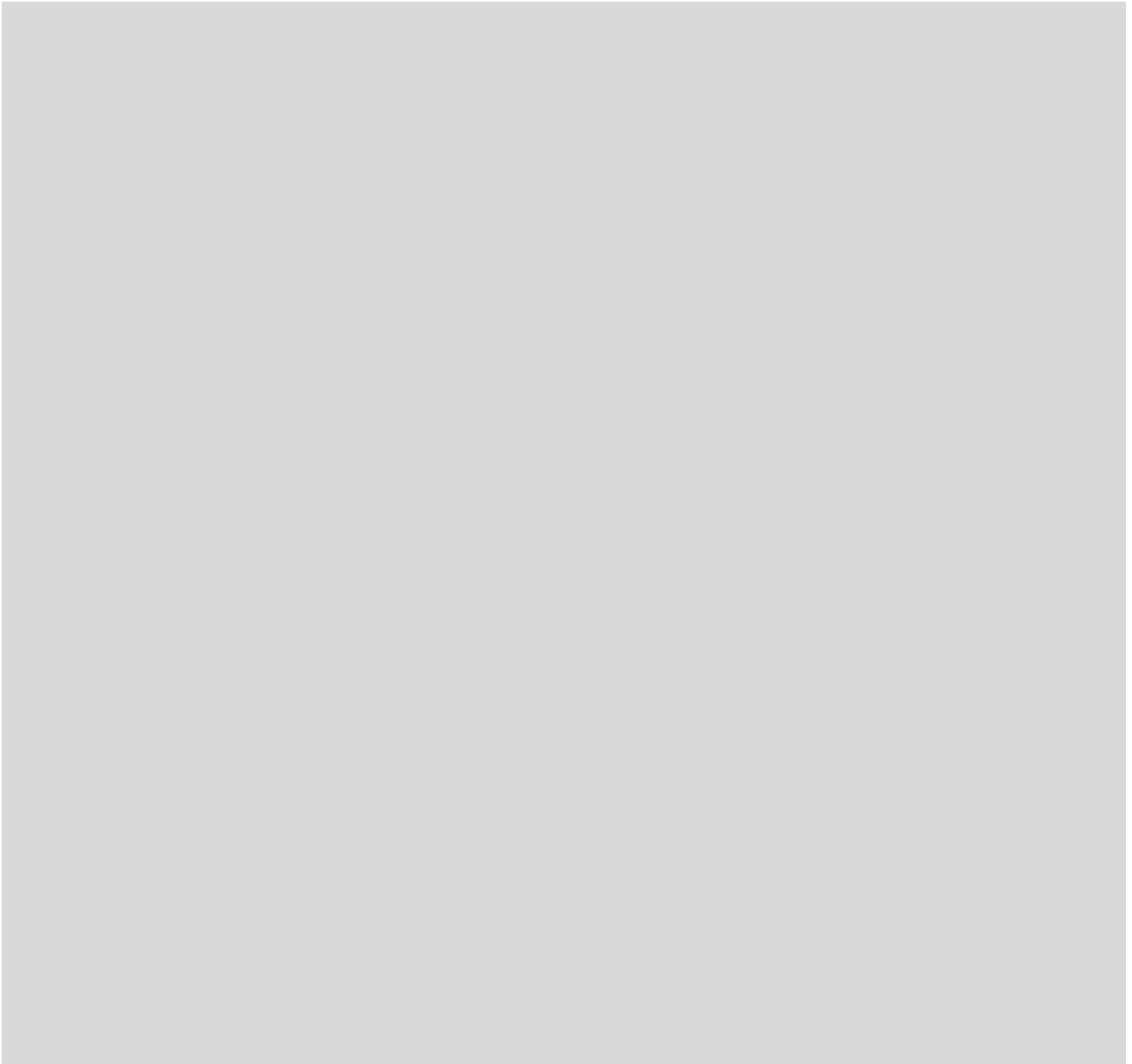


B-10

K-IBS16DO, K-IBS32DI, K-IBS16DI/16DO Module Description



Edition

101

B~IO

K-IBS16DO, K-IBS32DI, K-IBS16DI/16DO Module Description

1070 072 173-101 (99.03) GB



Reg. Nr. 16149-03

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1 Safety Instructions

Before you start working with the B-IO K-IBS, we recommend that you thoroughly familiarize yourself with the contents of this manual. Store this manual in a place to which all users have access at any time.

1.1 Proper use


This instruction manual presents a comprehensive set of instructions and information required for the standard operation of the described products. The described products are used as decentralized input and output hardware modules on the INTERBUS-S long-distance 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 requirements of the
 - COUNCIL DIRECTIVE 89/336/EEC of May 3rd 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 93/68/EEC (amendments of Directives), and 93/44/EEC (relating to machinery)
 - COUNCIL DIRECTIVE 73/23/EEC (electrical equipment designed for use within certain voltage limits)
 - Harmonized standards EN 50081-2 and EN 50082-2
- are designed for operation in an industrial environment (Class A emissions). The following restrictions apply:
 - No direct connection to the public low-voltage power supply is permitted.
 - Connection to the medium and/or high-voltage system must be provided via transformer.

The following applies for application within a personal residence, in business areas, on retail premises or in a small-industry setting:

- Installation in a control cabinet or housing with high shield attenuation.
- Cables that exit the screened area must be provided with filtering or screening measures.
- 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.

 **This is a Class A device. In a residential area, this device may cause radio interference. In such case, the user may be required to introduce suitable countermeasures, and to bear the cost of the same.**

Proper transport, handling and storage, placement and installation of the product are indispensable prerequisites for its subsequent flawless service and safe operation.

1.2 Qualified personnel

The relevant requirements of qualified personnel are based on 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 all aspects of maintaining and servicing machines and systems containing Programmable Logic Controllers (PLC). However, they will not require special PLC system skills.

Chapter 9 of this instruction manual also presents supplementary information for design engineers and project designers concerned with the layout and configuration of machines and systems utilizing PLC components, as well as for electrical engineers charged with installation and commissioning the referred machines and systems. Personnel thus identified requires special knowledge of PLC components and of the INTERBUS-S long-distance bus.

Interventions in the hardware and software of our products which are 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.

For this reason, only electrotechnicians as recognized under VDE 1000-10 who are familiar with the contents of this manual may install and service the products described.

Such personnel are

- those who, being well trained and experienced in their field and familiar with the relevant norms, are able to analyze the jobs being carried out and recognize any hazards which may have arisen.
- those who have acquired the same amount of expert knowledge through years of experience that would normally be acquired through formal technical training.

Please note our comprehensive range of training courses. Our training center will be pleased to provide you with further information, telephone: +49 (0)6062 78-258.

1.3 Safety markings on components



Danger: High voltage!



Electrostatically sensitive components!



Disconnect at mains before opening!



Pin for connecting PE conductor only!



This connection for functional earthing or low-noise earth only!



For screened conductor only!

1.4 Safety instructions in this manual



DANGEROUS ELECTRICAL CURRENT

This symbol is used to warn of the presence of **dangerous electrical current**. 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 inform the user of special features.

1.5 Safety instructions for the described product

**DANGER**

Retrofits or modifications may adversely affect the safety of the products described!

The consequences may include severe injuries, damage to equipment, or environmental hazards. Possible retrofits or modifications to the system using third-party equipment therefore have to be approved by Bosch.

**DANGER**

Danger of life through inadequate EMERGENCY-STOP devices! EMERGENCY-STOP devices must be active and within reach in all system modes. Releasing an EMERGENCY-STOP device must not result in an uncontrolled restart of the system! First check the EMERGENCY-STOP circuit, then switch the system on

**DANGER**

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

**DANGEROUS ELECTRICAL VOLTAGE**

Unless described otherwise, maintenance procedures must always be carried out only while the system is isolated from the power supply. During this process, the system must be blocked to prevent an unauthorized or inadvertent restart.

If measuring or testing procedures must be carried out on the active system, these must be carried out by trained electricians.

**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**

Only Bosch-approved spare parts may 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 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 be handled only 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 plastic 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.

1.6 Documentation, version and trademarks

Documentation

The present manual provides the user with comprehensive information about installation and operation of the B-IO K-IBS compact modules. Excluded from the descriptions appearing hereunder are general project planning and installation procedures for the INTERBUS-S field bus.

This instruction manual contains the following sections:

- Sections describing module operation
- Specifications
- Accessories / Spare parts
- Project planning / Installation
- Appendix

Trademarks

All trademarks referring to software that is installed on Bosch products when shipped from the factory represent the property of their respective owners.

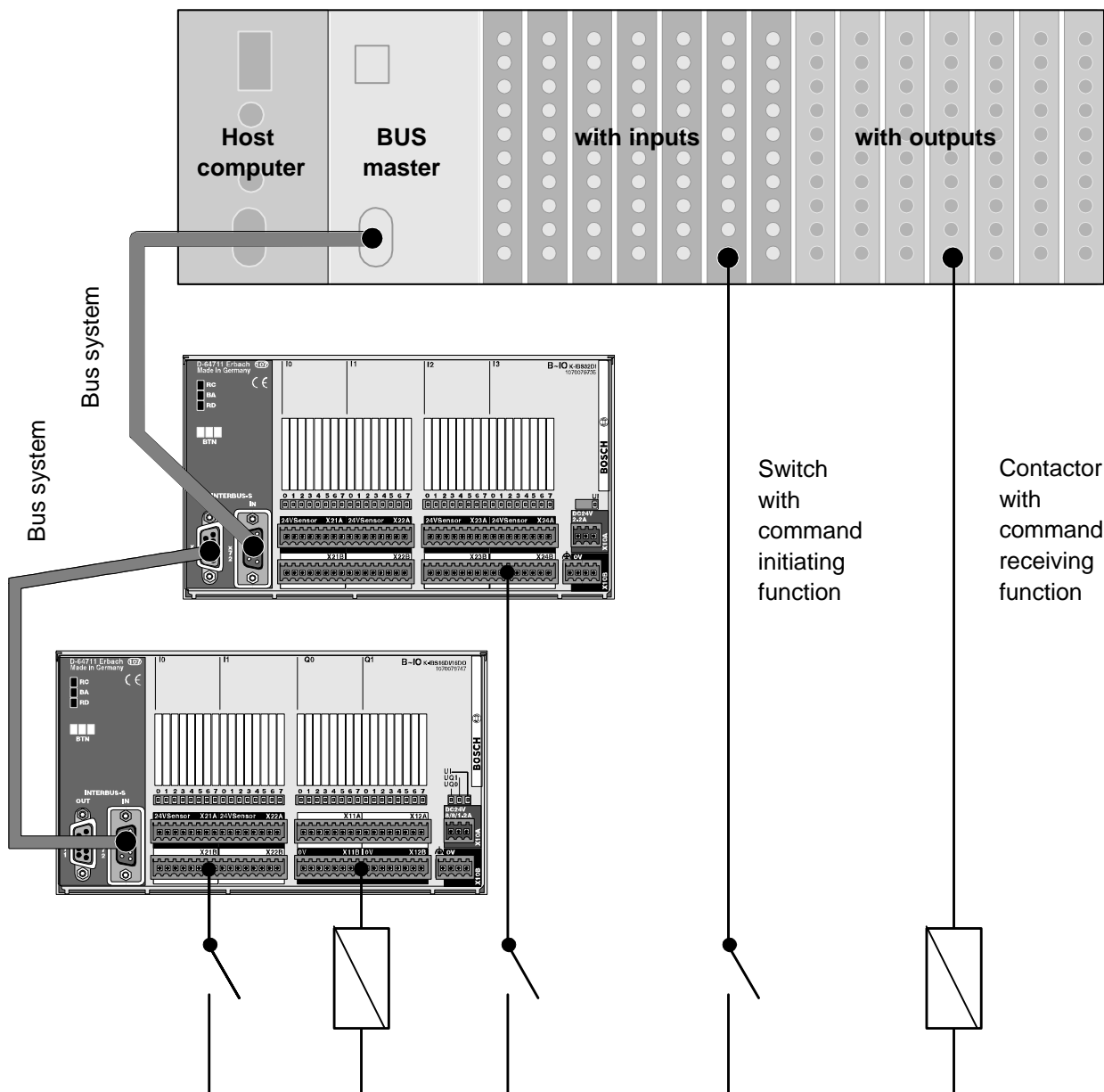
At the time of shipment from the factory, all installed software is protected by copyright. Software may therefore be duplicated only with the prior permission of the respective manufacturer or copyright owner.

INTERBUS-S® is a registered trademark of Phoenix Contact.

Notes:

2 System Overview

The B~IO K-IBS family of modules comprises decentralized terminal devices (in slave operation) for Programmable Logic Controllers (PLC), or for host computers that assume the functions of control units. Data transmission is accomplished via the INTERBUS-S in accordance with EN 50178. An application example appears below:



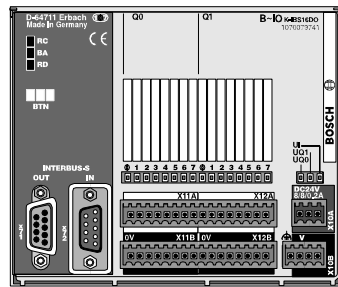
2.1 B~IO K-IBS Type Variants

K-IBS16DO

16-way output module, featuring

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

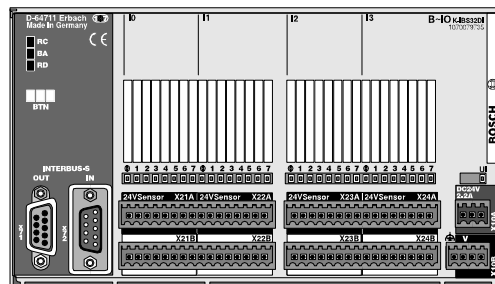
Order no.: 1070 079 741



K-IBS32DI

32-way input module, 24 V DC

Order no.: 1070 079 735

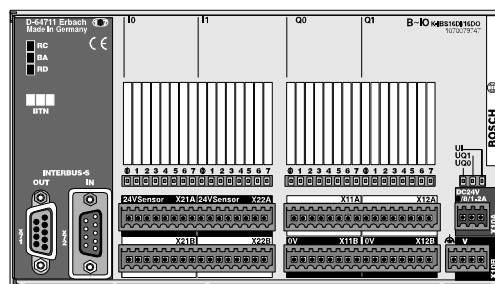


K-IBS16DI/16DO

32-way input / output module, featuring

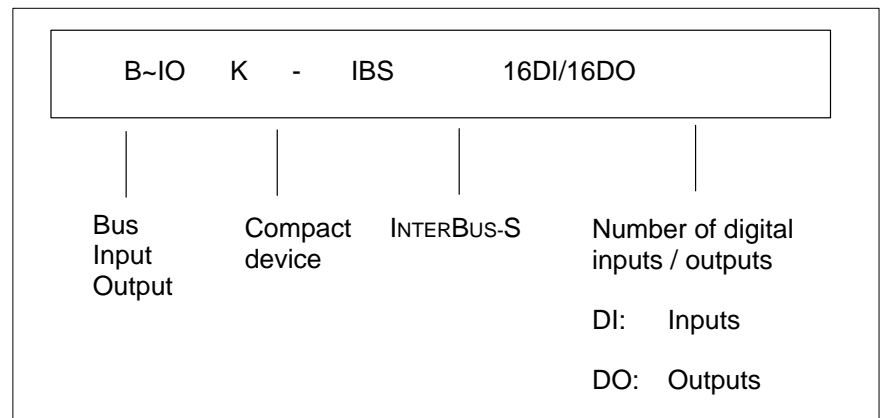
- 16 inputs, 24 V
- 8 outputs, 0.5 A
- 4 outputs, 1 A
- 4 outputs, 2 A

Order no.: 1070 079 747



2.2 Module Designations

The module designations are structured as follows:



2.3 Basic Functions

The controller – irrespective of the system being used – must be equipped with a connection for the INTERBUS-S in accordance with EN 50178.

A single INTERBUS-S data cable can be used to connect several B~IO K-IBS modules. The signal transmitters (sensors) and signal receivers (actuators) are directly connected to the respective ports on the B~IO K-IBS module. This practise provides a number of 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 connection of two, three, and four-wire sensors and actuators without requiring intermediate terminals.
- Simplified error diagnostics.

The bus connection of the B~IO K-IBS compact module –

- maintains constant contact with the governing control unit via INTERBUS-S.

The input terminals of the module –

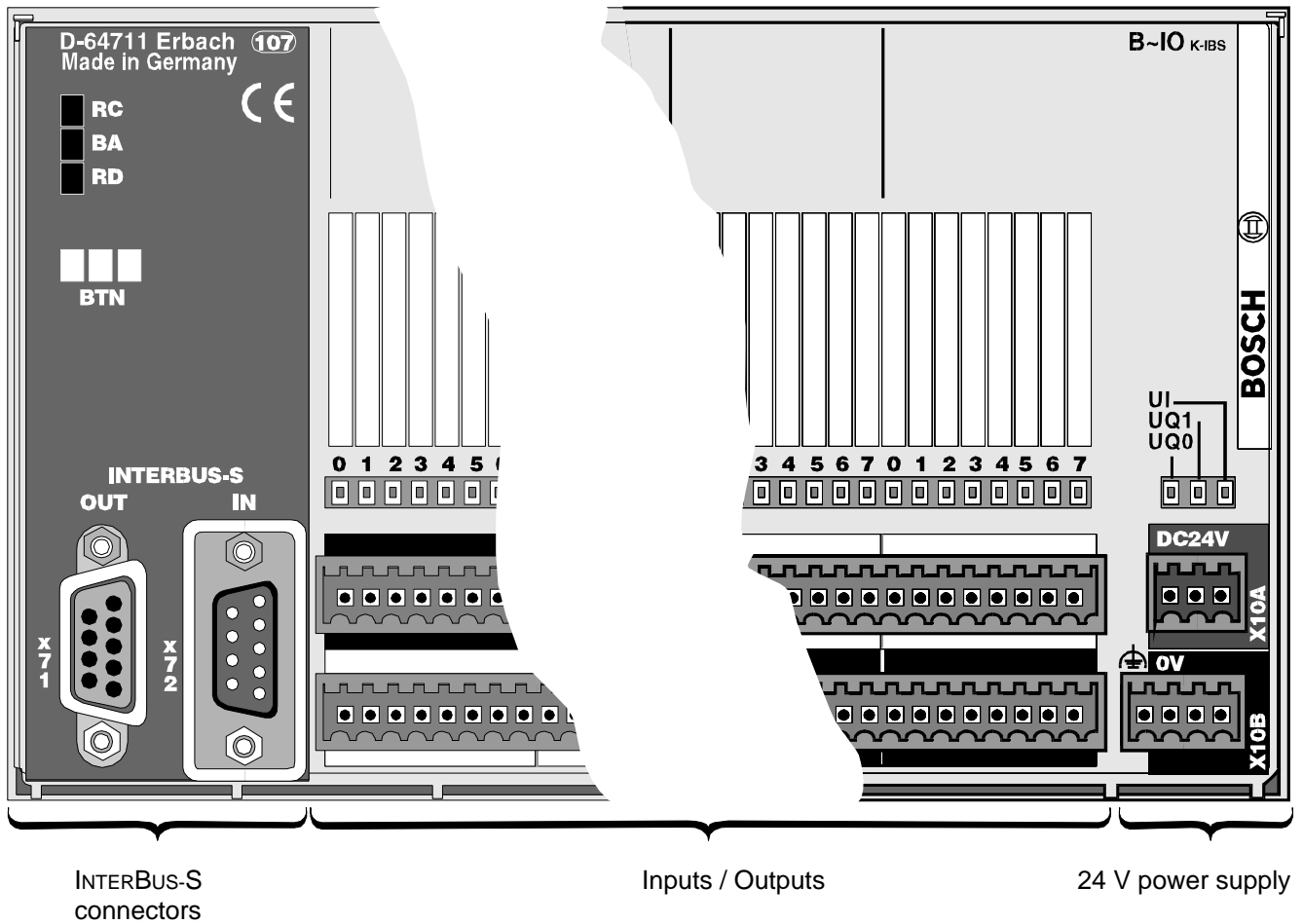
- provide a 24 V potential,
- process the input signals inbound from switches, light barriers and sensors, and
- forward the respective signals to the controller via the bus.

The output terminals of the module –

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

2.4 Hardware Configuration

Functional sections



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

- INTERBUS-S connectors
- Input / Output ranges
- 24 V power supply

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

Installation

The modules are placed directly on a 5 x 7.5 mm support rail (as per EN 50022) in the control cabinet.

Accessories

- 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

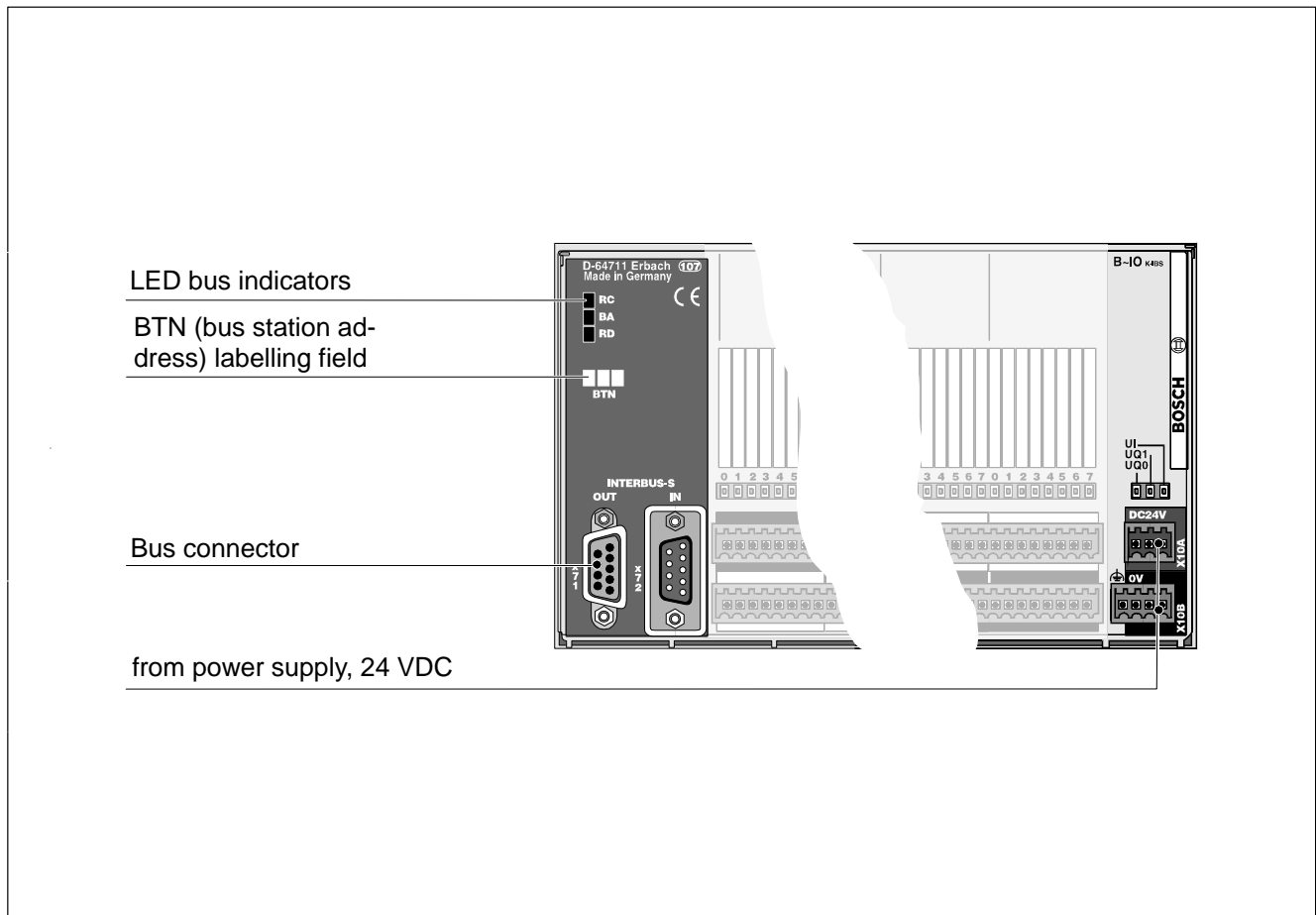
A complete list of spare parts and accessories appears in Chapter 8 of this manual.

3 Introduction and Bus Connection

3.1 Bus Configuration

The compact module uses its INTERBUS-S long-distance bus connection to maintain constant contact with the governing control unit.

- Via the INTERBUS-S, 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 INTERBUS-S, and directs the same to its outputs.



3.2 Connections

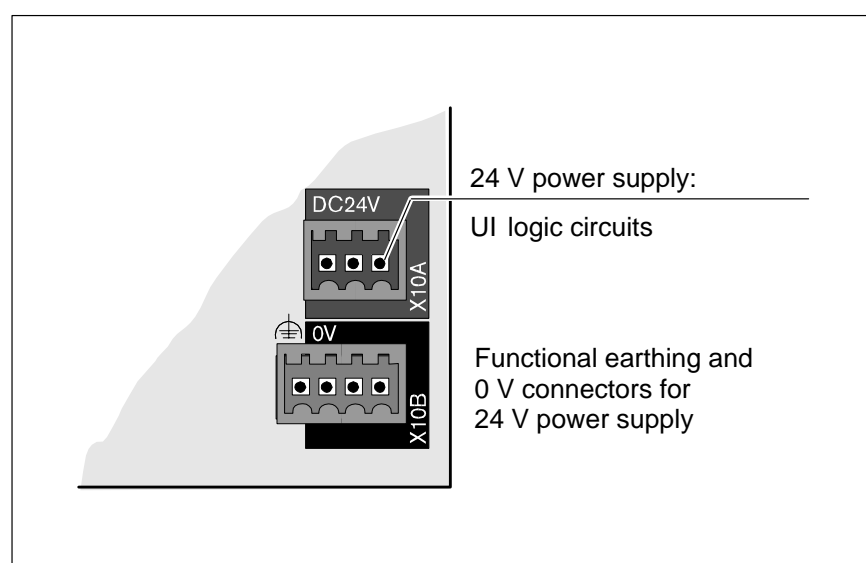
3.2.1 24 V Power Supply

The module requires a 24 V power supply for –

- UI logic circuits

The INTERBUS-S interface is electrically isolated from the 24 V power supply for UI logic circuits.

 **The 24 V power supply for UI logic circuits is NOT electrically isolated from inputs and outputs.**



3.2.2 INTERBUS-S


The INTERBUS-S represents a long-distance data bus in accordance with EN 50178.

The connection to the INTERBUS-S is accomplished by means of a female 9-pin D-SUB connector that is plugged onto to the male 9-pin D-SUB input connector (IN) of the B~IO K-IBS module, and then secured with captive screws. The bus can be looped to a subsequent bus station from the female 9-pin D-SUB output connector (OUT) on the B~IO K-IBS module.

Pin assignment

Pin no.	IN X72 Male connector	OUT X71 Female connector	Explanation
1	DO	DO	Send data
2	DI	DI	Receive data
3	COM	COM	Reference GND
4	–	–	–
5	–	+ 5V ISO	For RBST bridge
6	\overline{DO}	\overline{DO}	Send data
7	\overline{DI}	\overline{DI}	Receive data
8	–	–	–
9	–	RBST	Identifier in the event that additional bus stations are connected (remote bus stations)
Housing	Shield via RC circuit	Shield	

When assembling a connecting cable, care must be taken to ensure that the bridge between pin 5 and pin 9 in the male D-SUB connector connected to the female OUT connector is in place.

 **Unless stated otherwise, the INTERBUS-S installation guidelines and cabling recommendations issued by Phoenix-Contact shall be observed. In particular, refer to IBS SIG Part 1 UM or to the IBS SYS INST UM Installation Manual.**

3.3 Operation

Power-up Sequence

In the event that the B-IO K-IBS module is not energized at the time the governing control unit is powered up, the decentralized inputs and outputs will not be available. For this reason, power to the B-IO K-IBS module should be established and verified prior to starting the governing control unit.

Procedural sequence:

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

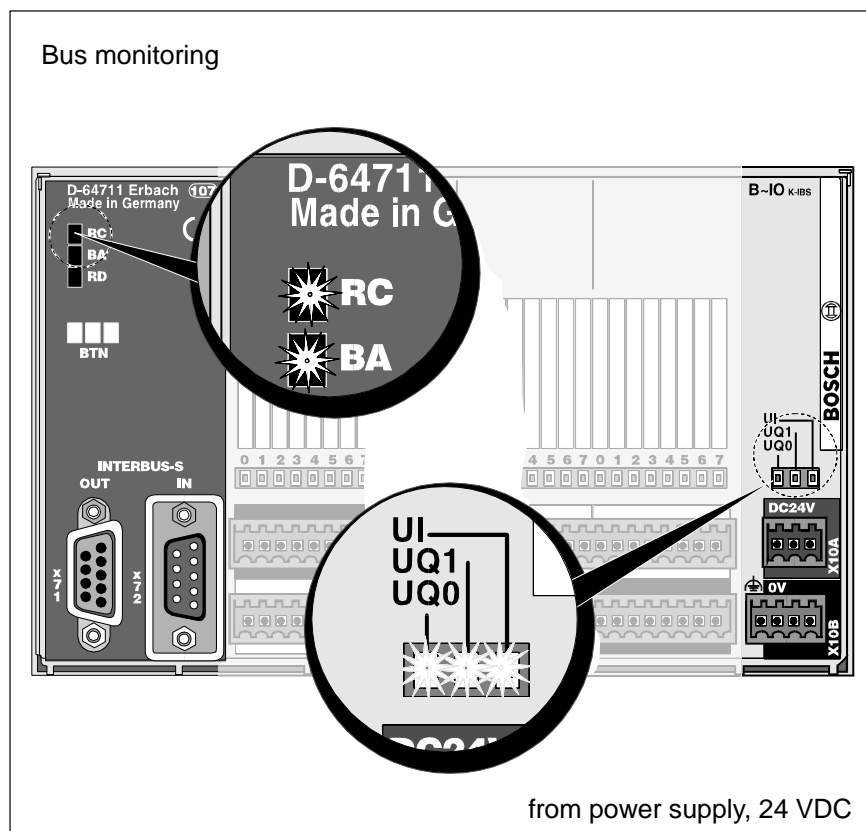
 **Observe the relevant information in the operating manual supplied with the governing control unit.**

Ongoing Operation

The bus connection module is operated by the governing control unit. As manual operation is not required, there are no relevant provisions.

The bus connection module is activated and working properly if –

- the UI LED illuminates green
- the RC LED illuminates green
- the BA LED illuminates green



3.4 Troubleshooting

3.4.1 Causes of Malfunctions

A basic differentiation can be made between the following malfunctions:

Malfunction	Indication	Cause	Remedial measures
Bus connection module			
Bus connection failure	UI LED fails to illuminate	24 V power supply is missing	Check function of 24 V power supply
Bus error	RC LED fails to illuminate	Governing control unit or bus master in RESET mode, or bus fault.	<ul style="list-style-type: none"> • Check the fault/error messages of the governing control unit • Check bus cabling
Outputs			
Output range not functioning	One of the UQ0 and UQ1 LEDs fails to illuminate	Missing 24 V power supply for one output byte	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 bus connection indicators
Faulty output range function	RC LED fails to illuminate	Host computer in RESET mode, or active RESET on bus master	Wait a few seconds until RESET has been completed
		Missing or faulty connection of inbound long-distance bus	Check bus cabling
	One or more output status indicators show an incorrect signal level although control unit sends the correct signal	Possible defect in output module	Replace B~IO K-IBS module
Overload condition on single output	UQ0 or UQ1 LED illuminates red	Overload in respective output byte	Investigate the cause

Malfunction	Indication	Cause	Remedial measures
Inputs			
Failure of input range	UI LED fails to illuminate	Missing 24 V power supply	Check function of 24 V power supply
Control unit receives wrong signal from input range	Governing control unit recognizes faulty signal for one or more input signals. Input status indicators indicate correct signal level.	Faulty signal supplied by input range or bus connection module	Replace B-IO K-IBS module
Faulty input range function	RC LED fails to illuminate	Host computer in Reset mode, or active Reset on bus master, OR	Wait a few seconds until Reset has been completed
		missing or faulty connection of inbound long-distance bus	Check bus cabling
Overload condition	UI LED illuminates red	Overload condition in power supply to sensors; total current exceeds > 2 A	Investigate the cause

3.4.2 Summary of Malfunction Indications

General Malfunction Indications

Name	LED	Function
RC	Green	Incoming bus OK, bus Reset of bus master inactive
	OFF	Governing controller or bus master in Reset mode, OR bus fault.
BA	Green	Active transfer of data packets on the bus
	OFF	No data is being transferred on the bus
RD	OFF	Outgoing bus loop is closed
	Red	Outgoing bus loop is open
UI	OFF	24 V power supply to logic circuits is missing
	Green	24 V power supply to logics circuits is OK
	Red	Modules featuring inputs only: Maximum permissible current for 24 V sensor power supply 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 of output byte 0. Illuminates only while using overloaded output
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 of output byte 1. Illuminates only while using overloaded output

3.5 Maintenance / Inspection

The bus connection module is maintenance-free. In the event that cleaning of the housing becomes necessary, no cleaning agents containing abrasives or solvents may be used.

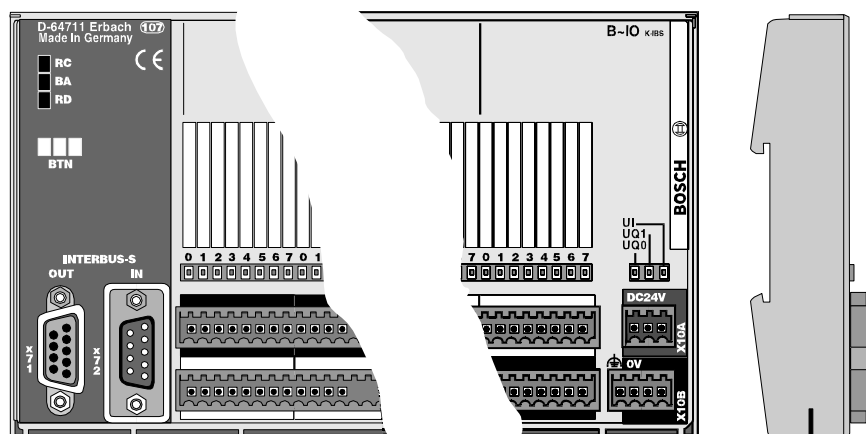
3.6 Installation

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-IBS modules.

- ☞ For more detailed information, refer to Chapter 7, “Specifications” and Chapter 9, “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 INTER-Bus-S.

Attaching the Module



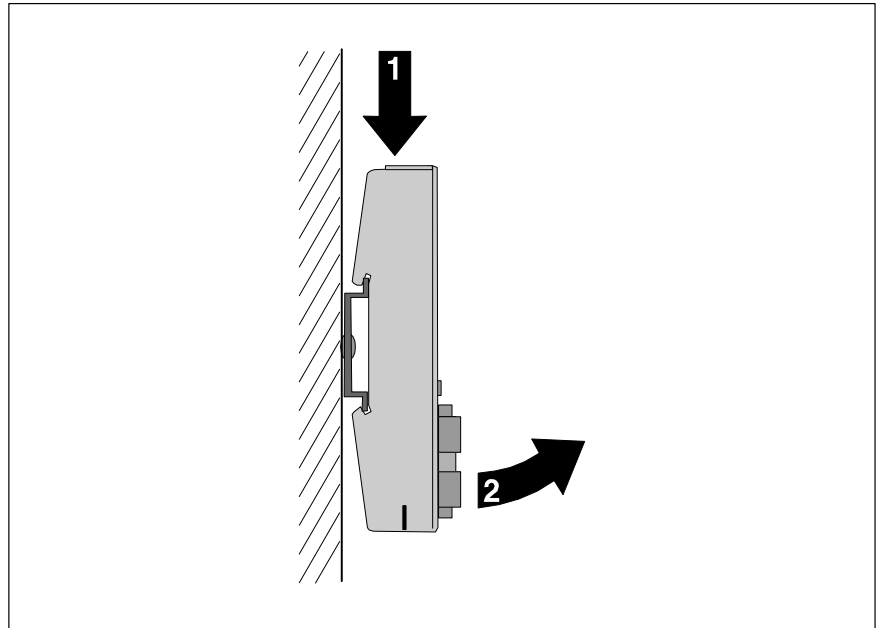
The modules are placed directly on a 35 x 7.5 mm support rail (as per EN 5022) in the control cabinet.

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 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.

- ☞ **Without exception, the routing of all connected cables must provide a measure of strain relief (e.g. cable channel).**

Bus Station Address

The physical addresses of bus stations on the INTERBUS-S are determined by the sequential placement of individual bus stations on the bus cable. The first station on the cable is automatically assigned address 001, the next bus station 002, and so forth. Each address is assigned only once on a given INTERBUS-S. The respective station address is determined by the B-IO K-IBS bus connection module through a dialog with the bus master at the time it is energized. For this reason, a bus address cannot be changed within the confines of an existing bus configuration. The only way to effect a change of bus station address is by physically moving a bus station from one location to another on the INTERBUS-S.

Determining the Bus Station Address

For documentation and system troubleshooting purposes, it is useful to identify the bus station by marking its physical bus station address in the BTN labelling field. This results in the following procedure for manual determination of the bus station address of a given module:

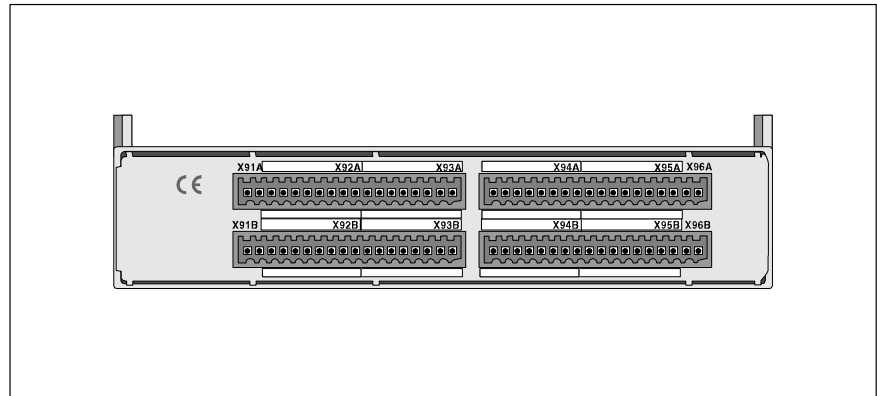
- Starting at the control unit, trace the bus cable and count the number of bus stations that are located between the control unit and the module in question.
- To the bus station count thus determined, add a count of 1. This is the address of the bus station in question.

☞ **Use the BTN labelling field to record the selected address which, in the example shown, is 003.**

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

3 or 4-wire Connections

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.

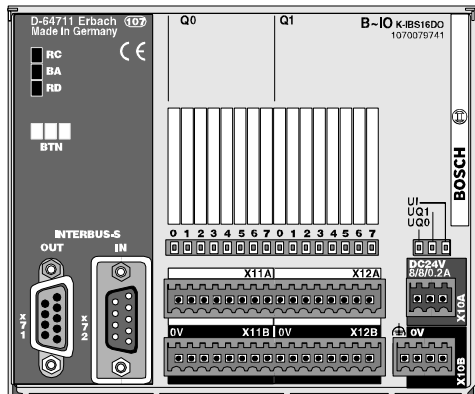


Accessories

- 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 8 of this manual.

4 K-IBS16DO



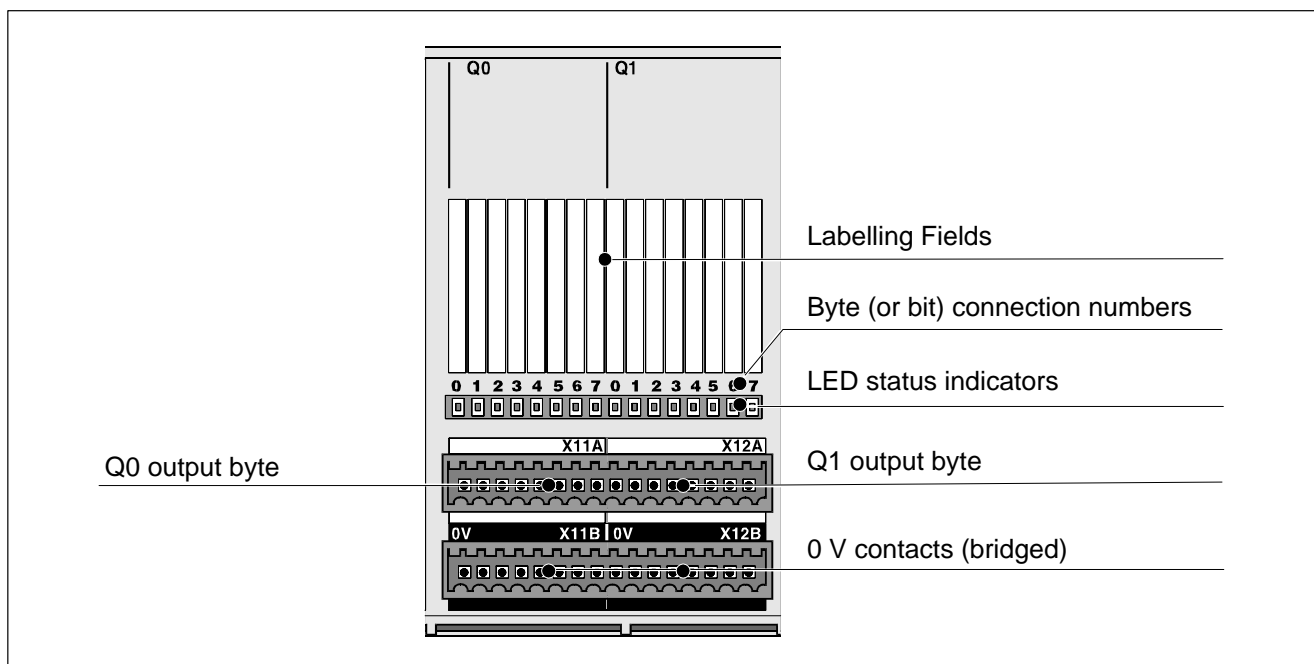
4.1 Hardware Configuration

The bus connection module controls the 16 digital semiconductor outputs. These 24 V outputs are non-latching.

- In the case of a failure of the power supply for output bytes UQ0 or UQ1, the output signal is reset, and the bus master will not receive an error message. Upon restart, the outputs are again automatically enabled in accordance with the signals received from the control unit.
- In the case of a failure of the power supply to the UI logic circuits of the bus connection module, all bus functions will be interrupted.

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

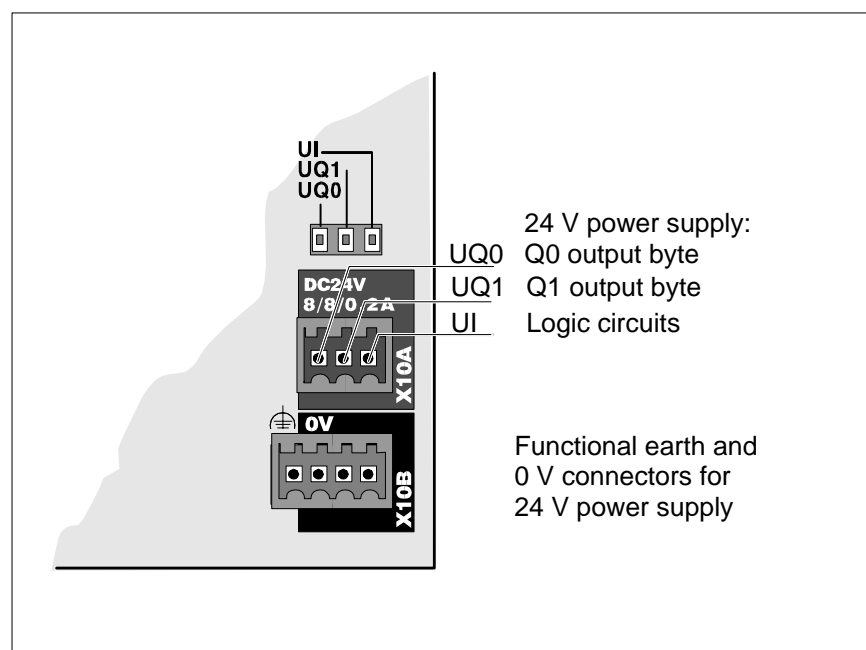


4.2 Connectors

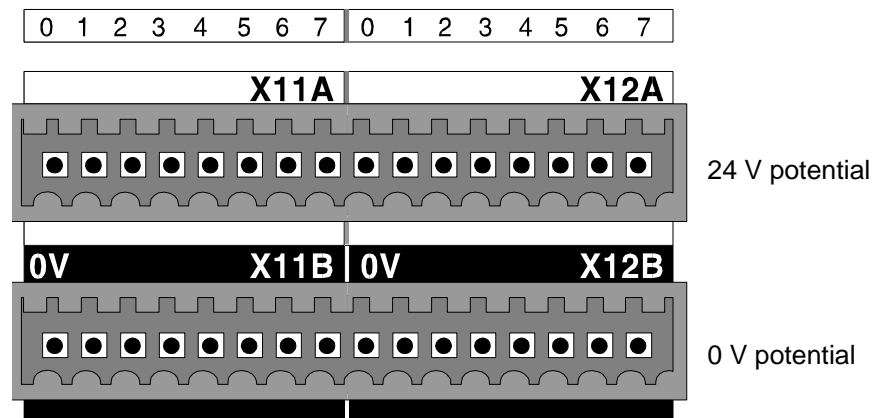
4.2.1 24 V Power Supply

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

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



4.2.2 Outputs



The following applies to output bytes Q0 and Q1:

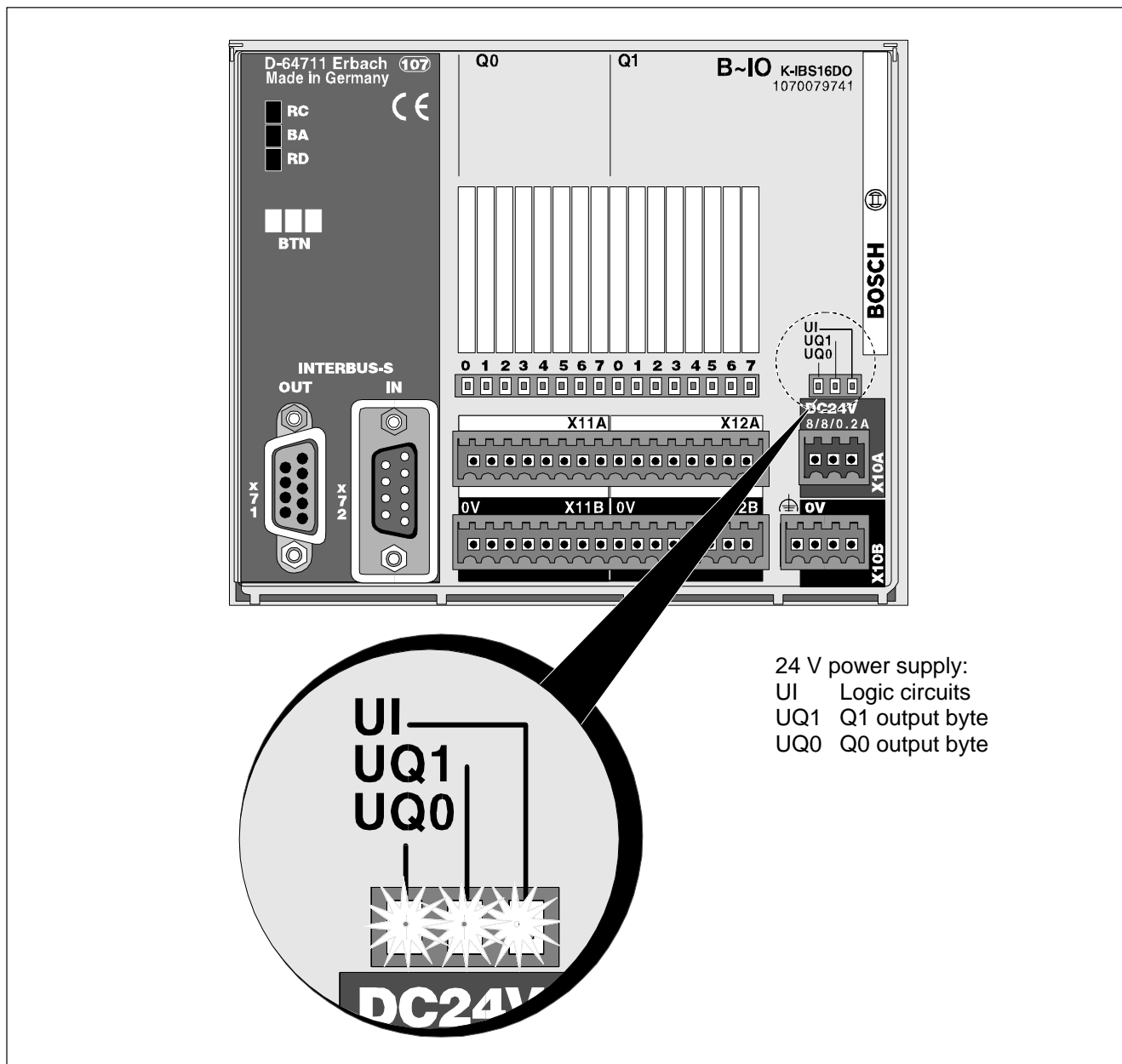
- 0.5 A outputs: bits 0 through 3
- 1 A outputs: bits 4 and 5
- 2 A outputs: bits 6 and 7

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.

4.3 Operation

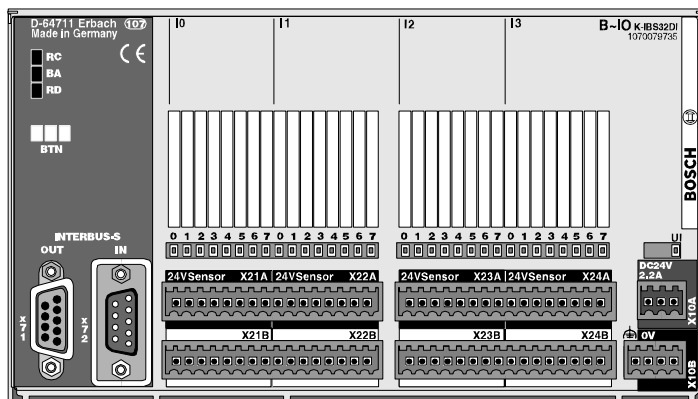
The outputs are serviced through the INTERBUS-S field bus connection. Manual operation is neither required nor provided for.



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

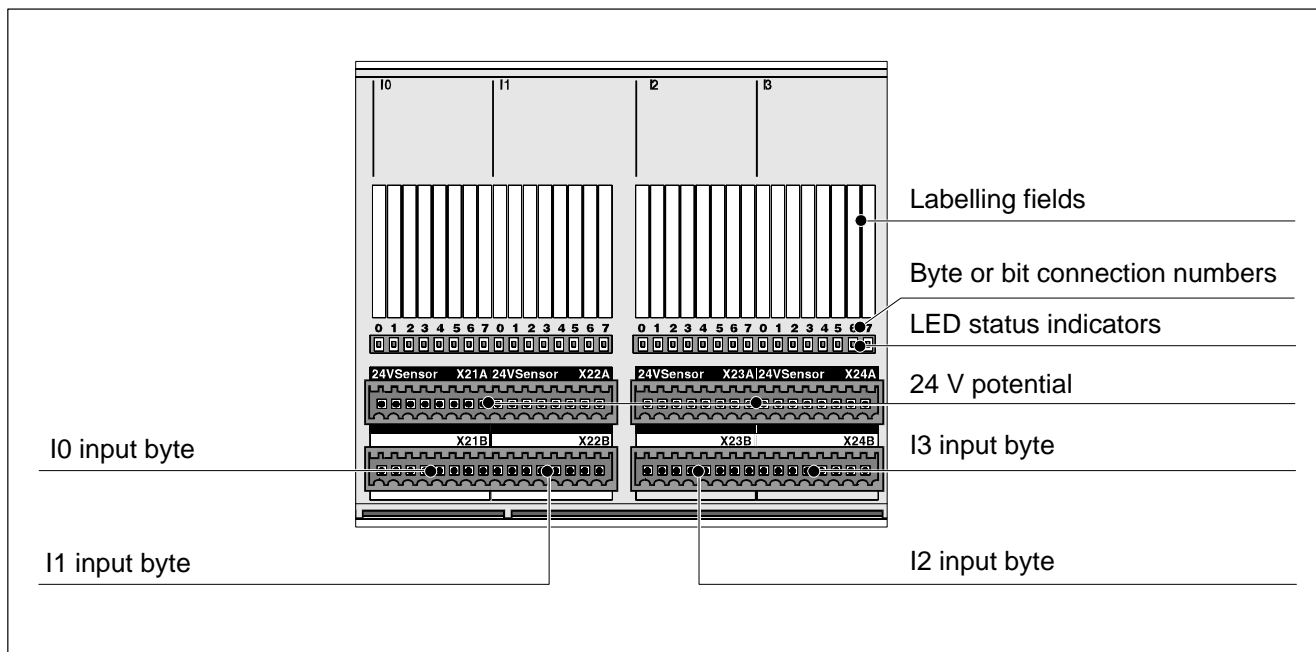
☞ For detailed information about fault indications, refer to Section 3.4, "Troubleshooting."

5 K-IBS32DI



5.1 Hardware Configuration

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

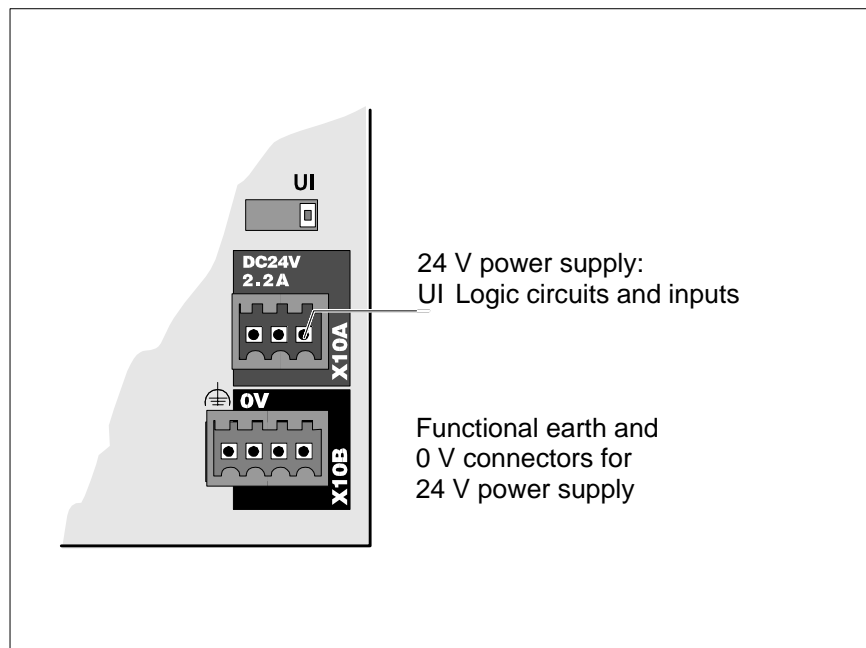


5.2 Connectors

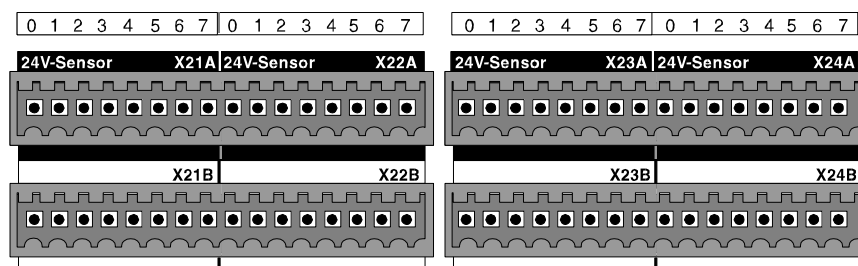
5.2.1 24 V Power Supply

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

- UI Logic circuits and inputs



5.2.2 Inputs

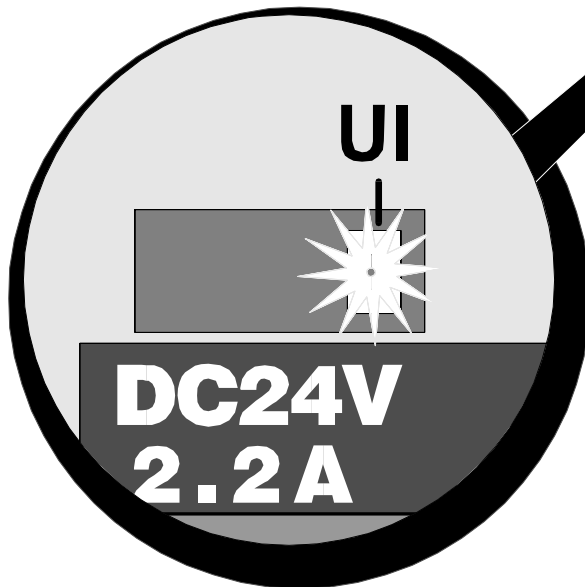
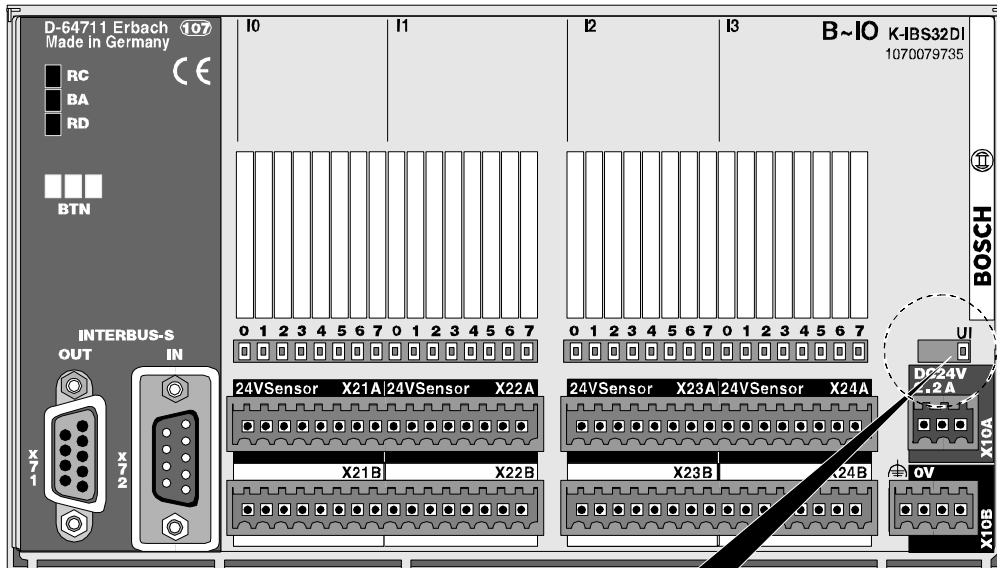


The following applies to input bytes I0 through I3:

- 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 green UI LED indicates whether or not the power supply for the sensors 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.


5.3 Operation

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



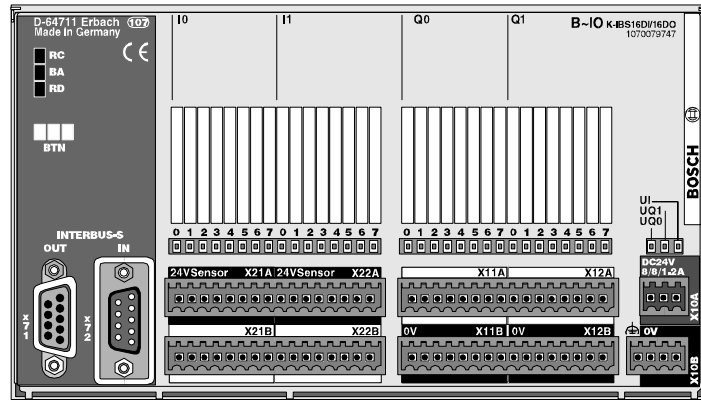
24 V power supply:
UI Logic circuits and sensors

The module is active when the UI, RC and BA LEDs illuminate green.

 For detailed information about fault indications, refer to Section 3.4, "Troubleshooting."

Notes:

6 K-IBS16DI/16DO



6.1 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 module receives the switching signals from the semiconductor inputs and, via the long-distance bus, passes them to the governing control unit for processing.

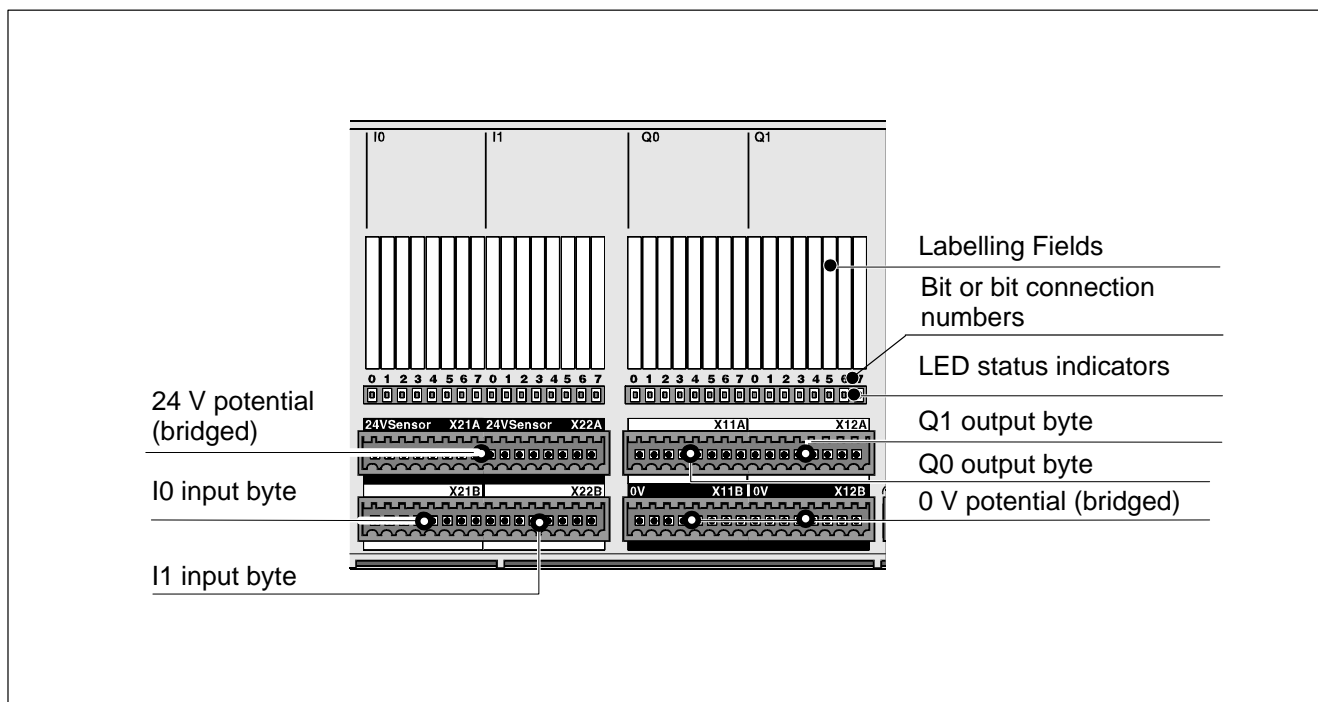
Outputs

The bus connection module controls the 16 digital semiconductor outputs. These 24 V outputs are non-latching.

- In the case of a failure of the power supply of output bytes UQ0 or UQ1, the output signal is reset, and the bus master will not receive an error message. Upon restart, the outputs are again automatically enabled in accordance with the signals received from the control unit.
- In the case of a failure of the power supply to the UI logic circuits of the bus connection module, all bus functions will be interrupted.

The following outputs are provided:

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

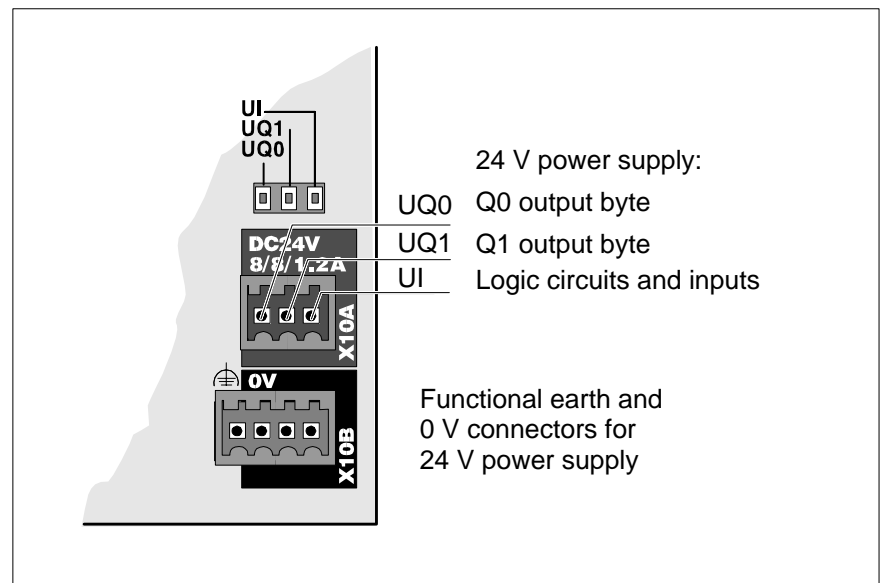


6.2 Connectors

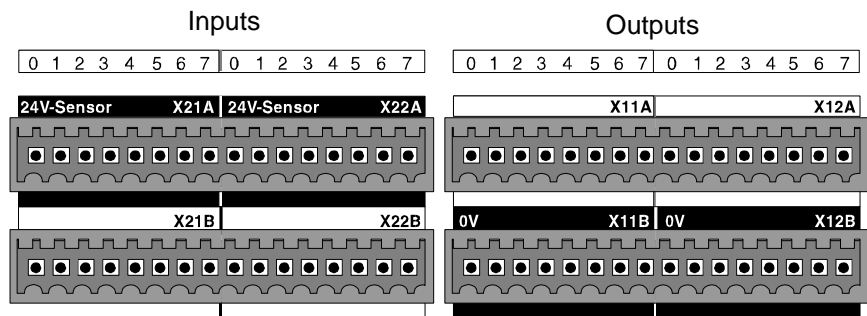
6.2.1 24 V Power Supply

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

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



6.2.2 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 green 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.

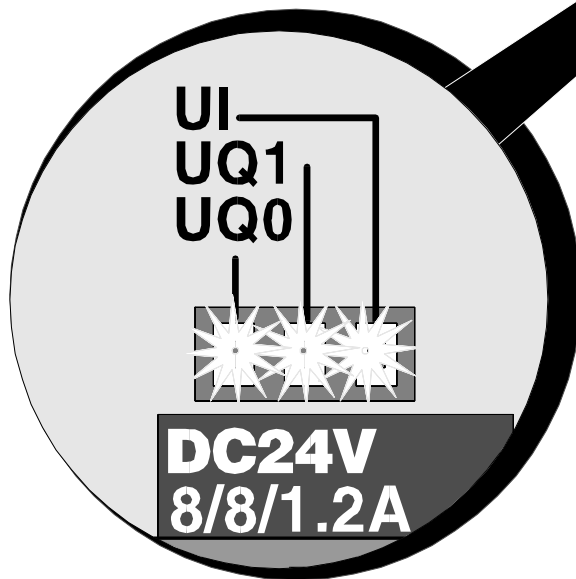
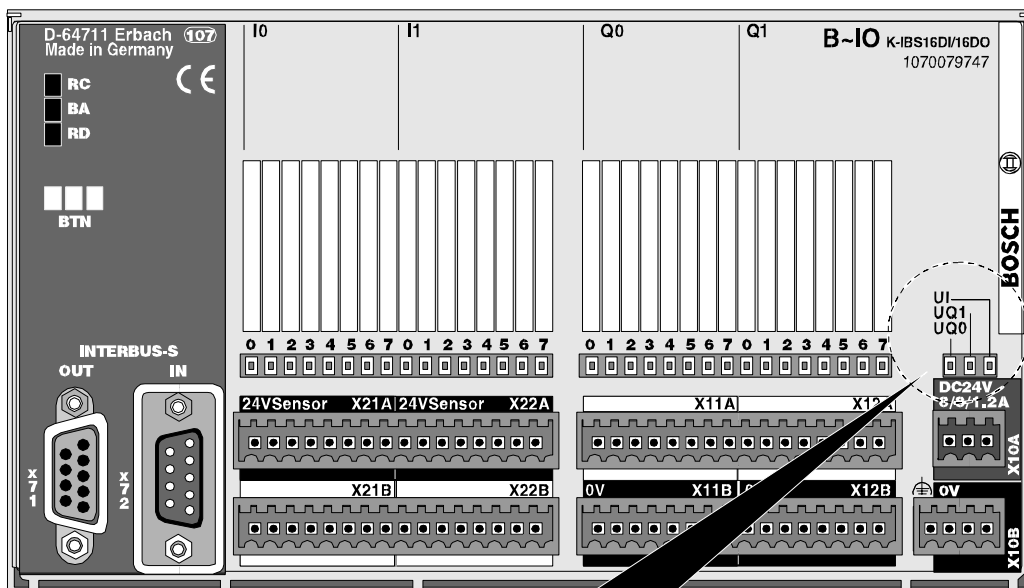
Outputs

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.

6.3 Operation

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



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

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

For detailed information about fault indications, refer to Section 3.4, "Troubleshooting."

Notes:

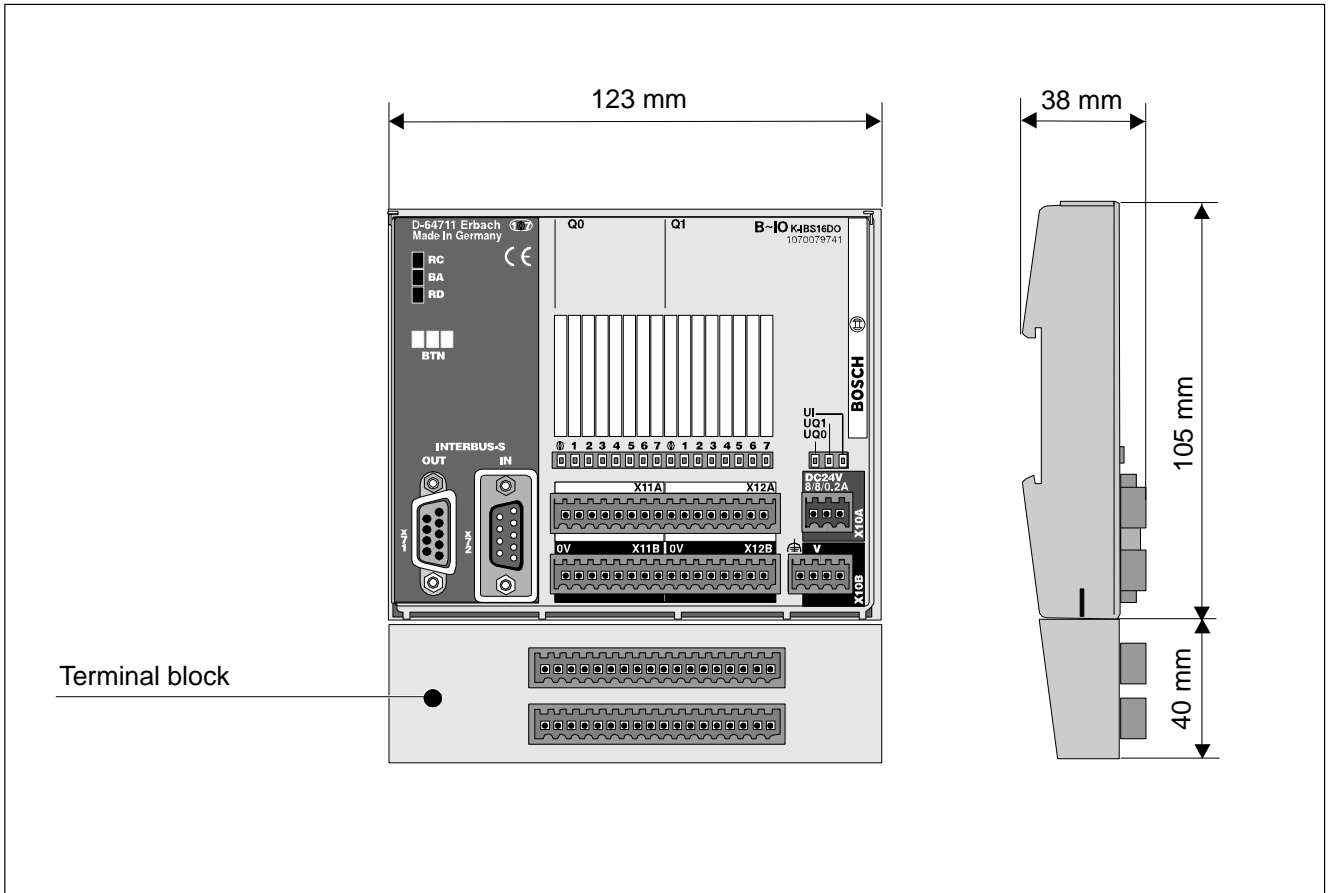
7 Module Specifications

7.1 B~IO K-IBS

Specifications	B~IO K-IBS
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"> ● Vibration, sinewave-shaped oscillations on 3 axes, as per DIN EN 61131-2 ● Shock loads, impacts on 3 axes, as per DIN EN 61131-2 	<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 11 ms semi-sinewave, 15 g
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 category IP 54.
Protection category, as per EN 60529	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-IBS
Transport resistance, as per DIN EN 61131-2	Drop height in package 1.0 m
INTERBUS-S interface type	Long-distance bus
Potential isolation <ul style="list-style-type: none"> • IN from OUT interface • IN/OUT interfaces from logic • Logic circuits from inputs / outputs 	Yes Yes No
Diagnostic message to control unit	No
Interference radiation <ul style="list-style-type: none"> • Harmful radiation • Radio interference suppression, enclosure, to DIN EN 50081-2 	None Classe A, as per 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, INTERBUS-S data line, as per DIN EN 61131-2 und 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

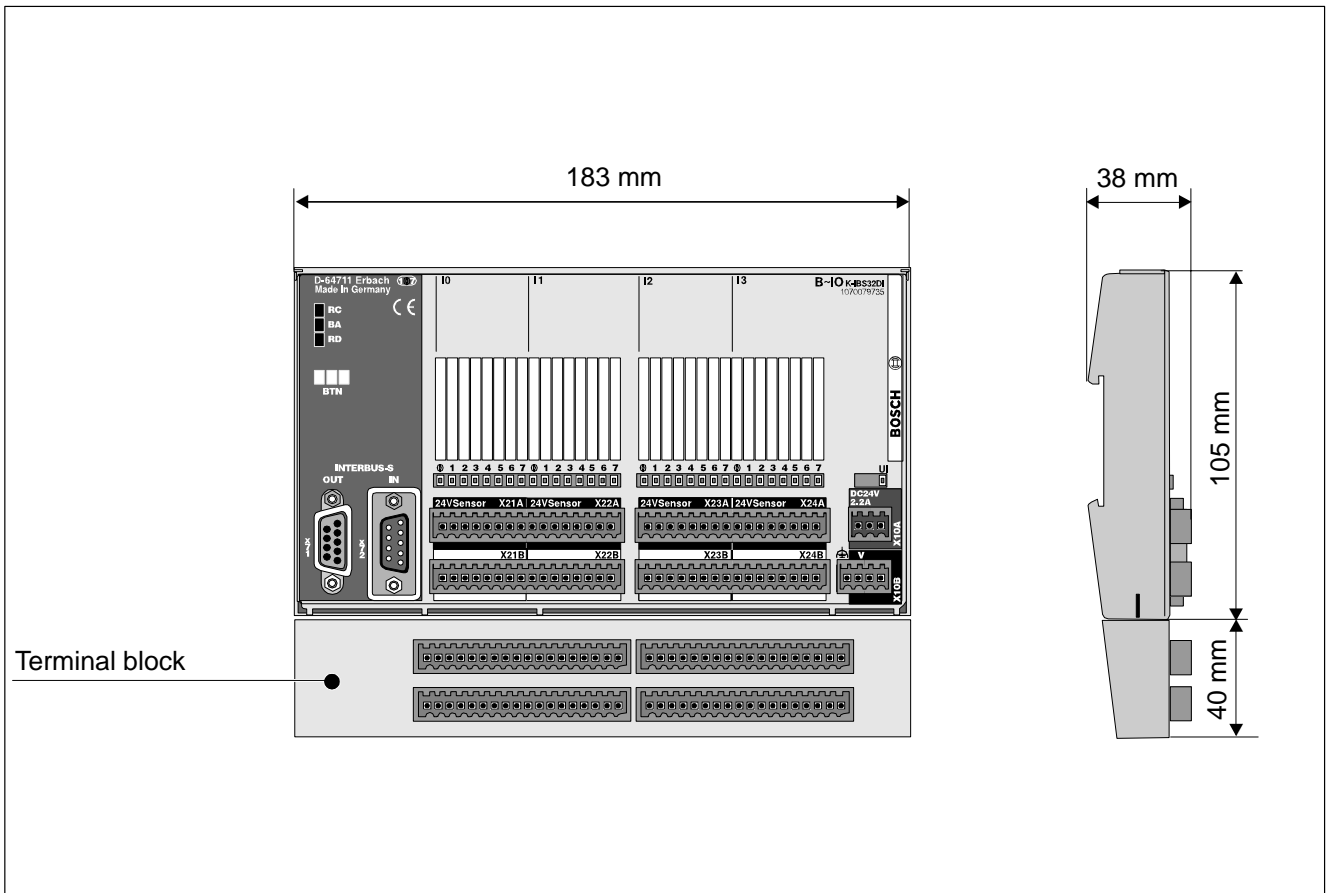
7.2 K-IBS16DO Specifications



Specifications	K-IBS16DO
Order no.	1070 079 741
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
Potential isolation between outputs	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		
Output 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 7.5		
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

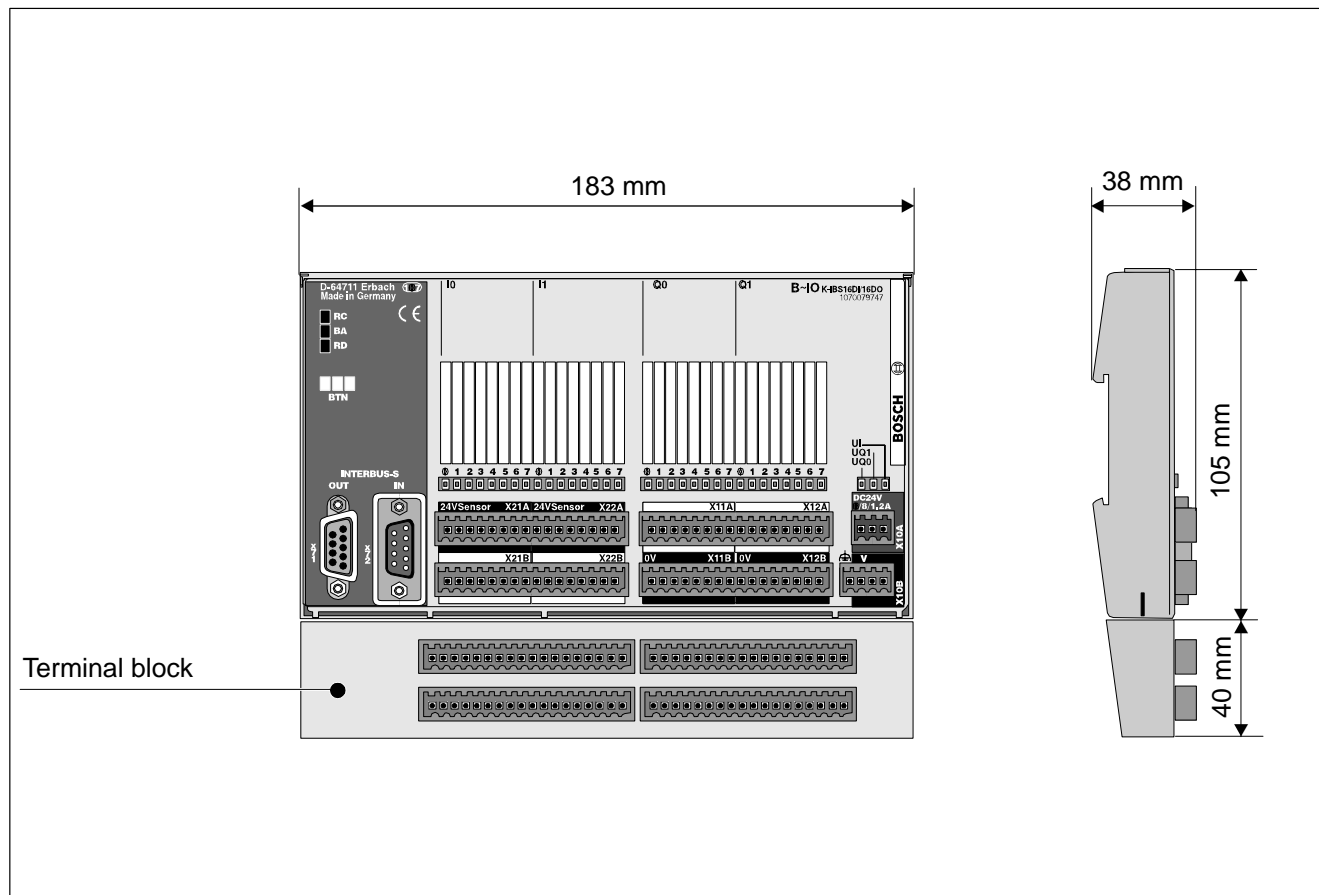
7.3 K-IBS32DI Specifications



Specifications	K-IBS32DI
Order no.	1070 079 735
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"> 0 → 1 1 → 0 	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

7.4 K-IBS16DI/16DO Specifications

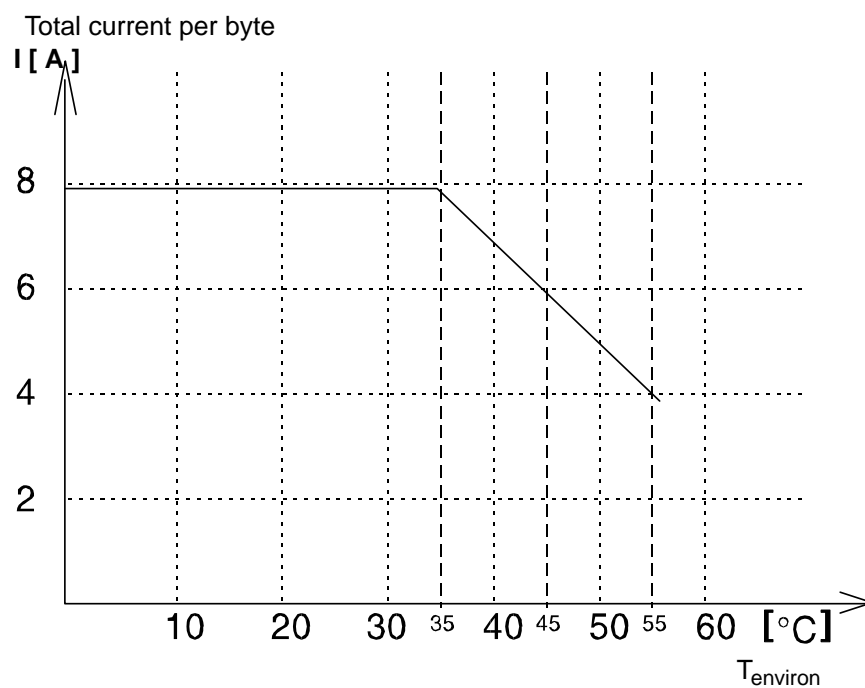


Specifications	K-IBS16DI/16DO
Order no.	1070 079 747
Power supply, as per DIN EN 61131-2	3 x 24 V, 19.2 through 30 V
Current draw from 24 V power supply	
<ul style="list-style-type: none"> ● UI, logic circuits and sensor power 	≤ 1,2 A
<ul style="list-style-type: none"> ● UQ0, externally supplied power 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. 500 g

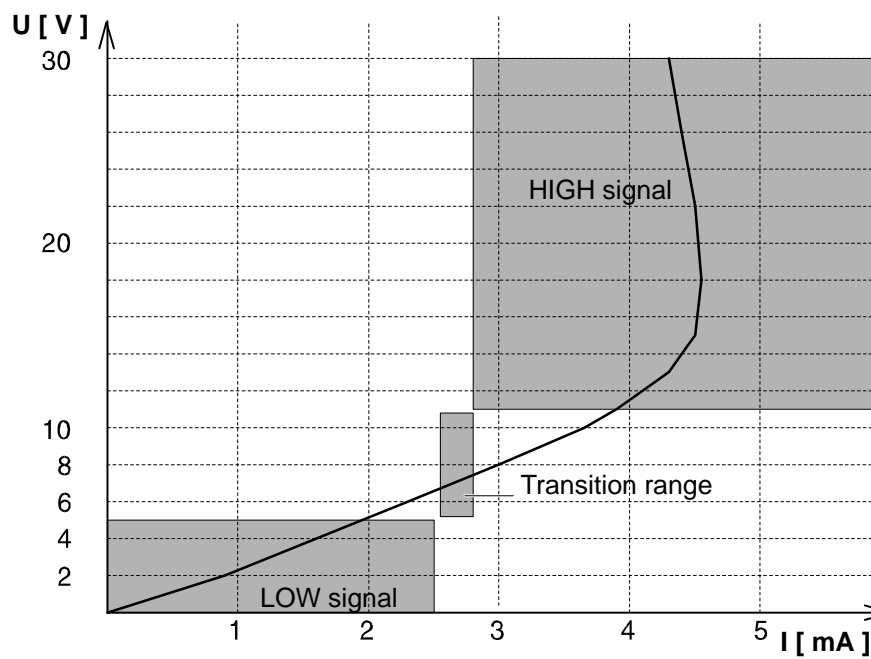
Specifications	Inputs
Inputs, as per DIN EN61131-2	16 digital inputs, type 1
Input voltage <ul style="list-style-type: none"> Nominal voltage LOW signal HIGH signal 	24 V -3 through 5 V 11 through 30 V
Input current <ul style="list-style-type: none"> LOW signal HIGH signal 	≤ 2.5 mA 2.8 through 6 mA
Power supplied to sensors <ul style="list-style-type: none"> Output voltage Nominal output current (total) Short-circuit/overvoltage protection 	typ. $E_{\text{ext}} - 1$ V 1 A 1.4 through 2.8 A
Delay time <ul style="list-style-type: none"> 0 \rightarrow 1 1 \rightarrow 0 	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		
Output 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 7.5		
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
Ausgangsverzögerung	< 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

7.5 Derating Curve



7.6 Typical Input Characteristic



8 Spare Parts & Accessories

8.1 B~IO K-IBS

Designation	Order no.	Application
B~IO K-IBS16DO	1070 079 741	Compact module featuring 16 outputs
B~IO K-IBS32DI	1070 079 735	Compact module featuring 32 inputs
B~IO K-IBS16DI/16DO	1070 079 747	Compact module featuring 16 inputs and 16 outputs

8.2 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-IBS16DO, Compact module featuring 16 outputs
RV4x18K	1070 080 155	<ul style="list-style-type: none"> • K-IBS32DI, Compact module featuring 32 inputs • K-IBS16DI/16DO, Compact module featuring 16 inputs and 16 outputs

8.3 Connector Strip Assortments

The connector strip assortments serve to establish the connection between the machine wiring and the respective B-IO K-IBS module. Using the extraction aids, they are easily removed. As a consequence, the removal or exchange of a B-IO K-IBS 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-IBS16DO, Compact module featuring 16 outputs
BL-SET-SA-K32	1070 080 343	<ul style="list-style-type: none"> ● K-IBS32DI, Compact module featuring 32 inputs ● K-IBS16DI/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-IBS16DO
BL-SET-SA-RV4x18K	1070 080 346	<ul style="list-style-type: none"> ● RV4x18K, terminal block w/ 4 x 18 contacts, for K-IBS32DI or K-IBS16DI/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-IBS16DO, Compact module featuring 16 outputs
BL-SET-FK-K32	1070 080 350	<ul style="list-style-type: none"> • K-IBS32DI, Compact module featuring 32 inputs • K-IBS16DI/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-IBS16DO
BL-SET-FK-RV4x18K	1070 080 353	<ul style="list-style-type: none"> • RV4x18K, terminal block w/ 4 x 18 contacts, for K-IBS32DI or K-IBS16DI/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-IBS16DO, Compact module featuring 16 outputs
BL-SET-SK-K32	1070 080 357	<ul style="list-style-type: none"> • K-IBS32DI, Compact module featuring 32 inputs • K-IBS16DI/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-IBS16DO
BL-SET-SK-RV4x18K	1070 080 360	<ul style="list-style-type: none"> • RV4x18K, terminal block w/ 4 x 18 contacts, for K-IBS32DI or K-IBS16DI/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-IBS16DO, Compact module featuring 16 outputs
BL-SET-TP-K32	1070 080 364	<ul style="list-style-type: none"> • K-IBS32DI, Compact module featuring 32 inputs • K-IBS16DI/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-IBS16DO
BL-SET-TP-RV4x18K	1070 080 367	<ul style="list-style-type: none"> • RV4x18K, terminal block w/ 4 x 18 contacts, for K-IBS32DI or K-IBS16DI/16DO

8.4 Connector Strip Extractor

Designation	Order no.	Application
Connector strip extractor, 3-wire	1070 919 512	
Connector strip extractor, 8-wire	1070 919 513	

8.5 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.

Designation	Order no.	Application
Identification labels	1070 080 309	suitable for all components
Gerätstammdaten	0170 075 547	Druck der Beschriftungsschilder

8.6 Bus Connector Accessories

Male Bus Connector, INTERBUS-S

Designation	Order no.	Application
Male Bus Connector	in preparation	

Bus cable, INTERBUS-S

Designation	Order no.	Application
Bus cable	in preparation	

9 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.)!

9.1 Mechanical Construction

Installation Method


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

-  **Without exception, the routing of all connected cables must provide a measure of strain relief (e.g. cable channel).**

The modules are placed directly on a 35 x 7.5 mm support rail (as per EN 50022) in the control cabinet.

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 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. 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.

Labelling Provisions

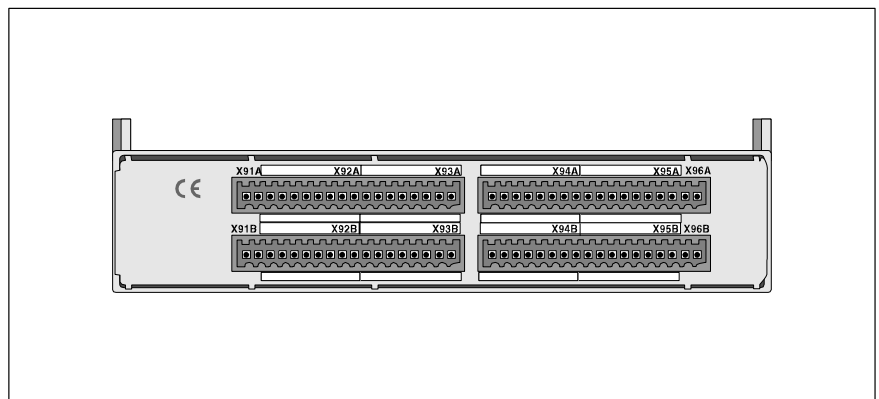
Labelling fields are provided on the module to record the bus station address, and to identify the various inputs and outputs. The labelling fields are designed to accept the ink of a permanent marker.

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-IBS 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:

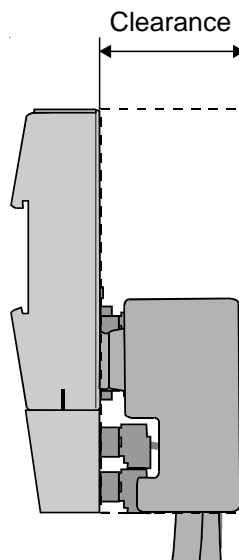
- Vertical, e.g. on back panel of control cabinet; bus connector to be located at bottom left
- Horizontal

Minimum Clearances

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

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.



9.2 Electrical Installation

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

B~IO K-IBS16DO

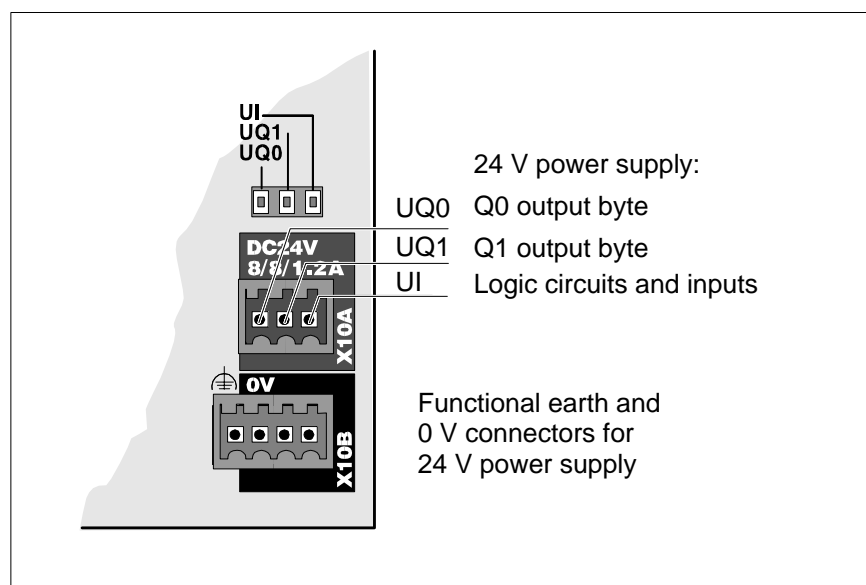
- UI Logic circuits
- UQ0 Output byte 0 power
- UQ1 Output byte 1 power

B~IO K-IBS16DI/16DO

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

B~IO K-IBS32DI

- UI Logic circuits and sensor power



9.2.1 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.

9.2.2 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:

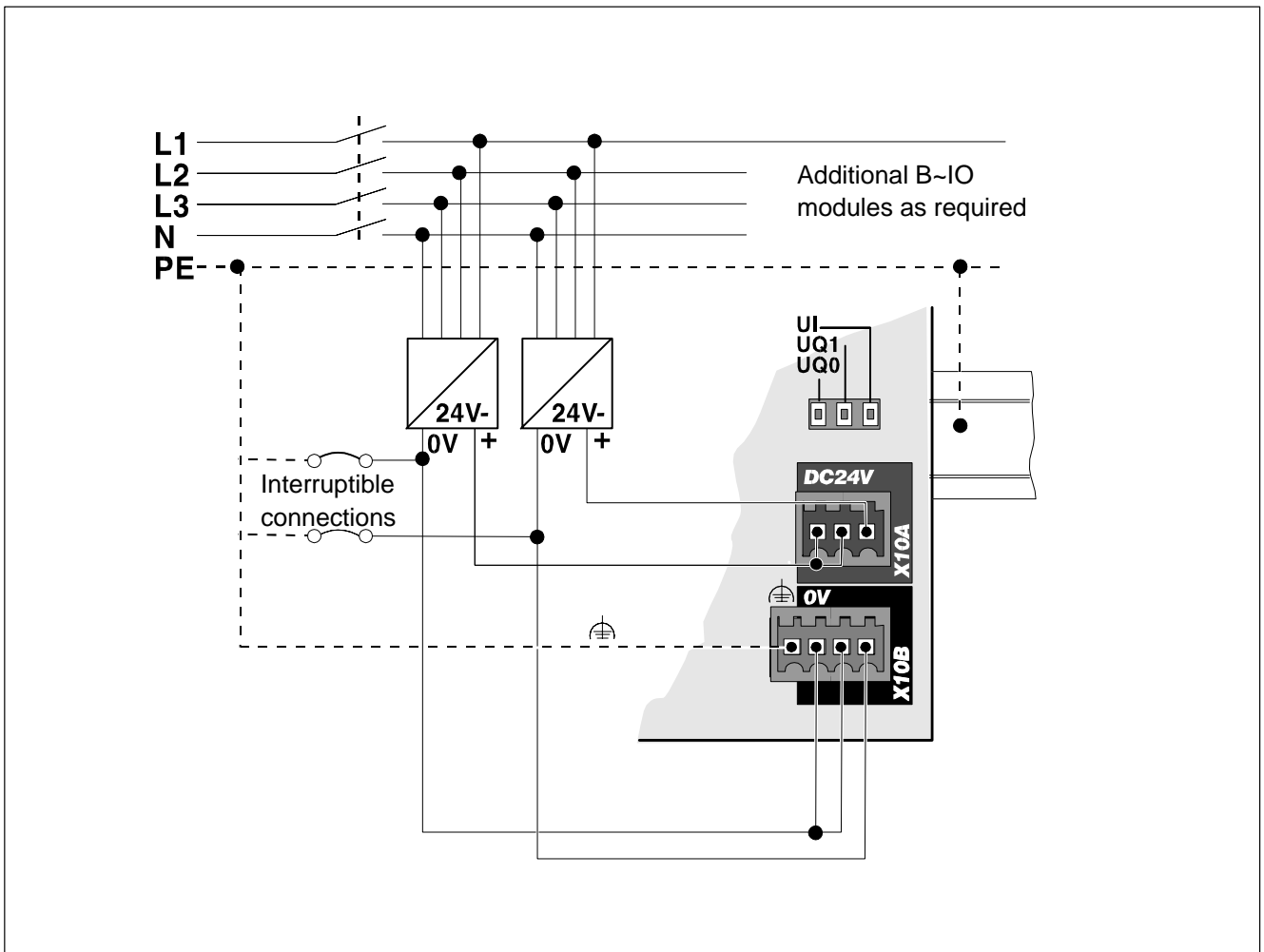
- Reference conductor connected to PE conductor, refer to section [9.2.3](#).
- Reference conductor not connected to PE conductor, see section [9.2.4](#).

9.2.3 Reference Conductor Connected to PE Conductor

The modules comprising the B~IO K-IBS 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).




9.2.5 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-IBS 16DO	1070 079 741	3 x 5 nF	5 nF
B~IO K-IBS 32DI	1070 079 735	5 nF	5 nF
B~IO K-IBS 16DI/16DO	1070 079 747	3 x 5 nF	5 nF

9.2.6 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 –

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

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

The rated 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 contacts of the power supply of B~IO 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.

9.2.7 Master Switch

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

9.2.8 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.

9.2.9 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.

 **Without exception, the routing of all connected cables must provide a measure of strain relief (e.g. cable channel).**

9.2.10 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

If low levels of interference are to be expected, a functional earthing connection via the earthing terminals of the power supply connections between the terminal on the B~IO K-IBS and the GND connection are possible.

Guidance value: Cable/strap length: max. 0,5 m
Cross-section: 1,5 mm²

Equipotential Bonding

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

9.3 Connectors

9.3.1 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

9.3.2 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.


In the event that in this case the outputs are addressed by the INTERBUS-S, (logical 1), a leakage current may flow although the module is not equipped with a 0 V terminal.

If the outputs are not addressed by the INTERBUS-S (logical 0), the following leakage current may flow:

- each 0.5 A output up to 25 mA
- each 1 A output up to 50 mA
- each 2 A output up to 50 mA

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

Overload Protection

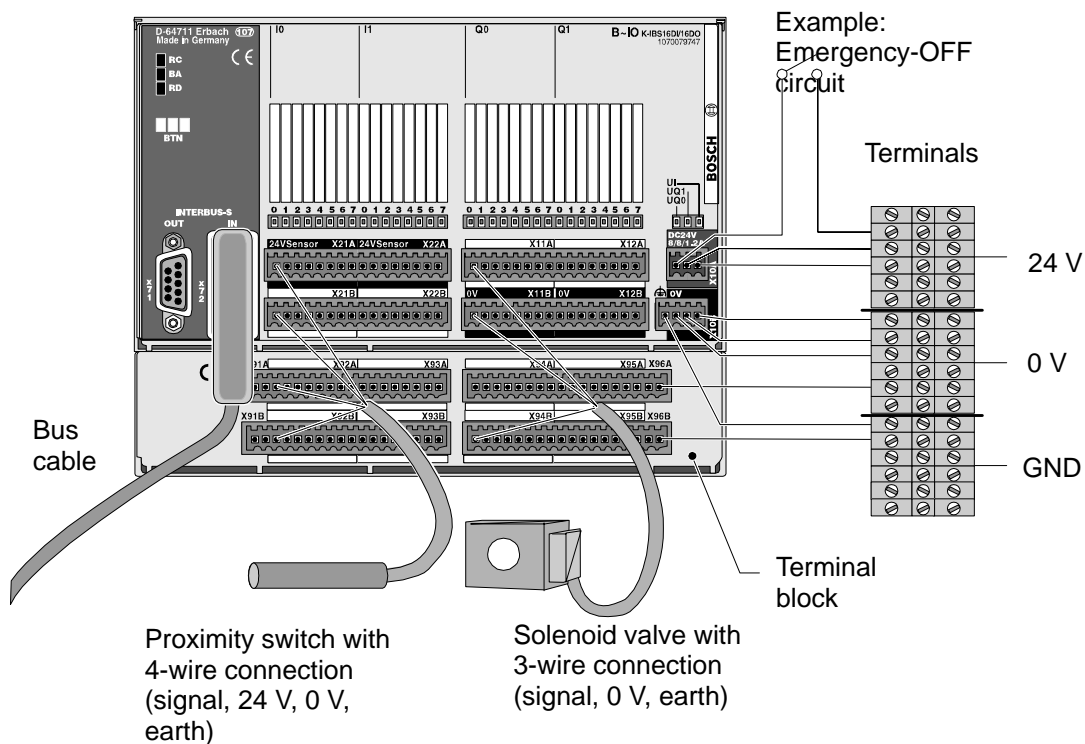
 During project design, it should be remembered that, deviating from the stipulations of DIN EN 61131-2, the 2 A outputs guarantee an output current of only 2 A with a supply voltage of up to 30 V.

9.3.3 Coupling Inputs and Outputs

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

9.4 Connection Example


The example below illustrates the connection of the B-IO K-IBS 16DI/16DO (module featuring 16 inputs and 16 outputs) as the last, or final, bus station:



9.5 IBS Configuration


Bus Station ID and Address Assignment

The B~IO K-IBS modules are equipped with the Supi3 application-specific integrated circuit (ASIC), and are compatible with Generation 3 and 4 bus masters.

 **As a prerequisite to the full utilization of all functions integrated in the ASIC, every component – including the bus master – connected to the INTERBUS-S system support the Generation 4 functions.**

The B~IO K-IBS modules feature the common identification code for digital long-distance bus stations, and occupy the corresponding address range.

Type	Identification Code	Address assignment
B~IO K-IBS16DI/16DO	03	1 word inputs + 1 word outputs
B~IO K-IBS32DI	02	2 words inputs
B~IO K-IBS16DO	01	1 word outputs

 **Dependent upon the bus master being employed, the HIGH and LOW byte in a given word may actually be the reverse of the indication on the label.**

Bus Station Address

Individual bus stations on the INTERBUS-S are assigned separate bus station addresses. For this purpose, a bus master configuration program (e.g. IBS CMD4 from Phoenix Contact), is required.

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

IBS Configuration Program

A suitable IBS configurator program is the IBS CMD4 available from Phoenix Contact.

Cyclical Data Exchange

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

No diagnostic messages are transferred to the bus master.

9.6 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.

A Appendix

A.1 Abbreviations

Abbr.	Explanation
B~IO	Bus Input Output
Bit	Smallest logical unit having the value of "0" (LOW) or "1" (HIGH).
Byte	A contiguous group of 8 bits
DI	Digital Inputs
DO	Digital Outputs
EMC	Electromagnetic compatibility
GSD	Device specification data
PE	Protective Earth conductor
PLC	Programmable Logic Controller

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