TSX Momentum

Bus Adapter for INTERBUS
User Manual

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www.schneider-electric.com

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

At a Glance

Document Scope

This user manual contains information about TSX Momentum components for use with the INTERBUS. It includes information about components using copper wiring, as well as components for use with fiber optic technology.

Validity Note

This user manual applies to TSX Momentum using Concept version 2.2 or later and Unity Pro version 1.0 or later.

NOTE: The INTERBUS modules described in this document can be configured using Concept IEC Programming Software version 2.2, or later. They are not configurable in Unity Pro.

The technical characteristics of the devices described in this document also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the reference or product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

Related Documents

NOTE: Current Information about the INTERBUS can be found on the INTERBUS Club Homepage: http://www.interbusclub.com

Title of Documentation	Reference Number
Modicon Momentum I/O Base User Guide	870 USE 002

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Part I
INTERBUS and INTERBUS Configuration with Momentum

Introduction

This section contains general information about INTERBUS, about configuration with Momentum, as well as the connection of the module and branch interface module and setup of the network.

What Is in This Part?

This part contains the following chapters:

Chapter 1
INTERBUS and INTERBUS Configuration with Momentum

Introduction

This chapter provides an overview of the INTERBUS and the INTERBUS configuration with Momentum.

What Is in This Chapter?

This chapter contains the following topics:

General Information about INTERBUS

What is INTERBUS?

INTERBUS is an open communication standard and is provided by over 200 manufacturers who offer wide range of different products. The high-speed network is used for the connection of I/O modules, sensors, actuators, and control devices to programmable logic controllers or large computer systems.

Features of the INTERBUS

The INTERBUS is a master/slave network, optimized for efficient I/O data exchange. It can communicate with up to 512 nodes over a distance of 12.8 km, and can read 1024 inputs and write 1024 outputs in 4 ms.

It offers an optimum flexibility of the configuration of control devices with regard to the number of I/O stations and transmission distances. Despite exceptional configuration flexibility, system performance and reliability of the I/O data have not been compromised.

Based on an open system architecture, terminal block modules (TIO) and Momentum I/O modules together with INTERBUS compatible products from other manufacturers can be integrated easily and cost effectively into a control system. Typical system configurations with Momentum I/O modules can be found in section *Examples of Configuration for INTERBUS, page 15*.

INTERBUS Configuration with TSX Momentum

General Information

The INTERBUS consists of remote bus and peripheral bus segments.

All bus segments transfer the same signals, but with differing electrical signal levels.

NOTE: TSX Momentum I/O modules can only be used on the remote bus and remote bus branches.

Remote Bus

The remote bus is used for the transfer of data over long distances, up to 400 m between 2 nodes when using copper cable and up to 300 m between 2 nodes when using HCS fiber optic cable. The remote bus is generated by the INTERBUS master. No voltages are carried by the remote bus cable. When using copper cable, the signal levels of the remote bus are implemented according to RS 485.

The bus operates full duplex with a transfer rate of 500 Kbaud.

Typical remote bus devices are, for example, Momentum I/O modules or bus terminals.

The sections between two remote bus nodes are called remote bus segments.

Remote Bus Branch

The remote bus terminal is created by a branch interface module (e.g. 170 BNO 671 00, 170 BNO 681 00). The branch interface module itself is a remote bus node on the INTERBUS network. The Momentum I/O modules on the remote bus branch are the same as those on the remote bus.

Switching Off Remote Bus Branches

The INTERBUS can only function properly as a shift register if all bus nodes are present and intact. If one node is switched off or fails, the data transfer is stopped by the bus master.

With INTERBUS topologies with branch terminals (see example *Construction of a Tree Structure,* *page 19*), the bus master can be configured so that remote bus branches after a branch interface module (CMD Tool, keyword group definition) can be switched off. The bus master then hides branches that are switched off with the help of the branch interface module, creates a new total frame and restarts the remaining bus. The data transfer on the INTERBUS only stops briefly for the identity cycle. This behavior must be configured on the bus master.

If a branch that was switched off should be included in the network again, the voltage supply must be turned on and the reconfiguration button on the branch interface module must be pressed.

Switching off the remote bus branches is frequently carried out when performing maintenance on machine or system parts or are not completely present during the commissioning phase. Even if one or several nodes fail unexpectedly, it is still possible that the bus where the node failure occurred continues to run, with the exception of the branches.

Transition from Copper Cable ↔ Fiber Optic Cable

There are two standard converters available for the transition from copper cable (RS485) to fiber optic cable and vice versa.

- OPTOSUB, requires a voltage supply
- OPTOSUB PLUS, does not require a voltage supply

The converters can be used with the following modules.

Module	OPTOSUB	OPTOSUB PLUS
BNO 671 0x	yes	yes
BNO 681 00	yes	yes
All TSX Momentum with 170 INT 110 03	yes	yes

Examples of Configuration for INTERBUS

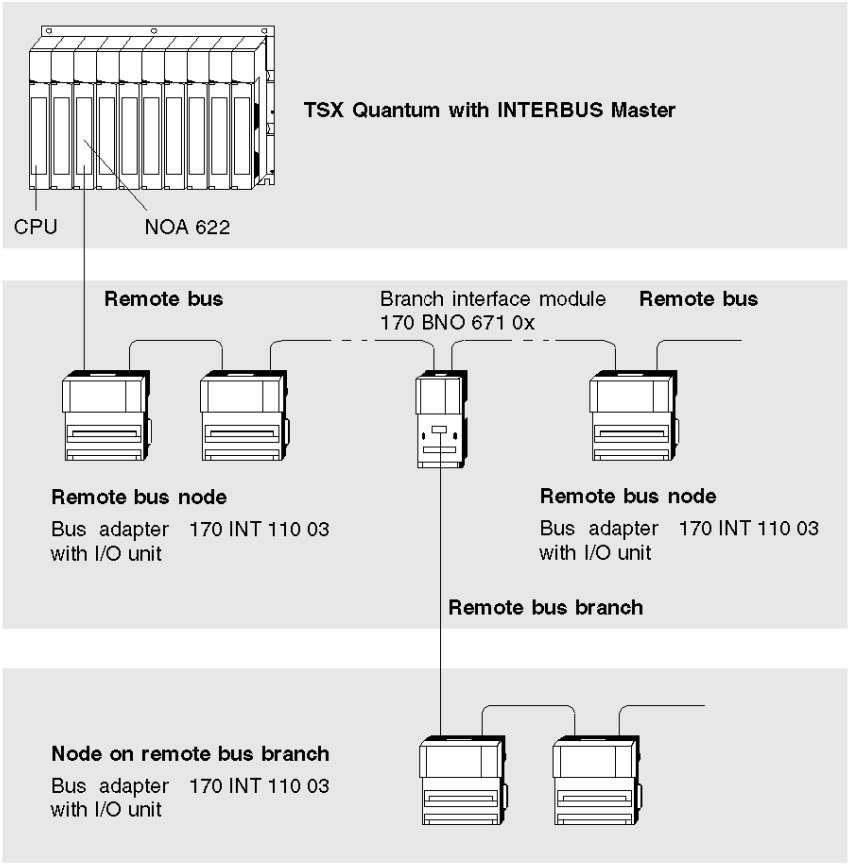
Overview

This section contains the following configuration examples.

Example	Description
No. 1	INTERBUS configuration with Momentum I/O modules, using copper cable (RS 485)
No. 2	INTERBUS configuration with Momentum I/O modules, using fiber optic cable
No. 3	INTERBUS configuration with Momentum I/O modules, using copper cable and fiber optic cable
No. 4	INTERBUS configuration with branch interface modules to clearly demonstrate a tree structure

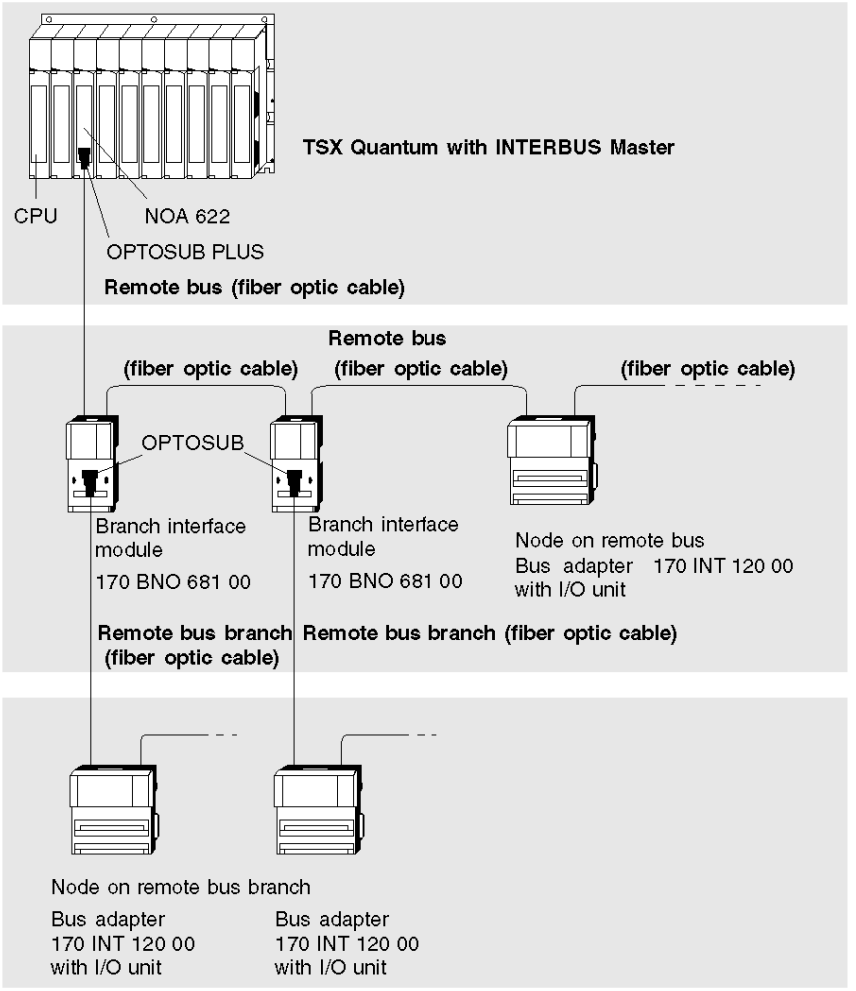
Cable Type: Copper Cable

This example shows the structure of an INTERBUS configuration with Momentum I/O modules using copper cable (RS 485).



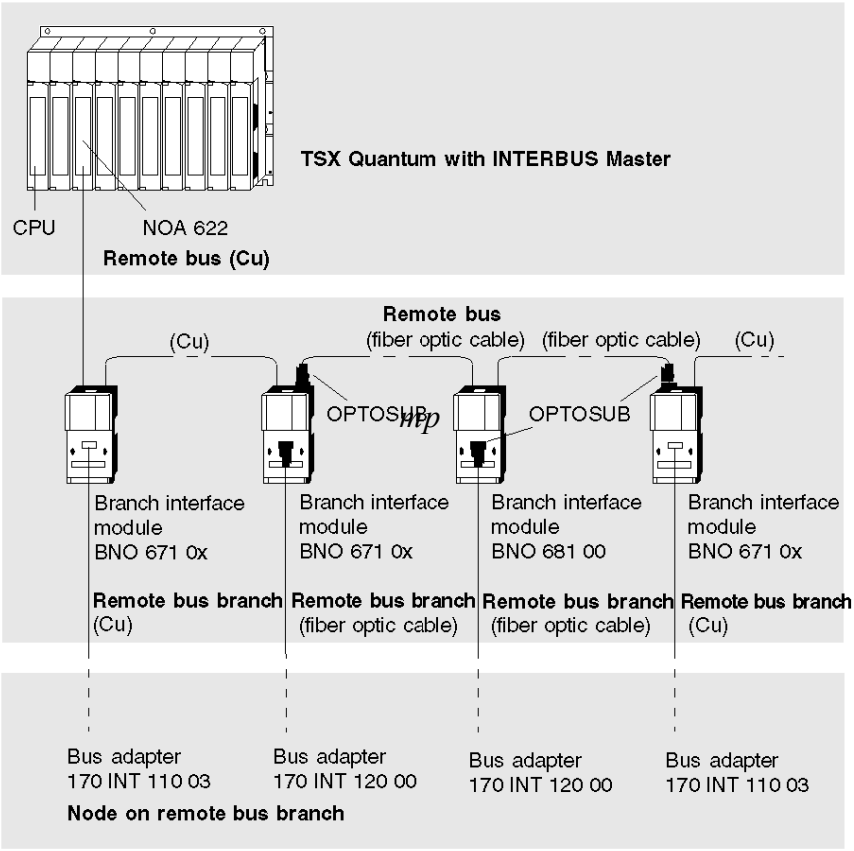
Cable Type: Fiber Optic Cable

This example shows the structure of an INTERBUS configuration with Momentum I/O modules using fiber optic cable.



Cable Type: Combination of Copper Cable and Fiber Optic Cable

This example shows the structure of an INTERBUS configuration using a combination of copper cable (RS 485) and fiber optic cable. The nodes on the remote bus branch are Momentum I/O modules.



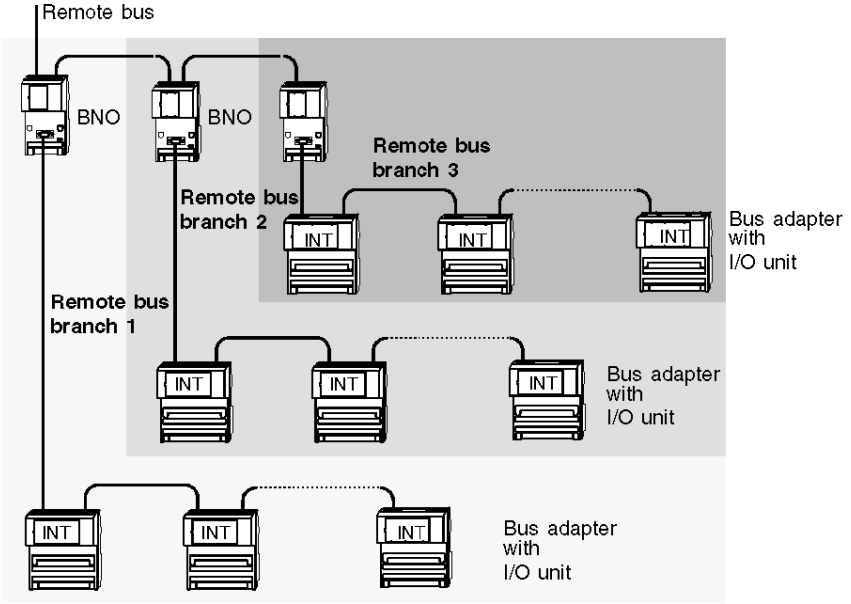
The conversion from copper cable to fiber optic cable is done with OPTOSUB or OPTOSUB PLUS, depending on the module used (see section *Transition from Copper Cable ↔ Fiber Optic Cable, page 14*).

A switch between copper cable and fiber optic cable can be made at any point. However, a maximum of 2 OPTOSUB plugs per branch interface module can be used.

Construction of a Tree Structure

This example shows a tree structure using branch interface modules on the INTERBUS. Each branch interface module is a remote bus node and enables the connection of a remote bus branch to the remote bus. Using a tree structure, the bus can be matched to the local requirements. Cabling expenditure can be considerably reduced in this way.

Structure example of Remote Bus branches in an INTERBUS Configuration:



Configuration Limits

INTERBUS Extension Limits

The INTERBUS extension limits for a standard PLC (e.g. TSX Quantum) are found in the following table.

Parameter	**Limit Data**	
Maximum number of nodes (slaves)	512	
Maximum distance between two nodes	**Cable Type**	**Length**
	shielded twisted pair	400m
	LWL HCS (200/230µm)	300 m *)
	LWL Polymer (980/1000µm)	50 m *)
Maximum network length	12.8 km	
Maximum number of I/O points	4096	
Transfer rate	500 Kbps/s	
Data throughput of 1000 I/O points	~ 4 ms	
*) minimum length 1m, exception: INT ↔ INT and INT ↔ BNO: 0.1 m		

Chapter 2
Use of I/O Units, the INTERBUS-Adapters and the INTERBUS Branch Interface Modules

Introduction

This chapter describes the relationship between an I/O Unit and the INTERBUS adapters 170 INT 110 03 for shielded cable and 170 INT 120 00 for fiber optic transmission, as well as the use of branch interface modules 170 BNO 671 0x and 170 BNO 681.

What Is in This Chapter?

This chapter contains the following topics:

General Relationship Between I/O Unit and Adapter

General Information

The INTERBUS adapters 170 INT 110 03 and 170 INT 120 00 form the communication interface between the I/O units and the INTERBUS network. It can be plugged onto any I/O unit to form a fully functioning I/O module that communicates via the INTERBUS.

The I/O modules of the TSX Momentum can be operated with any INTERBUS master with INTERBUS certification.

The bus adapter is not a PCP node.

NOTE: The 170 INT 110 03 and 170 INT 120 00 adapters support the complete diagnostic functionality of the INTERBUS firmware generation 4.

Functionality

Each bus node updates the INTERBUS telegram before passing it on to the next node. The I/O module gets its output data from the telegram and transfers its input data to the telegram.

Compatibility

The bus adapter can be combined with any I/O unit. The I/O modules are only specified for connection to the remote bus and the remote bus branches of the INTERBUS network.

Environmental Conditions

The environmental conditions of the bus adapter and the I/O units, on which they can be mounted, match each other. Both are performed in protection type IP20.

Further system data can be found in the user manual for the I/O units of the Momentum product family.

Use of INTERBUS Branch Interface Modules

Using Branch Interface Modules

The branch interface modules 170 BNO 671 00/01 and 170 BNO 681 00 are used for the following purposes.

- to create a tree structure on INTERBUS by means of remote bus branches (see example *Construction of a Tree Structure, page 19*)
- to turn off the remote bus branches on INTERBUS without having to pause the user program or the bus operation (see section *Switching Off Remote Bus Branches, page 13*)
- to turn disabled remote bus branches back on

Mechanical Construction of the I/O Unit and Adapter

General Information about Construction

The I/O modules have the standard Momentum housing.

A sliding label is delivered together with the I/O unit. It fits onto the space on the front of the adapter. The signal names belonging to the sensors and actuators can be entered here.

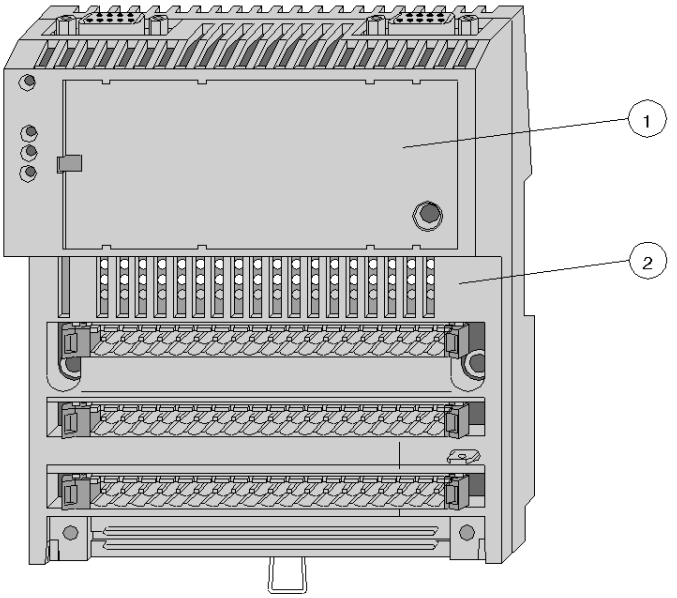
The name of the bus adapter can be seen through the space on the right-hand side of the sliding label.

Above and below the label tag there are ventilation slots to allow natural airflow for cooling when mounted vertically.

In the slots underneath the labeling film there are LEDs for diagnostics, status and operating elements (170 INT 120 00).

Diagram of the I/O Module with Adapter

View of an I/O module with mounted adapter, used here for connecting copper wires.



1 Bus adapter 170 INT 110 03
2 I/O module

Mechanical Construction of Branch Interface Modules

General Information about Construction

The branch interface module has the standard narrow Momentum housing.

A sliding label is delivered together with the branch interface module. It fits onto the space on the front of the branch interface module.

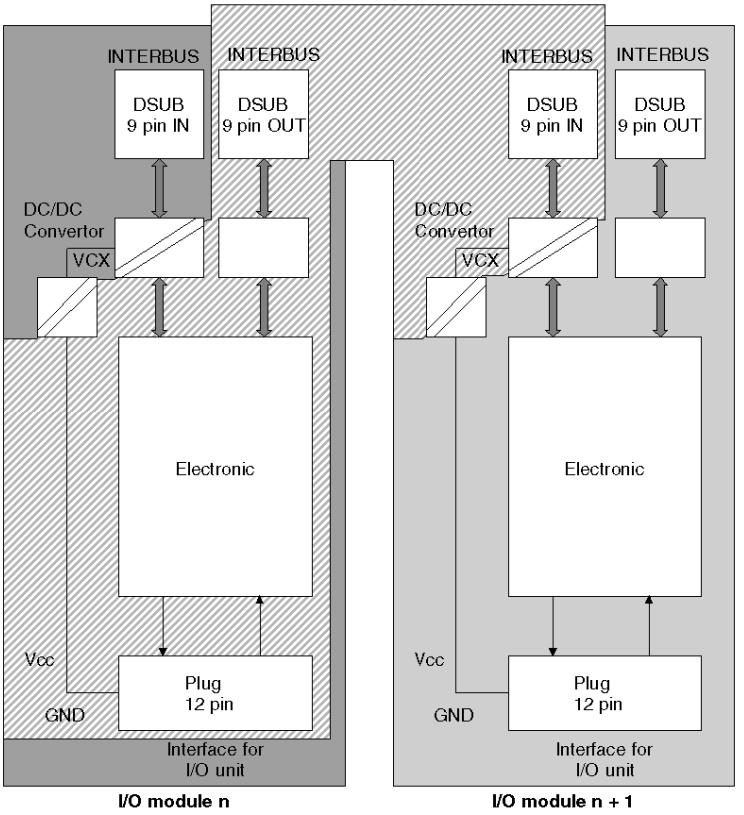
Above and below the label tag there are ventilation slots to allow natural airflow for cooling when mounted vertically.

In the slots underneath the labeling film there are LEDs for diagnostics, status and operating elements (170 BNO 681 00).

Potential Isolation of the I/O Modules (with Bus Adapter 170 INT 110 03)

Potential Isolation of the I/O Modules

The figure illustrates the potential relationships between two I/O modules, if these have the 170 INT 110 03 bus adapter.



The fields in the same shade of gray have the same reference potential.

Chapter 3
Assembly of Components and Connection of Cables

Introduction

This chapter describes the mounting of I/O unit, bus adapters and branch interface module as well as connection and preparation of the remote bus cable.

What Is in This Chapter?

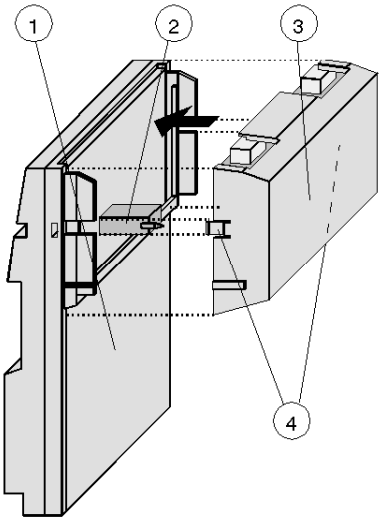
This chapter contains the following topics:

Mounting of the Bus Adapter

Mounting the Bus Adapter

The bus adapter is connected to the I/O unit with a plug. The spring clips serve as a lock and insure a mechanically secure fit.

Diagram to show how to mount the bus adapter onto the I/O unit:



1 I/O unit
2 Connecting plug (ATI interface)
3 Bus adapter (with 1 or 2 bus plugs depending on the bus type)
4 Spring clips

⚠ CAUTION

EQUIPMENT DAMAGE - ELECTROSTATIC DISCHARGE

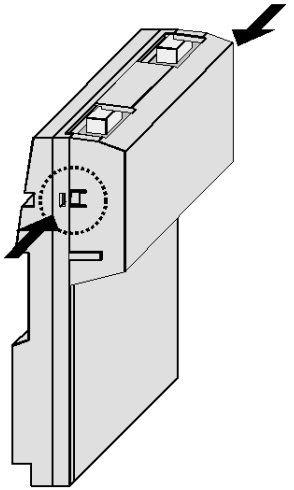
The I/O module corresponds to protection type IP20. These modules must be mounted in enclosed switch cabinets in electrical equipment rooms.

When working at switch cabinets, users must electrically discharge themselves to protect the modules from electrostatic charges.

Failure to follow these instructions can result in injury or equipment damage.

Disconnection of the Bus Adapter

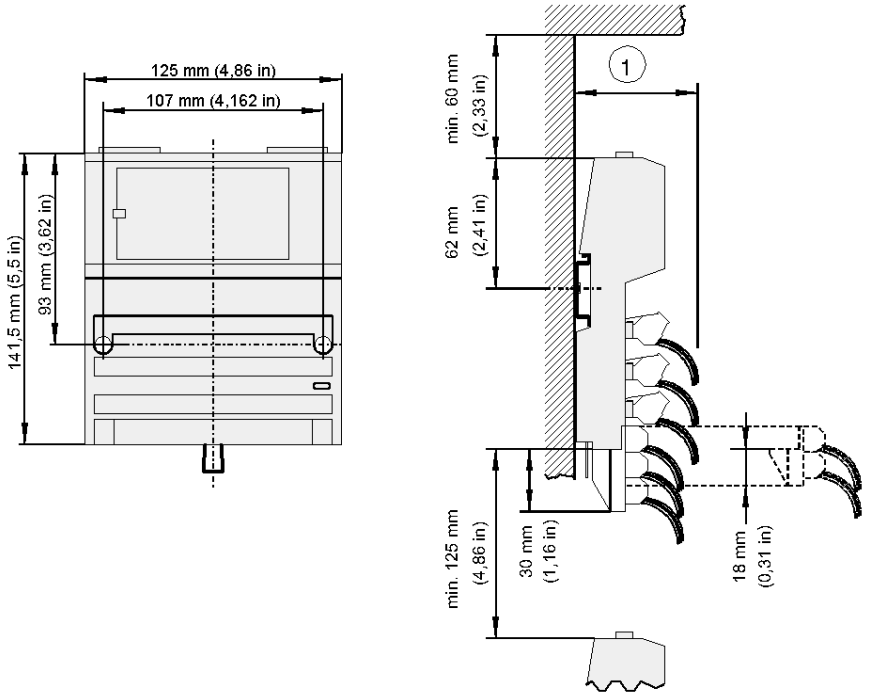
The adapter can be disconnected using a screwdriver (see arrow).



Mounting the I/O Module

Dimensions of the I/O Module

The following diagram shows the dimensions of the I/O module with bus adapter.



Module Type	Depth
Direct current (D.C.)	60 mm (2.72 inches)
Alternating current (A.C.)	65 mm (2.53 inches)

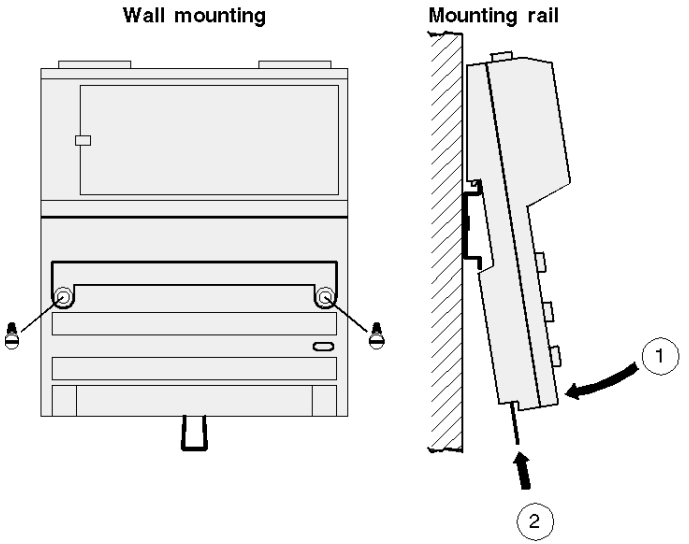
Mounting the I/O Module

The I/O module can be mounted on a DIN rail, or secured to a wall or a machine housing with just two screws.

A spring integrated into the backplane establishes an electrical ground contact with the mounting rail.

For mounting on the mounting rail, an additional earth connection from the PE screw of the module to the mounting rail must be made.

Diagram of the wall and DIN rail mounting:

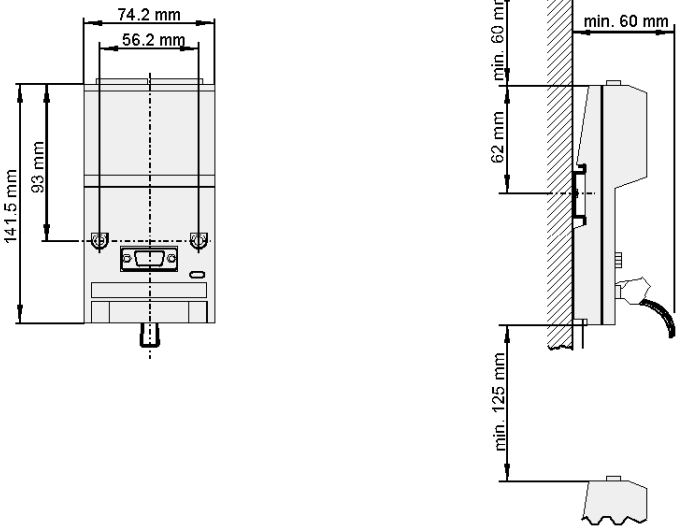


NOTE: Please carefully observe the detailed notes about mounting and grounding of the modules in the user manual for the Momentum product family I/O units. For ordering information, refer to the section *Additional Documentation*.

Mounting the Branch Interface Module

Bus Interface Module Dimensions

The following figure shows the bus interface module dimensions.



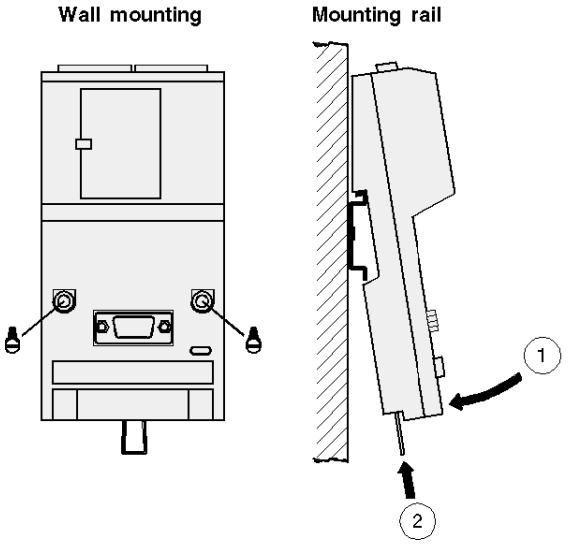
⚠ CAUTION
OVERHEATING MODULE The vertical gap must be maintained to ensure sufficient ventilation of the module. **Failure to follow these instructions can result in injury or equipment damage.**

Mounting of the Branch Interface Module

The branch interface module can be mounted on a DIN mounting rail, or secured to a wall or a machine housing with just two screws. A spring integrated into the backplane establishes an electrical ground contact with the mounting rail.

Mounting Diagram

Diagram of the wall and mounting rail:



NOTE: Please carefully observe the detailed notes about mounting and grounding of the modules in the user manual for the Momentum product family I/O units. For ordering information, refer to the section *Additional Documentation*.

General Information about Connecting the Remote Bus Cable

Creation of a Cable Plan

A complete cable plan should be created for the INTERBUS network, from which the cable paths and the protective measures (EMC) on the cables are clearly visible. The plan should identify the incoming and outgoing cable (incoming remote bus, outgoing remote bus) of each module.

Connection of the Remote Bus Cable

Modules within the INTERBUS network are connected to both of their plugs. One cable is connected to the cable for the incoming remote bus and one the other is connected to the cable for the outgoing remote bus.

Modules at the end of the network are only connected to one plug, that for the incoming remote bus.

Types of Connections

The cables of the INTERBUS network can be planned in two different types.

- as copper wires
- in fiber optic technology

Connection of Remote Bus Cable, Copper Cable

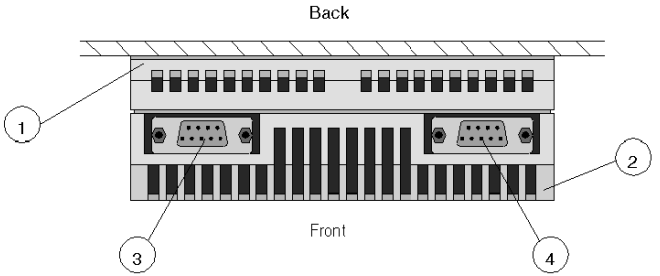
Using Copper Cable

Prefabricated cables are available in three different lengths for the remote bus. See *Overview of Ordering Information, page 48*. Each cable has two plugs for the connection of two neighboring modules.

All other cable lengths must be made by the customers themselves. See *Preparation of the Remote Bus Cable, using Copper Wiring, page 37*.

Location of the Connector Plug for the Remote Bus Cable (170 INT 110 03)

Location of the interfaces on the bus adapter 170 INT 110 03:



1 I/O module
2 INTERBUS adapter
3 Plug for incoming bus (pin)
4 Plug for outgoing bus (socket)

Pin Configuration of Adapter Plug (170 INT 110 03)

Diagram of the pin configuration on the bus adapter 170 INT 110 03:

Pin Configuration of the Incoming Remote Bus

Pin	Abbreviation	Term
1	DO	Data out
2	DI	Data IN
3	Common	Reference conductor
4	GND *	Reference conductor fiber optic adapter
5	Vcc *	Supply fiber optic adapter
6	DO_N	Data Out negated
7	DI_N	Data IN negated
8	Vcc *	Additional supply fiber optic adapter
9		not connected
*) galvanic potentially isolated		

Pin Configuration of the Outgoing Remote Bus

Pin	Abbreviation	Term
1	DO	Data out
2	DI	Data IN
3	Common	Reference conductor
4	GND	Reference conductor fiber optic adapter
5	Vcc	Supply fiber optic adapter
6	DO_N	Data Out negated
7	DI_N	Data IN negated
8	Vcc	Additional supply fiber optic adapter
9		Plug detection

Preparation of the Remote Bus Cable, using Copper Wiring

Preparation of the Remote Bus Cable

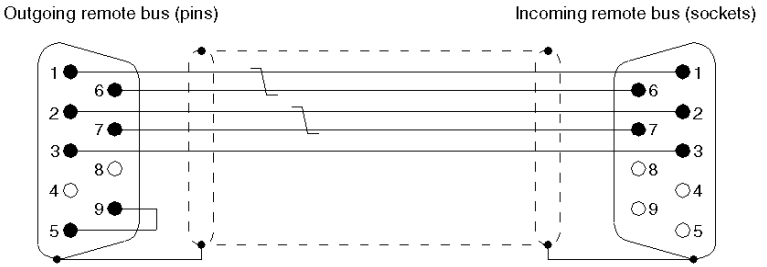
Plug sets are offered to make your own cables in customized lengths. The set contains one plug with pins (male) and one with sockets (female). See *Overview of Ordering Information, page 48*.

Before making the cable, please observe the following general guidelines.

- A 5 wire cable, shielded twisted pair, is required for the remote bus and can be ordered by the meter (KAB-3225-LI).
- The maximum length of the remote bus is 12.8 km. The distance between two remote bus nodes must be no more than 400m.
- The plugs for the outgoing remote bus always have pins, while those for the incoming remote bus always have sockets.
- In the plug for the outgoing remote bus the connections 5 and 9 must always be bridged. See Wiring Diagram (below).
- The cable shield must be connected to the plug housing with a large surface area.

Wiring Diagram

Wire the remote bus cable plug as follows.



Pin Configuration Cable Side Outgoing Remote Bus

Pin	Wire Color (KAB-3225-LI)	Abbreviation	Term
1	yellow	DO	Data out
2	gray	DI	Data IN
3	brown	Common	Reference conductor
5, 9	bridged (plug detection)		
6	green	DO_N	Data Out negated
7	pink	DI_N	Data IN negated

Pin Configuration Cable Side Incoming Remote Bus

Pin	Wire Color (KAB-3225-LI)	Abbreviation	Term
1	yellow	DO	Data out
2	gray	DI	Data IN
3	brown	Common	Reference conductor
6	green	DO_N	Data Out negated
7	pink	DI_N	Data IN negated

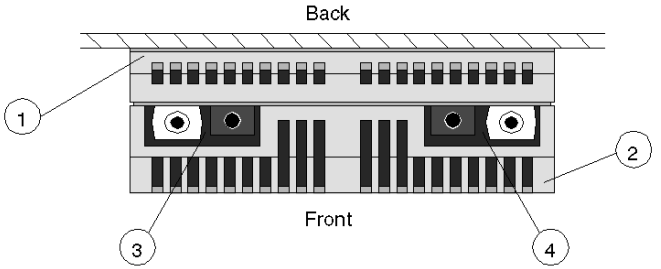
Connection of Remote Bus Cable, Construction in Fiber Optic Cable

Cable Type

Polymer or HCS fiber cables can be used for the incoming and outgoing remote bus. The cable necessary for the connection is obtainable by the meter. See *Overview of Ordering Information, page 48*.

Location of the Connector Plug for the Remote Bus Cable (170 INT 120 00)

Location of the interfaces on the Bus Adapter 170 INT 120 00:



1 I/O module
2 INTERBUS adapter
3 Plug for incoming bus (fiber optic interface)
4 Plug for outgoing bus (fiber optic interface)

Chapter 4
Electromagnetic Compatibility Measures for Bus Adapter 170 INT 110 03

Introduction

This chapter describes the electromagnetic compatibility measures for bus adapter 170 INT 110 03.

What Is in This Chapter?

This chapter contains the following topics:

Central Shielding Measures for the INTERBUS

Central Shielding Measures

For the commissioning phase, a large surface area connection should be made between each cable shield and ground (FE/PE rail) directly after the cable enters the switch cabinet.

Static Discharge

Very long bus cables, which have been laid but not yet connected, are discharged as follows.

Step	Action
1	Begin with the static discharge with the INTERBUS plug nearest to the FE/PE rail.
2	Touch the FE/PE rail of the switch cabinet with the metal of the plug case.
3	Then plug the bus plug into the device, but only after this has been statically discharged.
4	Discharge the cable's other INTERBUS plugs in the same way and then plug these into the device.

Notes for Connecting the Cable Shield with Earth

NOTE: The metal guide of the INTERBUS plug is internally connected with the cable shield during the construction of the cable. If the bus cable plug is plugged into the module's INTERBUS interface, a short connection is automatically established between the shield and PE.

Overvoltage Protection for Remote Bus Lines (Lightning protection)

Overvoltage Protection

To protect the transmission equipment from coupled voltage spikes (lightning strike), overvoltage protection equipment should be used in the remote bus cables, as soon as it is laid outside of buildings.

The nominal discharge current should, in this case, be at least 5kA.

The lightning arrestors **Type VT RS485** and **Type CT B110** from Dehn und Söhne GmbH & Co KG can, for example, be used. For the supplier address and order numbers for protection equipment and accessories, see *Overview of Ordering Information, page 48*.

To protect an INTERBUS cable, two protection device groups are required in each building. The first group (Type B110) is positioned where the cable enters the building and is used as the lightning conductor. The second group (Type RS485), close to the first node, is the overvoltage protection device.

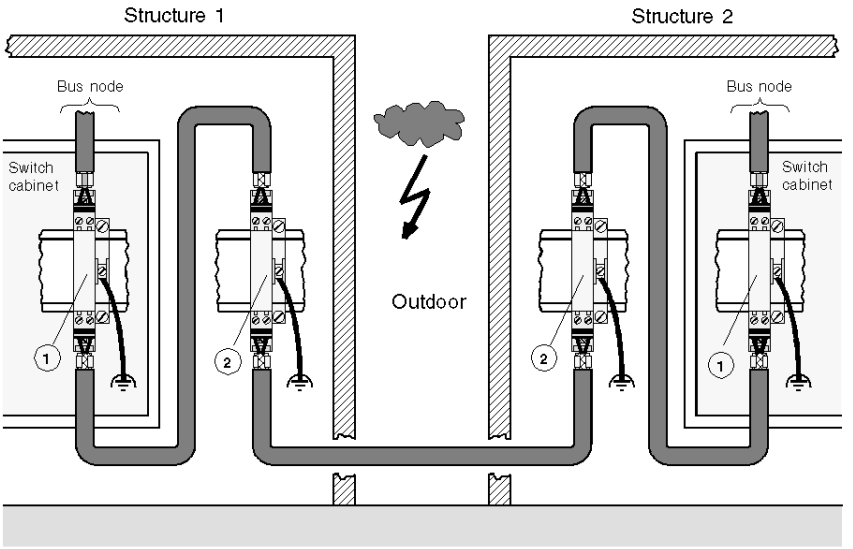
Connection Rules for Protection Devices

Before connection of the protection devices please observe the following rules.

- Install a functional ground (equipotential bonding rail).
- Assemble the protection devices near the building ground, so that the overload current is diverted along the shortest route.

  The cable (minimum 6mm^2) to the building and functional ground should be as short as possible.
- A maximum of 10 protection devices connected in series with 4 open land sections, for connecting buildings to each other, are allowed in the INTERBUS cables.
- Perform a Shield grounding *(see page 45)* of the INTERBUS lead according to the lightning arrestor used (type CT B110 or type VT RS485).

Protection Device Connection Plan



Type and number of the lightning arrestors from Dehn und Söhne GmbH &Co KG for a remote bus cable LiYCY (INTERBUS):

No.	Type	Number per Group
1	VT RS485	1
2	CT B110	3

NOTE: Information about assembly and connection of the cables can be found in the relevant installation instructions that come with lightning arrestor.

Shield Grounding with Protection Devices

Direct or indirect shield grounding are offered by the protection devices. An indirect grounding occurs using gas conductors.

The construction of the shield grounding depends on the type of lightning arrestor.

Lightning Arrestor Type	Direct Shield Grounding	Indirect Shield Grounding Using Gas Conductors
CT B110	Connect the shield of the incoming remote bus cable at connection IN and that of the remote bus cable at connection OUT. The shields are now galvanically connected with PE.	Connection of the shield as described for direct shield grounding. Put the gas conductor in the unit underneath the shield connection terminal on the input side.
	EMC cage clamp terminals fasten the remote bus cable shield on the input and output sides.	
VT RS485	Connect the shield of the incoming remote bus cable at connection IN2 and that of the remote bus cable at connection OUT2.	Connect the shield of the incoming remote bus cable at connection IN1, and the remote bus cable shield at connection OUT1. The gas conductor is installed in the device.
	Note: Connect the grounding terminals of the lightning arrestor to the PE.	

NOTE: Further information about grounding and shield grounding can be found in the relevant installation instructions that come with the lightning arrestor.

Chapter 5
Ordering Information for INTERBUS Components

Overview

In this chapter you can find the ordering information for INTERBUS components and required accessories.

What Is in This Chapter?

This chapter contains the following topics:

Overview of Ordering Information

Overview

The following products can be ordered.

- Bus adapter
- Branch interface module
- Terminal blocks
- Cables, connectors and overload protection equipment for copper wiring
- Cables, connectors and adapters for fiber optic technology

Ordering Details for INTERBUS Components

Bus Adapter

The following bus adapters are available.

Name	Order No.
Bus adapter for INTERBUS, up to 16 words, copper wire connection, SUPI 3 protocol chip	170 INT 110 03
Bus adapter for INTERBUS fiber optic cable, SUPI 3 protocol chip	170 INT 120 00
Legend strip set, 10 units	170 XCP 100 00

Branch Interface Module

The following branch interface modules are available.

Name	Order No.
Branch interface modules for INTERBUS, copper wire connection, SUPI 2 protocol chip	170 BNO 671 00
Branch interface modules for INTERBUS, copper wire connection, SUPI 3 protocol chip	170 BNO 671 01
Branch interface module for INTERBUS fiber optic cable, SUPI 3 protocol chip	170 BNO 681 00

Terminal Blocks

The following terminal blocks are available for the branch interface modules.

Name	Order No.
Screw clamp terminal block, 2.5 qmm, 3 units	170 XTS 011 00
Cage clamp terminal block, 2.5 qmm, 3 units	170 XTS 012 00

Cables, Connectors and Overload Protection Equipment for Copper Wiring

The following connectors, cables, and protection equipment for the connection of copper wiring are available.

Name	Order No.
INTERBUS connector set,Sockets/pins, 9 pin. DSUB	170 XTS 009 00
INTERBUS cable, 11 cm,with flat connectors	170 MCI 007 00
INTERBUS cable, 25cm,suitable for TIO modules, Branch interface module	170 MCI 025 00
INTERBUS cable, 100 cm	170 MCI 100 00

Name	Order No.
Remote bus cable (100m)	TSX IBS CA 100
Remote bus cable (400 m)	TSX IBS CA 400
Remote bus cable (by the meter)	KAB-3225-LI
Lightning arrestor type VT RS 485	Dehn Company, type no. 918,401
Lightning arrestor type CT 110	Dehn Company, type no. 919,510
Base for lightning arrestor of type CT 110	Dehn Company, type no. 919,506
Gas conductor for lightning arrestor of type CT 110	Dehn Company, type no. 919,502
EMC cage clamp terminal block for lightning arrestor of type CT 110	Dehn Company, type no. 919 508

NOTE: Supplier for the lightning arrestors and accessories:
Dehn und Söhne GmbH & Co KG, Postfach 1640, D-92306 Neumarkt/Opf.;
Homepage: http://www.dehn.de

Cables, Connectors and Adapters for Fiber Optic Technology

The following components are available for the connection with fiber optic technology:

Name	Order No.
Polymer cable	PSM-LWL/KDL/O, by the meter
HCS cable	PSM-LWL/HCS/O, by the meter
Polymer plug set	PSM-SET-FSMA/4
HCS plug set	PSM-SET-FSMA/4-HCS
Polishing set	PSM-SET-FSMA-POLISH
Cable with plug	PSM-LWL/KDL/2, by the meter
Cable with HCS plug	PSM-LWL/HCS/2, by the meter
Fiber optic adapter with additional voltage supply	OPTOSUB
Fiber optic adapter without additional voltage supply	OPTOSUB PLUS

NOTE: Supplier for the fiber optic accessories:
Phoenix Contact GmbH & Co;
Homepage: http://www.phoenixcontact.com

Part II
Module Description for INTERBUS Modules

Introduction

In this part the description of INTERBUS modules for Modicon TSX Momentum can be found in alphabetical order.

What Is in This Part?

This part contains the following chapters:

Chapter 6
Module Description for Branch Interface 170 BNO 671 00 / 170 BNO 671 01

Overview

This chapter describes the INTERBUS branch interface module 170 170 BNO 671 00 / 170 BNO 671 01 for the connection of copper cables.

What Is in This Chapter?

This chapter contains the following topics:

Short Description

General Information

The bus terminals 170 BNO 671 00 and 170 BNO 671 01 are remote bus nodes on the INTERBUS and are used for the connection of a remote bus branch that has the same extension limits as a remote bus.

The branch interface module 170 BNO 671 **00** operates with the protocol chip SUPI 2. The branch interface module 170 BNO 671 **01** operates with the protocol chip SUPI 3, and supports the entire diagnostic function of the Generation 4 INTERBUS firmware.

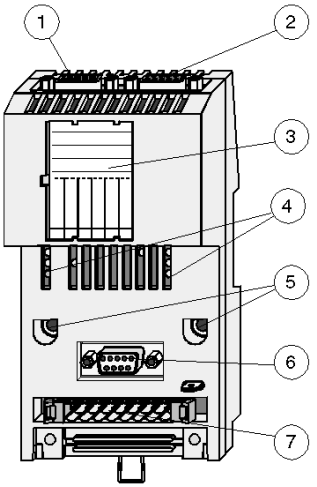
Mechanical Construction of the Branch Interface Module

It has two interfaces (incoming and outgoing remote bus), provided as RS 485 interfaces and 1 RS 485 interface for the remote bus branch. The incoming remote bus is electrically isolated. The interfaces conform to INTERBUS standards (DIN 19258).

The voltage supply and I/O periphery (relay output, keys) are connected via an 8 pin terminal block.

The operating status is displayed using 7 LEDs.

Location of Module Elements



1 INTERBUS connector (pins) for incoming remote bus
2 INTERBUS connector (sockets) for outgoing remote bus
3 Label tag
4 LED display
5 Holes for wall mounting
6 Interface for remote bus branch (outgoing remote bus)
7 Mounting area for terminal block

Electrical Functions of Branch Interface Module 170 BNO 671 00 / 01

Supply

The supply voltage is UB = 24 VDC.

The logical supply (VCC = 5 VDC) is created from the 24 VDC. It is monitored. If the voltage is in the tolerance range, a green LED will be switched on (ready). If the voltage falls outside tolerance, a reset will be triggered.

Interfaces

The branch interface module has an INTERBUS interface whose signals, inclusive of GND, are sent outwards using three 9 pin. DSUB plugs (for incoming and outgoing remote bus and remote bus branches). These signals are series connected to RS 485 drivers.

These interfaces are suitable for the use of OPTOSUB. Up to two OPTOSUBs can operate with the branch interface module.

The incoming remote bus signals are galvanically isolated from the other logic using optocouplers. The outgoing remote bus and remote bus branch signals have a potential connection. The branch interface module uses a special signal to test whether it is the last node at the remote bus.

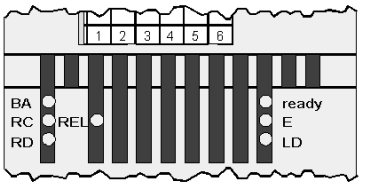
Peripheral Signals

The terminals of the terminal block include a reconfiguration button, with which the remote bus branch can be reconnected. A relay output is also available, which can indicate an error at the remote bus branch.

The relay contacts are change over contacts.

Display Elements

LED Display Location



LED Display Status

LED	Status	Function
BA	green	Bus active Data telegrams being transmitted.
	off	No data telegrams are being transmitted.
RC	green	Remote Bus Check. Incoming remote bus correctly connected and bus reset of the bus master inactive.
	off	Incoming remote bus not or incorrectly connected or bus reset of the bus master active.
RD	red	Remote Bus Disabled. Continuing remote bus is disabled.
	off	Continuing remote bus is not disabled.
REL	green	Relay output: Relay output is active, i.e. set.
	off	Relay output is not active, i.e. reset.
ready	green	Ready for operation. Supply voltage L+ for internal logic in the permitted range and module not in reset.
	off	Supply voltage L+ missing or outside the permitted range, or module in reset.
E	red	Remote bus branch error. Error in the remote bus branch.
	off	No error in the remote bus branch.
LD	green	Local Remote Bus Branch Disabled. The remote bus branch after the Branch interface module is disabled.
	off	The remote bus branch after the branch interface module is not disabled.

Mounting the Terminal Blocks

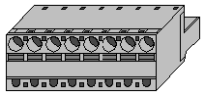
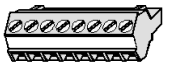
Connection

The I/O periphery and the voltage supply of the branch interface module are connected using an 8 pin terminal block.

Selection of Terminal Types

Two different types of terminal can be chosen according to its usage.

These are available as a set of three. See *Overview of Ordering Information, page 48*.

Diagram of Terminal	Terminal Block Type	Cable Cross Sectional Area
	Cage clamp terminals	up to 2.5 mm^2 (AWG 14)
	Screw clamp terminals	up to 2.5 mm^2 (AWG 12)

Use of Coding Pins

The module can be used in dangerous and safe voltage ranges. Hazardous voltages are higher than AC 30Vrms (30 VAC), 42.4Vpeak or 60 VDC.

A set of plastic coding pins is supplied with the terminal block. Correct usage of these coding pins will prevent insertion of terminal blocks that are wired for other voltages.

NOTE: To ensure maximum possible protection, a coding must be implemented during system setup.

Coding of the Terminal Block

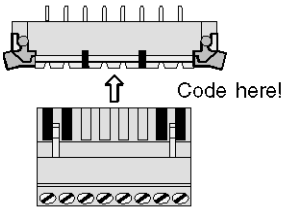
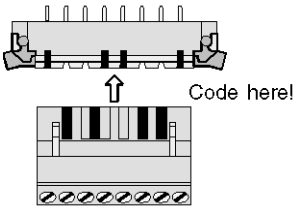
⚠ DANGER

ELECTRIC SHOCK

Ensure that the module is not powered when plugging the coding pins into the module and the terminal block.

Failure to follow these instructions will result in death or serious injury.

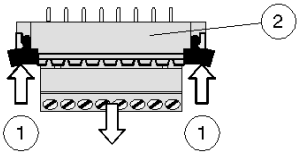
Code the terminal block and its counterpart on the module so the terminal blocks can not be exchanged with each other.

Voltage Range	Diagram of Coding
Safe (≤AC 30Vrms (30 VAC), 42.4Vpeak or 60 VDC	
Dangerous (≥AC 30Vrms (30 VAC), 42.4Vpeak or 60 VDC)	

Insertion and Removal of the Terminal Block

To insert, push the terminal block onto the row of pins on the module.

To remove, press both the ejectors.



1 Ejectors
2 Row of Pins

Wiring of the 170 BNO 671 00/01 Branch Interface Module

Protection Measures During Wiring

The following protection measures must be followed during the wiring of a branch interface module.

- The fuses (F1) must be the correct size for the connected loads.
- The contacts of the relay output must be fitted with a protective circuit when dealing with large loads, especially inductive loads (RC combinations, varistor, or, with DC voltages of an inverse diode).
- Up to two 2.2 nF according to PE are required per contact when wiring contacts.
  This depends on the degree of background interference (7 capacitors of this type can be found in the capacitive by-pass terminal GND 001).

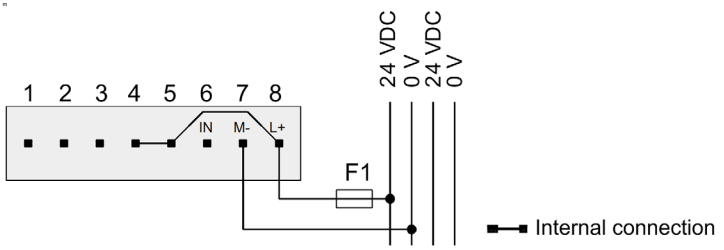
Supply of Voltages

The following voltages must be supplied externally.

- **L+** for supply of internal electronics (terminals 8 and 7)
- **1L1** for supply of the relay output (terminals 2 and 1 or 3)

L+ and 1L1 are electrically isolated from each other and the incoming remote bus.

Wiring Example of the Terminal Block



Technical Data

General Data

INTERBUS ID-Code	000C hex (length code = 0, ID code = 0C hex, = 12 dec.)
Current consumption	100 mA at 24 VDC
Max. output current	0.2 ... 2 A at 24 VDC
Supply voltage	24 VDC
Power dissipation	2.5 W typical

Potential Isolation

Bus to bus	500 VAC RMS
Voltage supply, relay contacts and remote bus	To each other and to the remote bus

Identification of Errors

Data exchange	Via LED display field and "Module Error" message to the bus master

Fuses

Supply voltage (24 VDC)	External – 200 mA fast-blow fuse
Relay output	External, according to requirements, maximum 4 A fast-blow fuse

Option

Fiber optic adapter	OPTOSUB or OPTOSUB PLUS (2 items maximum)

Reconfiguration Input

Signal level 1 signal	+15 ... 30 VDC
Signal level 0 signal	-30 ... +5 VDC
Input current	3 mA at 24 VDC

Relay Output

Construction of relay output (not to be used for network isolation)	potential free relay contact The contacts of the relay output must be fitted with a protective circuit when dealing with heavy loads, especially inductive loads (RC combinations, varistor, or, with DC voltages of a free-wheeling diode).

Relay Output: Voltage (Output)

Operating voltage for relay	24 VDC
Switched current for contact	min. 10 mA (only with new contacts)
Resistive load	0.5 A at 125 VAC 0.5 A at 110 VDC 2 A at 24 VDC
Lamp load	0.2 A at 24 VDC

Relay Output: Switching Cycle

Mechanical	1 x 108, 3/s;
Electrical	1 x 105, 20/min (2 A/30 VDC resistive load) 5 x 105, 20/min (1 A/30 VDC resistive load)

Chapter 7
Module Description for Branch Interface Module 170 BNO 681 00

Overview

This chapter describes the INTERBUS Branch interface module 170 BNO 681 00 and the connection of fiber optic technology.

What Is in This Chapter?

This chapter contains the following topics:

Short Description

General Information

The branch interface module 170 BNO 681 00 is a remote bus node on INTERBUS and is used for the connection of a remote bus branch that has the same extension limits as a remote bus.

The connection of the remote bus line uses fiber optic technology.

The branch interface module 170 BNO 681 00 operates with the protocol chip SUPI 3 and supports the entire diagnostic function of the Generation 4 INTERBUS firmware.

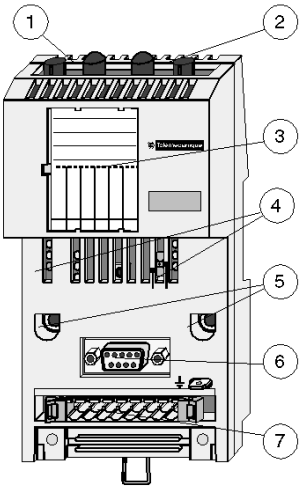
Mechanical Construction of the Branch Interface Module

It has two interfaces (incoming and outgoing remote bus), with fiber optic interfaces and one RS 485 interface for the remote bus branch. The interfaces conform to INTERBUS standards (DIN 19258).

The voltage supply and I/O periphery (relay output, manipulator) are connected via an 8 pin terminal block.

The operating status is displayed using nine LEDs.

Location of Module Elements



1 Fiber optic cable interface for incoming remote bus
2 Fiber optic cable interface for outgoing remote bus
3 Label tag
4 Display and operational elements
5 Holes for wall mounting
6 Interface for remote bus branch (outgoing remote bus)
7 Mounting area for terminal block

Electrical Functions of the Branch Interface Module 170 BNO 681 00

Supply

The supply voltage is UB = 24 VDC.

The logical supply (VCC = 5 VDC) is created from the 24 VDC. It is monitored. If the voltage is in the tolerance range, a green LED will be switched on (ready). If the voltage falls outside tolerance, a reset will be triggered.

Interfaces

The bus terminal has three INTERBUS interfaces. The incoming and outgoing interfaces are designed for the connection of fiber optic cables. The remote bus branch is connected using a 9 pin DSUB plug. This interface is suitable for the use of OPTOSUB.

The user of the module must establish decide if it is the last node at the remote bus, using an end identification slide switch.

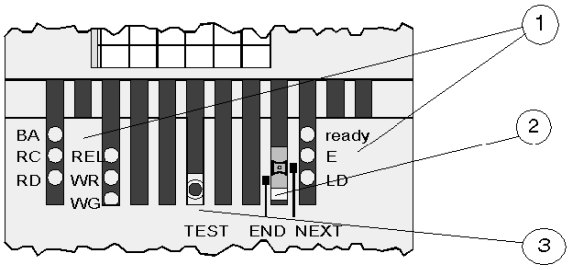
Peripheral Signals

The terminals of the terminal block include a reconfiguration button, with which the remote bus branch can be reconnected.

A relay output is also available, which can indicate an error at the remote bus branch. The relay contacts are change over contacts.

Description of Display and Operational Elements

Location of Elements



1 LEDs
2 Slide switch for end identification
3 TST button

LED Status

LED	Status	Meaning
BA	green	Bus active Data telegrams are being transmitted.
	off	No data telegrams are being transmitted.
RC	green	Remote Bus Check. Incoming remote bus correctly connected and bus reset of bus master inactive.
	off	Incoming remote bus not connected or incorrectly connected or bus master bus reset active.
RD	red	Remote Bus Disabled. Extended remote bus is switched off.
	off	Extended remote bus is not switched off.
REL	green	Relay output. Relay output is active, i.e. set.
	off	Relay output is not active, i.e. reset.
WR	On (red)	The light level at the outgoing remote bus optical receiver is below tolerance (- 26 dBm).
WG	On (red)	The light level at the incoming remote bus optical receiver is below tolerance (- 26 dBm).

LED	Status	Meaning
ready	green	Ready for operation. Supply voltage L+ for internal logic in the permitted range and module not in reset.
	off	Supply voltage L+ missing or outside the permitted range, or module in reset.
E	red	Remote bus branch error. Error in the remote bus branch.
	off	No error in the remote bus branch.
LD	green	Local Remote Bus Branch Disabled. The remote bus branch after the branch interface module is disabled.
	off	The remote bus branch after the branch interface module is not disabled.

Status of the Slide Switch

The slide switch determines whether the bus adapter is the last node at the remote bus.

Status	Meaning
NEXT	More nodes follow
END	Bus adapter is the last node.

Function of the TST Button

The quality of the line can be verified with the TST button without using an additional measuring device. If the INTERBUS is already installed, just press the button. The incoming light quantity is then captured and qualitatively assessed.

Status of WR and WG LEDs	Meaning
Both LEDs off	The incoming light quantity amounts to at least -22 dBm
At least 1 LED on	The light reserve is at critical limit. See section *Causes of Line Faults, page 68*.

Causes of Line Faults

Causes for the illumination of the WR or WG LEDs on pressing the TEST button and their possible solutions:

Causes	Solution
Transmission distance too long	select another type or use a repeater
Bending radius too small	select a larger radius
Quality of connector plug: Lens dirty End of fiber scratched	 Clean lens Cut end of fiber
Fiber broken	Replace optic fiber

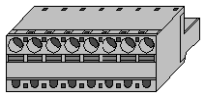
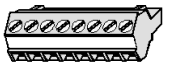
Mounting the Terminal Blocks

Connection

The I/O periphery and the voltage supply of the branch interface module are connected using an 8 pin terminal block.

Selection of Terminal Types

Two different types of terminal can be chosen according to its usage. These are available as a set of three. See *Overview of Ordering Information, page 48*.

Diagram of Terminal	Terminal Block Type	Cable Cross Sectional Area
	Cage clamp terminals	up to 2.5 mm^2 (AWG 14)
	Screw clamp terminals	up to 2.5 mm^2 (AWG 12)

Use of Coding Pins

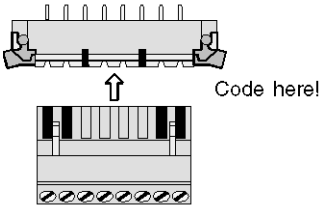
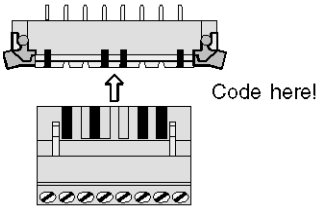
The module can be used in dangerous and safe voltage ranges. Hazardous voltages are higher than AC 30Vrms (30 VAC), 42.4Vpeak or 60 VDC.

A set of plastic coding pins is supplied with the terminal block. Correct usage of these coding pins will prevent insertion of terminal blocks that are wired for other voltages.

NOTE: To ensure maximum possible protection, a coding must be implemented during system setup.

Coding of the Terminal Block

Code the terminal block and its counterpart on the module so the terminal blocks can not be exchanged with each other.

Voltage Range	Diagram of Coding
Safe (≤AC 30Vrms (30 VAC),42.4Vpeak or 60 VDC	
Dangerous (≥AC 30Vrms (30 VAC), 42.4Vpeak or 60 VDC	

⚠ DANGER

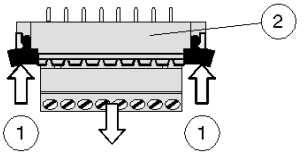
ELECTRIC SHOCK

Ensure that the module is not powered when plugging the coding pins into the module and the terminal block.

Failure to follow these instructions will result in death or serious injury.

Insertion and Removal of the Terminal Block

To insert, push the terminal block onto the row of pins on the module. To remove, press both the ejectors.



1 Ejectors
2 Row of Pins

Wiring of the Branch Interface Module 170 BNO 681 00

Protection Measures During Wiring

The following protection measures must be followed during the wiring of a branch interface module.

- The fuses (F1) must be the correct size for the connected loads.
- The contacts of the relay output must be fitted with a protective circuit when dealing with large loads, particularly inductive loads (RC combinations, varistor, or, with DC voltages of an inverse diode).
- Up to two 2.2 nF according to PE are required per contact when wiring contacts.
  This depends on the degree of background interference (7 capacitors of this type can be found in the capacitive by-pass terminal GND 001).

Supply of Voltages

The following voltages must be supplied externally.

- **L+** for supply of internal electronics (terminals 8 and 7)
- **1L1** for supply of the relay output (terminals 2 and 1 or 3)

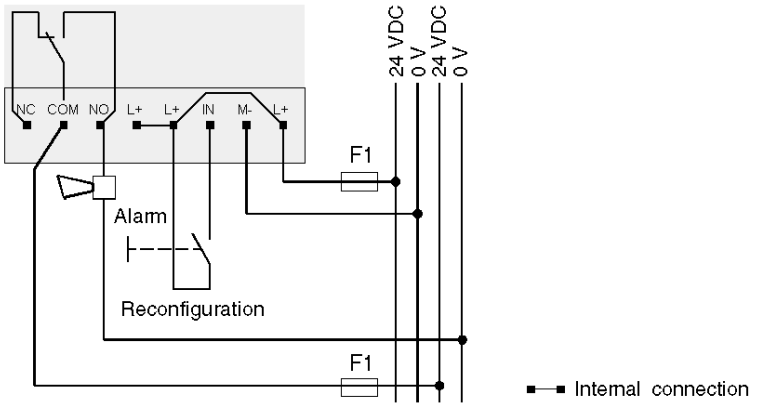
L+ and 1L1 are electrically isolated from each other and the incoming remote bus.

NOTE: The input for the reconfiguration request is not electrically isolated from the logic supply. It is designed for use with keys.

Terminal Assignments of the Terminal Block

Series	Terminal	Signal	Meaning
2	1	NC	Normally Closed Contact
2	2	COM (1L1)	Relay contact root
2	3	NO	Normally Open Contact
2	4,5,8	L+	Supply
2	6	IN	Input for reconfiguration request
2	7	M-	Reference potential

Wiring Example of the Terminal Block



Technical Data

General Data

INTERBUS ID-Code	000C hex (length code = 0, ID code = 0C hex, = 12 dec.)
Current consumption	100 mA at 24 VDC
Supply voltage	24 VDC
Power loss	2 W typical
Reference potential	MB

Potential Isolation

Potential isolation	L+, L- to each other and to the remote bus

Identification of Errors

Data exchange	Through LED display field and "Module Error" message to the bus master

Fuses

Supply voltage (24 VDC)	External – 200 mA fast-blow fuse
Relay output	External, according to requirements, maximum 4 A fast-blow fuse

Connection Type

Incoming remote bus	2 FSMA plugs (IEC 874-2 or DIN 47258)
Outgoing remote bus	2 FSMA plugs (IEC 874-2 or DIN 47258)
Remote bus branch	9 pin DSUB plug (potentially connected to socket terminal strip)
Reconfiguration button	8 pin Terminal block (terminals L+, IN)
Relay output	8 pin Terminal block (terminals NC, L1L, NO)

Option for Remote Bus Branch

Fiber optic adapter	OPTOSUB or OPTOSUB PLUS (2 items maximum)

Reconfiguration Input

Signal level 1 signal	+15 ... 30 VDC
Signal level 0 signal	-30 ... +5 VDC
Input current	3 mA at 24 VDC

Relay Output

Construction of relay output (not to be used for network isolation)	potential free relay contact The contacts of the relay output must be fitted with a protective circuit when dealing with large loads, especially inductive loads (RC combinations, varistor, or, with DC voltages of an inverse diode).

Relay Output: Voltage (Output)

Switching voltage for relay	Max. 24 VDC
Switching current for contact	min. 10 mA (only with new contacts)
Resistive load	2 A at 24 VDC
Lamp load	0.2 A at 24 VDC

Relay Output: Switching Cycle

Mechanical	1×10^8, 3/s;
Electrical	1×10^5, 20/min (2 A/30 VDC resistive load) 5×10^5, 20/min (1 A/30 VDC resistive load)

Bus Data

Transfer rate	500 Kbps
Wave length	660nm
max. bus length	12.8 km
max. distance between 2 modules	50 m (polymer lead 300 m (HCS lead)
IBS protocol chip	SUPI 3

Mechanical Structure

Format (W x H x D)	75 x 142 x 144 mm (for vendor, see section: Ordering Information)
Mass (weight)	150 g

Environmental Data

Specifications	developed according to VDE 0160, UL 508
Protection Type	IP20
Ventilation	Module hanging, natural convection
Ambient temperature	0 ... 60 degrees C

Chapter 8
Module Description for Bus Adapter 170 INT 110 03

Overview

This chapter describes the INTERBUS adapter 170 INT 110 03 for connection with copper cables.

What Is in This Chapter?

This chapter contains the following topics:

Brief Description

General Information

With the bus adapter 170 INT 110 03 every TSX Momentum I/O Unit can be used on INTERBUS.

The bus adapter can be used on the remote bus and the remote bus branch.

The adapter operates with the protocol chip SUPI 3 and supports the entire diagnostic functionality of the INTERBUS firmware generation 4 .

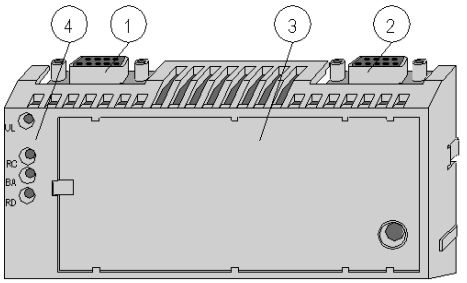
170 INT 110 03 supports modules with up to 16 words I/O.

Mechanical Construction of the Adapter

The adapter has two interfaces (incoming and outgoing remote bus), provided as RS 485 interfaces. The incoming remote bus is potentially isolated and the interfaces conform to INTERBUS standards (DIN 19258).

The operating status is displayed using 4 LEDs.

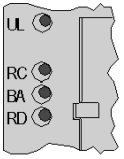
Location of Adapter Elements



1 INTERBUS connector (pins) for incoming remote bus
2 INTERBUS connector (sockets) for outgoing remote bus
3 Label (shipped with I/O Unit)
4 LED Display

LED Display

LED Display Location



LED Display Status

LED	Status	Meaning
UL	green	Supply voltage
RC	green	Remote Bus Check. Incoming remote bus correctly connected and bus reset of bus master inactive.
BA	green	Bus active Data telegrams are being transmitted.
RD	yellow	Remote Bus Disabled. Extended remote bus is switched off.

Technical Data

General Data

Supply	5 VDC / 250 mA (from I/O unit)
Current consumption	< 200 mA with 5 V (supplied from I/O unit) without fiber optic adapter
	< 400 mA with 5 V (supplied from I/O unit) with 2 fiber optic adapters
Power loss	0.8 W (typical) without fiber optic adapter

Potential Isolation

Incoming remote bus	Potentially isolated from other logic
Outgoing remote bus	No potential isolation

Identification of Errors

Data exchange	Red LED for bus errors (RD) and error messages from the I/O unit (module error)

Fuses

Supply voltage Vcc	Internal (for bus adapter) - none External (for I/O unit) - in compliance with guidelines set out in the description of the corresponding I/O unit

INTERBUS Data Interface

RS 485	see *Preparation of the Remote Bus Cable, using Copper Wiring, page 37*

Bus Data

Transfer rate	500 Kbps/s
max. bus length	12.8 km
max. distance between two modules	400m
IBS protocol chip	170 INT 110 03: SUPI 3

Option

Fiber optic adapter	OPTOSUB or OPTOSUB-PLUS

Chapter 9
Description of Module for Bus Adapter 170 INT 120 00 (Fiber Optic Cable)

Overview

This chapter describes the INTERBUS adapter 170 INT 120 00 for use with fiber optic cables.

What Is in This Chapter?

This chapter contains the following topics:

Brief Description

General Information

With the bus adapter 170 INT 120 00 every TSX Momentum I/O Unit can be used on INTERBUS.

The bus adapter can be used on the remote bus and the remote bus branch.

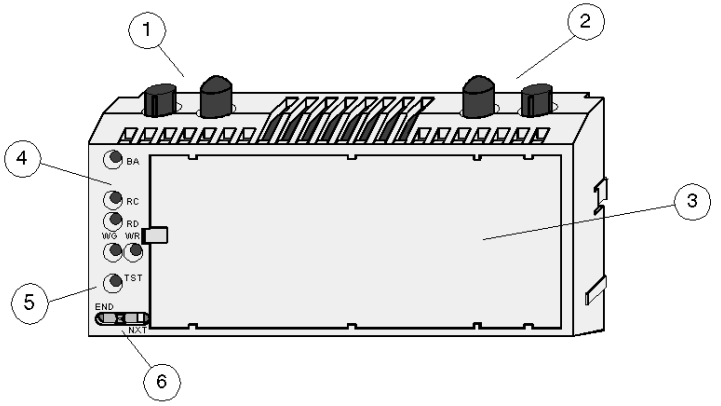
The bus adapter 170 INT 120 00 operates with the protocol chip Supi 3 and supports the whole diagnostic function of the Generation 4 INTERBUS firmware.

Mechanical Structure

The adapter has two interfaces (incoming and outgoing remote bus), with fiber optic interfaces. The interfaces conform to INTERBUS standards (DIN 19258).

The operating status is displayed using 5 LEDs.

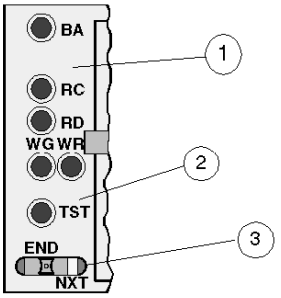
Location of Adapter Elements



1 Fiber optic interface for incoming remote bus
2 Fiber optic interface for outgoing remote bus
3 Label (shipped with I/O Unit)
4 LED Display
5 Test button
6 End Node Switch

Description of Display and Operational Elements

Location of Elements



1 LEDs
2 TST button
3 Slide switch for end identification

LED Status

LED	Status	Meaning
BA	green	Bus active Data telegrams are being transmitted.
	off	No data telegrams are being transmitted.
RC	green	Remote Bus Check. Incoming remote bus correctly connected and bus reset of bus master inactive.
	off	Incoming remote bus not connected or incorrectly connected or bus master bus reset active.
RD	red	Remote Bus Disabled. Extended remote bus is switched off.
	off	Extended remote bus is not switched off.
WG	On (red)	Light quantity at the receiver of the incoming remote bus is less than of the threshold value (- 26 dBm).
WR	On (red)	Light quantity at the receiver of the outgoing remote bus is less than of the threshold value (- 26 dBm).

Status of the Slide Switch

The slide switch determines whether the bus adapter is the last node at the remote bus.

Status	Meaning
NEXT	More nodes follow
END	Bus adapter is the last node.

Function of the TST Button

The quality of the line can be verified with the TST button without using an additional measuring device. If the INTERBUS is already installed, just press the button. The incoming light quantity is then captured and qualitatively assessed.

Status of WR and WG LEDs	Meaning
Both LEDs off	The incoming light quantity amounts to at least -22 dBm
At least 1 LED on	The light reserve is at critical limit. See *Causes of Line Faults, page 86*.

Causes of Line Faults

Causes for the illumination of the WR or WG LEDs on pressing the TEST button and their possible solutions:

Causes	Solution
Transmission distance too long	select another type or use a repeater
Bending radius too small	select a larger radius
Quality of connector plug: Lens dirty End of fiber scratched	 Clean lens Cut end of fiber
Fiber broken	Replace optic fiber

Technical Data

General Data

Supply	5 VDC / 250 mA (from I/O unit)
Current consumption	< 230 mA with 5 V (supplied from I/O unit)
Power dissipation	1.0 W (typical) without fiber optic adapter

Potential Isolation

Fiber optic interface (incoming)	Potentially isolated from other logic
Fiber optic interface (outgoing)	Potentially isolated from other logic

Identification of Errors

Data exchange	Red LED for bus errors (RD) and error messages from the I/O unit (module error)

Fuses

Supply voltage Vcc	Internal (for bus adapter) - none External (for I/O unit) - in compliance with guidelines set out in the description of the corresponding I/O unit

INTERBUS Data Interface

Plug type FSMA	IEC 874-2 or DIN 47258

Bus Data

Transfer rate	500 Kbps/s
max. bus length	12.8 km
max. distance between two modules	50 m (polymer lead) 300 m (HCS lead)
Wave length	660 nm
IBS protocol chip	SUPI 3

Part III
Software Connection of INTERBUS Modules

Chapter 10
Data Management and I/O Words

Introduction

This chapter describes data management and I/O words.

What Is in This Chapter?

This chapter contains the following topics:

I/O Words and ID Code

Function Mode

After connecting the supply voltage, the ID code of the I/O unit are automatically read from the bus adapter. The ID code provides the INTERBUS master with I/O type data (inputs and/or outputs) and the number of words required by the I/O module in the INTERBUS telegram. After the INTERBUS master has received and evaluated the ID codes from the I/O modules, it automatically begins data exchange in real time.

The length information is given in I or O words, the higher of the two values decides the I/O module position in the INTERBUS telegram.

The following values are possible: 1 ... 10, 12, 14, 16, 24 or 32 words.

Example for Determining the ID Code

The ID code for the 170 ADM 350 10 is 0103 hex.

- **01 = Length information states:** The module requires a word for data exchange (I and/or O word).
- **03 = Module type states:** The module has inputs and outputs.

Word Count and ID Code for Analog I/O Units

Name	Function	I words	O words	ID code
170 AAI 030 00	8 input channels	8	2	0633 hex 0651 dec
170 AAI 140 00	16 input channels	16	4	1233 hex 1851 dec
170 AAI 520 40	4 input channels, RTD, thermocouple	4	4	0433 hex 0451 dec
170 AAO 120 00	4 output channels	0	5	0531 hex 0549 dec
170 AAO 921 00	4 output channels	0	5	0531 hex 0549 dec
170 AMM 090 00	4 inputs, 2 outputs (digital) 4 input channels, 2 output channels (analog)	5	5	0531 hex 0551 dec
170 ANR 120 90	8 inputs, 8 outputs (digital) 6 input channels, 4 output channels (analog)	12	12	1633 hex 2251 dec

Word Count and ID Code for Digital I Units

Name	Function	I words	O words	ID code
170 ADI 340 00	16 inputs	1	0	0102
170 ADI 350 00	32 inputs	2	0	0202
170 ADI 540 50	16 inputs	1	0	0102
170 ADI 740 50	16 inputs	1	0	0102

Word Count and ID Code for Digital O Units

Name	Function	I words	O words	ID code
170 ADO 340 00	16 outputs	0	1	0101
170 ADO 350 00	32 outputs	0	2	0201
170 ADO 530 50	8 outputs	0	1	0101
170 ADO 540 50	16 outputs	0	1	0101
170 ADO 730 50	8 outputs	0	1	0101
170 ADO 740 50	16 outputs	0	1	0101

Word Count and ID Code for Digital I/O Units

Name	Function	I words	O words	ID code
170 ADM 350 10	16 inputs, 16 outputs	1	1	0103
170 ADM 350 11	16 inputs, 16 outputs	1	1	0103
170 ADM 350 15	16 inputs, 16 outputs	1	1	0103
170 ADM 370 10	16 inputs, 8 outputs	1	1	0103
170 ADM 390 10	16 inputs, 12 outputs	3	1	0303
170 ADM 390 30	10 inputs, 8 outputs	1	1	0103
170 ADM 690 50, see 1)	10 inputs, 8 outputs	1	1	0103
170 ADM 690 51	10 inputs, 8 outputs	1	1	0103
170 ARM 370 30	10 inputs, 8 outputs	1	1	0103
1) replaced by 170 ADM 690 51				

Word Count and ID Code for Experts

Name	Function	I words	O words	ID code
170 ADM 540 80	6 inputs, 3 outputs, 1 Modbus interface	16	16	1233 hex 1851 dec
170 AEC 920 00	Counter unit with 2 hardware counters	8	8	0633 hex 0651 dec

Data Management for I/O Units

Addressing with Digital I/O Units

The data exchange between the I/O unit and the bus adapter occurs 1:1.

With the TSX Momentum digital modules, the I/O points of the peripheral terminals are always mapped according to the following principles.

- Only words are mapped to (max. 2 for 32 inputs or 32 outputs).
- The most significant word (MSW) is sent or received first.
- The words sent from the bus adapter to the I/O unit (output words) represent the output values and parameters.
- The words sent from the I/O unit to the bus adapter (input words) represent the input values and status information.

Example of Data Management for 2 Digital I/O Units

Data management for the 170 ADI 350 00 (32 inputs) and 170 ADO 350 00 (32 outputs):

Word	Input Data 170 ADI 350 00	Output Data 170 ADI 350 00
1 (LSW)	Inputs 1 16	Outputs 1 16
2 (MSW)	Inputs 17 32	Outputs 17 32

LSW = Least Significant Word

MSW = Most Significant Word

Addressing with Analog I/O Units

The I/O data sent to and from the bus master is mapped onto the terminals of the I/O units in the following way.

- Each analog word is mapped onto a word.
- The most significant word (MSW) is sent or received first.
- The words sent from the bus adapter to the I/O unit (output words) represent the output values and parameters.
- The words sent from the I/O unit to the bus adapter (input words) represent the input values and status information.

Example of the Data Management for 1 Analog I/O Unit

Data management for the 170 AAI 140 00 (16 input channels):

Word	Input Data 170 AAI 140 00	Output Data 170 AAI 140 00
1 (LSW)	Value channel 1	Parameters for channel 1 4
2	Value channel 2	Parameters for channel 5 8
3	Value channel 3	Parameters, channels 9 12
4	Value channel 4	Parameters, channels 13 16
5	Value channel 5	not used
...	...	...
15	Value channel 15	not used
16 (MSW)	Value channel 16	not used

LSW = Least Significant Word

MSW = Most Significant Word

NOTE: Further information can be found in the TSX Momentum user manual.

Diagnostics

Error Monitoring

The internal voltage supply (Vcc) is supplied by the I/O unit. Vcc is monitored and a reset signal is generated if Vcc is outside the tolerance.

The potentially isolated voltage (Vcx) for the INTERBUS interface is generated using a DC/DC converter and is not monitored.

A SUPI protocol chip controls the display LEDs that provide data transfer information (bus active, remote bus check, remote bus disabled; see *Display and Operating Elements* of the relevant module description) and the operating elements (with components for the use of fiber optic technology).

The supervision time of the internal watchdog is 640ms and is signaled via the "BA" LED.

An I/O error created by the I/O Unit generates a module error in the INTERBUS adapter. This is recognized by the master and can be evaluated by the application program. A module error does not automatically lead to a bus failure.

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