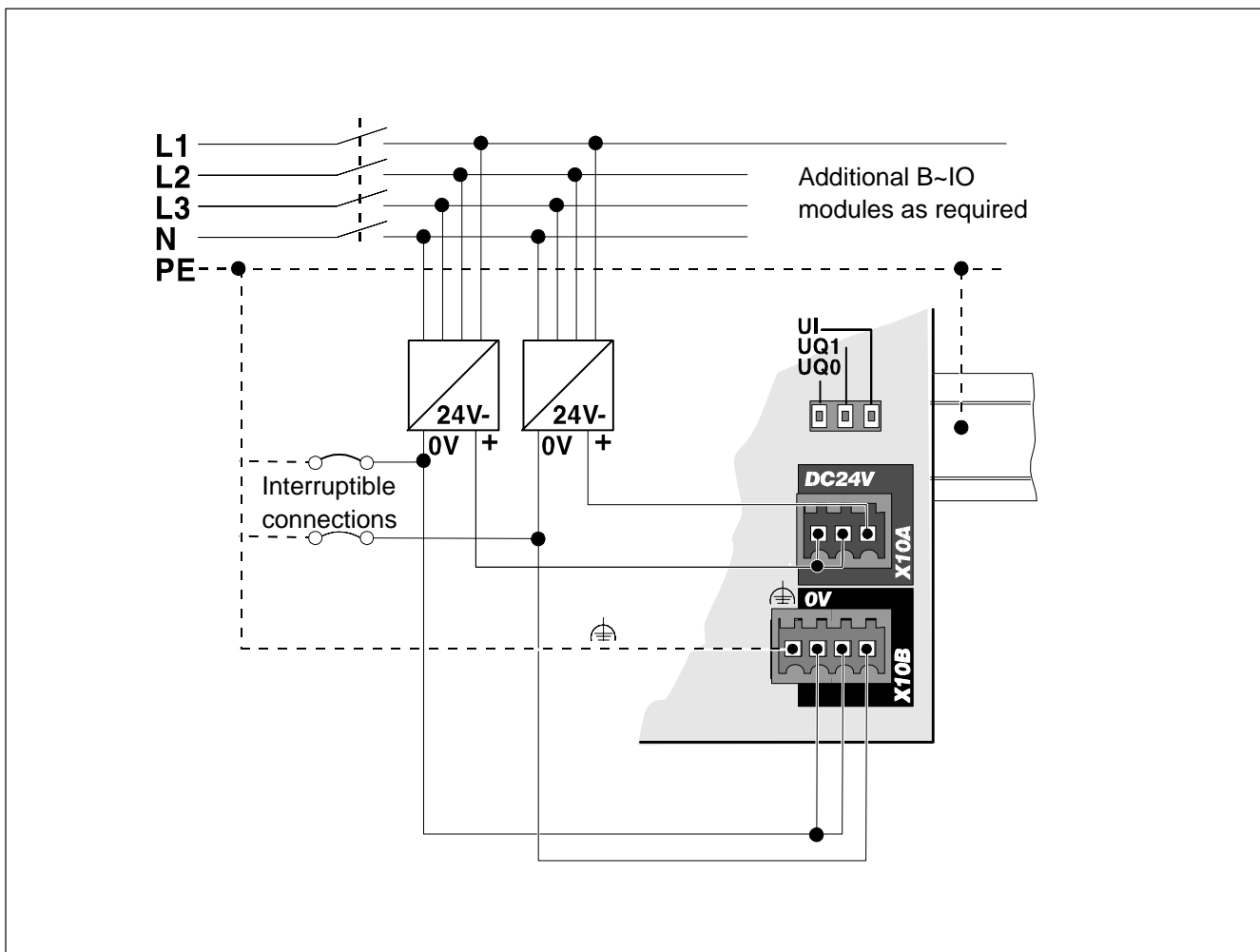
- Reference conductor connected to PE conductor, refer to section [8.2.3](#).
- Reference conductor not connected to PE conductor, see section [8.2.4](#).

8.2.3 Reference Conductor Connected to PE Conductor

The modules comprising the B~IO K-DP compact unit variants can be powered by one or more power supply units.

The reference conductor (N, 0 V) is connected, together with all interconnected PE connections, with the PE conductor system of the higher voltage.

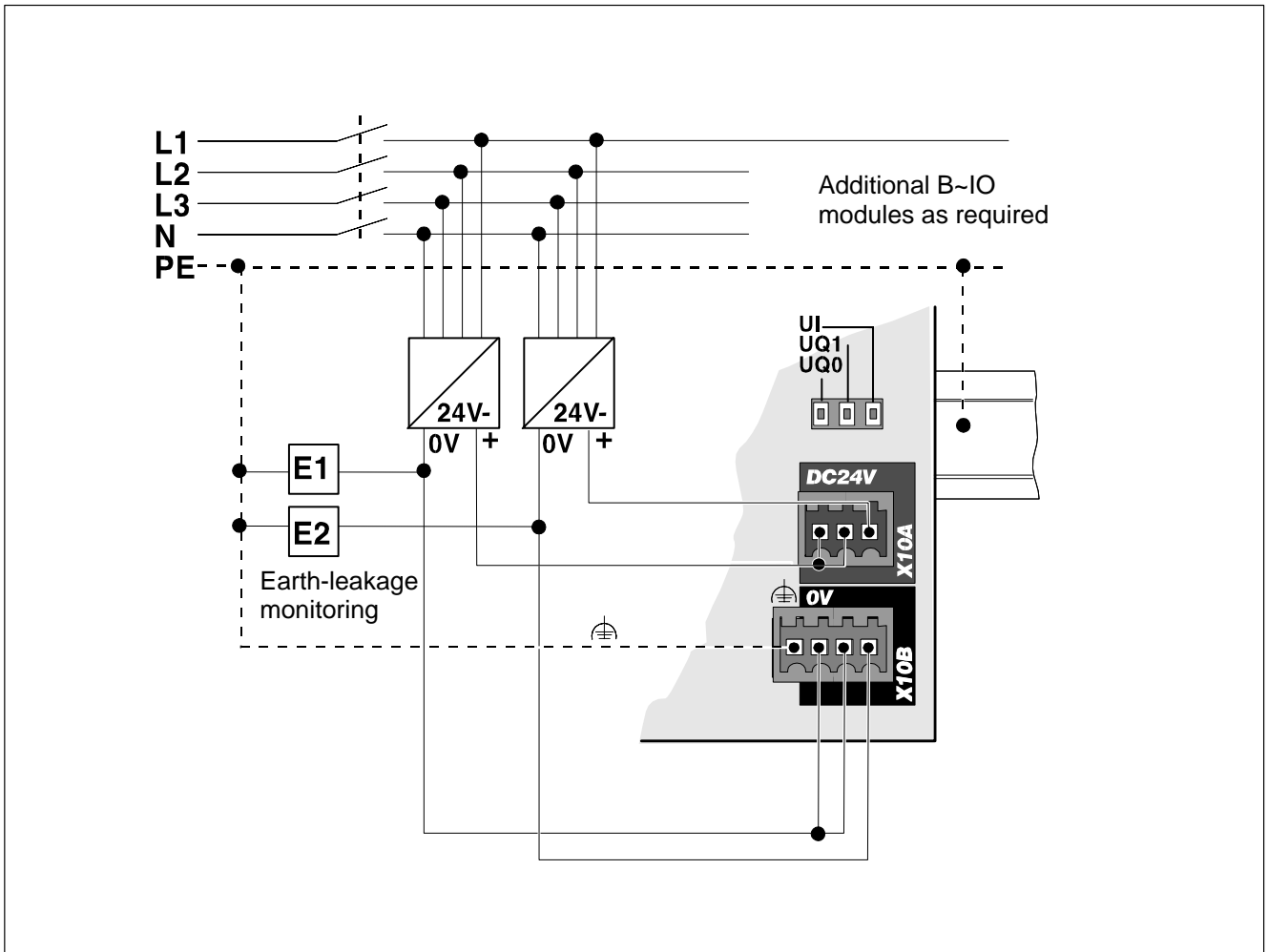
The interconnection between reference conductor and PE conductor must be made at the power supply module. To facilitate the measuring of insulation resistances of all system devices, this connection must be both easily accessible and readily interruptible (DIN VDE 0100 part 725).



8.2.4 Reference Conductor Not Connected to PE Conductor

The modules comprising the B-IO K-DP compact unit variants can be powered by one or more power supply units.

If the reference conductor (N, 0 V) is not to be interconnected with the PE system, an earth-leakage monitor must be employed for the detection of ground faults. The earth-leakage monitor must allow for capacitances between the live conductors and the PE conductor.



8.2.5 Capacitive Load

For the purpose of interference suppression, the B~IO series modules feature built-in capacitive loads between the power supply lines and the PE conductor.

Designation	Order no.	24 V → PE	0 V → PE
B~IO K-DP 16DO	1070 079 739	3 x 5 nF	5 nF
B~IO K-DP 32DI	1070 079 733	5 nF	5 nF
B~IO K-DP16DI/16DO	1070 079 745	3 x 5 nF	5 nF

8.2.6 Power Supply Rating

The rating of power supplies must account for the maximum currents, as per VDE 0100 part 523. A voltage of 24 V (+20 % , -15 %) must be measured at the device input. This voltage must be maintained even in the presence of –

- Mains voltage fluctuations, e.g. due to uneven mains and load utilization
- Varying load conditions on B~IO series modules, such as short-circuit, standard load, lamp load or idle status

The maximum cable cross-section for the power supply of B~IO series modules is 1.5 mm².

Voltage Dips

To maintain its operation, the power supply for the logic circuits of B~IO series modules is capable of bridging voltage dips of up to 10 milliseconds.

8.2.7 Master Switch

A master switch conforming to VDE 0100 requirements must be provided for B~IO series modules, sensors and actuators.

8.2.8 Fuses

Fuses are required to protect the cables and devices.

When selecting fuses, a variety of criteria must be considered. The major criterion comprises the nominal current of the electrical circuit to be protected – refer also to VDE 0100 part 430. The nominal current also dictates the conductor cross-section, as per VDE 0100 part 523.

For additional information, refer to the German-language publication:

Handbuch Nr. 32
VDE Schriftenreihe
Bemessung und Schutz von Leitungen und Kabeln nach DIN 57100,
VDE 0100 Teil 430 und Teil 523.

In addition, relevant information is available from many manufacturers of fuses and circuit-breakers.

8.2.9 Wiring

Connections for B~IO series modules must be routed individually from the terminal blocks in the control cabinet to the terminals corresponding to each bus station. Sensors and actuators are connected directly to the device by means of 2-wire connections. Sensors and actuators utilizing 3 or 4-wire connections are connected by means of the terminal blocks that are available as optional accessories.

8.2.10 Earthing Arrangements

Functional Earthing

B~IO series modules must be fastened to a metallic support that is grounded, i.e., the rear panel of the control cabinet.

The attachment is effected with the use of DIN rails (top-hat rails). DIN rails must be grounded, for which purpose the chromate or similar surface treatment at the connection point must be removed down to the bare metal.

To provide optimum interference protection, functional earthing will be required. The functional earthing connection must be as short as possible or, most ideally, consist of a ground strap.

Guidance value:	Cable/strap length:	max. 1 m
	Cross-section:	6 mm ²

Equipotential Bonding

Equipotential bonding, as per DIN VDE 0100 part 540, must exist between system components and power supply.

8.3 Connectors

8.3.1 Inputs

All inputs feature common 24 V and 0 V potentials.



CAUTION!

An input voltage below –3 V can damage the module.

Any 2-wire proximity switch meeting the following conditions can be used:

- Closed-circuit current $\leq 2.5 \text{ mA}$
- Voltage drop $\leq 8 \text{ V}$

The following 2-wire proximity switches must not be used:

- 2-wire proximity switches that largely conform to the IEC 947-5-2 standard
- 2-wire proximity switches conforming to the NAMUR standard

8.3.2 Outputs

Inductive Loads

Inductive loads, such as solenoid valves or contactors, must be provided with a damping network in immediate proximity to the load. Otherwise, any interruption of the line connecting an output and an inductive load will cause a significant noise level. In unfavourable conditions, the noise level can become the cause of system malfunctions.

Especially when a switch is connected in series with the inductive load (safety lock), a damping network must be present.

All industry-standard damping networks may be employed.

For additional information, please consult the German-language manual "Handbuch zur Entstörung von geschalteten Induktivitäten" available from:

Friedrich Lütze GmbH & Co
Abteilung Marketing
Bruckwiesenstraße 17 - 19
D – 71384 Weinstadt (Großheppach)

Output Parallelling

Output connections in parallel can be used to increase output currents. This requires all corresponding output bits in the control unit to be set. Parallelling requires the observance of all module-specific requirements.

Positive Polarity Protection

Positive polarity connections are ensured only when no external power supply is connected.



CAUTION!

Damage to the module may be caused by the following:

- Polarity switching with simultaneous short-circuit of output lines.
 - Polarity switching while externally polarized suppressor diodes are connected to outputs.
 - Application of an external voltage exceeding 24 V.
-

GND Continuity Protection

The 0-reference of connected loads must be returned to the 0-V terminal of the outputs of the B~IO series modules. A 2-wire load connection must be established. In the event that the 0-reference is **not** returned (single-wire connection), GND continuity is no longer ensured.

If in this case the outputs are controlled via the PROFIBUS-DP (logical 1), an operational current may flow although the module does not feature a 0-volt connection.

If the outputs are not controlled via the PROFIBUS-DP (logical 0), a leakage current of up to 25 mA per output may flow.

In the event that outputs are paralleled, the current will multiply accordingly.

Overload Protection



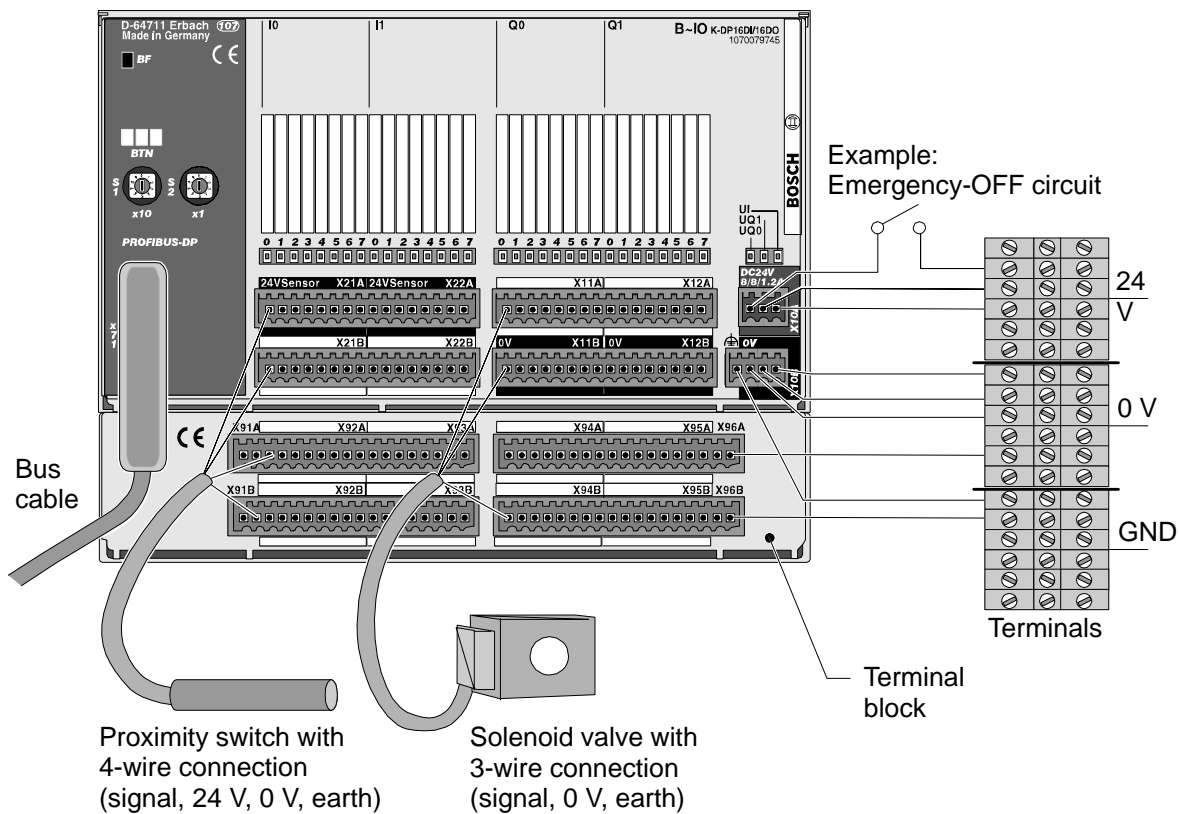
During project design, it should be remembered that, deviating from the stipulations of DIN EN 61131-2, the 2 A outputs guarantee an output current of only 2 A with a supply voltage of up to 30 V.

8.3.3 Coupling Inputs and Outputs

The interconnection of inputs and outputs is permitted. The connection of an additional load is not required.

8.4 Connection Example

The example below illustrates the connection of the connector strips of the B~IO K-DP16DI/16DO (compact module with 16 inputs and 16 outputs).





8.5 PROFIBUS-DP Configuration

Setting bus station address

A separate bus station address must be assigned to each bus station on the PROFIBUS-DP field bus.

The address is located within the range of 0 through 99, and is selected with the aid of the S1 and S2 rotary switches.

 **The selected bus station address is queried only at the time of activating the power supply, and adopted during the subsequent module start-up.**

 **If a change is made during ongoing operation to the bus station address settings on switches S1 and S2, the change will come into effect only with the subsequent module start-up.**

The bus station address should be marked on the labelling field located on the front panel.

Baud Rate

The B~IO K-DP series modules automatically detect the baud rate that is selected on the PROFIBUS-DP. The following baud rates are supported:

- 9.6 kbaud
- 19.2 kbaud
- 93.75 kbaud
- 187.5 kbaud
- 500 kbaud
- 1.5 Mbaud
- 3 Mbaud
- 6 Mbaud
- 12 Mbaud

Subsequent to automatic baud rate detection, the bus station logs in on the bus master. It is then ready for operation.

If no baud rate was detected or an incorrect bus station address was selected, these conditions are indicated by the red illumination of the BF LED. A correct baud rate and address will cause the BF LED to extinguish.

DP Configuration Program

The operation of the B~IO K-DP series modules requires the use of a DP configuration program (*DP-Konfigurator*).

The functions of the *DP-Konfigurator* program include the specification of the bus station address, and the assignment of PLC addresses to the decentralized inputs and outputs.

In addition, the *DP-Konfigurator* is used to select the bus parameter settings, such as the baud rate, for example.

Two versions of the *DP-Konfigurator* are available for Bosch controllers:

- WinDP for Windows® 95 / NT®
- PROFI-DP for MS-DOS®.

To operate the B~IO series modules in conjunction with bus masters of other manufacturers, the DP configuration program of the respective manufacturer must be used.

Device Specification File for PROFIBUS-DP

In accordance with DIN EN 50170 Part 2, the data file containing all major device specifications (GSD file) contains all information required to connect the modules to any desired DP master. The file is evaluated by the DP configuration program.

The Bosch-proprietary device specification file (GSD file) bears the filename RBxx0121.GSD, whereby the xx represents the version number of the GSD file.

Cyclical Data Exchange

In cyclical operation, input and output data is exchanged between the governing PLC and the B~IO K-DP series module via PROFIBUS-DP.

No diagnostic messages are transferred to the bus master.

SYNC Mode

Upon receiving a SYNC command from the DP master, the output statuses of the B~IO series modules are frozen. The output data that is subsequently transferred is not output until the next SYNC command is received from the DP master. This operating mode can be cancelled by sending an UnSYNC command from the DP master.

This facilitates the synchronization of the outputs of several DP slaves.

FREEZE Mode

Upon receiving a FREEZE command from the DP master, the input statuses of the B~IO series modules are frozen, and are ready for transfer to the DP master. Repeating the FREEZE control command causes the procedure to be repeated. This operating mode can be cancelled by sending an UnSYNC command from the DP master.

This facilitates the synchronization of the inputs of several DP slaves.

8.6 Electromagnetic Compatibility (EMC)

A machine plant or a system as an entity must meet the interference immunity requirements defined in applicable standards. The compliance with the referred requirements is the responsibility of the systems designer and/or supplier of the machine compound.

As stand-alone components, the members of the B~IO module family meet the requirements of the EMC Directive. Conformity with applicable standards was tested on a specific system configuration. This does not mean, however, that this automatically results in guaranteed EMC compliance with any given system configuration. The responsibility for the entire system rests with the plant engineering supplier.

Emissions & Radio Interference

For deployment in a residential area, the user will be required to take additional measures:

- Installation of the input/output system in a control cabinet, and/or in an enclosure providing highly effective EMC shielding.
- To comply with the requirement for low emission levels, filtering and screening measures must be implemented on all lines exiting from the shielded area, i.e., the control cabinet.

Notes:

A Appendix

A.1 PLC Terminology Deutsch / English

Operanden / Operands

Deutsch		English	
AST	Anwender-Stack	AST	Application stack
AWP	Anwenderprogrammzähler	UPP	User program pointer counter
A	Ausgang	O	Output
AZ	Ausgangszusatzfeld	EO	Extended output
D	Datum	D	Data
DB	Datenbaustein	DM	Data module
DF	Datenfeld	DF	Data field
DP	Datenpuffer	DB	Data buffer
E	Eingang	I	Input
EZ	Eingangszusatzfeld	EI	Extended input
F	Fehler	E	Error
FI	FIFO-Operand (Warteschlange)	FI	FIFO operand
IA	Interface-Ausgang	IO	Interface output
IE	Interface-Eingang	II	Interface input
K	Konstante	K	Constant
KD	Doppelwort-Konstante	KD	Constant double word
KF	Gleitkomma-Konstante	KF	Constant floating point
KME	Koordinierungsmerker einfach	CFS	Coordination flag single
KMP	Koordinierungsmerker permanent	CFP	Coordination flag permanent
Kx.y	Zeitkonstante	Kx.y	Constant of time
M	Merker	M	Marker
'nr'	Parameternummer	'nr'	Number as parameter
P	Parameter	P	Parameter
PI	Peripherieinterrupt	PI	Peripheral interrupt
S	Systembereich	S	System range
SI	Systeminterrupt	SI	System interrupt
SM	Sondermerker	SM	Special marker
T	Zeit	T	Time
TI	Zeitinterrupt	TI	Time interrupt
Z	Zähler	C	Counter
\$	direkte Adreßeingabe der Befehle L und T	\$	Operand absolute
-xx	Symbolischer Operand	-xx	Symbol

Befehle/Instructions

Deutsch		English	
ADC	Addition mit Carry	ADC	Addition with carry
ADD	Addition	ADD	Addition
AF	Alarm freigeben	AE	Alarm enable
AS	Alarm sperren	AD	Alarm disable
BA	Baustein aufruf unbedingt	CM	Call module
BAAG	Baustein aufruf arithmetisch größer, AG=1	CMAG	Call module arithmetical greater, AG=1
BAB	Baustein aufruf bedingt, VKE=1	CMC	Call module conditional, RES=1
BAC	Baustein aufruf Carry, C=1	CMCY	Call module carry, C=1
BACN	Baustein aufruf Carry nicht, C=0	CMCN	Call module carry not, C=0
BACZ	Baustein aufruf Carry oder Null, C=1 oder Z=1	CMCZ	Call module carry or zero, C=1 or Z=1
BAI	Baustein aufruf invers, VKE=0	CMCI	Call module conditional invers, RES=0
BALG	Baustein aufruf logisch größer, LG=1	CMLG	Call module logical greater, LG=1
BAM	Baustein aufruf Minus, N=1	CMM	Call module minus, N=1
BAMZ	Baustein aufruf Minus oder Null, N=1 oder Z=1	CMMZ	Call module minus or zero, N=1 or Z=1
BAN	Baustein aufruf nicht Null, Z=0	CMN	Call module not zero, Z=0
BAO	Baustein aufruf Overflow, O=1	CMO	Call module overflow, O=1
BAON	Baustein aufruf Overflow nicht, O=0	CMON	Call module overflow not, O=0
BAP	Baustein aufruf Plus, N=0	CMP	Call module plus, N=0
BAX	Baustein aufruf im zweiten Segment	CMX	Call module into second segment
BAZ	Baustein aufruf Null, Z=1	CMZ	Call module zero, Z=1
BE	Baustein ende unbedingt	EM	End of module
BEAG	Baustein ende arithmetisch größer, AG=1	EMAG	End of module arithmetical greater, AG=1
BEB	Baustein ende bedingt, VKE=1	EMC	End of module conditional, RES=1
BEC	Baustein ende Carry, C=1	EMCY	End of module carry, C=1
BECN	Baustein ende Carry nicht, C=0	EMCN	End of module carry not, C=0
BECZ	Baustein ende Carry oder Null, C=1 oder Z=1	EMCZ	End of module carry zero, C=1 or Z=1
BEI	Baustein ende invers, VKE=0	EMI	End of module invers, RES=0
BELG	Baustein ende logisch größer, LG=1	EMLG	End of module logical greater, LG=1
BEM	Baustein ende Minus, N=1	EMM	End of module minus, N=1
BEMZ	Baustein ende Minus oder Null, N=1 oder Z=1	EMMZ	End of module minus Zero, N=1 or Z=1
BEN	Baustein ende nicht Null, Z=0	EMN	End of module not zero, Z=0
BEO	Baustein ende Overflow, O=1	EMO	End of module overflow, O=1
BEON	Baustein ende Overflow nicht, O=0	EMON	End of module overflow Not, O=0
BEP	Baustein ende Plus, N=0	EMP	End of module plus, N=0
BEZ	Baustein ende Null, Z=1	EMZ	End of module zero, Z=1
BID	Wandlung Binär in Dezimal	BID	Binary to decimal conversion
BLA	Block anfang	SBL	Start of block
BLAA	Block anfang absolut	SBLA	Start of block absolute

Deutsch		English	
BLE	Blockende	EBL	End of block
BX	2. Datenbaustein aufruf	CX	2nd call data module
BXB	2. Datenbaustein aufruf bedingt, VKE=1	CXC	2nd call data module conditional, RES=1
BXI	2. Datenbaustein aufruf bedingt invers VKE=0	CXCI	2nd call data module conditional invers, RES=0
CH	Tausche unbedingt	CH	Change
CHAG	Tausche arithmetisch größer, AG=1	CHAG	Change arithmetical greater, AG=1
CHB	Tausche bedingt, VKE=1	CHC	Change conditional, RES=1
CHC	Tausche Carry, C=1	CHCY	Change carry, C=1
CHCN	Tausche Carry nicht, C=0	CHCN	Change carry not, C=0
CHCZ	Tausche Carry oder Null, C=1 oder Z=1	CHCZ	Change carry or zero, C=1 or Z=1
CHI	Tausche bedingt invers, VKE=0	CHCI	Change conditional invers, RES=0
CHLG	Tausche logisch größer, LG=1	CHLG	Change logical greater LG=1
CHM	Tausche Minus, N=1	CHM	Change minus, N=1
CHMZ	Tausche Minus oder Null, N=1 oder Z=1	CHMZ	Change minus or zero, N=1 or Z=1
CHN	Tausche nicht Null, Z=0	CHN	Change not zero, Z=0
CHO	Tausche Overflow, O=1	CHO	Change overflow, O=1
CHON	Tausche Overflow nicht, O=0	CHON	Change overflow not, O=0
CHP	Tausche Plus, N=0	CHP	Change plus, N=0
CHZ	Tausche Null, Z=1	CHZ	Change zero, Z=1
CLSB	Lösche Systembefehle	CLSI	Clear system instruction
CMP	Zweier-Komplement	TC	Two's complement
DBA	Baustein aufruf registerindirekt	DCM	Dynamical call module
DEB	Wandlung Dezimal in Binär	DEB	Decimal to binary conversion
DEC	Dekrement	DEC	Decrement
DEF	Definition	DEF	Define
DEFW	Definition Wort	DEFW	Define word
DI	Sperren Interruptgruppe	DAI	Disable all interrupts
DIV	Division	DIV	Division
DX		DX	
EI	Freigeben Interruptgruppe	EAI	Enable all interrupts
ERE	Anwenderereignis erreicht	EVA	Event achieved
ERH	Anwenderereignis anfordern im Hintergrund	EVB	Event instruction background
ERS	Anwenderereignis anfordern im Hintergrund mit Systeminterrupt	EVS	Event with system interrupt
ERU	Anwenderereignis anfordern unmittelbar	EVD	Event instruction directly
EXC	Tausche Registerinhalt	EXC	Exchange
FF	Feld freigeben	FR	Field release
FS	Feld schützen	FS	Field save

Deutsch		English	
G	Größer	GT	Greater than
GG	Größer oder gleich	GTE	Greater than or equal
GL	Gleich	EQ	Equal
HLT	Halt	HLT	Halt
IF	Interrupt freigeben	EI	Enable interrupt
INC	Inkrement	INC	Increment
IR	Interrupt rücksetzen (löschen)	RI	Reset interrupt
IS	Interrupt sperren	DI	Disable interrupt
K	Kleiner	LT	Less than
KG	Kleiner oder gleich	LTE	Less than or equal
KL	Kleiner	LT	Less than
L	Laden	L	Load
LABB	Laden Inhalt des Abbildbereiches	LIMR	Load image range
LAH	Laden absolut adressiert im Hintergrund	LAB	Load absolut range in background
LAS	Laden absolut adressiert im Hintergrund mit Systeminterrupt	LAS	LAB with system interrupt
LAU	Laden absolut adressiert unmittelbar	LAD	Load absolut range directly
LFH	Laden feldadressiert im Hintergrund	LFB	Load field in background
LFI	Laden aus FIFO-Speicher	LFI	Load from FIFO
LFS	Laden feldadressiert im Hintergrund mit Systeminterrupt	LFS	LFB with system interrupt
LFU	Laden feldadressiert unmittelbar	LFD	Load field directly
LI	Laden Interruptregister der Interruptgruppe	LAI	Load all interrupts
LM	Laden der Interruptmaske	LIM	Load interrupt mask
LMB	Laden des Inhalts des Memorybereiches	LMB	Load memory band
LMBX	LMB im zweiten Segment	LMBX	LMB into second segment
LO	Leer Oder, entspricht: O(	LO	Empty logical or, O=(
LPB	Laden Peripherie Bus	LPB	Load periphery bus
LPC	Laden Programmzähler	LPC	Load program counter
LSP	Laden Stack Pointer	LSP	Load stack pointer
LUZ	Laden Uhrzeit zyklisch	LCC	Load clock cyclical
LUZS	Laden Uhrzeit zyklisch mit Systeminterrupt	LCCS	LCC with system interrupt
LZS	Laden Zeit-Sollwert	LNT	Load normalize time
MUL	Multiplikation	MUL	Multiplication
N	Einer-Komplement	N	Negation, one's complement
NOP0	Leeranweisung 0, 0000H	NOP0	No operation, 0000H
NOP1	Leeranweisung 1, FFFFH	NOP1	No operation, FFFFH
O	Oder	O	Or
ON	Oder nicht	ON	Or not

Deutsch		English	
O(	Oder Klammer auf	O(	Empty logical or, O(
P	Prüfe Bit	TST	Test
PE	Programmende	EP	End of program
Pi	Parameterfestlegung bei parametrisierten Bausteinaufruf, i='nr'	Pi	Parameter line, i='nr'
PN	Prüfe negiert Bit	TSTZ	Test on zero
POP	Transferiere vom Stack	POP	Transfer out from stack
PSi	Parameterfestlegung bei Systembefehlen, i='nr'	PSi	Parameter line of system instructions, i='nr'
PUSH	Lade auf Stack	PUSH	Load into stack
R	Rücksetzen	R	Reset
RC	Rücksetze Carry Flag	RCY	Reset carry
RCL	Rotieren links durch Carry	RCL	Rotate through carry left
RCR	Rotieren rechts durch Carry	RCR	Rotate through carry right
RFI	Rücksetzen FIFO (Lösche FIFO)	RFI	Reset FIFO
RI	Rücksetzen der Interruptregister der Interruptgruppe	RAI	Reset all interrupts
ROL	Rotieren links	ROL	Rotate left
ROM	Rücksetzen ohne Monitoranzeige	RWM	Reset without monitoring
ROR	Rotiere rechts	ROR	Rotate right
RT	Rücksetzen Zeit	RT	Reset time
RZ	Rücksetzen Zähler	RC	Reset counter
S	Setzen	S	Set
SA	Starte Zeit als Ausschaltverzögerung	SF	Start time as falling delay
SAR	Schiebe arithmetisch rechts	SAR	Shift arithmetical to right
SBB	Subtraktion mit borgen	SBB	Subtraction with borrow
SC	Setze Carry Flag	SCY	Set carry
SE	Starte Zeit als Einschaltverzögerung	SR	Start time as raising delay
SI	Starte Zeit als Impuls	SP	Start time as puls
SINT	Sende Interrupt	SINT	Send interrupt
SLL	Schiebe logisch links	SLL	Shift logical to left
SLR	Schiebe logisch rechts	SLR	Shift logical to right
SOM	Setzen ohne Monitoranzeige	SWM	Set without monitoring
SP	Sprung unbedingt	JP	Jump
SPAG	Sprung arithmetisch größer, AG=1	JPAG	Jump arithmetical greater, AG=1
SPB	Sprung bedingt, VKE=1	JPC	Jump conditional, RES=1
SPC	Sprung Carry, C=1	JPCY	Jump carry, C=1
SPCN	Sprung Carry nicht, C=0	JPCN	Jump carry not
SPCZ	Sprung Carry oder Null, C=1 oder Z=1	JPCZ	Jump carry or zero, C=1 or Z=1
SPI	Sprung bedingt invers, VKE=0	JPCI	Jump conditional inverse, RES=0

Deutsch		English	
SPLG	Sprung logisch größer, LG=1	JPLG	Jump logical greater, LG=1
SPM	Sprung Minus, N=1	JPM	Jump minus, N=1
SPMZ	Sprung Minus oder Null, N=1 oder Z=1	JPMZ	Jump minus or zero, N=1 or Z=1
SPN	Sprung nicht Null, Z=0	JPN	Jump not zero, Z=0
SPO	Sprung Overflow, O=1	JPO	Jump overflow, O=1
SPON	Sprung Overflow nicht, O=0	JPON	Jump overflow not, O=0
SPP	Sprung Plus, N=0	JPP	Jump plus, N=0
SPZ	Sprung Null, Z=1	JPZ	Jump zero, Z=1
SS	Starte Zeit als speichernde Einschaltverzögerung	SRE	Start time as raising delay extended
SUB	Subtraktion	SUB	Subtraction
SV	Starte Zeit als verlängerter Impuls	SPE	Start puls extended
SWAP	Vertausche Hi-/Lo-Byte im Register	SWAP	Interchange operand bytes
SYN	Synchronisationspunkt erreicht	SYN	Synchronisation point achieved
SZ	Setze Zähler	SC	Set counter
T	Transfer	T	Transfer
TABB	Transferiere in den Abbildbereich	TIMR	Transfer image range
TAH	Transfer absolut adressiert im Hintergrund	TAB	Transfer absolut range in background
TAS	Transfer absolut adressiert im Hintergrund mit Systeminterrupt	TAS	TAB with system interrupt
TAU	Transfer absolut adressiert unmittelbar	TAD	Transfer absolut range directly
TDEC	Zeit dekrementieren	TDEC	Time decrement
TFH	Transfer feldadressiert im Hintergrund	TFB	Transfer field in background
TFI	Transfer in FIFO-Speicher	TFI	Transfer FIFO
TFS	Transfer feldadressiert im Hintergrund mit Systeminterrupt	TFS	TFB with system interrupt
TFU	Transfer feldadressiert unmittelbar	TFD	Transfer field directly
TH	Zeit halt	TH	Timer halt
TM	Transfer der Interruptmaske	TIM	Transfer interrupt mask
TMB	Transfer in Memory-Bereich	TMB	Transfer memory band
TMBX	TMB im zweiten Segment	TMBX	TMB into second segment
TPB	Transfer Peripherie Bus	TPB	Transfer periphery bus
TSP	Transferier Stack Pointer	TSP	Transfer stack pointer
U	Und	A	And
UG	Ungleich	NEQ	Not equal
UN	Und nicht	AN	And not
VGL	Vergleichen logisch	CPL	Compare logical
VGLA	Vergleichen logisch und arithmetisch	CPLA	Compare logical and arithmetical
WE	Wecken	AB	Alarm bell request
WES	Wecken mit Systeminterrupt	ABS	AB with system interrupt

Deutsch		English	
WEZ	Wecken zyklisch	ABC	Alarm bell request cyclical
WEZS	Wecken zyklisch mit Systeminterrupt	ABCS	ABC with system interrupt
XO	Exklusiv Oder	XO	Exclusive or
XON	Exklusiv Oder nicht	XON	Exclusive or not
ZR	Zähle rückwärts	CD	Count down
ZV	Zähle vorwärts	CU	Count up
=	Zuweisung	=	Equal-to sign
=OM	Zuweisung ohne Monitoranzeige	=WM	Equal without monitoring
*	Hilfsmarke setzen	*	Set help label
(	Klammer auf	(	Left bracket
)	Klammer zu	)	Right bracket
)N	Klammer zu negiert	)N	Right bracket with negation

Bausteine / Modules

Deutsch		English	
ASS	Assemblerbaustein	ASS	Assembler module
DB	Datenbaustein	DM	Data module
FB	Funktionsbaustein	FM	Function module
OB	Organisationsbaustein	OM	Organization module
PB	Programmbaustein	PM	Program module
ZB	Zusatzbaustein	EM	Extended module

Sonstige Software-Begriffe / Miscellaneous software terms

Deutsch		English	
AWL	Anweisungsliste	IL	Instruction list
FUP	Funktionsplan	FUD	Function diagram
KPL	Kontaktplan	LD	Ladder diagram
OKN	Operandenkennzeichen	OID	Operand identifier
OPD	Operand	OPD	Operand
OPE	Operandenergänzung	OPA	Operand attribute
OPR	Operator	OPR	Operator
OPT	Operationsteil	OPP	Operation part
PA	Programmanweisung	PI	Program instruction
PAE	Parameterergänzung	PAA	Parameter attribute
PAR	Parameter	PAR	Parameter
PZ	Programmzweig	RG	Program rung
Q	Quelloperand	SRC	Source operand
WSB	Weiterschaltbedingung		Step-on condition
Z	Zielloperand	DEST	Destination operand

A.2 Abbreviations

Abbr.	Explanation
B~IO	Bus Input Output
Bit	Smallest logical unit, having a value of "0" or "1" (LOW or HIGH)
BTN	Bus station (address)
Byte	A contiguous group of 8 bits
DI	digital inputs
DO	digital outputs
DP	PROFIBUS-DP field bus
EMC	Electromagnetic compatibility
GSD	Device specification file
PE	Protective Earth (conductor)
PLC	Programmable Logic Controller

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