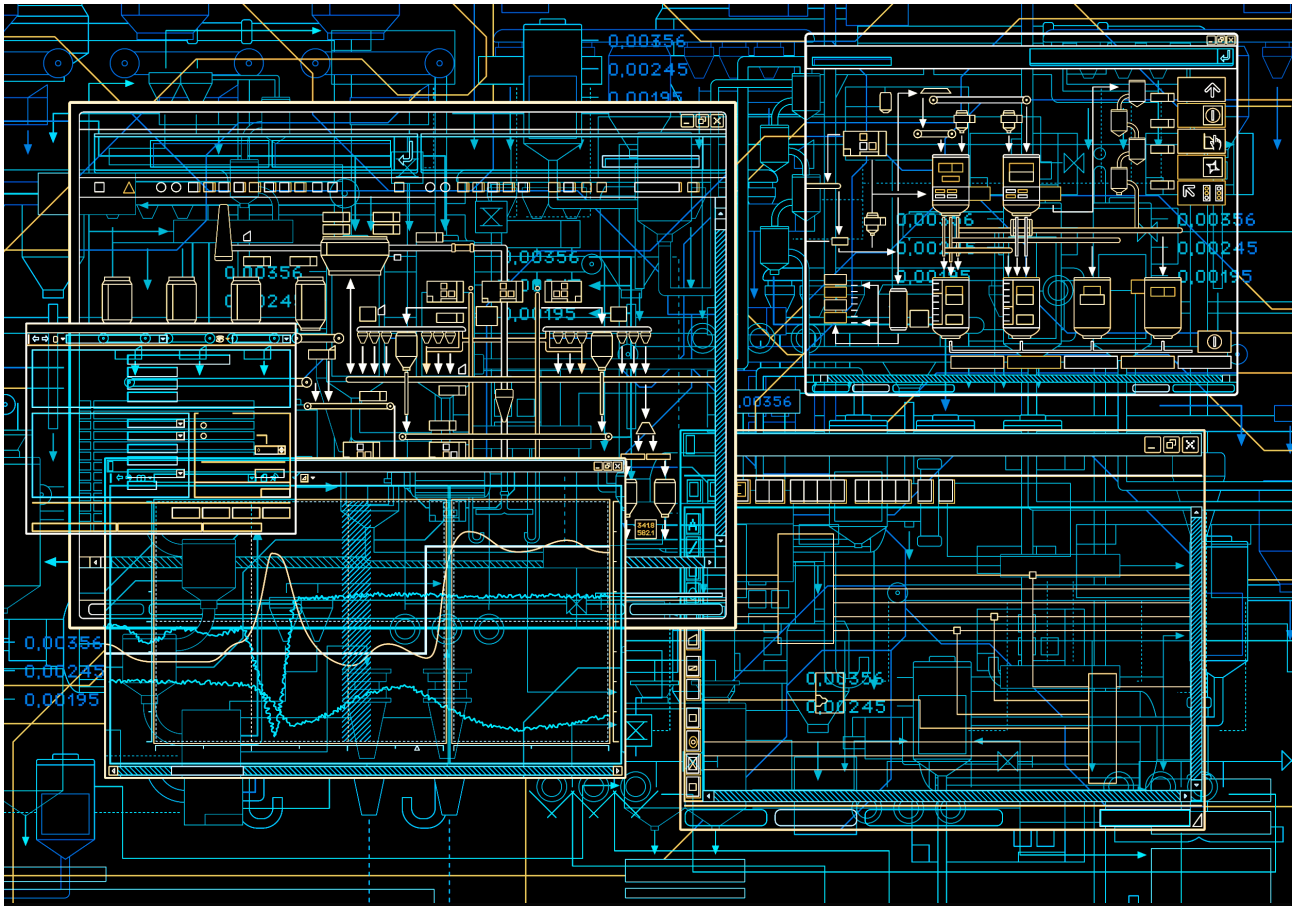

S800 I/O

Product Guide

Power and productivity
for a better world™

S800 I/O

Product Guide

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Section 4 - Ordering

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Safety Summary

Electrostatic Sensitive Device
Devices labeled with this symbol require special handling precautions as described in the installation section.

GENERAL WARNINGS

Equipment Environment
All components, whether in transportation, operation or storage, must be in a noncorrosive environment.

Electrical Shock Hazard During Maintenance
Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing.

SPECIFIC WARNINGS

Page 108: In I.S. applications modules with I.S. Interfaces MUST be mounted right most of the I/O station or as a separate group.

The installation must be performed by qualified personnel. It must comply with the relevant national/international standards (e.g. IEC 79-14, CEI 64-2, BS 5345 Pt. 4, DIN VDE 165) and in line with the established installation rules and recommended practice (e.g. CEI 64-8, ANSI/ISA RP-12.6). The conformity of hazardous area field devices with the related system documentation must always be checked.

When using modules with I.S. Interfaces in non I.S.applications, the I.S. modules can be placed in any position following the same rules as non I.S. modules.

SPECIFIC CAUTIONS

Page 120: The calculated load of Advant Fieldbus 100 must be equal to or less than 70%.

Page 122: The calculated load of Advant Fieldbus 100 must be equal to or less than 50%. NOTE! 1 ms cycle time is not allowed.

Page 123: The calculated load of Advant Fieldbus 100 must be equal to or less than 50%. NOTE! 1 ms cycle time is not allowed.

Safety Summary

About This Book

General

This Product Guide is primarily intended for sales representatives within ABB. The Product Guide is distributed to internal ABB customers and to important external customers, as a complement to existing product information.

This Product Guide does not contain last-minute product information and updates which might affect functionality and/or performance. For information on late changes and restrictions, please refer to the Release Notes.

This Product Guide describes the S800 I/O system, presenting information in terms of what can be installed and configured as well as operational possibilities.

This product guide does not describe the different controller connect products. For more details, see separate product guides.

The product guide is intended as an introduction to S800 I/O system, as well as a reference when discussing technical solutions with customers.

The guide provides:

- Information on S800 I/O system key benefits, both on product and functional levels.
- An overview of functions offered by S800 I/O system.
- Technical and Performance data for S800 I/O system.

Instructions on how to order, with reference to system configurations.

Document Conventions

Microsoft Windows conventions are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, etc.

Warning, Caution, Information, and Tip Icons

This publication includes **Warning**, **Caution**, and **Information** where appropriate to point out safety related or other important information. It also includes **Tip** to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

Electrical warning icon indicates the presence of a hazard which could result in *electrical shock.*

Warning icon indicates the presence of a hazard which could result in *personal injury.*

Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in *corruption of software or damage to equipment/property.*

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, **fully comply** with all **Warning** and **Caution** notices.

Terminology

A complete and comprehensive list of Terms is included in the Industrial^{IT} Extended Automation System 800xA, Engineering Concepts instruction (3BDS100972Rxxxx). The listing included in Engineering Concepts includes terms and definitions as they that apply to the 800xA system where the usage is different from commonly accepted industry standard definitions and definitions given in standard dictionaries such as ***Webster's Dictionary of Computer Terms*.**

Term	Description
AF 100	Advant Fieldbus 100 is the communications bus between the I/O stations and the Advant Controllers. (FCI to CI52x)
DTM	Device Type Manager is a standardized software for configuration, diagnostics, HART data communication based on the FDT standard.
FCI	The Fieldbus Communication Interface (FCI) device contains the interface to the fieldbus (e.g. AF 100), ModuleBus interface and power regulators. The FCI module can manage 24 I/O devices (up to 12 directly and to the others in 1 to 7 I/O clusters).
Base cluster	Consists of single or red. FCIs plus I/O modules connected directly to the FCI.
G3 compliant	The module withstand more severe environmental conditions according to ISA-S71.04.
HART	Highway Addressable Remote Terminal is a digital communication protocol developed for applications in industrial process metrology.
I/O cluster	An extension of the I/O Station's ModuleBus connected to the FCI by fiber optic connections. Up to 12 I/O devices per cluster.
I/O device	A complete I/O device consists of one MTU and one I/O module.
I/O module	Is an active, electronic and signal conditioning unit. Can be a part of an I/O device or a S800L I/O module.

Term	Description
I/O station	An I/O station consists of one or two FCI(s), 1-7 I/O clusters and up to 24 I/O devices.
ModuleBus	Is an incremental, electrical or optical, bus for interconnection of I/O devices.
(ModuleBus) Extension cable	Is used when extending the electrical ModuleBus (within the max. 2 meters).
MTU	The Module Termination Unit is a passive base unit containing process terminals and a part of the ModuleBus.
OSP	Outputs Set as Predetermined. A user configurable action on an output module when communications is lost to the FCI or Controller.
PROFIBUS-DP	PROFIBUS-DP is a fieldbus standard.
PROFIBUS-DPV1	PROFIBUS-DPV1 is a fieldbus standard.
RTD	Resistance Temperature Detector.
SOE	Sequence of events. Time stamping of status changes for digital inputs.
TC	Thermocouple
I.S.	Intrinsic Safety is a protection technique to prevent explosion in hazardous areas of a process plant.
SIL	Safety Integration Level
HCIR	Hot Configuration in Run
CI810	Stands for CI810, CI810V1, CI810V2, CI810A and CI810B
CI840	Stands for CI840 and CI840A
TB840	Stands for TB840 and TB840A

Related Documentation

A complete list of all documents applicable to the 800xA Industrial^{IT} Extended Automation System is provided in Released User Documents, 3BUA000263Rxxxx. This document lists applicable Release Notes and User Instructions. It is provided in PDF format and is included on the Release Notes/Documentation media provided with your system. Released User Documents are updated with each release and a new file is provided that contains all user documents applicable for that release with their applicable document number. Whenever a reference to a specific instruction is made, the instruction number is included in the reference.

New This Release

New functions in the I/O 800 system:

- Support for new S800 I/O module AI825 with 4 galvanically isolated bipolar channels.
- Support for new S800 I/O module DI825 with 8 125 V d.c. channels with SOE.
- Support for long distance ModuleBus in star configuration using the new S800 modem TB825. The long distance fiber optic cable should be of type 62,5/125 µm fiber with ST (bayonet) contacts.
- Two new S800 termination units are released. The new TU833 are similar to TU830 but with cage clamp terminals and TU813 are similar to TU814 but for 250 V applications.
- An Extended HART mode is introduced for S800 I/O via PROFIBUS. This mode of operation allows for HART data transfer of large packages up to 227 bytes. This mode is required when a HART device sends packages larger than 64 bytes.

Always check which S800 I/O feature support is included in the controller that the I/O is connected to.

Section 1 Key Benefits

The S800 I/O is a distributed, highly modularized and flexible I/O-system with eco-efficient design, providing easy installation of the I/O modules, process cabling and connection to drives systems. The S800 I/O modules and termination units can be mounted and combined in many different configurations to fit your space requirements and suit many types of applications.

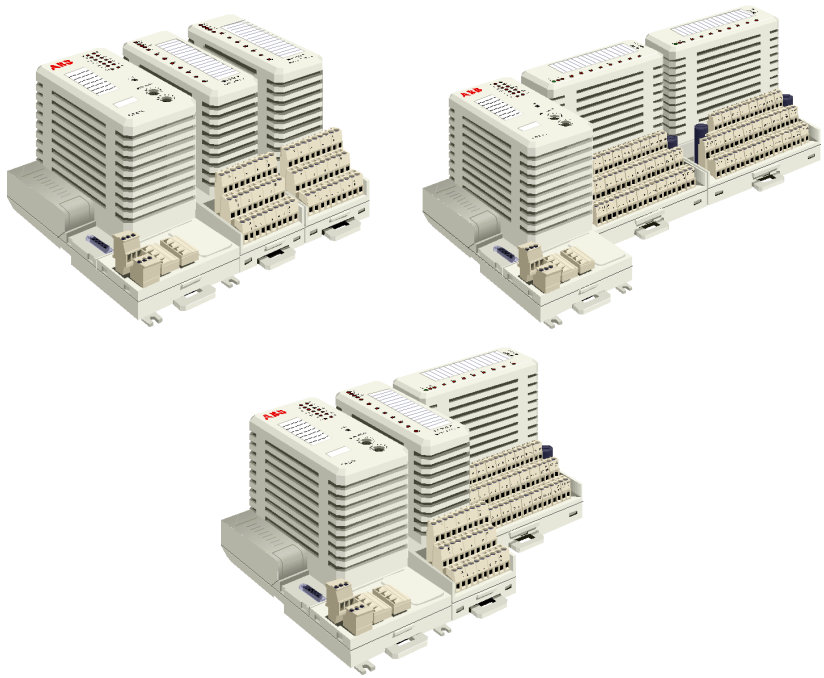

Figure 1. S800 I/O Fieldbus Communication Interface with I/O-modules on Compact and Extended MTUs

Product Benefits

Some of the benefits of the S800 I/O system are:

- Flexibility, permitting a virtually infinity number of installation arrangements for any application:
  - small to large
  - easy mounting on a DIN rail
  - etc.
- Modularity, permitting step-by-step expansion
- Cost-effectiveness, making you save on hardware, cabling, installation and maintenance
- Reliability and auto-diagnostics
- Saves panel costs
- Reduces downtime
- Easy to configure
- Redundancy can be introduced on all levels

Features

The major features of the S800 I/O system are:

- Communicates over PROFIBUS-DP/DPV1 or Advant Fieldbus 100.
- Quick faultfinding with help of LEDs of each module and channel.
- An extensive scope of Digital input/output modules and Analog input/output modules.
- Digital input/output modules and Analog input/output modules with Intrinsic Safety interfaces.
- Mounted on standard DIN rails type NS 35/75 according to EN 50022.
- Support of dual redundancy in power supply, fieldbus connection and I/O channel.
- Support of fieldbus media supervision, bumpless change-over and failure reporting.
- All outputs can be individually set to freeze or to take on predefined values.
- Easy connection to drives systems, minimizing communication delays and cost.
- All modules have plastic injection molded enclosures which provide safety protection degree IP20 according to IEC 529.
  The plastic used is halogen free.
- I/O modules are protected from destruction by a mechanical keying arrangement if an attempt is made to insert a module type in a position with a different key code than the factory set code of the I/O module. Terminal units have keys which are set to key code of its I/O module's key code.
  (S800L I/O modules do not use Termination Units).
- An electrical ID is checked at start-up, if this does not match the configured type, the I/O module is not taken into operation.
- Hot-swap of S800 I/O modules (except S800L modules) allowing replacement of faulty modules without disconnecting field power or system power to the I/O-station.
- HART pass-through communication.

- I/O modules allow for 55°C ambient temperature except for vertical mounted Compact MTU with I/O modules allow for 40°C ambient temperature.
- Support of connection to external Intrinsic Safety Barriers.
- High integrity I/O modules, IEC 61508 SIL3 certified.
- Hot Configuration In Run via Profibus.
- Coated modules, also compliant to ISA-S71.04 level G3 compliant modules.
- Galvanic isolation between process and system. Channel vise galvanic isolation is also available.
- SOE support by time stamped events with resolution down to 0.4 ms. Available for 24/48/125 V d.c. digital inputs.
- Long distance distribution in star configuration.

Section 2 Product Description

Introduction

Figure 2 shows the basic construction of I/O Stations without any redundancy. To increase the up-time, a number of component can be set up with redundancy:

- Power Supply
- I/O Module
- Fieldbus Communication Interface (FCI)
- Fieldbus
- ModuleBus

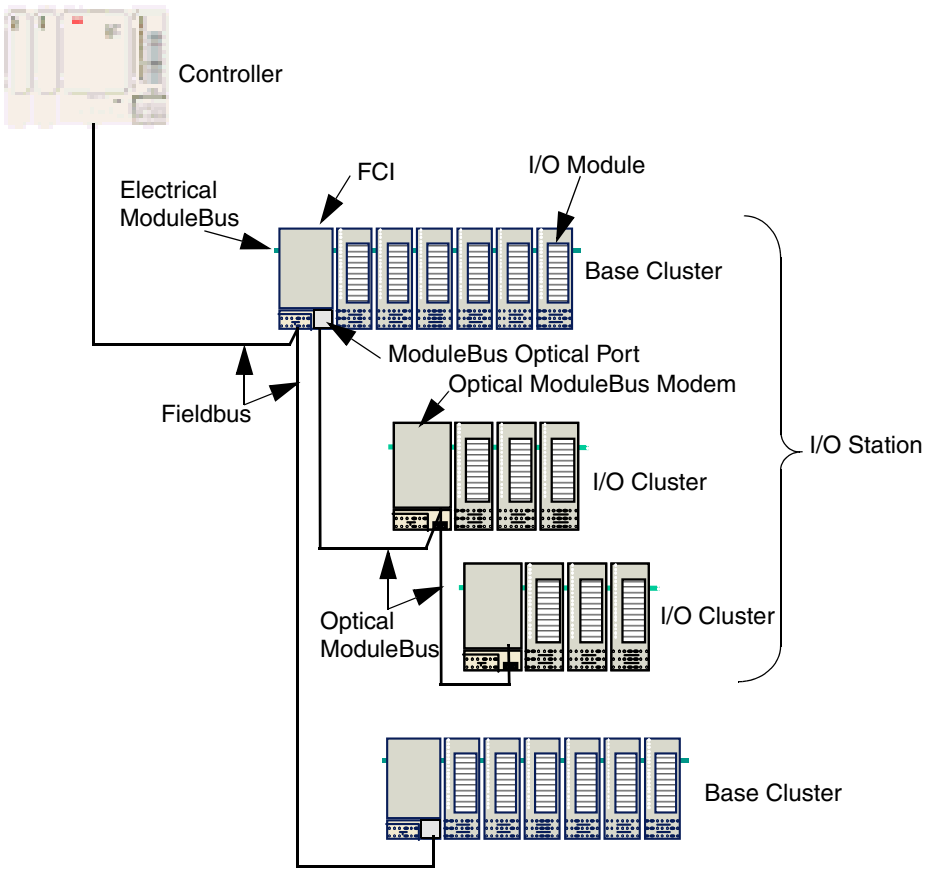

Figure 2. I/O Station Overview

An example of a system using redundancy for all these components is shown in Figure 3.

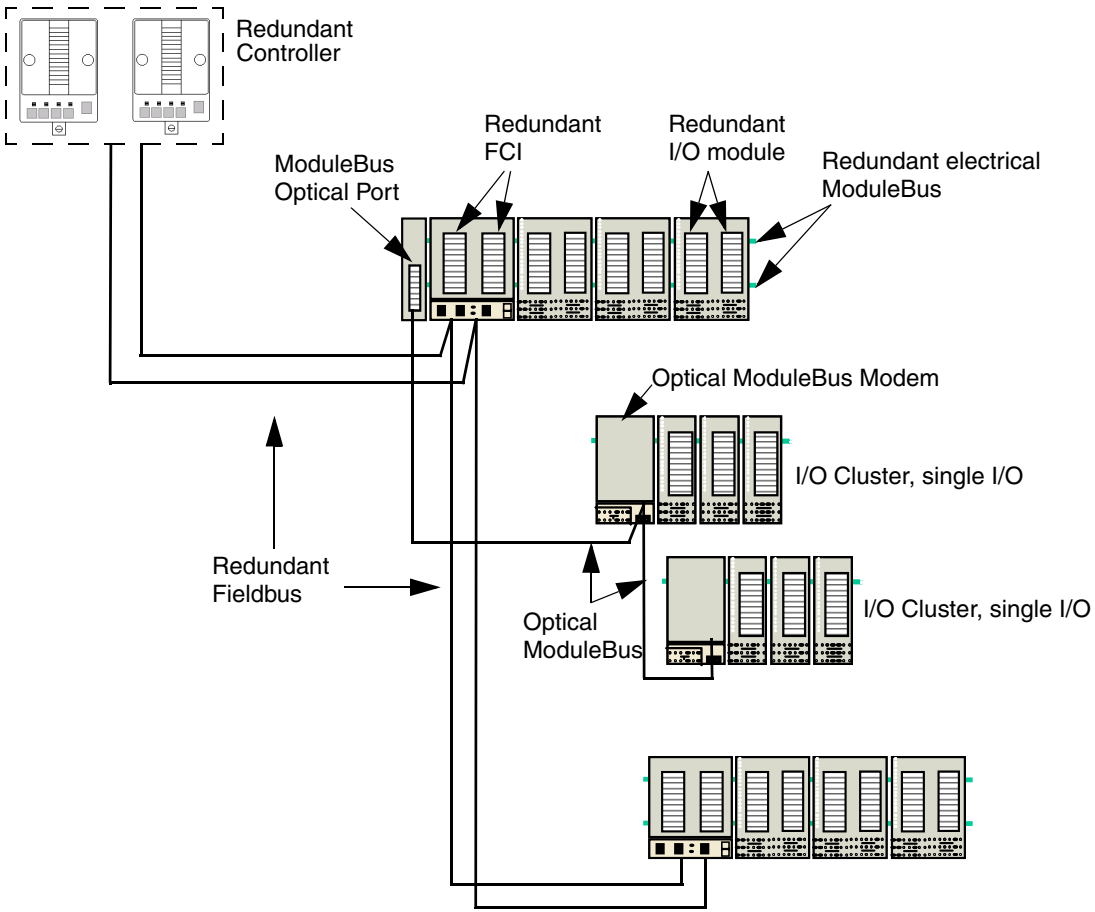

Figure 3. I/O Station Overview with Maximum Redundancy and Additional Single I/O Modules

It is not necessary to implement redundancy on all components, but there are some dependencies:

- Redundant FCI requires:
  - redundant fieldbus
- Redundant I/O Module (only in base cluster) requires:
  - double electrical ModuleBus
  - redundant FCI
  - redundant fieldbus

Product Overview

S800 I/O provides distributed I/O on PROFIBUS and Advant Fieldbus 100 (AF100). S800 I/O is also used as a communication link to some of ABB's Drives.

With the network definition PROFIBUS, it means the both versions; PROFIBUS-DP and PROFIBUS-DPV1.

An I/O station can be configured over the Fieldbus. Typical parameters are signal range, filter time, etc.

The status of the modules are indicated by LEDs and also accessible over the fieldbus. Analog values are scaled 0-100% of the signal range. AI/AO modules are scanned every 4th I/O scan cycle. RTD/TC every 10th cycle.

Values are transferred cyclically on the fieldbus limited by the fieldbus and the fieldbus master. The Fieldbus Communication Interface is scanning the I/O modules cyclically. The cycle time, 4-108 ms, is dependent on type and number of modules.

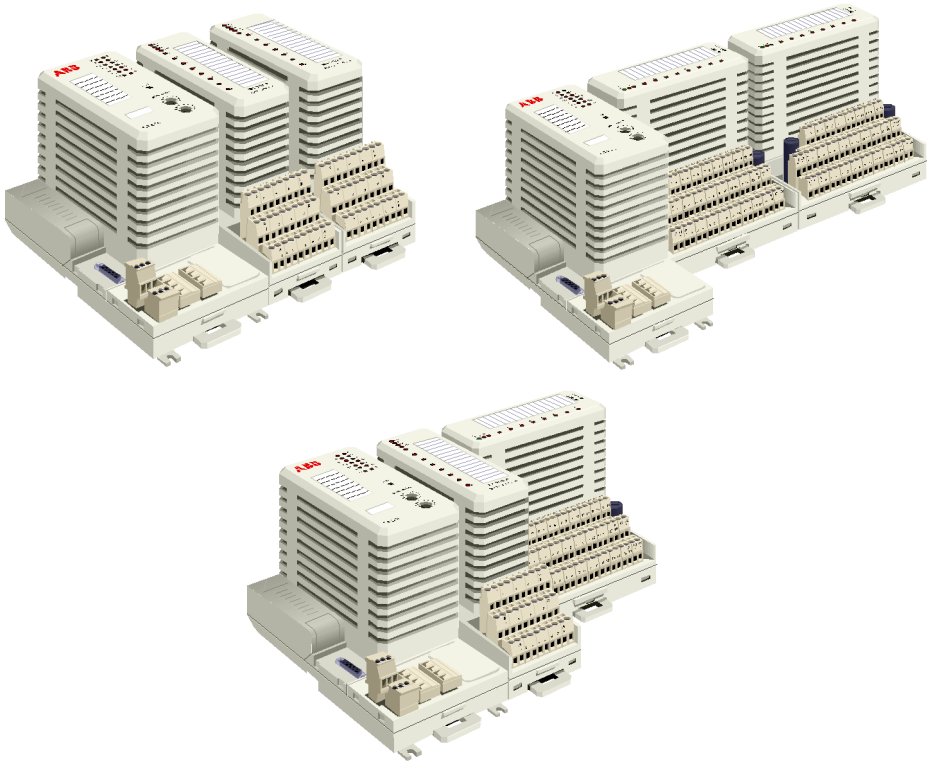

Figure 4. S800 I/O Station

S800 I/O Station

An S800 I/O station includes:

- 1 (or 2 if redundant) Fieldbus Communication Interface (FCI)
- up to 24 S800 I/O modules divided into
  - 1 base cluster
  - up to 7 additional I/O clusters, each one containing up to 12 I/O modules.

Base Cluster

A base cluster includes:

- 1 (or 2 if redundancy) Fieldbus Communication Interfaces (FCI)
- up to 12 S800 I/O modules or 6 pairs if redundant I/O.

I/O Cluster

An I/O cluster includes:

- 1 optical ModuleBus modem
- up to 12 S800 I/O modules.

I/O Modules

Any combination of I/O modules is possible, within the limits in Table 1.

Table 1. The max. I/O Configuration of S800 I/O Connected to Advant Fieldbus 100 and PROFIBUS.

Item	Max. No.
S800 I/O stations per Advant Fieldbus 100	79(1)
S800 I/O station per PROFIBUS	99
S800 I/O modules per station connected via AF100	24(2)
S800 I/O modules per station connected via PROFIBUS. Supported I/O modules types.	See Chapter 3, Technical Data and Performance

(1) If other than S800 I/O stations are used on the same Advant Fieldbus 100, the maximum number of S800 I/O stations must be reduced with a corresponding number of stations.
(2) Without Optical ModuleBus Expansion the maximum number is 12.

Functional Description

Product Configuration Examples

To give you some ideas about the use of S800I/O, this section includes some basic configuration examples.

PROFIBUS

An S800 I/O station can be connected to a PROFIBUS network using the Fieldbus Communication Interface (FCI) CI801/CI830/CI840.

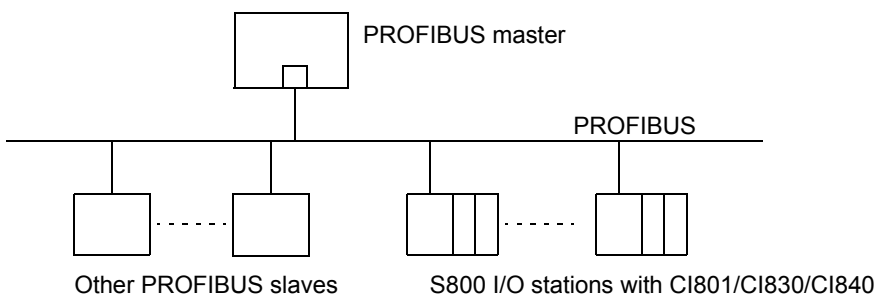

Figure 5. A PROFIBUS-DP Configuration Example

PROFIBUS with redundancy

Redundancy on PROFIBUS includes redundant cable and redundant Fieldbus Communication Interface CI840 and redundant I/O modules.

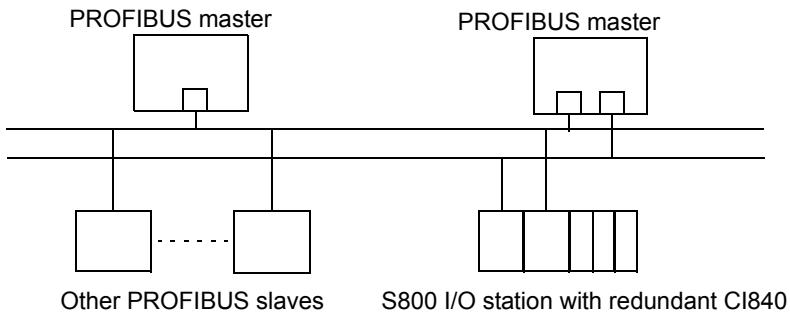

Figure 6. A PROFIBUS-DPV1 Configuration with Redundancy Example

Advant Fieldbus 100 with or without media redundancy

Media redundancy on Advant Fieldbus 100 includes redundant cable and redundant modems and the CI810 FCI.

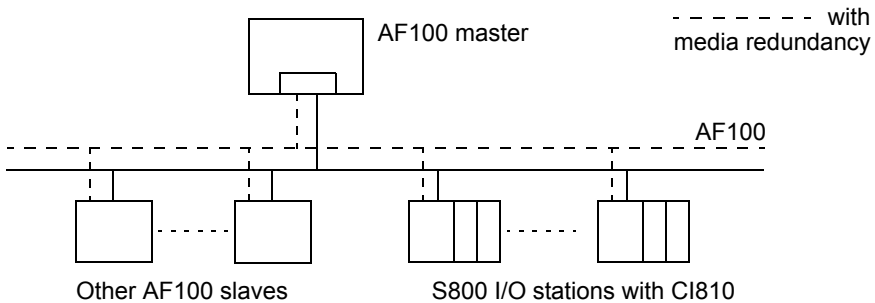

Figure 7. An AF100 Configuration with/without Media Redundancy Example

Advant Fieldbus 100 with redundancy

Redundancy on Advant Fieldbus 100 includes redundant cable and redundant modems and redundant CI820 FCI together with the interconnecting unit TB815.

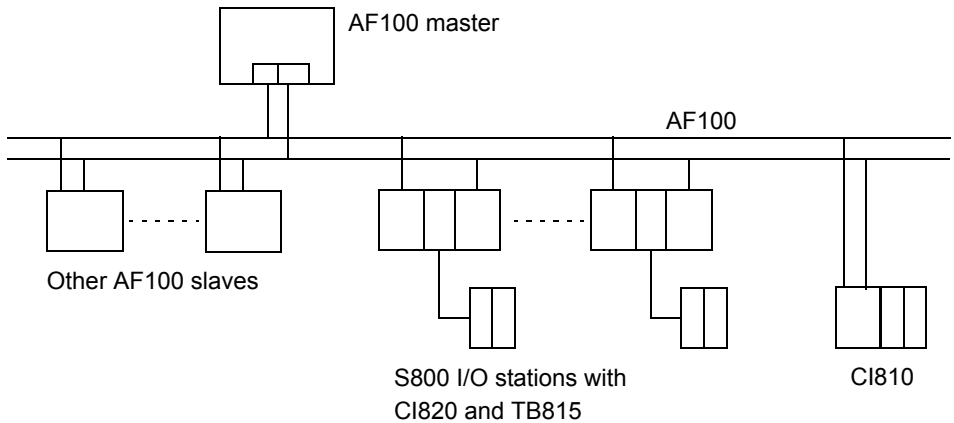

Figure 8. An AF100 Configuration with Redundancy Example

Communication

S800 I/O uses Advant Fieldbus 100 or PROFIBUS as an external communication interface and ModuleBus as an internal communication link between clusters and their I/O modules.

Advant Fieldbus 100

S800 I/O is connected to Advant Fieldbus 100 via twisted pair. When connected to Advant Fieldbus 100, the communication interface module and its S800 I/O modules are called an S800 I/O Station.

An S800 I/O station works as a slave for one parent controller. If several S800 I/O stations are connected to the same Advant Fieldbus 100 together with more than one controller, each S800 I/O station needs its own dedicated parent controller.
See Figure 9.

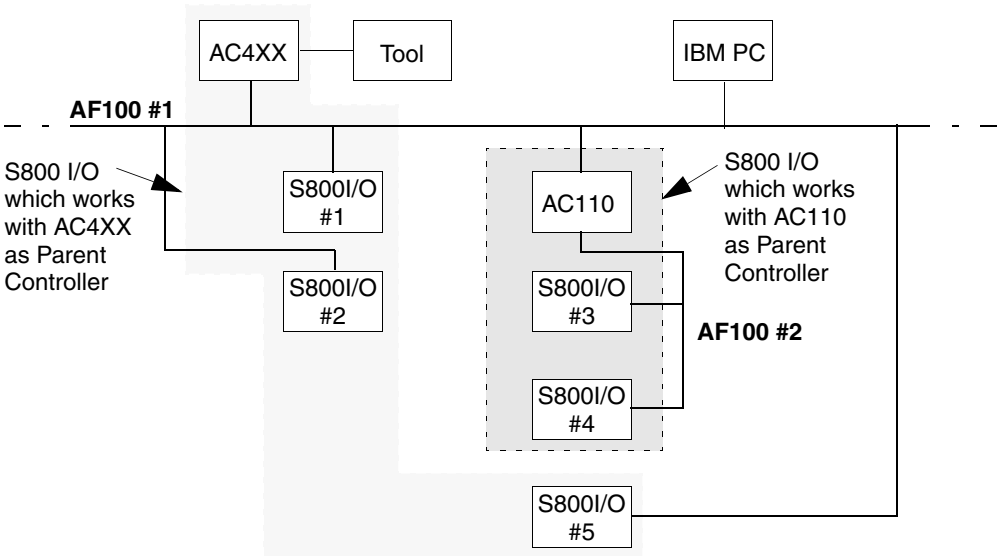

Figure 9. Connection to Advant Fieldbus 100

PROFIBUS

S800 I/O and a communication interface module can be directly connected to PROFIBUS-DP or PROFIBUS-DPV1 network.

When connected to PROFIBUS, the communication interface module and its S800 I/O modules are called a S800 I/O station.

An S800 I/O station works as a slave on PROFIBUS.

ModuleBus

A Fieldbus Communication Interface module communicates with its S800 I/O modules over the ModuleBus internally in the base cluster and externally with other additional clusters within the same S800 I/O station by using Optical ModuleBus modems TB820, TB840 or TB840A. The Optical ModuleBus modems are connected via optical cables to a ModuleBus Optical port module on the communication interface module.

The maximum length of the Optical ModuleBus expansion is dependent of the number of Optical ModuleBus modems and Optical Media Converter. The maximum length between two clusters are 15 m (49 ft.) with plastic fibre and 200 m (667 ft) with HCS glass fibre. When using Optical Media Converter the maximum length is 1000 m (3280 ft). Factory made optical cables (plastic fibre) are available in lengths of 1.5, 5 and 15 m (5, 16 or 49 ft).

Within a cluster, the electrical ModuleBus is made up of increments integrated into each MTU and S800L modules. Each communication interface module and Optical ModuleBus modem have a ModuleBus outlet connector to connect to an MTU or S800L module. An MTU and S800L module has a bus inlet and a bus outlet connector. By adding, an MTU or S800L module to a communication interface module or a Optical ModuleBus modem, the bus is automatically expanded, offering optional further expansion of MTUs or S800L modules to a maximum of 12 MTUs or S800L modules. The electrical ModuleBus can be divided up in sections by using Extension cables, Figure 33. The electrical ModuleBus must not exceed 2.5 m (100”). Unique position codes are automatically assigned to each MTU or S800L modules as the bus is expanded.

The Optional ModuleBus expansion can be built up in three ways:

- simplex (ring) communication configuration. See Figure 10.
- duplex communication configuration. See Figure 11.
- star configuration with the optical Media Converter. See Figure 12.

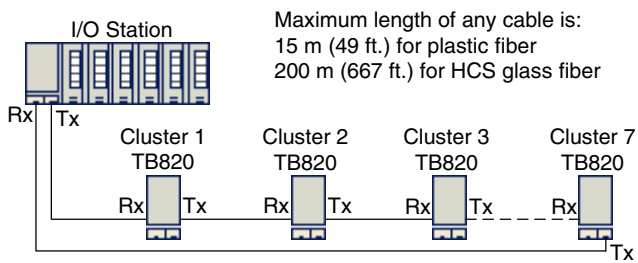

Figure 10. Optical ModuleBus and I/O Clusters, Simplex Communication

- Simplex provides a one-way ring connection from the FCI to the modem, to the second modem, etc., and back from the last modem to the FCI.

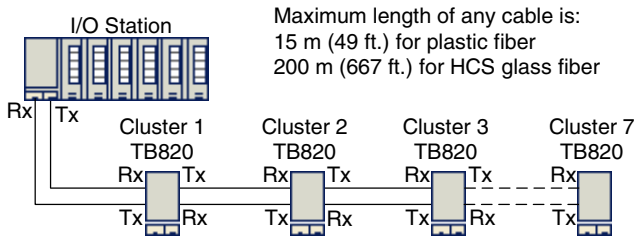

Figure 11. Optical ModuleBus and I/O Clusters, Duplex Communication

- Duplex provides a two-way connection, and is normally the best communication design.
- Duplex allows additional modems to be added down-stream on-line.
- A cable break or loss of a modem will only affect I/O Clusters down-stream of the failure.

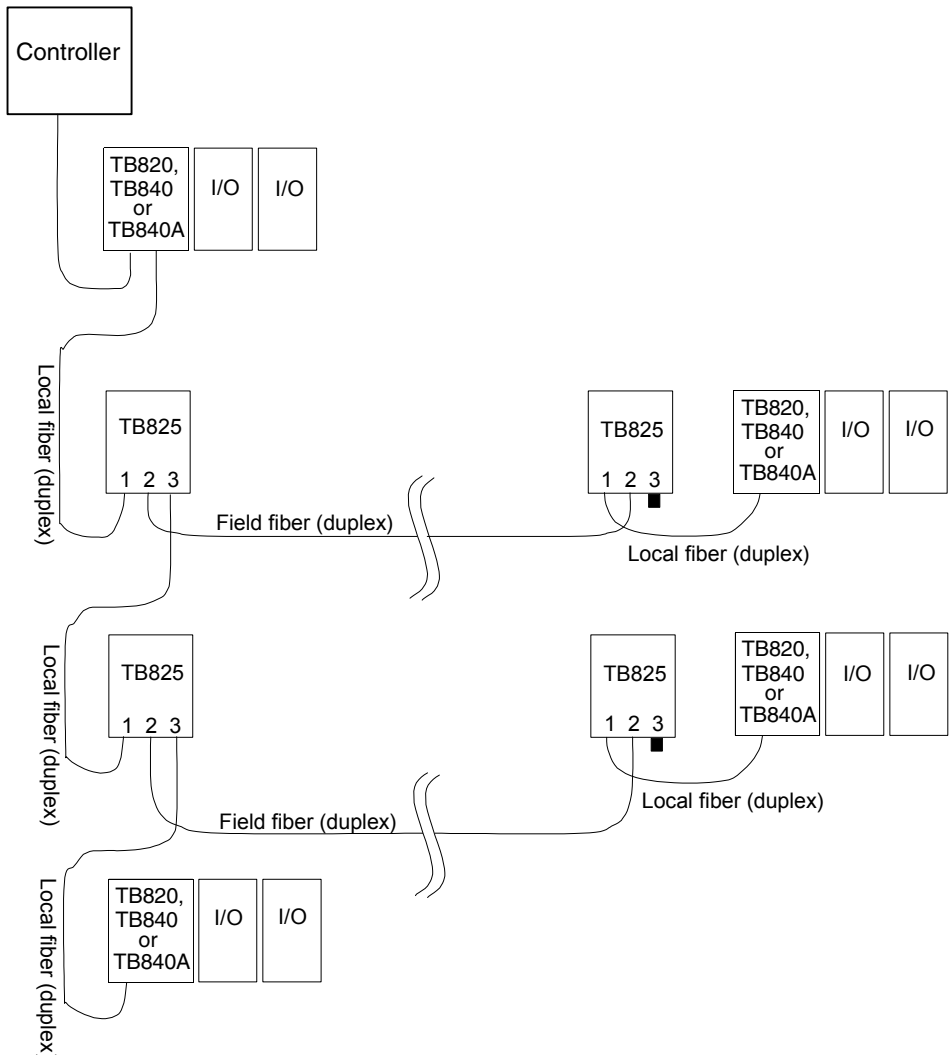

Figure 12. ModuleBus configuration with Optical Media Converter TB825

Fieldbus Communication Interface

A Fieldbus Communication Interface module is used as communication interface to connect S800 I/O modules to the fieldbus.

There are five different FCI modules:

- CI801 for PROFIBUS-DPV1
- CI810 for Advant Fieldbus 100, with or without media redundancy
- CI820 for Advant Fieldbus 100 fully redundant communication
- CI830 for PROFIBUS-DP
- CI840 for PROFIBUS-DPV1 fully redundant communication

They all have an isolated input for 24 V d.c. power (19.2 - 30 V). The power source can be the SD821/SD822/SD823 power supplies, battery, or other IEC664 Installation Category II power sources. Power status inputs, 2 x 24 V, to monitor 1:1 redundant mains are also provided.

CI801 has a 9 pin D-sub connector and modems for PROFIBUS-DPV1 and a connection for the Optical ModuleBus via TB806/TB842.

CI810 has two connectors and modems for a media redundant Advant Fieldbus 100 twisted pair cables and a connection for the Optical ModuleBus.

CI820, together with the interconnection unit TB815, is used when a fully redundant configuration is required. CI820 comprises the Advant Fieldbus 100 twisted pair connection and TB815 the Optical ModuleBus connection.

CI830 has a 9 pin D-sub connector and modems for PROFIBUS-DP and a connection for the Optical ModuleBus.

CI840 together with termination unit TU846/TU847 is used when a fully redundant configuration is required. CI840 is mounted on TU846/TU847 and has a connector for power supply and two 9 pin D-sub connectors for PROFIBUS-DPV1 connection. TU846/TU847 has two service ports and two address switches. CI840 also has a connection for the Optical ModuleBus via TB806/TB842 or TB846/TB842.

CI801 and CI840 supports Hot Configuration in Run (HCIR) and HART pass-through. HCIR makes it possible to change the I/O station configuration without stopping the I/O station execution.

The front plate of the communication modules provides LEDs for diagnostic and status indications. Two rotary switches are provided for setting of the I/O station address. No other addresses are required to be set within the I/O-station. Labels for optional user text and item number are also provided. The communication plugs can be inserted/removed without interrupting the communication between stations on the bus.

The type designation CI810 in this document includes all types of models CI810, CI810V1, CI810V2, CI810A and CI810B if no other information is given.

Table 2. Fieldbus Communication Interface

Module Type	Description
CI801	Fieldbus Communication Interface for PROFIBUS-DPV1. Support for Hot Configuration in Run and HART pass-through(1). PROFIBUS Modem for twisted pair cable. Power supply 24 V (19.2 - 30 V d.c.) Rated isolation voltage 50 V. Also in a G3 compliant version.
CI810	Single Advant Fieldbus 100 FCI. 2 x Advant Fieldbus 100 Modems for twisted pair cable. Power supply 24 V(19.2-30 V), Rated isolation voltage 50 V.
CI820	Advant Fieldbus 100 FCI for redundancy configuration. Advant Fieldbus 100 modem for twisted pair cable. Power supply 24 V (19.2-30 V), Rated isolation voltage 50 V.
CI830	Fieldbus Communication Interface for PROFIBUS-DP. PROFIBUS Modem for twisted pair cable. Power supply 24 V (19.2 - 30 V d.c.) Rated isolation voltage 50 V.

Table 2. Fieldbus Communication Interface (Continued)

Module Type	Description
CI840	Fieldbus Communication Interface for PROFIBUS-DPV1 for redundancy configuration. Support for Hot Configuration in Run and HART pass-through(1). PROFIBUS Modem for twisted pair cable. Power supply 24 V (19.2 - 30 V d.c.) Rated isolation voltage 50 V. Also in a G3 compliant version (CI840Z).
TB815	Interconnection unit used with CI820.
TU846	Module Termination Unit for dual CI840, redundant I/O.
TU847	Module Termination Unit for dual CI840, non redundant I/O. Also in a G3 compliant version (TU847Z).

(1) Always check the controller documentation for information about supported functionality.

Module Termination

The MTUs are totally passive units and all active circuitry is allocated to the I/O module containing process connections and ModuleBus part. Please, see Module Termination Unit on page 65, for further information.

Table 3. S800M I/O Termination Units

Module Type	Description
TU805	Terminal Unit, 2*18 terminals, 50 V. Used to enable 2 - and 3-wire connections on DI801 and DO801. The Terminal Unit is mounted direct on DI801 or DO801.
TU810	Compact MTU, 3*8 + 2*3 terminals, 50 V. Typically used with 24/48 V d.c binary and -20 - +20 mA analog modules for minimum DIN-rail space. Also in a G3 compliant version (TU810Z).
TU811	Compact MTU, 2*8 terminals, 250 V. Typically used with 120/230 V d.c/a.c binary modules or relay outputs for minimum DIN-rail space. Also in a G3 compliant version (TU811Z).
TU812	Compact MTU, 25 pin D-sub Connector for field connection, 50 V (1). Typically used with 24/48 V d.c binary and -20 - +20 mA analog modules providing easy and fast installation with pre-fabricated cables.
TU813	Compact MTU, Crimp Snap-in Connector for field connection, 250 V (2). Typically used with 120/230 V d.c/a.c. binary modules. The Crimp Snap-in connector type makes it possible to mix parts from different cables into the same MTU and pre-fabricate the cabling.
TU814	Compact MTU, Crimp Snap-in Connector for field connection, 50 V (3). Typically used with 24/48 V d.c binary and -20 - +20 mA analog modules. The Crimp Snap-in connector type makes it possible to mix parts from different cables into the same MTU and pre-fabricate the cabling.
TU830	Extended MTU, 3*16 + 2*4 terminals, 50 V. Typically used with 24/48 V d.c binary and -20 - +20 mA analog modules. Provides terminals for field power distribution.

Table 3. S800M I/O Termination Units (Continued)

Module Type	Description
TU831	Extended MTU, 8*2 terminals, 250 V. Typically used with 120/230 V d.c/a.c binary modules. Provides terminals for field power distribution.
TU833	Extended MTU, 3*16 + 2*4 spring-case terminals, 50 V. Typically used with 24/48 V d.c binary and -20 - +20 mA analog modules. Provides terminals for field power distribution.
TU834	Extended MTU, 2x16 terminals, 50 V, 8 channels with individual shunt sticks
TU835	Extended MTU, 4*2 groups + 2*4 power terminals, 50 V, individually fused per channel. Channel wise fused transducer power outlets. Usable for 2-wire transmitters.
TU836	Extended MTU, 2*4 groups + 2*6 power terminals, 250 V, individually fused per channel. For loads where the power supply always is taken from the MTU.
TU837	Extended MTU, 2*4 groups + 2*6 power return terminals, 250 V, fused. For loads where the power supply always is taken from the MTU or without the power supply per channel.
TU838	Extended MTU, 2*4 groups + 2*4 power return terminals, 50 V, fused. AI: Each channel includes terminals for current and voltage, fused power outlet and signal return. Usable for 2-, 3- and 4-wire transmitters. DI: Each channel includes terminals for 16 signals, 16 signal returns and 16 power outlets. The power outlets are wired in pairs. Each pair has a common fuse.
TU842	Redundant horizontal MTU, 3*16 + 2*4 terminals, 50 V for redundant I/O modules
TU843	Redundant vertical MTU, 3*16 + 2*4 terminals, 50 V for redundant I/O modules
TU844	Redundant horizontal MTU, 2*16 + 2*4 terminals, 50 V for redundant I/O modules. 8 positions for shuntsticks for current or voltage signals.

Table 3. S800M I/O Termination Units (Continued)

Module Type	Description
TU845	Redundant vertical MTU, 2*16 + 2*4 terminals, 50 V for redundant I/O modules. 8 positions for shuntsticks for current or voltage signals.
TU890	Compact MTU, I.S. applications, 50 V. For use with I/O modules with Intrinsic Safety interfaces.
TU891	Compact MTU, Non I.S. applications, 50 V. For use with I/O modules with Intrinsic Safety interfaces in non-Intrinsic Safety applications. Also in a G3 compliant version (TU891Z).
TY801K01	Set of 8 pcs. of shunt sticks for current or voltage signals together with AI845 or AI880/AI880A and TU844 or TU845.
TY804K01	Set of 8 pcs. of shunt sticks for NAMUR signals together with DP840 and TU844 or TU845.
Mounting Kit	Used for horizontal mounting of CI801, CI840 and TB840 on a vertical DIN-rail.
Horizontal Mounting Profile	Mounting profile with one DIN-rail and one cable duct.

(1) Connector is not enclosed.
(2) The three cable plugs are enclosed, see Table 4.
(3) Connector is not enclosed. Three connectors are needed, see Table 4.

Table 4. Cable Connectors for TU813 and TU814, Supplied by Phoenix Contact

Part	No	Name
Cable plug TU813	1809792	MSTBC 2.5/8-STZF-5.08
Cable plug TU814	1808890	MSTBC 2.5/10-ST-5.08

Table 4. Cable Connectors for TU813 and TU814, Supplied by Phoenix Contact (Continued)

Part	No	Name
Crimp snap in connector	1879531	MSTBC-MT 0.2-0.5
	3190564	MSTBC-MT 0.5-1.0
	3190551	MSTBC-MT 1.5-2.5
Crimping tool	1204038	CRIMPFOX MT 2.5
Remove insulation tool	1204384	QUICK WIREFOX 6

ModuleBus Items

The ModuleBus supports up to 8 cluster, one base cluster and up to 7 I/O cluster, connected to each other via optical cables, Optical ModuleBus modems and a ModuleBus Optical port module. MTUs and S800L I/O modules can within a cluster be set up in two or three groups with extension cable adaptors fitting the bus outlet and inlet connectors of communication interface, MTUs and S800L modules. At the last MTU' or S800L modules bus outlet a terminator module, TB807, must be inserted.

Table 5. ModuleBus Items

Module Type	Description
TB810	ModuleBus Optical port with 10 Mbit driver for ModuleBus Optical expansion used together with S800I/O and Drive equipment Option to the communication interface. Used together with CI810, CI820 and CI830.
TB811	ModuleBus Optical port with 5 Mbit driver for ModuleBus Optical expansion used together with Drive equipment Option to the communication interface. Used together with CI810, CI820 and CI830.

Table 5. ModuleBus Items (Continued)

Module Type	Description
TB820	Optical ModuleBus modem. Optical and electrical ModuleBus interface. Power supply 24 V (19.2-30 V), Rated isolation voltage 50 V.
TB825	ModuleBus Optical media converter, converts between plastic opto fiber or HCS fiber with Versatile link connectors and glass optical fiber with ST connectors.
TB840	Optical ModuleBus modem for redundant configuration. Optical and electrical ModuleBus interface. Power supply 24 V (19.2-30 V), Rated isolation voltage 50 V.
TB842	ModuleBus Optical port with 10 Mbit driver for ModuleBus Optical expansion used together with S800I/O and Drive equipment Option to the communication interface. Used together with CI840.
TB845	Bus Outlet. ModuleBus extent. cable adaptor D-sub 25, female. For dual ModuleBus.
TB846	Bus Inlet. ModuleBus extent. cable adaptor D-sub 25, male. For dual ModuleBus or carrier for TB842.
TK811V015	Optical ModuleBus expansion cable with connectors, duplex cable plastic fibre1.5 m (4.9 ft.)
TK811V050	Optical ModuleBus expansion cable with connectors, duplex cable plastic fibre 5 m (16.4 ft.)
TK811V150	Optical ModuleBus expansion cable with connectors, duplex cable plastic fibre 15 m (49.2 ft.)
TK812V015	Optical ModuleBus expansion cable with connectors, Optical simplex cable plastic fibre, 1.5 m (4.9 ft.)
TK812V050	Optical ModuleBus expansion cable with connectors, Optical simplex cable plastic fibre, 5 m (16.4 ft.)
TK812V150	Optical ModuleBus expansion cable with connectors, Optical simplex cable plastic fibre, 15 m (492 ft.)

Table 5. ModuleBus Items (Continued)

Module Type	Description
TB805	Bus Outlet. ModuleBus extent, cable adaptor D-sub 25, female. For single ModuleBus. Also in a G3 compliant version (TB805Z).
TB806	Bus Inlet. ModuleBus extent. cable adaptor D-sub 25, male. For single ModuleBus or carrier for TB842. Also in a G3 compliant version (TB806Z).
TB807	ModuleBus terminator. One each per base and I/O cluster. G3 compliant.
TK801V003	ModuleBus extension cable. Shielded Cable 0.3m (1.0 ft.), D-sub 25, male, female. G3 compliant.
TK801V006	ModuleBus extension cable Shielded cable 0.6m (2.0 ft.) D-sub 25, male, female. G3 compliant.
TK801V012	ModuleBus extension cable Shielded cable 1.2m (4.0 ft.) D-sub 25, male, female. G3 compliant.
TU807	Module Termination Unit for single TB840/TB840A.
TU840	Module Termination Unit for redundant TB840/TB840A, redundant I/O.
TU841	Module Termination Unit for redundant TB840/TB840A, non-redundant I/O.
TU848	Module Termination Unit for redundant TB840/TB840A, redundant I/O and individual power supply connections.
TU849	Module Termination Unit for redundant TB840/TB840A, non-redundant I/O and individual power supply connections.

Optical ModuleBus expansion cables with other length and performance, see Opto Connectors and Cables on page 86.

I/O Modules

S800 I/O system provides a variety of I/O modules, covering analog and digital signals of various types, and interfaces for RTDs and TCs of various types.

For positioning applications using incremental encoders, a special interface unit is available comprising a complete positioning loop.

The S800 I/O system provides I/O modules with typically 2-16 channels depending on type and ratings of the individual module.

All I/O modules are supervised at system start-up as well as under normal operation. The status of an S800 I/O module is indicated with front mounted LEDs; RUN (R), green, normal operation, FAULT (F), red, when a fault is detected, WARNING (W), yellow, when a channel fault is detected and OUTPUT SET AS PREDETERMINED (O), yellow, when the module has lost communication (for output modules). S800L I/O modules only have one STATUS (S) LED showing RUN (green) and FAULT (red). All S800 I/O modules (except S800L) can be replaced with both system power and field power connected.

Digital I/O Modules

The digital I/O modules all have galvanic isolation relative to chassis ground. All modules have LEDs to indicate channel status (on/off) and the standard set of module status indicators. Some output modules and modules with Intrinsic Safety interfaces have indication for the channel error status.

The S800 I/O modules 24/48 V d.c. have channels isolated in groups. Each group has a field power status input to indicate presence of field power. Loss of field power is indicated on Warning LED, module status set to warning and channel status set to error.

The 120/250 V a.c. or d.c. modules have individually isolated channels. The input module can be configured to monitor field power status.

S800L I/O modules 24 V d.c. have one isolated group with 16 channels. Used together with TU805 enable 2-and 3-wires connections. The input modules can be configured to monitor field power status. Loss of field power will set module status to warning and channel status to error.

Outputs do not need external inductive load suppression components.

Table 6. S800 Digital Modules

Module Type	Type(1)	Description	Suitable MTU
DI801	L	Digital Input 24 V d.c., 1*16 channels (2) Rated isolation voltage 50 V	(3)
DI802	L	Digital input 120 V a.c., 110 V d.c. 8*1 channels Rated isolation voltage 250 V	
DI803	L	Digital input 230 V a.c., 220 V d.c. 8*1 channels Rated isolation voltage 250 V	
DI810		Digital Input 24 V d.c., 2*8 channels (4) Rated isolation voltage 50 V Also in a G3 compliant version (DI810Z).	TU810 TU812 TU814 TU830 TU833 TU838
DI811		Digital Input 48 V d.c., 2*8 channels (3) Rated isolation voltage 50 V	TU810 TU812 TU814 TU830 TU833 TU838
DI814		Digital Input 24 V d.c. 2*8 channels(4), current source. Rated isolation voltage 50 V	TU810 TU812 TU814 TU830 TU833 TU838
DI820		Digital Input 120 V a.c., 110 V d.c., 8*1 channels Rated isolation voltage 250 V. Also in a G3 compliant version (DI820Z).	TU811 TU813 TU831

Table 6. S800 Digital Modules (Continued)

Module Type	Type(1)	Description	Suitable MTU
DI821		Digital Input 230 V a.c., 220 V d.c., 8*1 channels Rated isolation voltage 250 V. Also in a G3 compliant version (DI821Z).	TU811 TU813 TU831
DI825		Digital Input 8*1 galvanic isolated channels, 125 V d.c. with sequence of event (SOE) handling.	TU811 TU813 TU831
DI830		Digital Input 24 V d.c. 2*8 channels SOE handling. Rated isolation voltage 50 V	TU810 TU812 TU814 TU830 TU833 TU838
DI831		Digital Input 48 V d.c. 2*8 channels SOE handling. Rated isolation voltage 50 V	TU810 TU812 TU814 TU830 TU833 TU838
DI840		Digital Input 24 V 1*16 channels SOE handling. Rated isolation voltage 50 V. Advanced on-board diagnostics. For single and redundant applications.	Redundant: TU842 TU843 Single: as DI830
DI880(5)		High Integrity Digital Input 24 V d.c. 1*16 channels For single and redundant applications.	See DI840
DI885		Digital Input 24/48 V d.c.1*8 channels open-circuit monitoring, SOE handling. Rated isolation voltage 50 V	TU810 TU812 TU814 TU830 TU833

Table 6. S800 Digital Modules (Continued)

Module Type	Type(1)	Description	Suitable MTU
DI890		Digital Input, I.S. interface, 8*1 channels Galvanic isolation between channels. Rated isolation voltage 50 V.	TU890 TU891
DO801	L	Digital Output 24 V d.c. 0.5 A protected, 1*16 channels(2) Rated isolation voltage 50 V	(3)
DO802	L	Digital Output Relay 8*1 channels, 24-230 V a.c./110 V d.c. 2 A cos $\varphi > 0,4$ d.c. < 60 W. Varistor protected Rated isolation voltage 250 V.	
DO810		Digital Output 24 V d.c. 0.5 A protected, 2*8 channels(4) Rated isolation voltage 50 V. Also in a G3 compliant version (DO810Z).	TU810 TU812 TU814 TU830 TU833
DO814		Digital Output 24 V d.c. 0.5 A protected, 2*8 channels(4), current sink Rated isolation voltage 50 V	TU810 TU812 TU814 TU830 TU833
DO815		Digital Output 24 V d.c. 2 A protected, 2*4 channels. Rated isolation voltage 50 V. Also in a G3 compliant version (DO815Z).	TU810 TU812 TU814 TU830 TU833
DO820		Digital Output Relay 8*1 channels 24-230 V a.c. 3 A cos $\varphi > 0.4$ d.c. < 42W. Varistor protected Rated isolation voltage 250 V. Also in a G3 compliant version (DO820Z).	TU811 TU813 TU831 TU836 TU837

Table 6. S800 Digital Modules (Continued)

Module Type	Type(1)	Description	Suitable MTU
DO821		Digital Output Relay 8*1 normally closed channels 24-230 V a.c./d.c. 3 A cos φ > 0.5 d.c. < 42 W Varistor protected Rated isolation voltage 250 V	TU811 TU813 TU831 TU836 TU837
DO840		Digital Output 24 V d.c. 0.5 A protected, 2*8 channels Rated isolation voltage 50 V. Advanced on-board diagnostics. For single and redundant applications.	Redundant: TU842 TU843 Single: as DO810
DO880(5)		High Integrity Digital Output 24 V d.c. 1*16 channels For single and redundant applications.	See DO840
DO890		Digital Output 11 V 40 mA, I.S. interface, 4*1 channels Galvanic isolation between channels Rated isolation voltage 50 V	TU890 TU891

Table 6. S800 Digital Modules (Continued)

Module Type	Type(1)	Description	Suitable MTU
DP820		Pulse Counter 2 channels Pulse count and frequency measurement 1.5 MHz 2* inputs and 1* outputs for gated counting, counter synchronization and open loop positioning Rated isolation voltage 50 V.	TU810 TU812 TU814 TU830 TU833
DP840		Pulse Counter 8 channels Pulse count or frequency measurement 20 kHz. Interface for NAMUR, 12 V and 24 V. The input can be read as digital input signals. For single and redundant applications. Rated isolation voltage 50 V. Also in a G3 compliant version (DP840Z).	TU810 TU812 TU814 TU830 TU833 TU842 TU843 TU844 TU845

(1) Type L = S800L I/O
(2) 1*16, equals 1 groups of 16 channels
(3) With TU805 enables 2- and 3-wires connections.
(4) 2*8, equals 2 groups of 8 channels
(5) Only to be used with AC 800M controller PM865 on ModuleBus.

Analog I/O Modules

All the analog I/O modules have galvanic isolation relative to chassis ground in a group of 4 or 8 channels. Some of the modules also has isolation between channels. The modules have the standard set of module status indicators.

Open circuit detection is available for inputs and outputs configured for 4…20 mA and for the RTD and TC inputs.

Table 7. S800 Analog Modules

Module Type	Type(1)	Description	Suitable MTU
AI801	L	Analog Input 1*8 channels. 0…20 mA, 4...20 mA, 12 bit., 0.1% Current shunt resistor 250 Ω is protected to 30 V. Rated isolation voltage 50 V.	-
AI810		Analog Input 1*8 channels. 0…20 mA, 4...20 mA, 0…10 V, 2...10 V, 12 bit., 0.1% Current shunt resistor 250 Ω is protected to 30 V. Rated isolation voltage 50 V.	TU810 TU812 TU814 TU830 TU833 TU835 TU838
AI820		Analog Input differential 1*4 channels. -20…20 mA, 0...20 mA, 4...20 mA, -5...5 V, 0...5 V, 1...5 V, -10…10 V, 0...10 V, 2...10 V, 14 bit + sign, 0.1%, CMV 50 V. Current shunt resistor 250 Ω is protected to 30 V. Rated isolation voltage 50 V	TU810 TU812 TU814 TU830 TU833
AI825		Analog Input 4*1 channels for applications requiring galvanic isolated channels, -20...20 mA, 0(4)...20 mA, -10...10V, 0(2)...10 V	TU811 TU813 TU831

Table 7. S800 Analog Modules (Continued)

Module Type	Type(1)	Description	Suitable MTU
AI830/ AI830A		Analog Input 1*8 ch, Pt100 (-80...80°C, -200...250°C, -200...850°C), Ni100 (-60...180°C), Ni120 (-80...260°C), Cu10 (-100...260°C) Resistor (0...400 Ω), 14 bit. Pt100 according to IEC751 ITPS-68, IEC ITP-90, US Ind Std, US lab Std, JIS C 1604:1981 and JIS C 1604:1997 Ni100 according to DIN 43760 Ni120 according to MIL-T-24388C Cu10 according to TCR 0.00427 Rated isolation voltage 50 V.	TU810 TU812 TU814 TU830 TU833
AI835		Analog Input 1*8 ch Thermocouple (TC), type B (0...1820°C), type C (0...2300°C), type E (-270...1000°C), type J (-210...1200°C), type K (-270...1372°C), type N (-270...1300°C), type R (-50...1768°C), type S (-50...1768°C), type T (-270...400°C), linear -30...75 mV, 14 bit. Rated isolation voltage 50 V.	TU810 TU812 TU814 TU830 TU833
AI843		Analog Input 1*8 ch Thermocouple (TC), -30 mV to 75 mV linear, or TC types B, C, E, J, K, L, N, R, S, T, and U, 16 bit. Rated isolation voltage 50 V Advanced on-board diagnostics. For single and redundant applications.	TU830 TU833 TU842 TU843
AI845		Analog Input 1*8 channels. 0...20 mA, 4...20 mA, 0...5 V, 1...5 V, 12 bit, 0,1%. HART interface. Rated isolation voltage 50 V. Advanced on-board diagnostics. For single and redundant applications.	Redundant: TU844 TU845 Single: as AI810

Table 7. S800 Analog Modules (Continued)

Module Type	Type(1)	Description	Suitable MTU
AI880/ AI880A(2)		High Integrity Analog Input 1*8 channels. 0...20 mA, 4...20 mA For single and redundant applications. AI880A has support for HART pass-through communication. Complies with the NAMUR recommendation NE43.	TU834 TU844 TU845
AI890		Analog Input 1*8 channels. 0…20 mA, 4...20 mA, 12 bit, 0.1% I.S. interface. Rated isolation voltage 50 V	TU890 TU891
AI893		Analog Input 1*8 channels for 2- or 3-wire RTD and Thermocouple RTD: Pt..., Ni..., Cu... and linear TC: B, C, D, E, J, K, L, N, R, S, T, U and linear 15 bit + sign, I.S. interface Rated isolation voltage 50 V. G3 compliant.	TU890 TU891
AI895		Analog Input 1*8 channels. 4...20 mA, 12 bit, 0.1% I.S. and HART interface. Rated isolation voltage 50 V. G3 compliant.	TU890 TU891
AO801	L	Analog Output 1*8 channels, 0…20 mA, 4...20 mA, 12 bit, 0.1%. RL maximum 850 Ohms. Rated isolation voltage 50 V.	-
AO810/ AO810V2		Analog Output 1*8 channels, 0…20 mA, 4...20 mA, 14 bit, 0.1%. RL maximum 500/850 Ohms. Rated isolation voltage 50 V.	TU810 TU812 TU814 TU830 TU833

Table 7. S800 Analog Modules (Continued)

Module Type	Type(1)	Description	Suitable MTU
AO820		Analog Output 4*1 channels, -20…20 mA, 0...20 mA, 4...20 mA, -10…10 V, 0...10 V, 2...10 V, 12 bit + sign, 0.1%, individually isolated. Current output RL maximum 550 Ohms. Voltage output RL minimum 2 kohms. Rated isolation voltage 50 V.	TU810 TU812 TU814 TU830 TU833
AO845/ AO845A		Analog Output 1*8 channels. 4...20 mA, 12 bit, 0,1%. HART interface, RL maximum 750 Ohms. Rated isolation voltage 50 V. Advanced on-board diagnostics. For single and redundant applications.	Redundant: TU842 TU843 Single: as AO810/ AO810V2
AO890		Analog Output 1*8 channels. 0…20 mA, 4...20 mA, 12 bit, 0.1% I.S. interface, RL maximum 750 Ohms. Rated isolation voltage 50 V	TU890 TU891
AO895		Analog Output 1*8 channels. 4...20 mA, 12 bit, 0.1% I.S.and HART interface, RL maximum 750 Ohms. Rated isolation voltage 50 V. G3 compliant.	TU890 TU891

(1) Type L = S800L I/O
(2) Only to be used with AC 800M controller PM865 on ModuleBus.

Drives Integration

ABB Standard and Engineered drives can be connected to the S800 I/O system. The FCI works as a communication link between the fieldbus master and the drives. No application software concerning this functionality is stored in the FCI. Check the available support for each FCI type.

The following drives are considered to be standard drives:

- ACS400 with standard drive
- ACS600/800 with standard application
- ACS600/800 with crane application
- ACS600/800 with pump and fan application (PFC)
- DCS400/500 with standard drive
- DCS600 with crane application

The following drives are considered to be engineered drives:

- ACS600/800 with system application
- ACS600/800 with system application (PMSM)
- ACS600/800 IGBT with supply (ISU) application
- ACS600/800 with Multi Block Programming application ABxR7xxx
- ACS800 with crane application
- ACS800 Rolling Mill Application (RMO) A4xR7xxx
- ACS800LC DSU with diode supply unit applications
- ACS6000C with cyclo converter drive
- ACS6000SD with synchronous drive
- ACS6000AD with asynchronous drive
- ACS1000 with standard drive
- DCS600 with system application
- DCS600 with crane application

Product Benefits

By integrating drives and the control system, full advantage can be taken to added functions. Process data are measured with improved accuracy for even more exact process control, while the ready made information permits a total overview of the drives in the process.

Features

The ABB drives integration includes features such as:

- Fieldbus solutions which results in lower wiring costs.
- Optical transmission between FCI and drives allows installations in an electrical disturbed environment.
- Faults in drives available as alarms and in diagnostic displays reduces trouble shooting and maintenance costs.
- Warnings from drives available as events and in diagnostic displays allows the operator to determine when preventive service is needed.
- Predefined type circuit solutions reduces project engineering and commissioning.

The connection is made directly to the drives system through an optical ring or a star by using a Distributed Branching Unit. One important aspect is the simplicity in the connection. No extra hardware is needed in any of the devices, that is, the functions are included in the basic products, minimizing communication delays and cost.

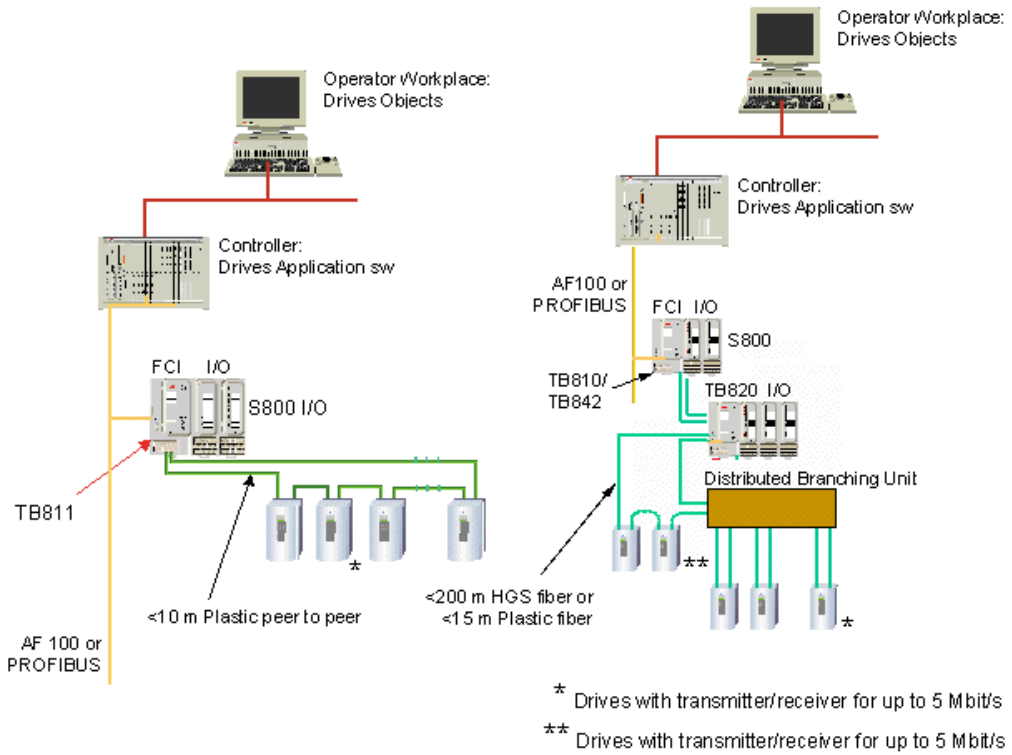

Figure 13. Examples of Drives Integration

Information from the drives:

Process values are sent as cyclic data, with an updating frequency decided by the application engineer. The data enables the control system to have access to basic information such as speed, current, torque and diagnostic information.

Information from the fieldbus master:

A setpoint for speed or torque in percentage or absolute values can be sent. It is also possible to give commands to the drive, for example, start, stop and fault reset.

TB810 and TB842 are equipped with a transmitter/receiver for up to 10 Mbit/s and TB811 for up to 5 Mbit/s. A ModuleBus must have the same type of transmitter/receiver on each node.

Support for connections to instruments in Hazardous Areas

S800 I/O provide two possibilities to connections of instruments in Hazardous areas, both integrated with special I/O modules and with support for external Intrinsic Safety systems.

The S800 I/O includes I/O modules and MTU with Intrinsic Safety interfaces, namely AI890, AI893, AI895, AO890, AO895, DI890, DO890 and TU890. The interfaces are classified Ex ia, Group IIC and the modules are ATEX certified.

Correct and safe operation of the Intrinsic Safety aspects of MTU and I/O Modules with Intrinsic Safety interfaces calls for expert installation and commissioning as well as correct operation and meticulous maintenance. Only those persons conversant with the installation commissioning, operation and maintenance of similar apparatus and who has the necessary qualifications should work on these products.

Make sure installation is carried out observing the safety regulations pertaining to the installation and operation of electrical systems and the directives and guidelines on explosion protection (Hazardous Area equipment should comply with the descriptive system document).

The set of I/O modules and MTUs **are not** intended for hazardous area installation unless it is included in a suitable enclosure which conforms to the applicable standards. To mount the equipment in a Zone2 hazardous area then an enclosure or cabinet which provides ingress protection of IP54 rating is required.

For I.S. applications, the maximum limit for AC power supply is 250 V_{rms} and the user must ensure that the DC power supply to the FCI and I/O is limited to 60 V.

Support for Externally Connected Accessories

Connection to External Intrinsic Safety System

Intrinsic Safety System from Pepperl+Fuchs Elcon (manufacturer outside ABB) is supported via S800 I/O modules and a special MTU.

Supported Intrinsic Safety System is the HiD Series 2000.

The S800 I/O modules are connected via MTU TU812, a standard cable from Pepperl+Fuchs Elcon and a specific adapter board, one for each I/O module types according to Table 8. Standards cables 0.2 m (0.66 ft) and 1.3 m (4.3 ft). Max cable length 100 m (109 yd).

Table 8. Supported Modules and Intrinsic Safety Components

ABB delivery		Pepperl+Fuchs Elcon delivery		
S800 I/O module	**Terminal unit**	**Termination and adaptor board**	**Intrinsic Safety modules**	**Note**
AI810	TU812	2108/HAT/ABB-AI-H-01	2026, 2030, 2062, 2072	Dual channel modules
		2108/HAKE/ABB-AI-H-01(1)	2026, 2030 using passive connection	Dual channel modules
AO810/ AO810V2	TU812	2108/HAT/ABB-AO-H-01	2032, 2034, 2038	Dual channel modules
		2108/HAKE/ABB-AO-H-01(1)	2032, 2034, 2038	Dual channel modules
DI810	TU812	2108/HAT/ABB-DI-01	2824, 2844	Quad channel modules
DO810	TU812	2108/HAT/ABB-DO-01	2872, 2874, 2876, 2878	Dual channel modules
		2108/HAKE/ABB-DO-H-01(1)	2872, 2874, 2876, 2878	Dual channel modules

(1) Loop-disconnected terminals

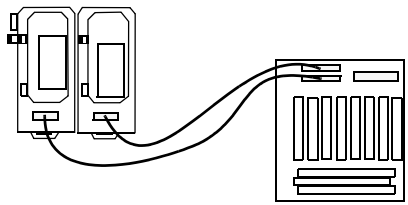

Figure 14. Example of Connection between S800 I/O and Intrinsic Safety System from Pepperl+Fuchs Elcon

Pepperl+Fuchs Elcon can provide a HART protocol connection to I/O modules integrated with the Intrinsic Safety system using the MUX 2700 Remote Board for HART.

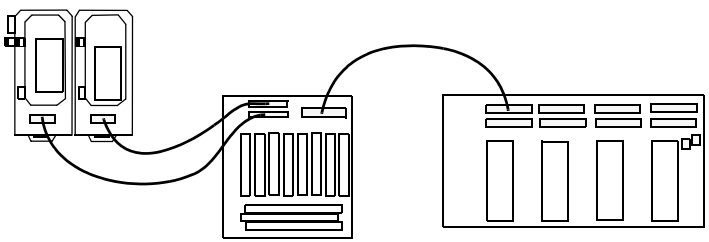

Figure 15. Example of Connection between S800 I/O and Intrinsic Safety System and HART Protocol Connection

Connection to ABB Entrelec Interfast Pre-wiring Solutions

ABB Entrelec offers solutions for fast termination solutions with pre-wired cables and an assortment of terminations and signal adaptions. This offer connects to S800 I/O via the TU812 termination unit which provides a D-sub connector. Multipurpose cables are also available. Further information is available in the ABB Entrelec catalog "Pre-wiring system for PLC's, Interfast", 1SNC127001C0206.

Connection to Phoenix Contact Varioface solutions

Phoenix Contact offers solutions for fast termination solutions with pre-wired cables and an assortment of terminations and signal adaptions. This offer connects to S800 I/O via the TU812 termination unit which provides a D-sub connector. Further information is available when following the link www.s800connection.com.

Support for HART Communication

S800 I/O provides possibilities to communicate via HART protocol with HART Field Devices via PROFIBUS-DPV1 using CI840 or CI801 or AF100 using CI810 or CI820. There are four I/O modules that have HART interface, AI845, AO845, AO845A, AI895 and AO895.

For HART connection via external HART MUX, see Support for connections to instruments in Hazardous Areas on page 57.

S800 I/O provides the possibilities for HART communication, but the user function is defined by the system (operator stations and controllers) S800 I/O is included in. Always read the relevant system documentation for information about the supported features and needed components of S800 I/O.

On PROFIBUS, an Extended HART mode gives a possibility to pass-through long HART data frames up to 227 bytes. This will reduce the possible amount of I/O modules per station. The longest HART data frame without the Extended HART mode is 64 bytes.

Support for Safety System Requirements

The High Integrity I/O is certified for EN 61508-SIL3, DIN V 19250/DIN V VDE 0801-AK6 and EN954-1 Category 4. The High Integrity I/O has to be used together with a certified controller to comply with the standards. There are three modules that belong to the High Integrity I/O family that are certified for these standards, AI880/AI880A, DI880 and DO880. The modules are supported by the AC 800M controller PM865 only and have to use the optical ModuleBus modem TB840 when adding optical clusters.

Make sure installation is carried out observing the requirement and guidelines in the documentation.

FCIs and TB820 can not handle High Integrity I/O modules.

Redundancy Functionality

Fieldbus Communication Interface (FCI)

When using redundant FCI, one is primary and one is secondary. If the primary FCI fails it will hand over to the secondary FCI.

If using redundant FCI and redundant electrical ModuleBus, the primary FCI will control both electrical ModuleBuses. When the primary FCI fails, the secondary FCI will take control of both electrical ModuleBuses.

Input Modules

When using redundant input modules, all reading is done from the primary input module. The input module will diagnose itself, and when the primary input module fails the secondary input module will be set as primary instead.

The secondary input module is checked for error status at a lower cycle rate than the primary.

Analogue Output Modules

When using redundant AO modules, half the output current is generated from each AO module. The AO module will diagnose itself, and when one fails, it disconnects

and a direct communication between the two redundant AO modules will ensure that the second AO module quickly doubles its output current.

Digital Output Module

When using redundant DO modules, they both work parallel to each other. They give the same output and the small time difference between them, in setting a signal high or low, does not make a difference.

When one DO module fails it will give output signals set to low. The DO module that still work will override by setting some signals to high.

Software Components

Fieldbus Communication Interface

The system software of a Fieldbus Communication Interface comprises a real-time operating system. The software is installed at delivery.

Upgrades are available for download for the system software for field upgrade. Cables to connect a standard PC with the FCI are available in the S800 I/O price list.

Hardware Components

The highly modularized hardware of S800 I/O includes the following components:

- I/O Modules
- Module Termination Units (MTUs).
- Fieldbus Communication Interface
- ModuleBus Items

The communication interface modules, Optical ModuleBus modem, MTUs and S800 I/O modules are mounted on standard DIN-mounting rails according to EN50022 NS 35/7,5.

An S800 I/O station can consist of a base cluster and up to 7 additional I/O clusters. The base cluster consists of a communication interface module and up to 12 I/O modules. I/O cluster 1 to 7 consist of an Optical ModuleBus modem and up to 12 I/O modules. An S800 I/O Station can have of up to 24 I/O modules in total. I/O cluster 1 to 7 are connected to the communication interface module through an optical expansion of the ModuleBus.

I/O Modules

There are two types of S800 I/O modules:

- S800 I/O modules designed to be used together with the Module Termination Units. See Figure 20 and Figure 22.
- S800L I/O modules
  - designed to be directly mounted on a standard DIN-rail and containing process connection, via detachable connectors. The S800L modules have only mechanical lock device and can not be removed with power on.
  - as accessories to 24 V DI/DO modules, Terminal Unit TU805 enables 2- and 3-wires connections, see Figure 17.

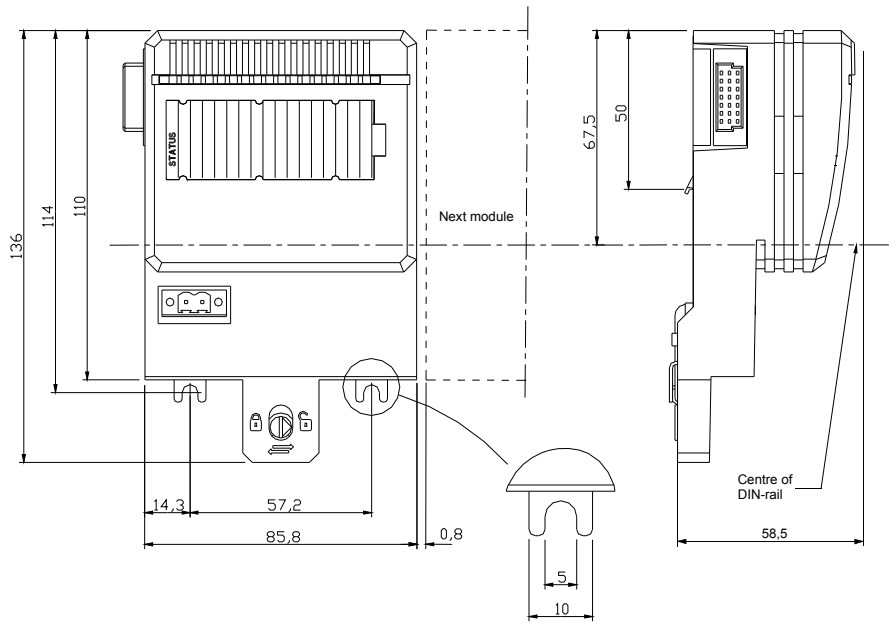

Figure 16. Dimensions for S800L Modules

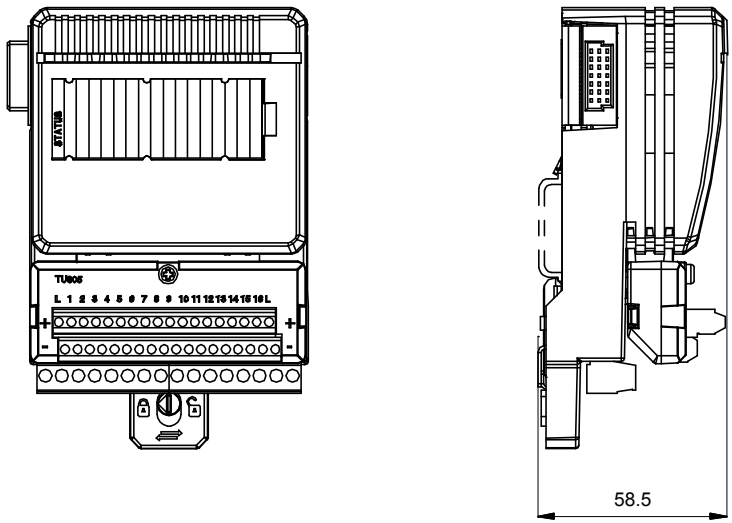

Figure 17. S800L Module with TU805

Module Termination Unit

Module Termination Units (MTUs) act as I/O module carriers and are available as Compact, Extended, Intrinsic Safety and Redundant MTUs. A Compact MTU normally offers termination of one wire per channel for a 16 channel module. With Compact MTUs power distribution of field circuits must be made with external terminal blocks and current limiting components if required. Extended MTUs with group-wise isolated interfaces allow for two or three wire termination of field circuits and provide group-wise or individually fuses for powering field objects. Extended MTUs which offer two or three wire terminations allows direct field object cable termination. The need for external marshalling is therefore drastically reduced or eliminated when Extended MTUs are used. An Intrinsic Safety MTU offers termination of field objects located in hazardous areas.

A redundant MTU have two ModuleBuses, two positions for I/O modules and a common process connection.

Compact and Intrinsic Safety MTUs are 58mm (2.3”) wide, Extended MTUs are 120mm (4.72”) wide and Redundant MTUs are 124 mm (4.88”) wide. The MTU types can be mixed and matched within an I/O-station to fit a user’s needs. Choice of MTU type can be made freely trading space versus termination needs.

MTUs are available with rated isolation voltages 50 V and 250 V. The 50 V types can be used with all 24/48 V discrete I/O and analog I/O modules. The MTUs with 250 V rated isolation voltage are used with all 120 V and 250 V rated I/O modules.

An inserted I/O module is assigned the unique position identity of its MTU. Through the incremental bus design the physical size of an S800 I/O installation is directly proportional to the number of installed MTUs.

The S800 I/O modules can be inserted and removed from MTUs without disturbing system operation.

The physical lock for S800 I/O which locks an I/O module to its MTU allows I/O module removal only when the lock is in its unlocked position. The locking mechanism also acts as a logic lock so that an I/O module is operable only when the lock is in the locked position. If the lock is in its unlocked position, output channels are de-energized and I/O modules can be inserted/removed without need to remove system or field power.

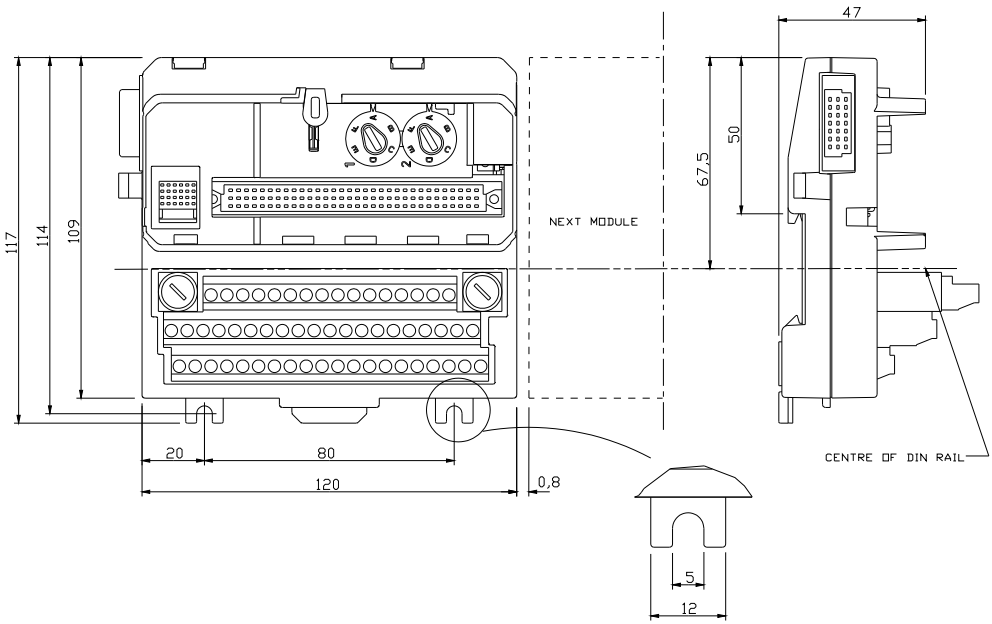

Figure 18. Typical Extended MTU with I/O Module

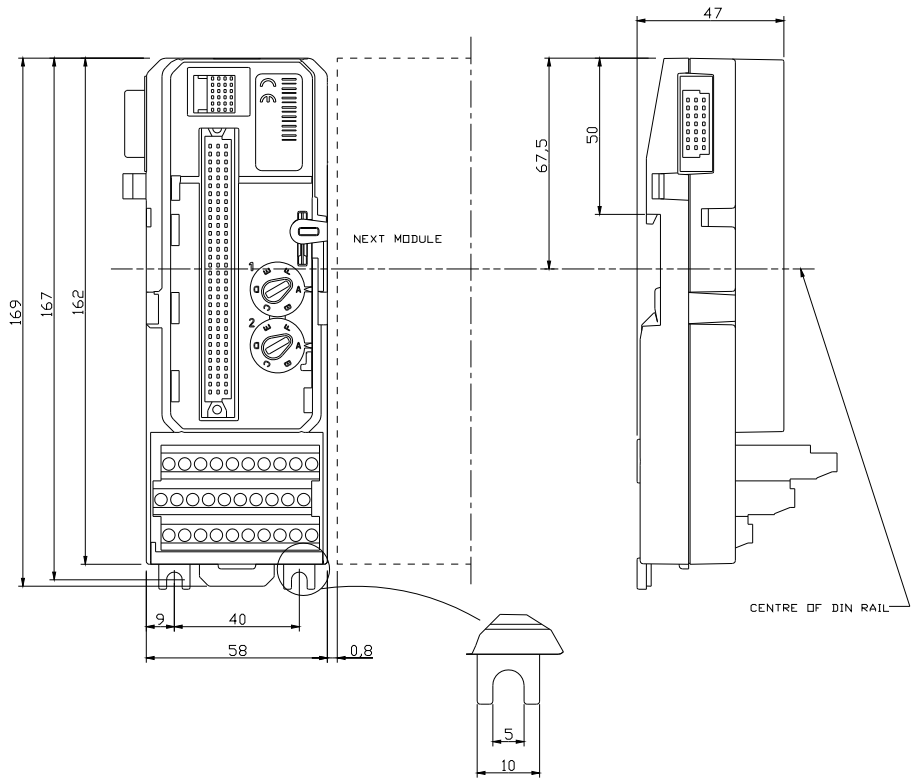

Figure 19. Typical Compact MTU with I/O Module

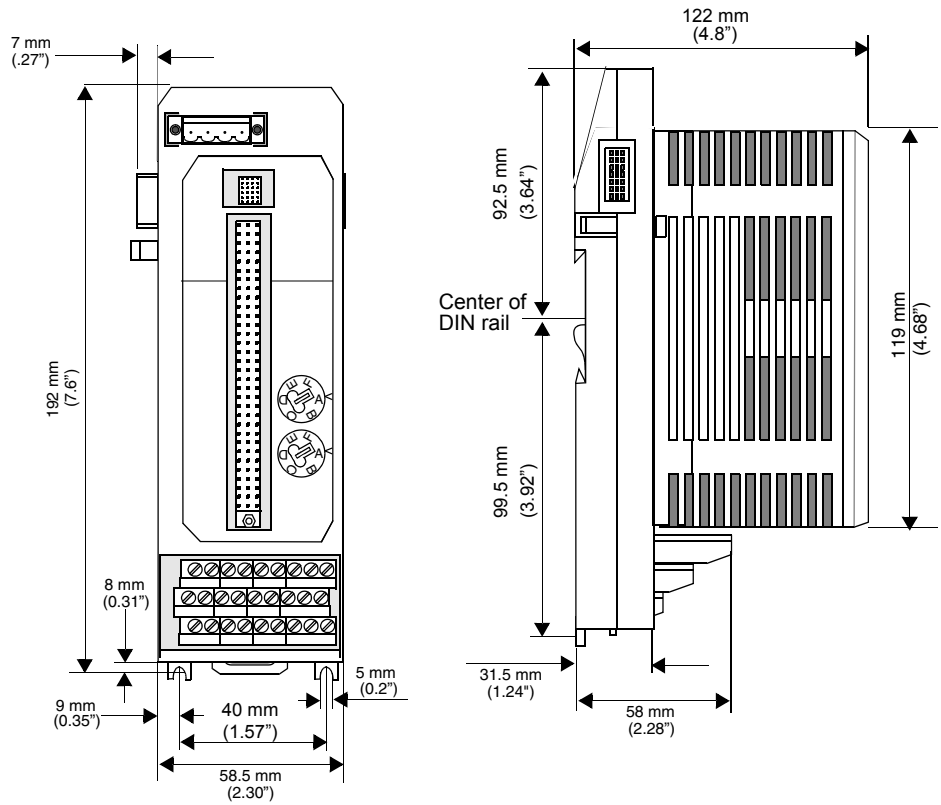

Figure 20. Compact MTU for Intrinsic Safety without and with I/O Module

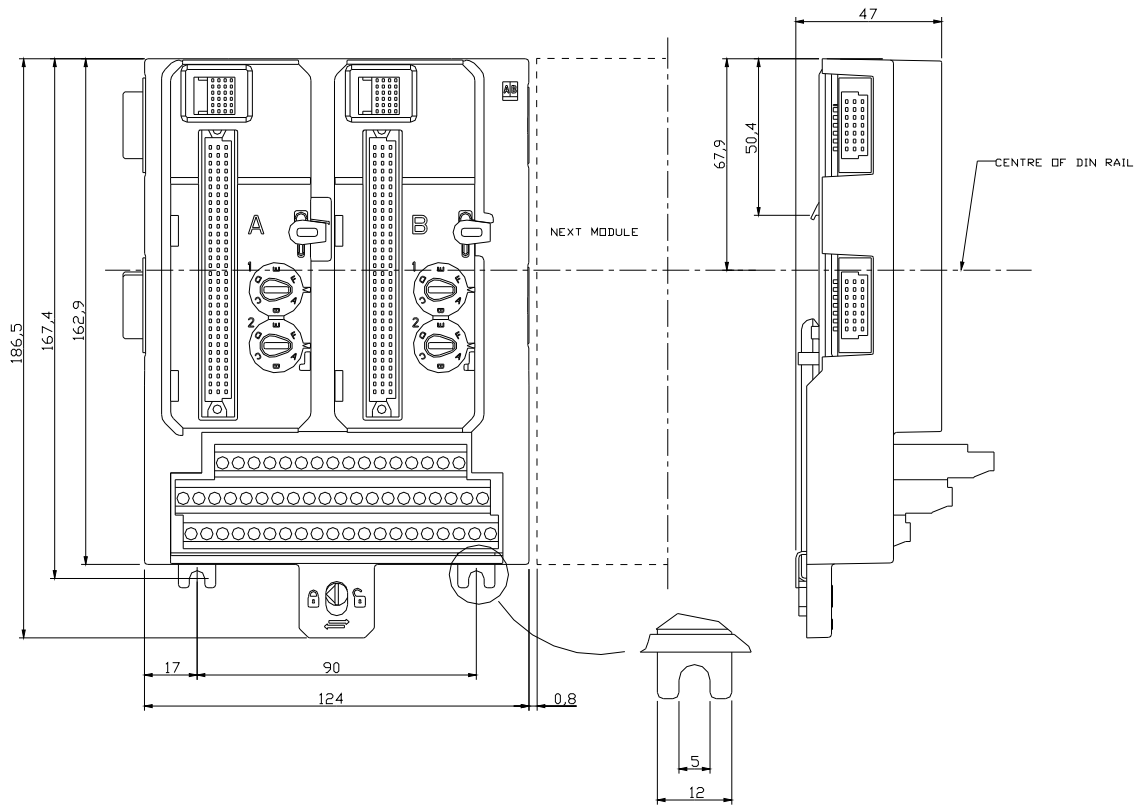

Figure 21. Typical Horizontal Redundant MTU

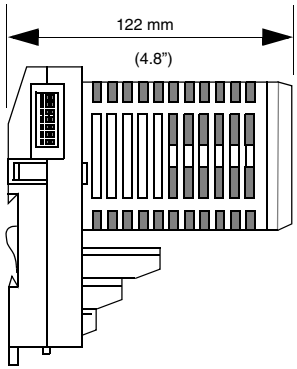

Figure 22. MTU with I/O Module

Fieldbus Communication Interface

The Fieldbus Communication Interface (FCI) module is a configurable communication interface which performs operations such as signal processing, gathering of various supervision information, OSP handling and configuration of re-inserted I/O modules. The FCI connects to a controller by way of different types of fieldbuses.

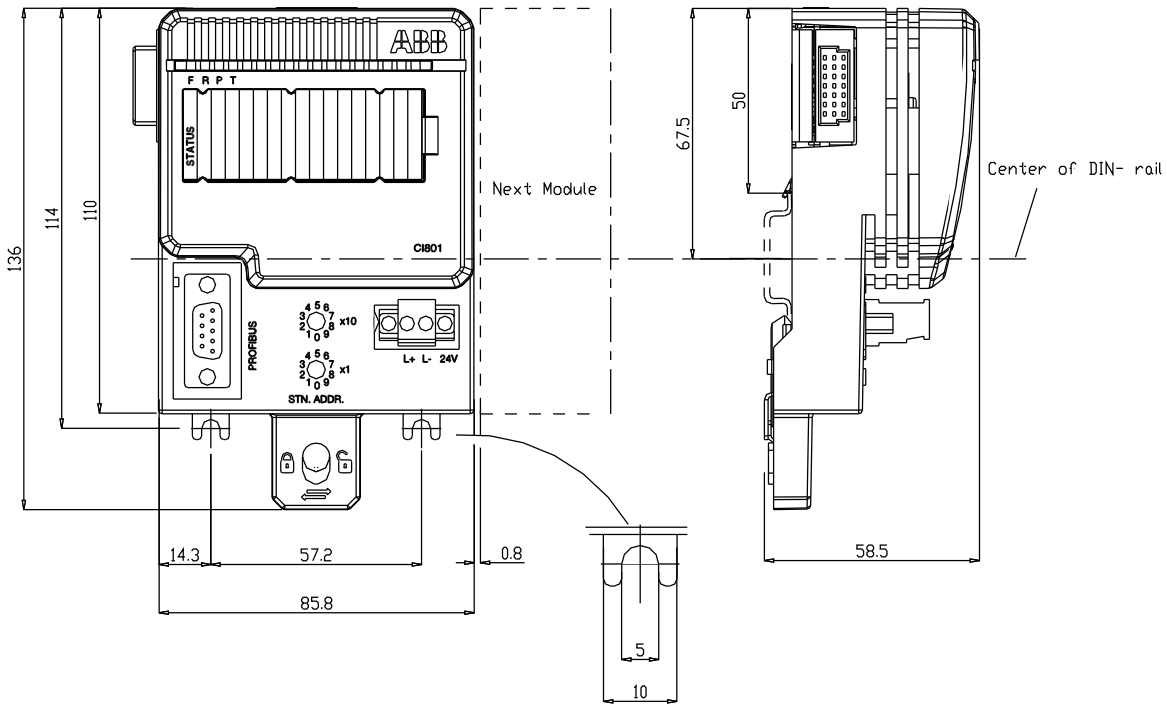

Figure 23. CI801 FCI Dimensions

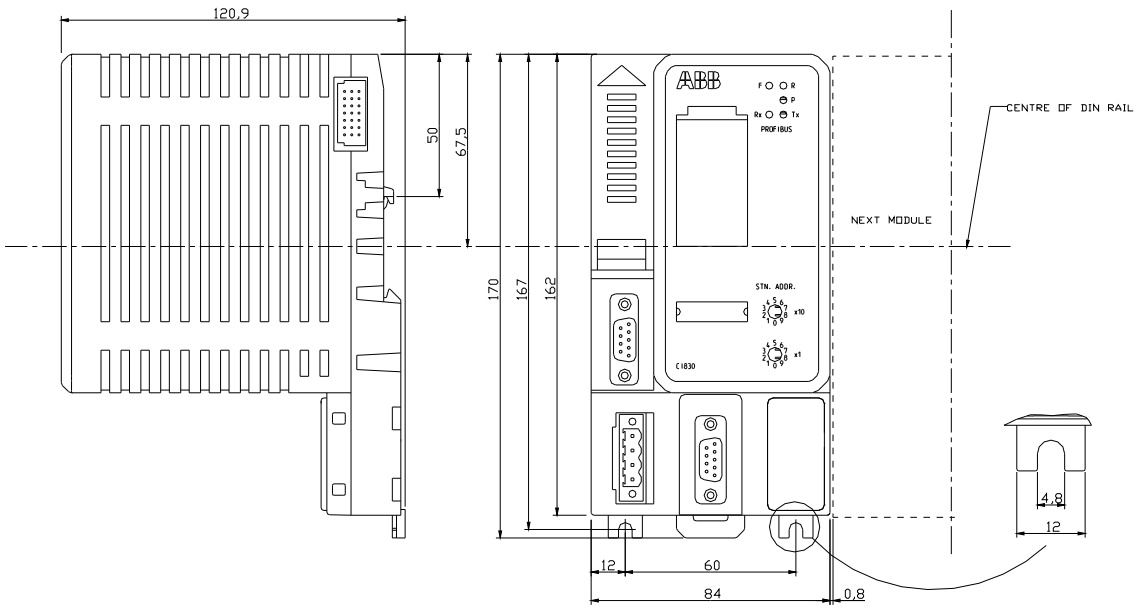

Figure 24. CI810 and CI830 FCI Dimensions

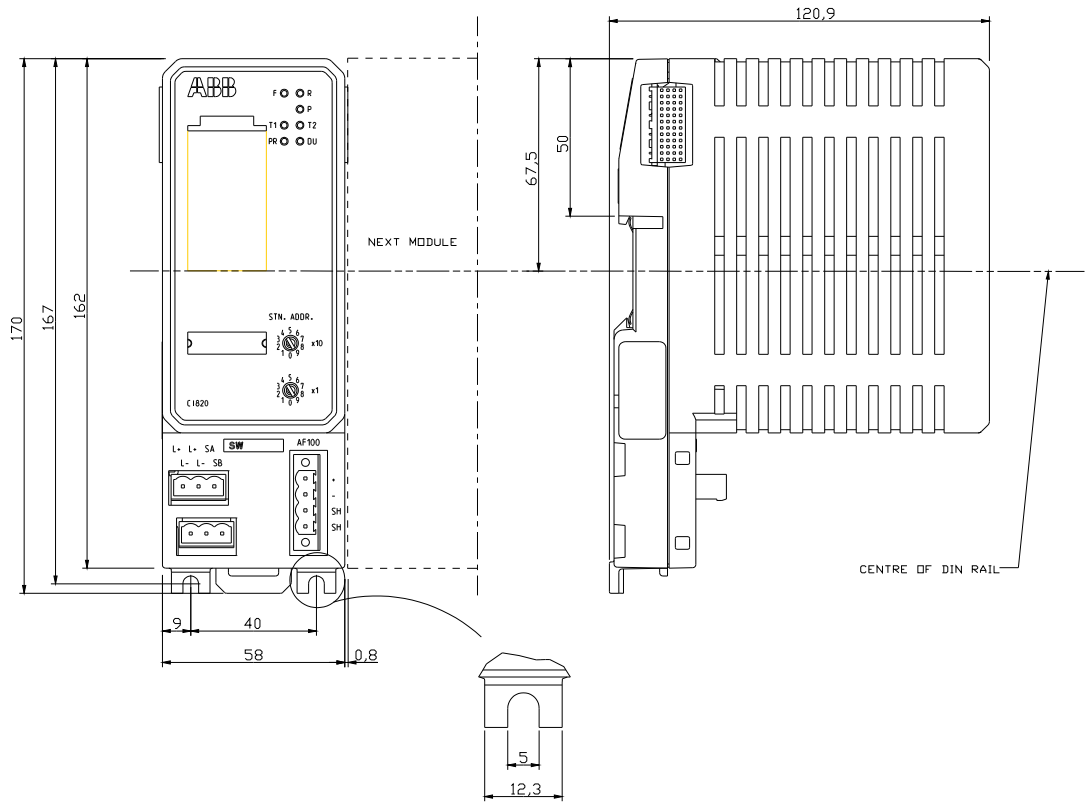

Figure 25. CI820 FCI Dimensions

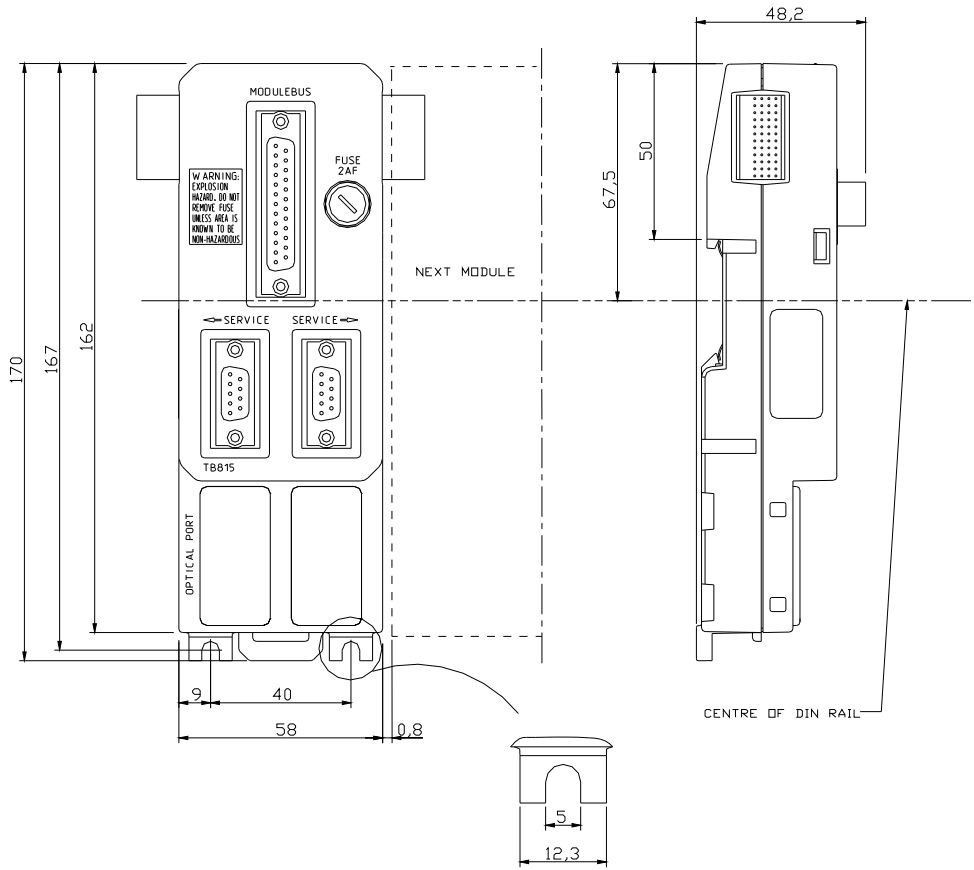

Figure 26. TB815 Interconnection Unit Dimensions

Figure 27 shows the TB815 configured with two CI820 FCIs for redundant operation.

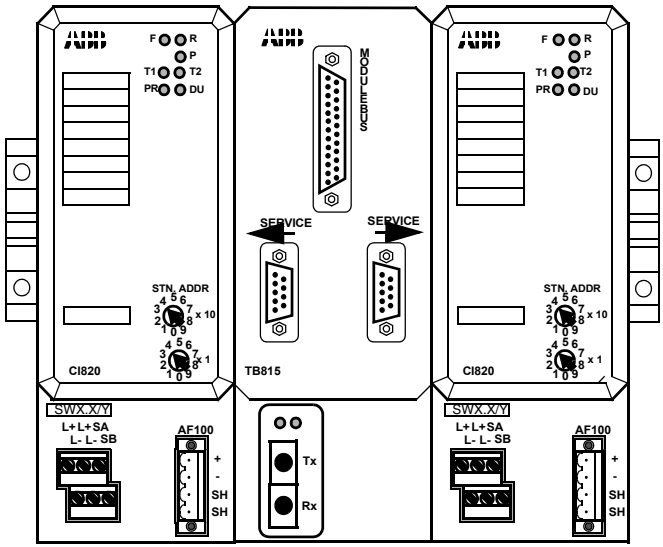

Figure 27. Redundant CI820 FCIs and TB815 Interconnection Unit Layout

Figure 28 shows the MTU TU847 (TU846) with redundant CI840. TU847 has one ModuleBus and are used for single I/O modules. TU846 has two ModuleBuses and are used for redundant I/O modules.

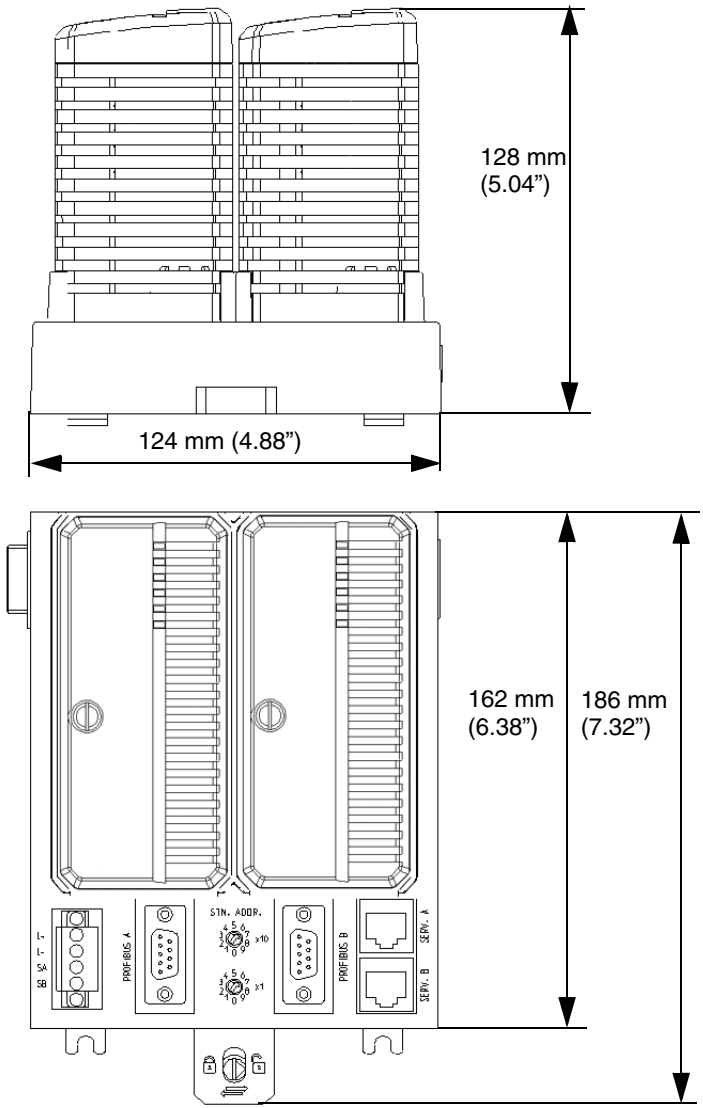

Figure 28. Redundant CI840 FCI and MTU TU847.

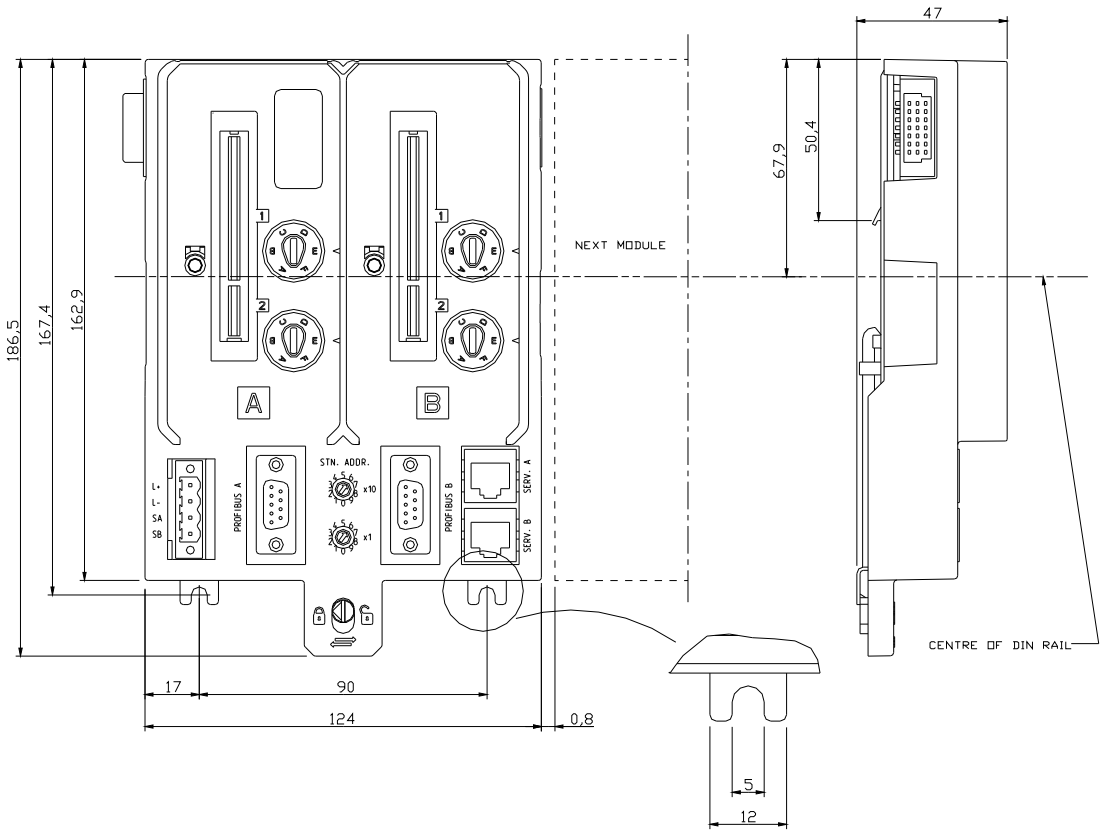

Figure 29. Dimension for typical MTU for CI840 or TB840

S800M I/O modules may be exchanged during system operation. A module locking mechanism disconnects ModuleBus and process signals safely from the module. A newly inserted I/O module is automatically put into operation if the system identifies the module as being of the correct type and without faults.

ModuleBus

TB820 ModuleBus Modem

The TB820 ModuleBus Modem is a fiber optic interface to the ModuleBus. The ModuleBus Modem has an electrical and an optical interface which are logically the same bus. A maximum of 12 I/O modules can be connected to the electrical ModuleBus and up to seven clusters can be connected to the fiber optic ModuleBus.

The TB820 ModuleBus Modem has a rotary switch that selects its cluster number, 1 to 7, on the optical ModuleBus.

The ModuleBus Modem communicates with the FCI or Controller via the Optical ModuleBus.

The TB820 ModuleBus Modem provides 24 V d.c. protected (from the source) and an isolated, protected 5 V d.c. power to the cluster's I/O modules by way of the electrical ModuleBus connection. One power source (single or redundant 24 V d.c.) can be connected to the power terminals (L+ & L-). Redundant power supply can be supervised via inputs SA and SB.

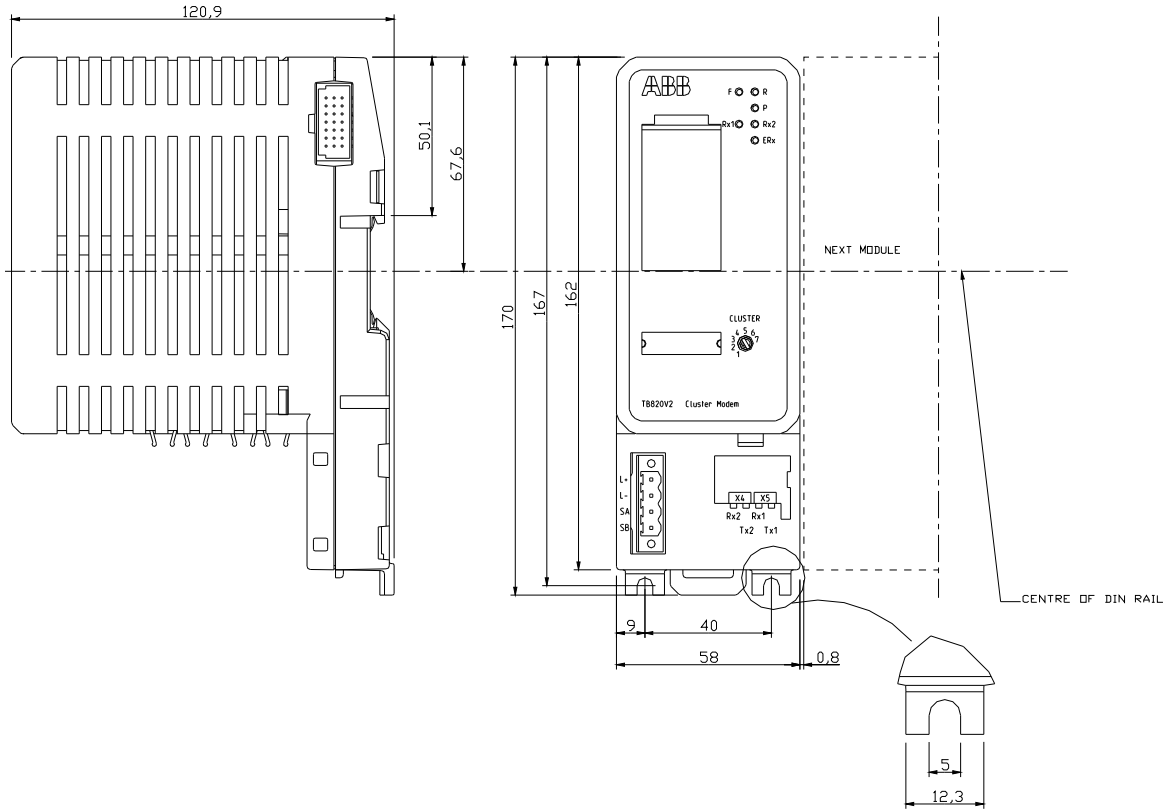

Figure 30. TB820 ModuleBus Modem

TB840 ModuleBus Modem and TU807/TU840/TU841/TU848/TU849 Module Termination Unit

The TB840 ModuleBus Modem is a fiber optic interface to the Optical ModuleBus. TB840 is used in redundancy configurations where each TB840 is connected to different optical ModuleBus lines and to single or dual electrical ModuleBuses.

Termination Unit TU840 connects TB840 to redundant I/O. Termination Unit TU841 connects TB840 to non-redundant I/O.

Termination unit TU848 has individual power supply connections and connects TB840 to redundant I/O. Termination unit TU849 has individual power supply connections and connects TB840 to non-redundant I/O.

The ModuleBus Modem has an electrical and an optical ModuleBus interface which are logically the same bus. A maximum of 12 I/O modules can be connected to the electrical ModuleBus and up to seven clusters can be connected to the fiber optic ModuleBus.

The cluster address sets by a rotary switch on the Termination Unit TU807/TU840/TU841/TU848/TU849 in range 1 to 7.

The TB840 ModuleBus Modem provides 24 V d.c. protected (from the source) and an isolated, protected 5 V dc power to the cluster's I/O modules by way of the electrical ModuleBus connection. One power source (single or redundant 24 V d.c.) can be connected to the power terminals (L+ & L-). Redundant power supply can be supervised via inputs SA and SB.

The rotary switch and the connectors for power supply is located on TU807/TU840/TU841/TU848/TU849. See Figure 31, for dimensions see also Figure 29.

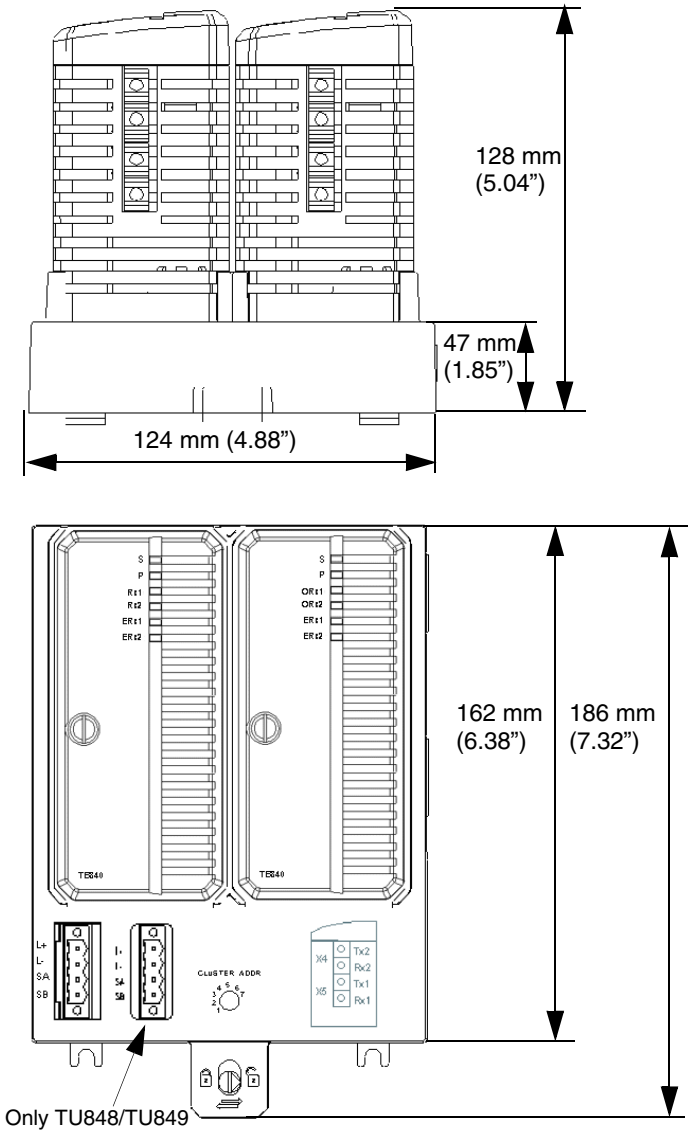

Figure 31. TB840 and TU840/TU841

TB825 Optical Media Converter

ModuleBus Optical media converter, converts between plastic opto fiber or HCS fiber with Versatile link connectors and glass optical fiber with ST connectors.

The TB825 is built in S800L mechanics and DIN rail mounted.

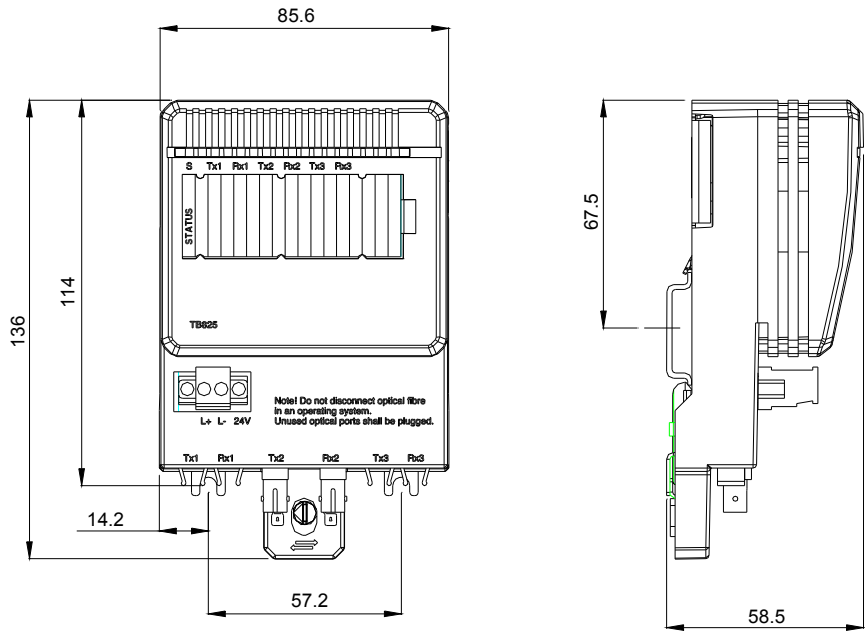

Figure 32. TB825 Optical Media Converter

ModuleBus Optical Port, TB810/TB811

The ModuleBus Optical ports TB810/TB811 have two connectors for the Optical ModuleBus expansion and one connector for connection to the Fieldbus Communication Interface module, (FCI). The ModuleBus Optical ports are used together with the communication modules CI810, CI820 (TB815) and CI830.

TB810/TB811 is connected directly on the FCI.

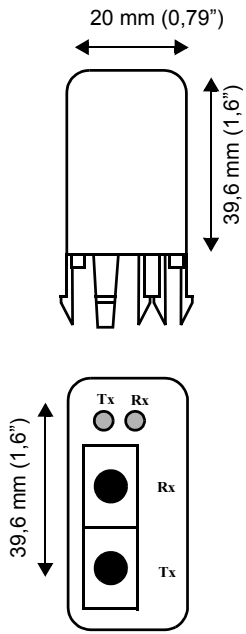

Figure 33. ModuleBus Optical Port TB810/TB811

ModuleBus Optical Port, TB842

The ModuleBus Optical port TB842 has two connectors for the Optical ModuleBus expansion and one connector for connection to the Fieldbus Communication Interface module, (FCI). The ModuleBus Optical ports are used together with the communication modules CI801 or CI840.

TB842 is connected to CI801 through TB806 and to CI840 through TB806 and TU847 or TB846 and TU846.

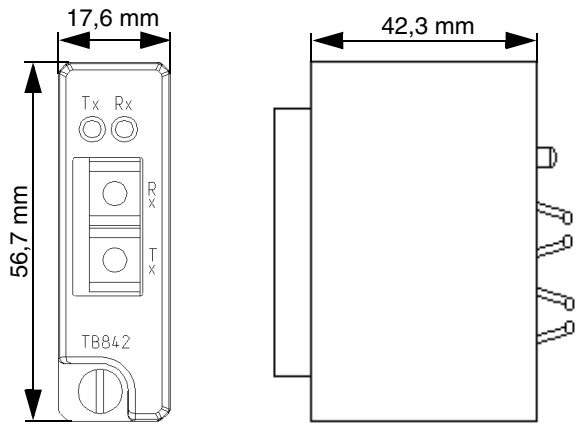

Figure 34. ModuleBus Optical Port TB842

Opto Connectors and Cables

Local Optical Cable. Opto connectors type Agilent's, former Hewlett-Packard, Versatile Link can handle both plastic and HCS optic fibre.

Plastic Optical Fiber (POF) up to 15 m.

- Extra low loss attenuation
- Simplex or duplex cable
- Latching simplex or duplex connector.
- Cable attenuation maximum 4 dB

Hard Clad Silica (HCS) fiber up to 200 m.

- Riser or plenum
- Simplex or duplex cable
- Latching simplex or duplex connector
- Cable attenuation maximum 2 dB

Field Optical Cable. Glass Optical Fiber, multimode up to 1000 m.

- Fiber dimensions: 62.5/125 µm
- Connector type: ST, bayonet
- Wave length: 820 nm
- Max cable attenuation: 3.5 dB (1000 m of unspliced cable)

ModuleBus Extension Cable Adaptors TB805, TB806 for single ModuleBus

The ModuleBus extension cable adaptors exist in two types for bus outlet and bus inlet. The adaptors have two connectors for the electrical ModuleBus and for the ModuleBus extension cable. See Figure 35 on the next page.

MTUs and S800L I/O modules can within a cluster be set up in two or more physically separated groups with extension cable adaptors which fit to the bus outlet and inlet connectors of communication interface modules, Optical ModuleBus modem, MTUs and S800L modules. The factory made extension cables which plug into the cable adaptors are available in lengths of 0.3, 0.6 and 1.2 m (1, 2 or 4 ft.), allowing together with up to 12 I/O modules, for a total bus length of 2.5 m (8.2 ft.).

TB805 and TB806 also exists in G3 compliant versions, TB805Z and TB806Z.

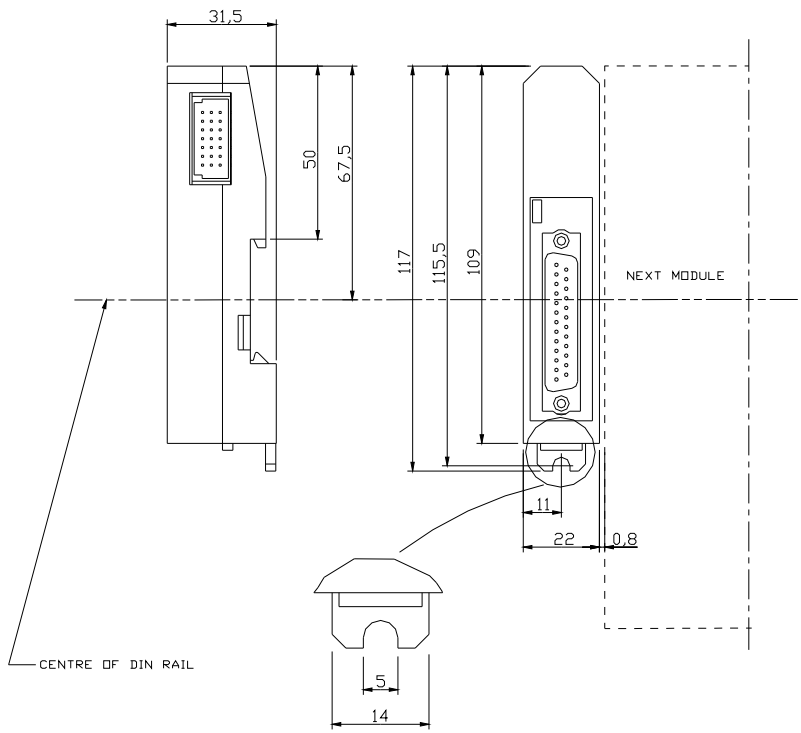

Figure 35. ModuleBus Cable Inlet/Outlet

ModuleBus Extension Cable Adaptors TB845, TB846 for dual ModuleBus

The ModuleBus extension cable adaptors for dual electrical ModuleBuses exists in two types for ModuleBus outlet and ModuleBus inlet.

The adaptors have two connectors for the electrical ModuleBus and two for the ModuleBus extension cable. See Figure 36 and Figure 37.

MTUs can within a cluster be set up in two or more physically separated groups with extension cable adaptors which fit to the bus outlet and inlet connectors of communication interface modules, Optical ModuleBus modem and MTUs. The factory made extension cables are available in lengths of 0.3, 0.6 and 1.2 m (1, 2 or 4 ft.), allowing together with up to 6 MTUs, for a total bus length of 2.5 m (8.2 ft.).

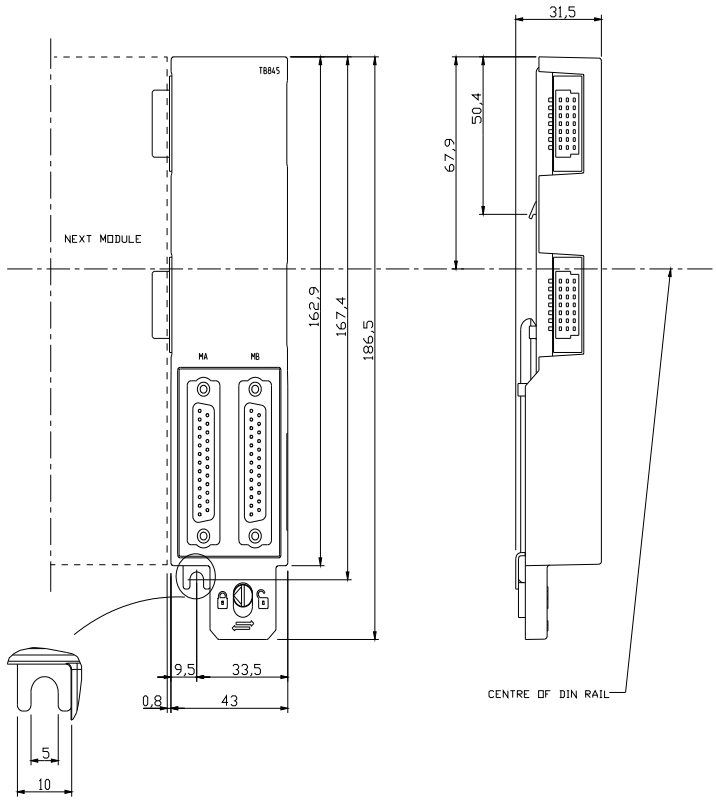

Figure 36. Module Outlet Module TB845

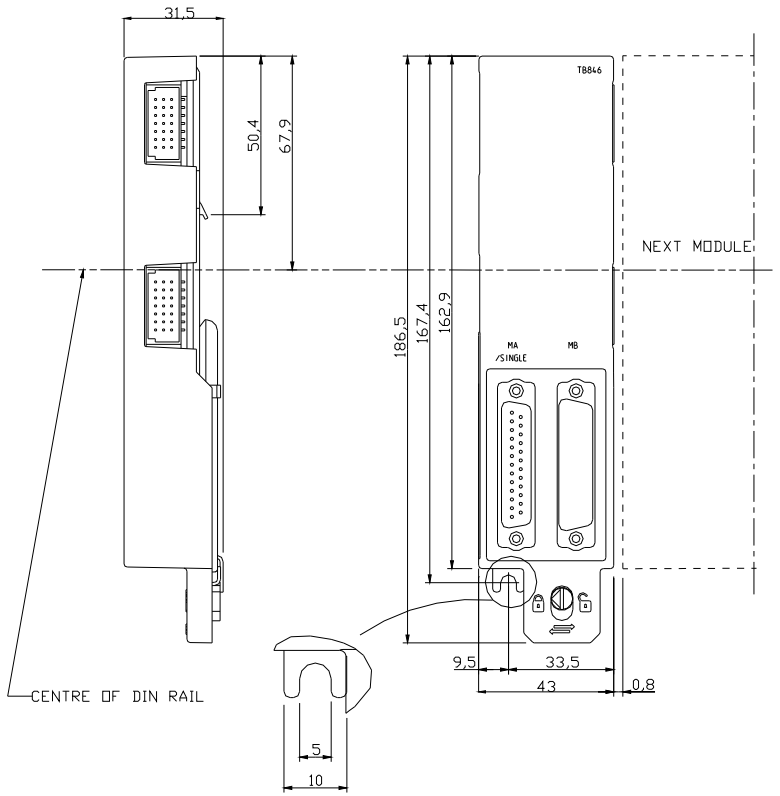

Figure 37. ModuleBus Inlet Module TB846

ModuleBus Terminator Module TB807

There must be a ModuleBus terminator module at the end of each electrical ModuleBus.

The module is G3 compliant.

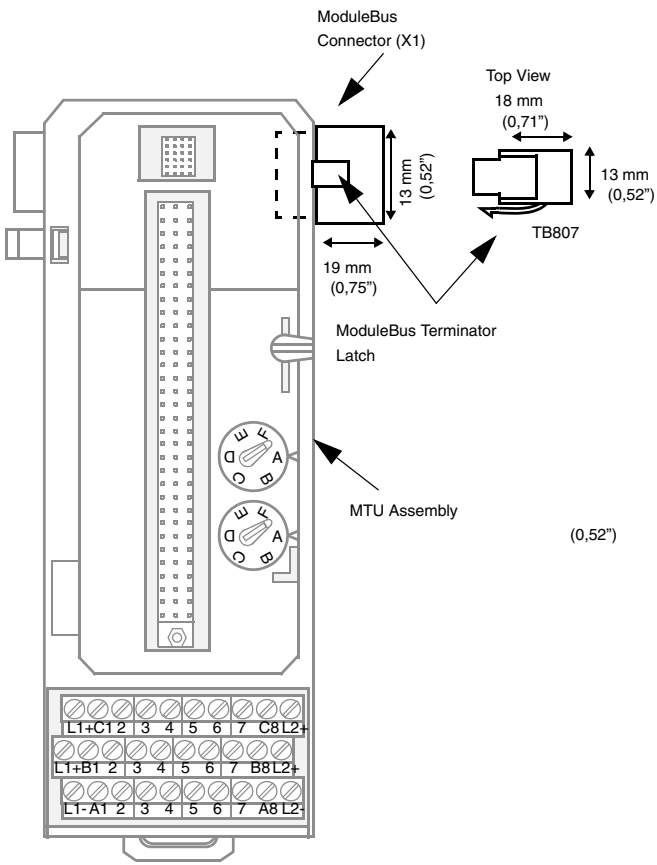

Figure 38. ModuleBus Terminator Module

Power Supplies

The power supplies SD821, SD822 and SD823 (24 V output) can be used to power processor modules and S800 I/O modules, through the processor unit and to power 24 V field circuits (optional). The primary side can connect to industrial mains installation class III (IEC664).

The outputs are protected and can operate with resistive, capacitive and constant power loads, for example, switched mode power converters.

The outputs of the supplies of same type can be connected in parallel to increase power, 2*SD821, 2*SD822 or 2*SD823, or be configured for redundant mains to increase availability, 2*SD821, 2*SD822 or 2*SD823, plus one SS822 or two SS823. The voting unit SS822 has two power OK signals, one for each input power and SS823 has one power OK signal.The signals can connect to the SA or SB inputs of the Communication interface module, or to an Optical ModuleBus modem (to monitor power status in 1:1 redundant mains configurations.)

In a parallel connections the life time will decrease due to not perfect load sharing. To get a better load sharing the output voltage from the power supply units (only SD823) should be adjusted to the same value. Each power supply should be connected to the load via a cable of the same area and length as the others. The length should be ≥ 1 m and the area not bigger than necessary.

Table 9. Power Supplies

Module Type	Description
SD821	Power Supply 115/230 V a.c./24 V d.c. 2.5 A Rated isolation voltage 300 V.
SD822	Power Supply 115/230 V a.c./24 V d.c. 5 A Rated isolation voltage 300 V. Also in a G3 compliant version (SD822Z).
SD823	Power Supply 115/230 V a.c./24 V d.c. 10 A Rated isolation voltage 300 V.

Table 9. Power Supplies (Continued)

Module Type	Description
SS822	Voting Device 20 A. Dual d.c. 24 V to single 24 V. Rated isolation voltage 50 V. Also in an G3 compliant version (SS822Z).
SS823	Power Voting Unit 20A with overvoltage protection. Two units required for redundancy. Rated isolation voltage 50 V.

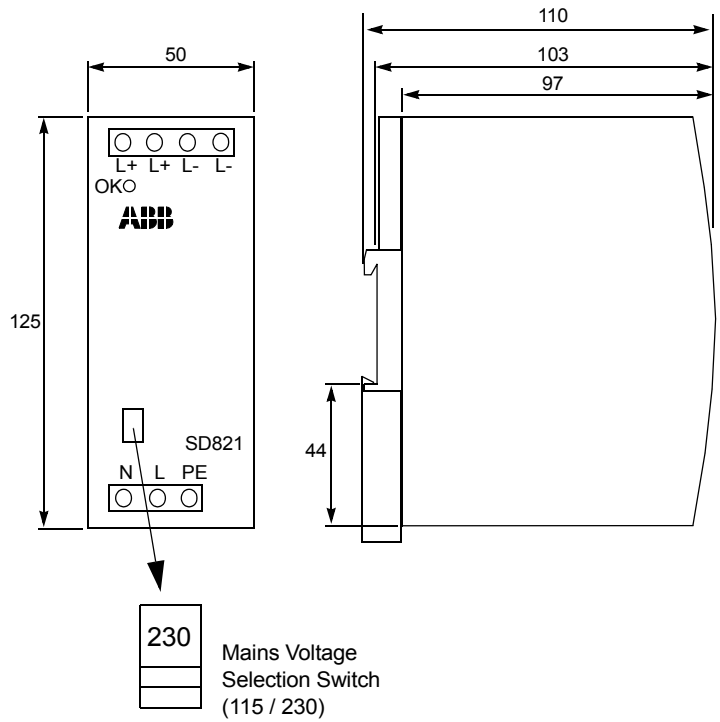

Figure 39. Power Supply Module SD821

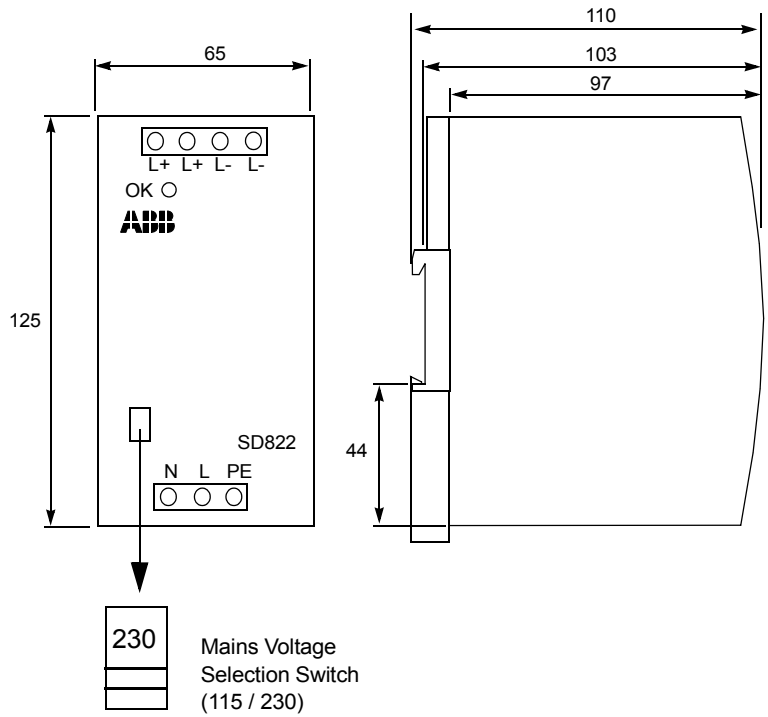

Figure 40. Power Supply Module SD822

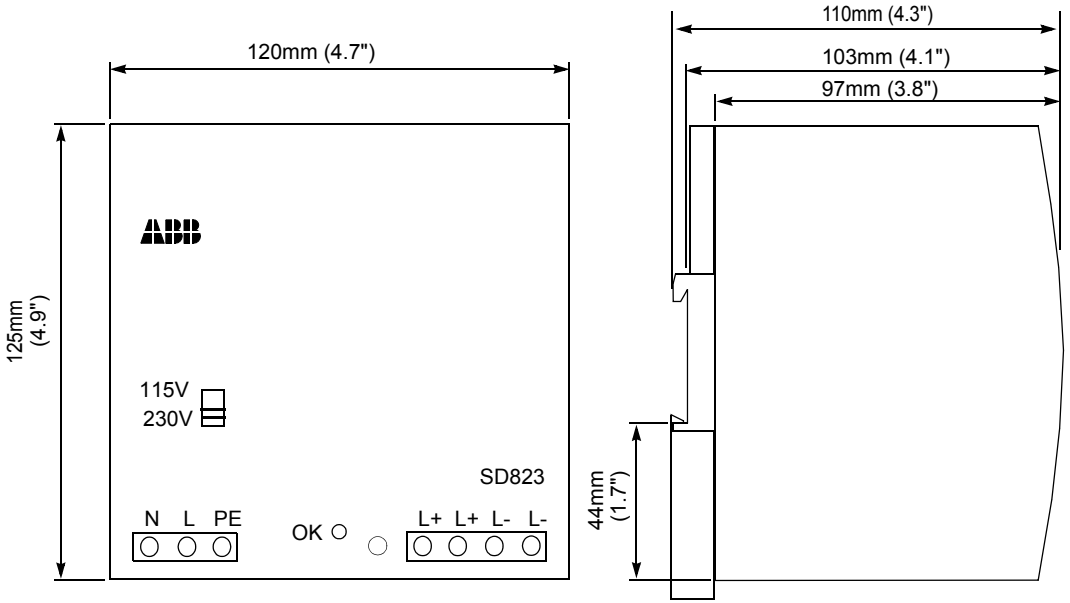

Figure 41. Power Supply Module SD823

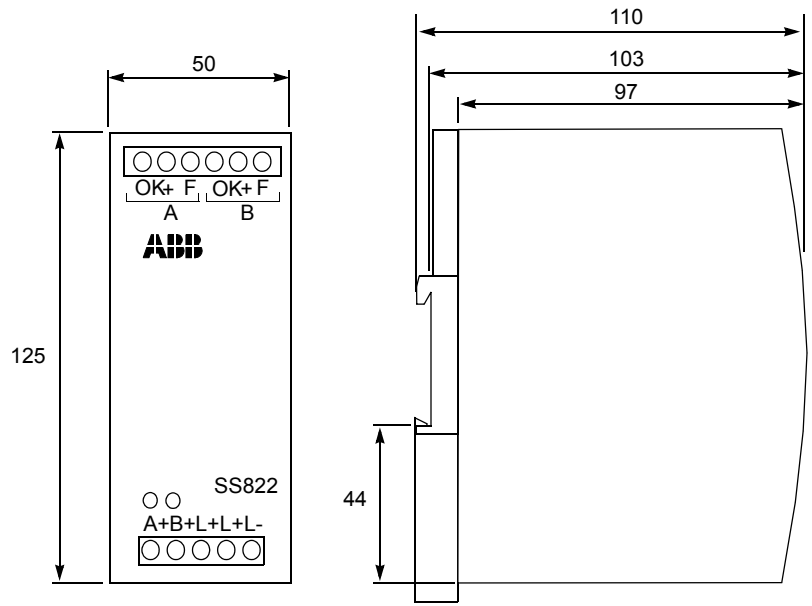

Figure 42. Voting Unit SS822

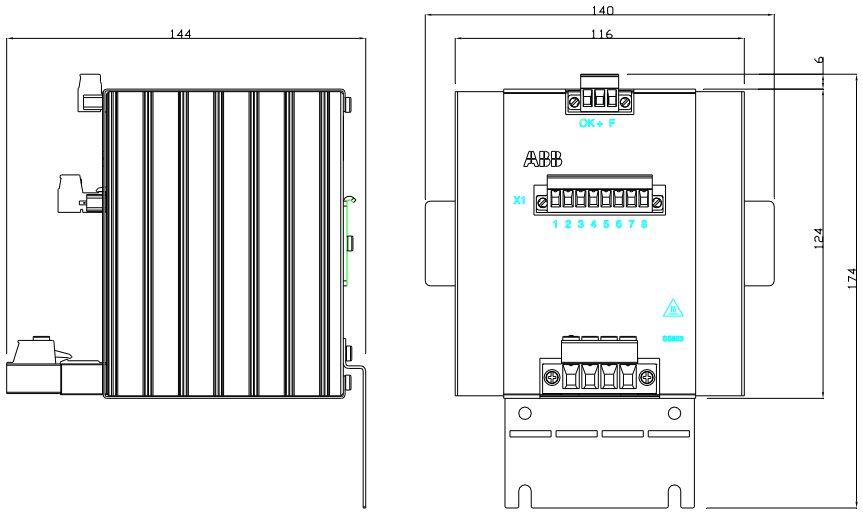

Figure 43. Voting Unit SS823

Mounting Equipment

Mounting Kit for CI801/CI840/CI840A/TB840/TB840A

The Mounting Kit is used for horizontal mounting of CI801/CI840/CI840A and TB840/TB840A on a vertical DIN-rail. This enables the higher range of the ambient temperature for CI801/CI840/CI840A and TB840/TB840A.

Apart from MTUs for CI840, TB840 can also ModuleBus cable adapters be mounted on the Mounting Kit.

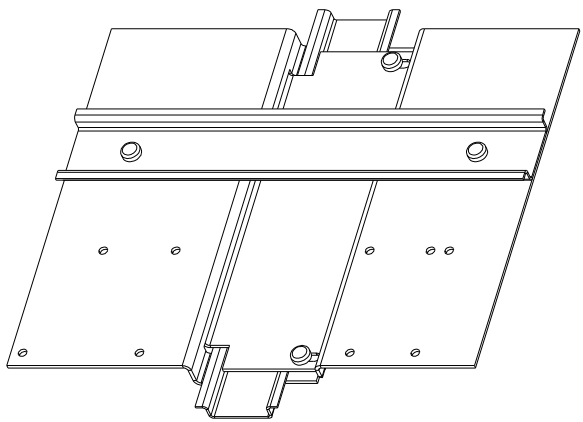

Figure 44. Mounting Kit for CI801/CI840/CI840A/TB840/TB840A

Table 10. Mounting Kit Dimensions

Item	Value
Width	200 mm (7.87”)
Depth	170 mm (6.69”)
Height	17 mm (0.67”)
Weight	0.5 kg (1.10 lbs.)

There are 9 different configuration alternatives for mounting of MTUs, see Figure 45.

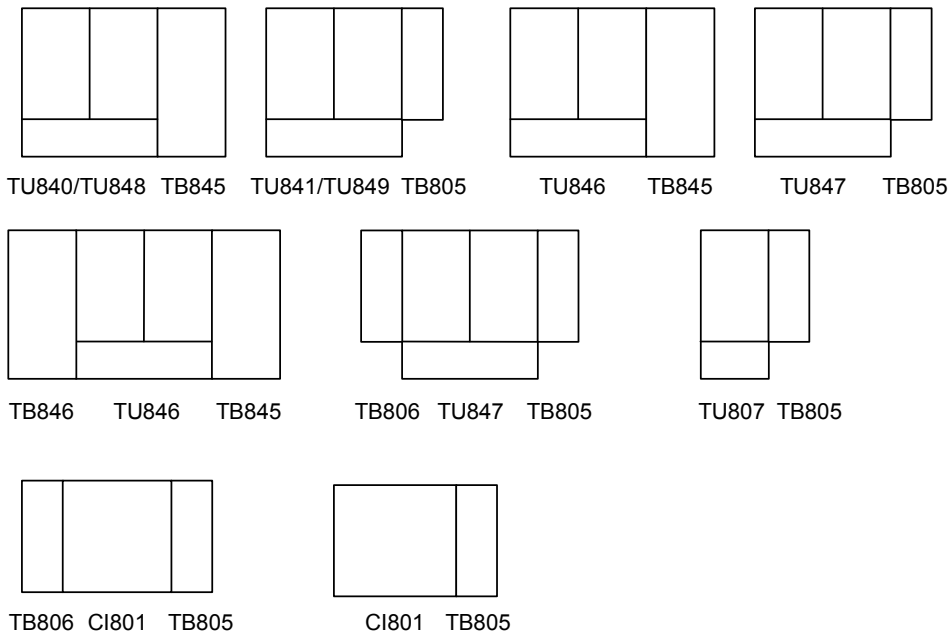

Figure 45. Configurations for mounting of MTUs on the Mounting Kit

Prefabricated Aluminium Profile

Prefabricated aluminium profile for mounting of S800 I/O modules in cabinets or other types of installations. The profile supports good mechanical stability and chassis ground connection.

There are aluminium profiles for horizontal 465 mm (19”), 592 mm (24”) or 719 mm (28.31”) mounting, see Figure 46.

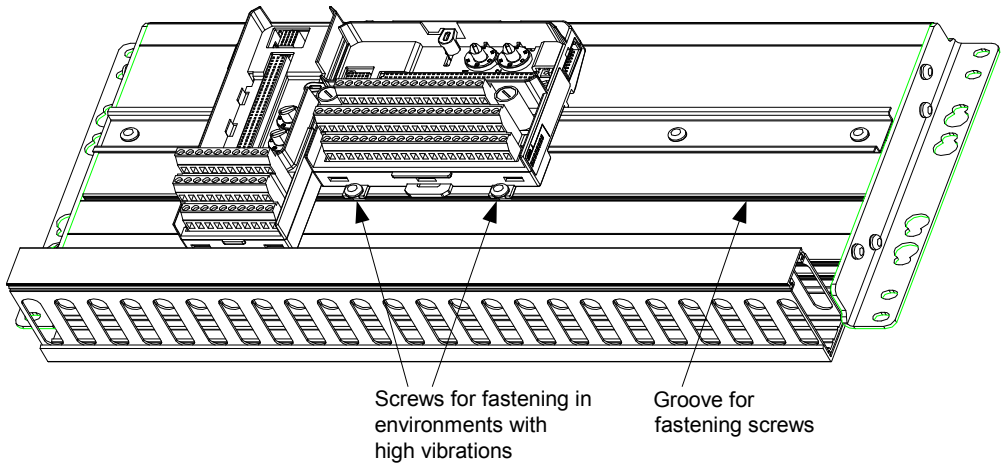

Figure 46. MTU mounted on aluminium profile

The profile has grooves for screws that can be used for fastening the modules in an environment with high vibrations.

The horizontal profile has one DIN-rail and one cable duct.

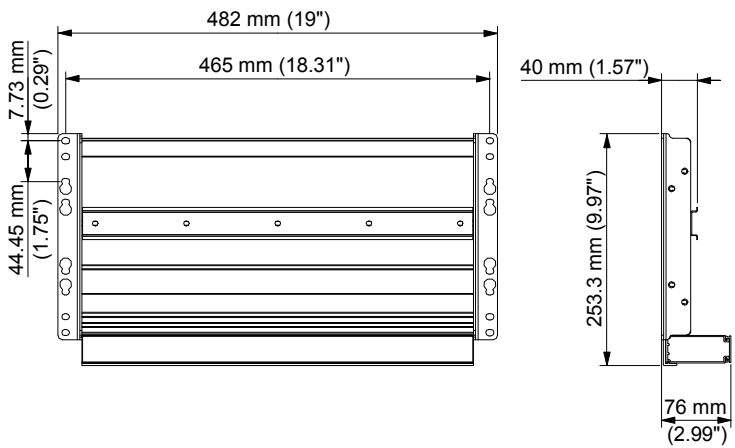

Figure 47. Prefabricated Aluminium Profile Dimensions

G3 compliant modules

Some modules are available in both G3 compliant and non-compliant versions and some are G3 compliant in their standard appearance. The G3 compliant modules withstand more severe environmental conditions according to ISA-S71.04.

A “Z” in the type designation indicates that the module is G3 compliant, but the modules are the same as the non-compliant S800 I/O versions in all other aspects, for example configuration. Modules that are G3 compliant in their standard appearance are not marked with “Z”.

During transport, storage and installation must special caution be taken:

- Dividable connectors/terminals must not be left unconnected/open in G3 environment if they are intended to be used later.
- Modules must not be stored in G3 environment due to unprotected connectors/terminals, also valid for modules in packaging.

I/O Station Configurations

An I/O station can consist of one Base I/O cluster and up to seven I/O clusters. The Base I/O cluster consists of a FCI, single or redundant, and up to 12 I/O modules.

The I/O cluster consists of one ModuleBus Modem and up to 12 I/O modules. For I/O station with single FCI for PROFIBUS or AF100, and redundant FCI for AF100, see Figure 48. Both PROFIBUS and AF100 have non redundant ModuleBus Extension.

For I/O station with redundant FCIs, and for PROFIBUS with non redundant ModuleBus Extension, see Figure 49.

For I/O cluster connected to controller AC800M, via redundant ModuleBus Extension, see Figure 50. Redundant ModuleBus Extension can only be used together with AC800M.

Redundant I/O can only be configured in the base cluster.

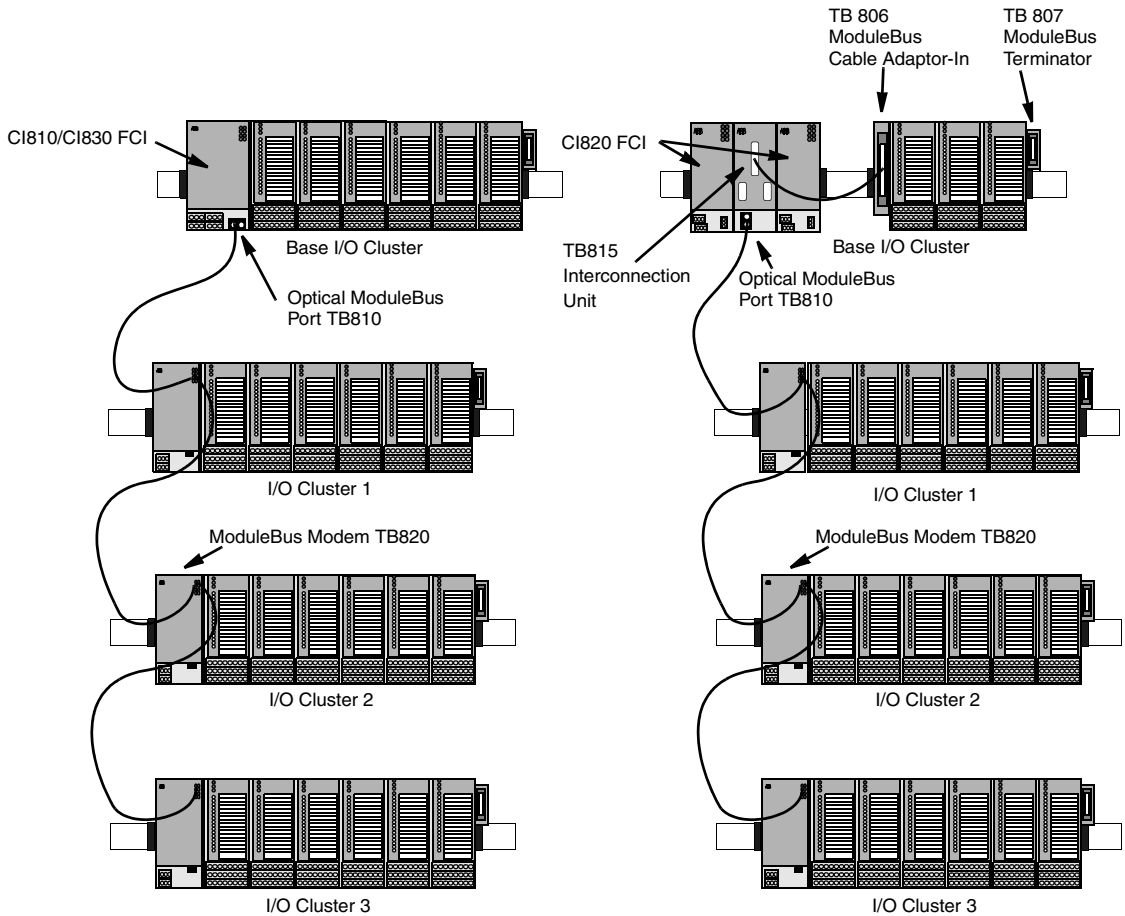

Figure 48. Optical ModuleBus Extension from CI810, CI820, CI830

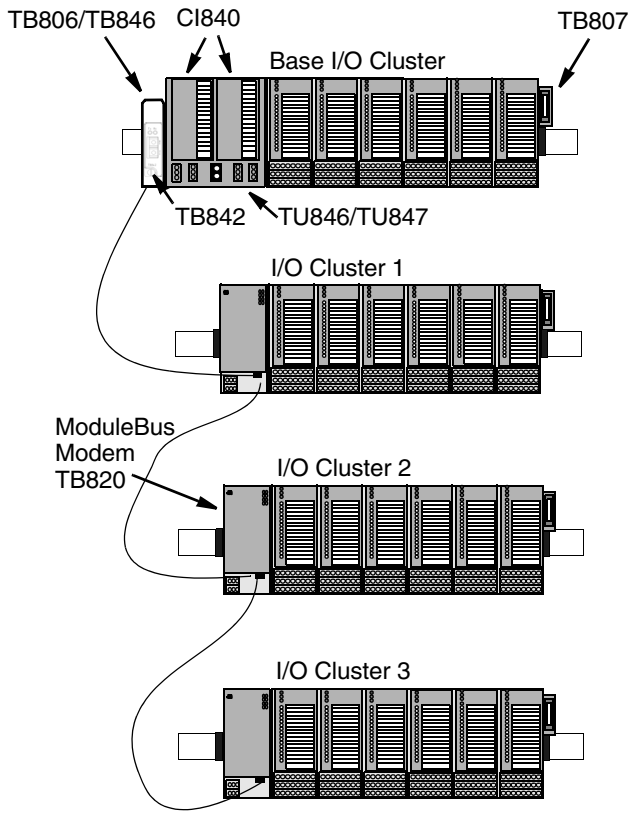

Figure 49. Optical ModuleBus Extension from CI840

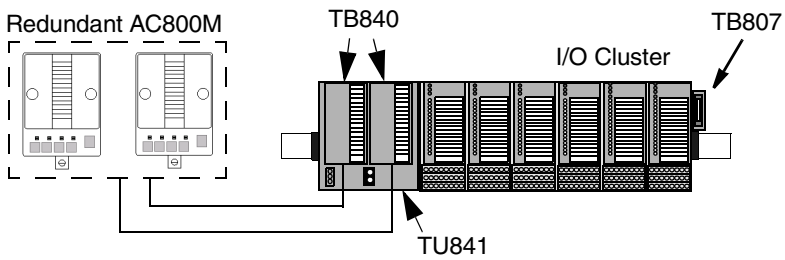

Figure 50. Optical ModuleBus Connection to Redundant TB840

Mounting

The I/O station can be mounted horizontally, vertically or in combinations (Figure 51 to Figure 55). Compact or Extended MTUs or S800L modules can be used depending on available space and preferred way of installing the field wiring (external marshalling/power distribution or direct on Extended MTUs using built in 2/3 wire termination and power distribution arrangements). Compact and Extended MTUs as well as S800L modules can be mixed and matched within the I/O station to suit the required field termination.

The S800 I/O is mounted on a DIN-rail. The DIN-rail is mounted in a cabinet or on an enclosure wall to a metal sheet with fastening screws every 100 mm to ensure a good chassis ground connection in the cabinet or on an open track. The FCI, ModuleBus Modem, MTUs and S800L I/O modules are mounted on the DIN-rail.

It is recommended to use end supports when mounting the I/O station.
In environments with major vibrations, the MTUs shall be screwed on the metal sheet.

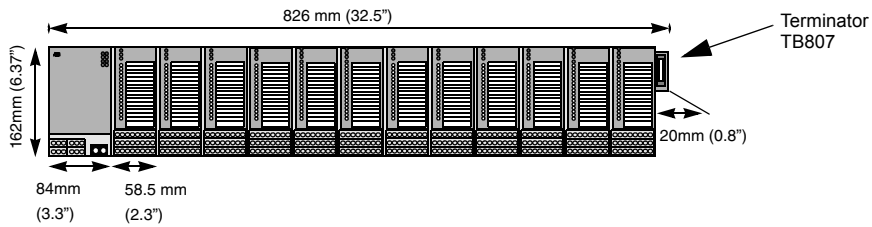

Figure 51. Horizontal Mounting of 1 FCI (left) and 12 S800M I/O MTUs (Compact)

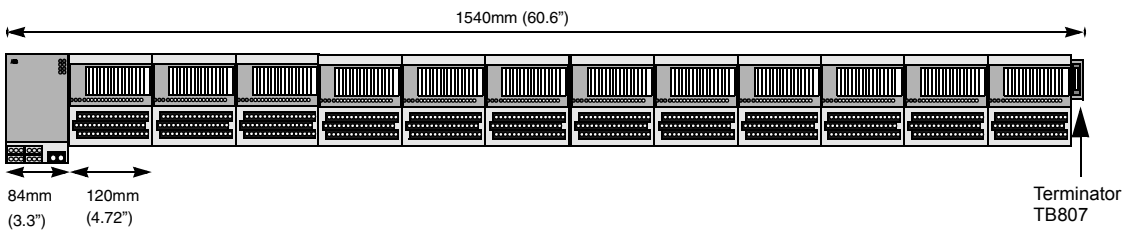

Figure 52. Horizontal Mounting of 1 FCI (left) and 12 S800M I/O MTUs (Extended)

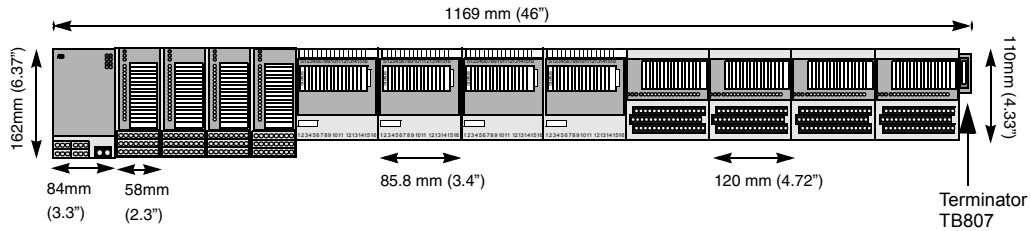

Figure 53. Mixed Mounting of 1 FCI and 4+4+4 S800M I/O MTUs (Compact and Extended) and S800L I/O Modules

By using extension cable(s) a very flexible mounting arrangement is possible, adapting to required panel or cabinet layout. The maximum length of an electrical ModuleBus should not be more when 2.5 m (100")

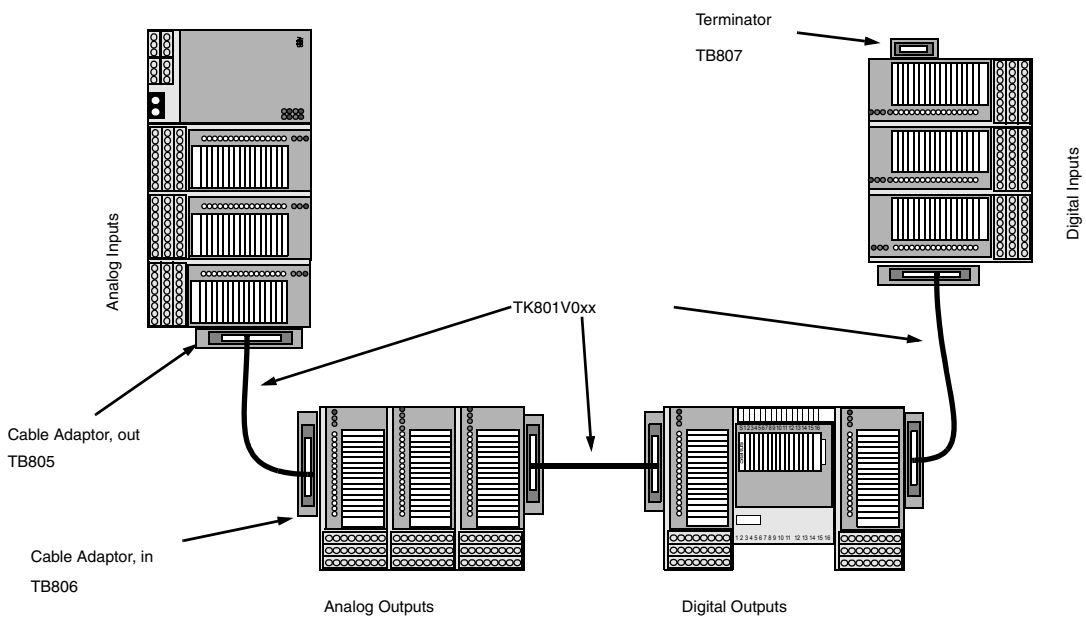

Figure 54. I/O Station in Small Groups

In I.S. applications modules with I.S. Interfaces MUST be mounted right most of the I/O station or as a separate group.

The installation must be performed by qualified personnel. It must comply with the relevant national/international standards (e.g. IEC 79-14, CEI 64-2, BS 5345 Pt. 4, DIN VDE 165) and in line with the established installation rules and recommended practice (e.g. CEI 64-8, ANSI/ISA RP-12.6). The conformity of hazardous area field devices with the related system documentation must always be checked.

When using modules with I.S. Interfaces in non I.S.applications, the I.S. modules can be placed in any position following the same rules as non I.S. modules.

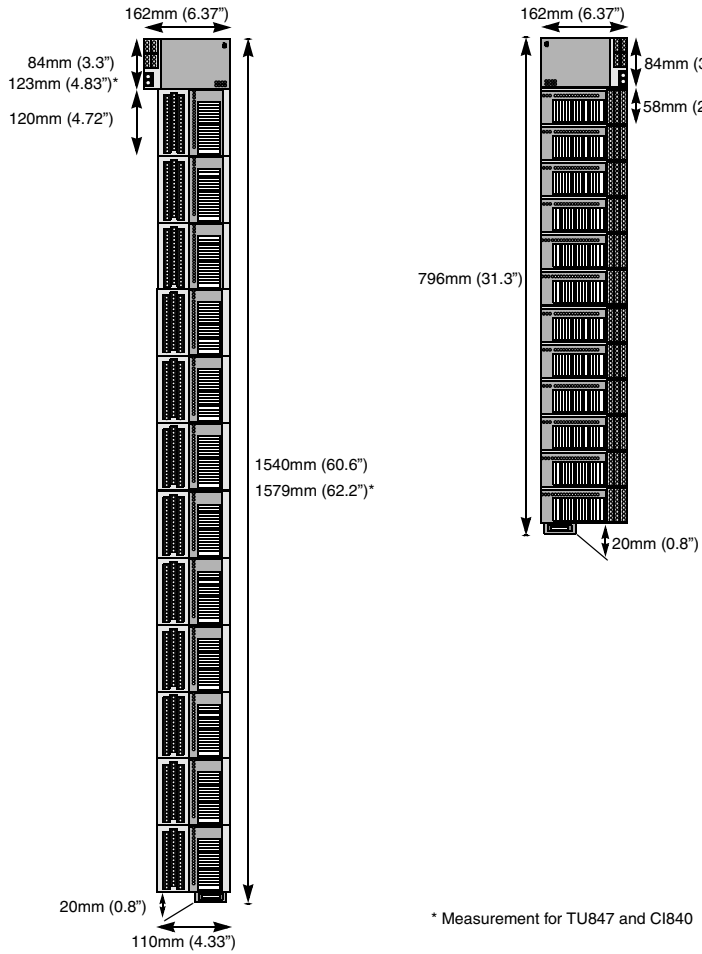

Figure 55. Vertical Mounting of S800M I/O MTUs

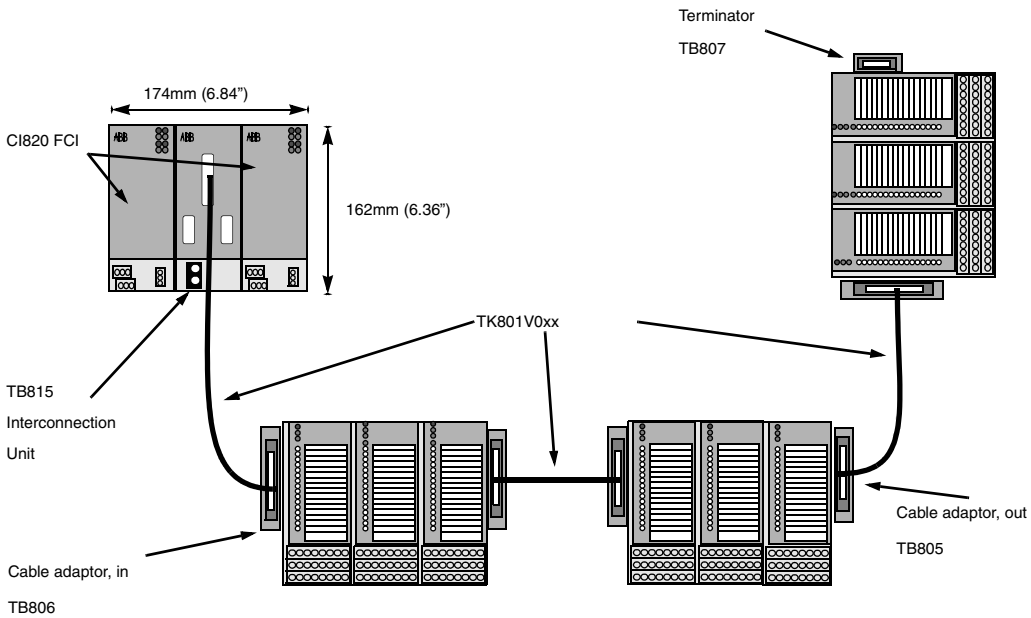

Figure 56. I/O Station with Redundant CI820 FCIs

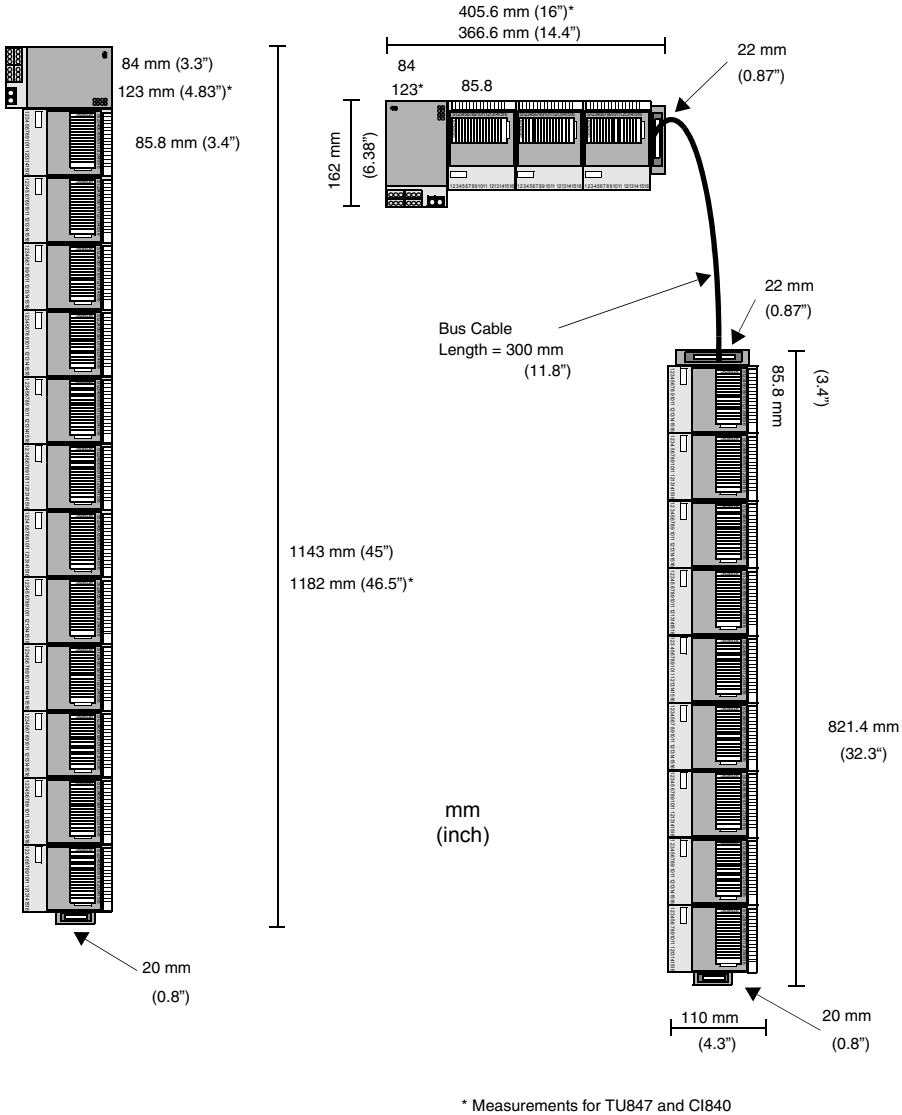

Figure 57. Maximum Layout of I/O Cluster with S800L

Section 3 Technical Data and Performance

General Specifications

Standards and Approvals

Please check how the approvals are applicable for each module.

Electrical Safety Standards and Approvals

EN 3810	Electronical and Electrical Test, Measuring and Process Control Equipment
EN 50178	Electronic Equipment for Use in Power Installations
IEC 601131-2	Programmable Controllers Part 2: Equipment Requirements and Tests
EN 601131-2	Programmable Controllers Part 2: Equipment Requirements and Tests
UL 508	Industrial Control Equipment.
CSA 22.2 No.142-M1987	Process Control Equipment. Industrial Products

Hazardous Classified Locations

CSA 22.2 No.213-M1987	Non-Incendive Electrical Equipment for use in Class 1, Division 2 Hazardous Locations
FM 3600	Electrical Equipment for use in Hazardous (Classified) locations
FM 3611	Non-Incendive Electrical Equipment for use in Class 1, Division 2 Hazardous Locations
UL 60079-15	Electrical Equipment for use in Class 1, Division 2 and Hazardous Locations

CE-marking

S800 products fulfill the requirements of EU-directives 89/336/EEC "Electromagnetic Compatibility" (EMC Directive) and 72/23/EEC "Electrical Equipment Designed for Use between Certain Voltage Limits" (Low Voltage Directive). Declarations of conformity are available on request.

G3 Compliant

G3 compliant modules fulfills the severity level in the standard ISA-S71.04 Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants.

The G3 compliant modules shall not be stored in more severe environment than G2 if the contacts are unconnected.

Transport and Storage Conditions

S800 modules should be transported and stored in their original packaging.

Condition	Range	Standard
Temperature	-25 to +70 °C	IEC/EN 61131-2
Humidity	RH = 5 to 95%, no condensation	
Altitude	-500 to +3000 m	
Pollution degree	Degree 2	IEC 60664-1
Corrosive atmosphere	1000 Angstrom copper corrosion over 28 days	ISA 71.04 Class G2
Fall in package	< 10 kg: 300 mm 10-40 kg: 300 mm >40 kg: 250 mm Free-fall drop height in original product package	IEC 61131-2
Shock	150 m/s^2, 11 ms	

Climatic operating conditions

Condition	Operative range	Standard
Temperature(1)	0 to +55 °C, no condensation 0 to +40 °C compact MTUs or S800L modules on vertical DIN-rail, non condensing	IEC/EN 61131-2
Temperature change	3 °C/min	
Humidity	RH = 5 to 95%, no condensation	
Altitude	2000 m	
Pollution degree	Degree 2	IEC 60664-1
Corrosive atmosphere	<1000 Angstrom copper corrosion over 28 days <2000 Angstrom copper corrosion over 28 days	ISA 71.04 severity level G2 ISA 71.04 severity level G3

(1) Approvals are issued for +5 to +55 °C.

Mechanical operating conditions

	Operative range	Standard
Vibration, three axis Sinusoidal, 10<f<50 Hz	Continuous: 0.0375 mm amplitude Occasional: 0.075 mm amplitude	IEC/EN 61131-2
Sinusoidal, 50<f<150Hz	Continuous 0,5 g Occasional: 1,0 g	
Shock	150 m/s^2, 11 ms	
Emitted noise	<55 dB (A)	

EMC

Radiated Radio Frequency Emission IEC/EN 61000-6-4 (Class A), IEC/EN 61131-2		
Test	**Limits**	**Generic standards**
30 MHz -230 MHz	40 dB (µV/m) quasi peak	EN 55011
230 MHz - 1000 MHz	47 dB (µV/m) quasi peak	

Conducted Radio Frequency Emission, AC mains port IEC 61000-6-4 (Class A), IEC/EN 61131-2		
Test	**Limits**	**Generic standards**
0,15 MHz -0,50 MHz	79 dB (µV/m) quasi peak 66 dB (µV/m) average	EN 55011
0,50 MHz - 5 MHz	73 dB (µV) quasi peak 60 dB (µV/m) average	
5 MHz - 30 MHz	73 dB (µV) quasi peak 60 dB (µV/m) average	

Immunity IEC/EN 61000-6-2, IEC/EN 61131-2 Continuous...		
Test	**Severity**	**Generic standards**
Radiated RF field	10 V/m	IEC/EN 61000-4-3
Conducted RF field	10 V	IEC/EN 61000-4-6

Transients immunity		
Electrostatic discharge	4 kV contact discharge 8 kV air discharge	IEC/EN 61000-4-2
Electrical fast transient/Burst	4 kV, mains power supply 2 kV, signal power ports 1 kV, other lines	IEC/EN 61000-4-4
Surge	4 kV, common mode, power supply 2 kV, differential mode, power supply 2 kV, common mode, P I/O, com. 1 kV, differential mode, P I/O, com.	IEC/EN 61000-4-5
Power frequency magnetic field	30 A/m, cont. 3 A/m for CRTs	IEC/EN 61000-4-8

Overvoltage Categories

Installation type	Category	Standards
Equipment permanently connected to low voltage mains	Overvoltage categories III	IEC/EN 60664-1, EN 50178
Equipment not energized directly from the low voltage mains	Overvoltage categories II	

Equipment Class and Insulation Voltages

Overvoltage Categories According to IEC 60664-1

AC mains power supplies are compliant with Overvoltage Category III networks (industrial mains). All I/O signals are overvoltage II compliant.

Equipment Class

S800 equipment class is Class 1 according to IEC 60536. Class 1 means protection of electric shock by protective earth connection (PE). In this case this means a PE-connection must be made to the DIN rail.

Insulation Voltage

All accessible ports on S800 modules are galvanically isolated from ground and system. For actual module isolation configuration, please consult module data sheets.

Insulation Test Voltage

Type test, insulation test voltage:

500 V a.c. or 700 V d.c. 1 minute for RIV 50 V[1] modules

2000 V a.c. 1 minute for RIV 250 V[1] modules

Routine Test, insulation test voltage:

850 V d.c. 1 second for RIV 50 V[1] modules

2000 V a.c. 1 second for RIV 250 V[1] modules

1. Modules with a working voltage of less than 50 V have RIV 50 V. RIV 250 V applies to all modules having a working voltage greater than 50 V. It should be noted that insulation test voltage specifications, according to electrical safety standards, do not imply that permanent connection to circuits with voltages greater than the specified Rated Insulation Voltage is allowed. Connection to voltages higher than specified RIV violates electrical safety codes and may expose users to electric shock.

Capacity and Performance

Advant Fieldbus 100 Load

The bus load is calculated in with different figures according to the bus length:

- for bus length max 2000 m (2200 yards), use Table 11
- for bus length max 8500 m (9300 yards), use Table 12
- for bus length max 15000 m (16400 yards), use Table 13.

To calculate the bus load in percent (AF100%load), at the required Cycle Time, the CI810/CI820 (FCI) loading per station and the I/O Module Type quantity times the per cent loading.

For bus load calculation, use the formula:

$AF100_{\%load} = CI810/CI820_{load} + S800\ I/O\ Module\ 1_{load} + S800\ I/O\ Module\ n_{load} + ...$

Calculation of load for AF100 with a length of max 2,000 m (2,200 yards)

Due to the organization of the Advant Fieldbus 100 scans, some constraints are imposed on the transmissions. To guarantee message transfer etc., at least 30% of the fieldbus load is reserved. The remaining load (up to 70%) can be used for S800 I/O Station loading and other station loading.

The calculated load of Advant Fieldbus 100 must be equal to or less than 70%.

Below is an example for an I/O Station with one CI810 FCI, 2 AI810s, two AO810/AO810V2s, four DI810s and four DO810s using 128ms cycle time for AI and AO modules and 64ms for DI and DO modules:

$$AF100_{\%load} = 0.033\% + (2 \times 0.197\%_{AI810}) + (2 \times 0.221\%_{AO810/AO810V2}) + (4 \times 0.138\%_{DI810}) + (4 \times 0.146\%_{DO810}) = 2.005\%\ Load$$

Table 11. % of load on the Advant Fieldbus 100 by S800 I/O (up to 2000 m Bus Length)

Cycle Time (ms)	Module Type								
	AI801 AI810 AI890 AI895	AI820	AI830 AI830A AI835	AO801 AO810 AO810V2 AO890 AO895	AO820	DI801, DI802 DI803, DI810 DI811, DI814 DI820, DI821 DI830, DI831 DI885, DI890	DO801(1), DO802 DO810(1), DO814(1), DO815(1), DO820(1), DO821(1), DO890(1)	DP820(2) INSCANT	DP820(2) OUT-SCANT
1	25.2%	15.6%	25.3%	25.23%	15.62%	8.8%	8.8%	25.2%	15.6%
2	12.6%	7.8%	12.6%	12.63%	7.815%	4.4%	4.4%	12.6%	7.8%
4	6.3%	3.9%	6.3%	6.325%	3.915%	2.2%	2.2%	6.3%	3.9%
8	3.15%	1.95%	3.15%	3.175%	1.965%	1.1%	1.1%	3.15%	1.95%
16	1.575%	0.975%	1.575%	1.6%	0.99%	0.55%	0.55%	1.575%	0.975%
32	0.788%	0.488%	0.788%	0.812%	0.503%	0.275%	0.275%	0.788%	0.488%
64	0.394%	0.244%	0.394%	0.418%	0.259%	0.138%	0.138%	0.394%	0.244%
128	0.197%	0.122%	0.197%	0.221%	0.137%	0.069%	0.069%	0.197%	0.122%
256	0.098%	0.061%	0.098%	0.123%	0.076%	0.034%	0.034%	0.098%	0.061%
512	0.049%	0.03%	0.049%	0.074%	0.046%	0.017%	0.017%	0.049%	0.030%
1024	0.025%	0.015%	0.025%	0.049%	0.03%	0.009%	0.009%	0.025%	0.015%
2048	0.012%	0.008%	0.012%	0.037%	0.023%	0.004%	0.004%	0.012%	0.008%
4096	0.006%	0.004%	0.006%	0.031%	0.019%	0.002%	0.002%	0.006%	0.004%

(1) Readbacks increase the load depending on the cyclicity and with the same amount as the net load at the cycle time. For Master the cycle time is 1024 which gives 0.009% more load. For MOD the cycle time is configurable.

(2) Total load = (load generated by INSCANT) + (load generated by OUTSCANT)
The total load if INSCANT is 32 ms and OUTSCANT is 64 ms is:
Total load = 0.788 + 0.244 = 1.032%

Calculation of load for AF100 with a length of max 8,500 m (9,300 yards)

Due to the organization of the Advant Fieldbus 100 scans, some constraints are imposed on the transmissions. To guarantee message transfer etc., at least 50% of the fieldbus load is reserved. The remaining load (up to 50%) can be used for S800 I/O Station loading and other station loading.

The calculated load of Advant Fieldbus 100 must be equal to or less than 50%. **NOTE! 1 ms cycle time is not allowed**.

Table 12. % of load on the Advant Fieldbus 100 by S800 I/O (8,500 m Bus Length)

Cycle Time (ms)	Module Type								
	AI801 AI810 AI890 AI895	AI820	AI830 AI830A AI835	AO801 AO810 AO810V2 AO890 AO895	AO820	DI801, DI802 DI803, DI810 DI811, DI814 DI820, DI821 DI830, DI831 DI885, DI890	DO801(1), DO802(1) DO810(1) DO814(1), DO815(1) DO820(1), DO821(1) DO890(1)	DP820(2) INSCANT	DP820(2) OUT-SCANT
2	16.60%	11.80%	16.60%	16.63%	11.82%	8.40%	8.40%	16.60%	11.80%
4	8.300%	5.900%	8.300%	8.332%	5.923%	4.200%	4.200%	8.300%	5.900%
8	4.150%	2.950%	4.150%	4.182%	2.973%	2.100%	2.100%	4.150%	2.950%
16	2.075%	1.475%	2.075%	2.107%	1.498%	1.050%	1.050%	2.075%	1.475%
32	1.038%	0.738%	1.038%	1.070%	0.761%	0.525%	0.525%	1.038%	0.738%
64	0.519%	0.369%	0.519%	0.551%	0.392%	0.263%	0.263%	0.519%	0.369%
128	0.259%	0.184%	0.259%	0.292%	0.207%	0.131%	0.131%	0.259%	0.184%
256	0.130%	0.092%	0.130%	0.162%	0.115%	0.066%	0.066%	0.130%	0.092%
512	0.065%	0.046%	0.065%	0.097%	0.069%	0.033%	0.033%	0.065%	0.046%
1024	0.032%	0.023%	0.032%	0.065%	0.046%	0.016%	0.016%	0.032%	0.023%
2048	0.016%	0.012%	0.016%	0.049%	0.035%	0.008%	0.008%	0.016%	0.012%
4096	0.008%	0.006%	0.008%	0.041%	0.029%	0.004%	0.004%	0.008%	0.006%

(1) Readbacks increase the load depending on the cyclicity and with the same amount as the net load at the cycle time. For Master the cycle time is 1024 which gives 0.016% more load. For MOD the cycle time is configurable.

(2) Total load = (load generated by INSCANT) + (load generated by OUTSCANT)
The total load if INSCANT is 32 ms and OUTSCANT is 64 ms is:
Total load = 1.038 + 0.369 = 1.407%

Calculation of load for AF100 with a length of max 15,000 m (16,400 yards)

Due to the organization of the Advant Fieldbus 100 scans, some constraints are imposed on the transmissions. To guarantee message transfer etc., at least 50% of the fieldbus load is reserved. The remaining load (up to 50%) can be used for S800 I/O Station loading and other station loading.

The calculated load of Advant Fieldbus 100 must be equal to or less than 50%. **NOTE! 1 ms cycle time is not allowed.**

Table 13. % of load on the Advant Fieldbus 100 by S800 I/O (15,000 m Bus Length)

Cycle Time (ms)	Module Type								
	AI801 AI810 AI890 AI895	AI820	AI830 AI830A AI835	AO801 AO810 AO810V2 AO890 AO895	AO820	DI801, DI802 DI803, DI810 DI811, DI814 DI820, DI821 DI830, DI831 DI885, DI890	DO801(1), DO802 DO810(1), DO814(1), DO815(1), DO820(1), DO821(1), DO890(1)	DP820(2) INSCANT	DP820(2) OUT-SCANT
2	20.60%	15.80%	20.60%	20.64%	15.83%	12.40%	12.40%	20.60%	15.80%
4	10.30%	7.900%	10.30%	10.34%	7.931%	6.200%	6.200%	10.30%	7.900%
8	5.150%	3.950%	5.150%	5.190%	3.981%	3.100%	3.100%	5.150%	3.950%
16	2.575%	1.975%	2.575%	2.615%	2.006%	1.550%	1.550%	2.575%	1.975%
32	1.288%	0.988%	1.288%	1.328%	1.018%	0.775%	0.775%	1.288%	0.988%
64	0.644%	0.494%	0.644%	0.684%	0.525%	0.388%	0.388%	0.644%	0.494%
128	0.322%	0.247%	0.322%	0.362%	0.278%	0.194%	0.194%	0.322%	0.247%
256	0.161%	0.123%	0.161%	0.201%	0.154%	0.097%	0.097%	0.161%	0.123%
512	0.080%	0.062%	0.080%	0.121%	0.093%	0.048%	0.048%	0.080%	0.062%
1024	0.040%	0.031%	0.040%	0.080%	0.062%	0.024%	0.024%	0.040%	0.031%
2048	0.020%	0.015%	0.020%	0.060%	0.046%	0.012%	0.012%	0.020%	0.015%
4096	0.010%	0.008%	0.010%	0.050%	0.039%	0.006%	0.006%	0.010%	0.008%

(1) Readbacks increase the load depending on the cyclicity and with the same amount as the net load at the cycle time. For Master the cycle time is 1024 which gives 0.009% more load. For MOD the cycle time is configurable.

(2) Total load = (load generated by INSCANT) + (load generated by OUTSCANT)
The total load if INSCANT is 32 ms and OUTSCANT is 64 ms is:
Total load = 1.288 + 0.494 = 1.782%

PROFIBUS CI801

Number of S800 I/O Stations

Maximum number of S800 I/O stations per bus: 99 stations

Supported communication speeds: 9.6 kbit/s to 12 Mbit/s

Maximum number of S800 I/O stations per Profibus bus segment: 32 stations.

Maximum number of S800 I/O modules in a station: 24 modules

Maximum number of S800 I/O modules per cluster: 12 modules

Calculation of Number of S800 I/O Modules per Station

Due to the PROFIBUS-DP specification it is not possible to always connect 24 I/O modules to one FCI. The reason is that the S800 I/O system includes more data and user parameters than PROFIBUS-DP can handle. Table 14 shows maximum number of modules that can be connected to one CI801.

Table 14. Maximum Number of Modules on CI801

Module Type	Number of Modules
AI801, AI810, AI830, AI830A, AI835, AI890, AI893, AI895	14 (11)
AI820, AI825	24 (22)
AI843	11 (9)
AI845	14 (11)
AO801, AO810, AO810V2, AO890, AO895	7 (5)
AO820	14 (11)
AO845, AO845A	7 (5)
DI801, DI802, DI803, DI810, DI811, DI820, DI821	24 (24)
DI840	16 (16)
DO801, DO810, DO814	22 (21)
DO802, DO815, DO820, DO821	24 (24)
DO840	20 (19)
DP820	8 (6)
DP840	7 (5)
Standard Drives	9 (7)

The values in brackets are in Extended HART mode and HCIR.

In order to find out if a given configuration of analog and digital modules can be used the following method should be used:

- Fill in number of modules in Table 15.
- Calculate the sum in the three columns:
  - Sum User Parameters
  - Sum Input Bytes
  - Sum Output Bytes
- Calculate the three total sums for:
  - ParamSize
  - InSize
  - OutSize.
- Check that:
  - ParamSize is less than or equal to 221 (220 if HCIR is used)
  - InSize is less than or equal to 239 in normal mode, 199 in Extended HART mode
  - OutSize is less than or equal to 112 in normal mode, 90 in Extended HART mode

  If any of these three values is too high then the configuration can **not** be used.

Table 15. Calculation of Number of Modules on CI801

Module Type	User Parameters	Input Bytes	Output Bytes	Number of Modules	Sum User Parameters	Sum Input Bytes	Sum Output Bytes
AI801	13	17	0				
AI810	13	17	0				
AI820	9	9	0				
AI825	9	9	0				
AI830/ AI830A	12	17	0				
AI835	15	17	0				
AI843	16	20	2				
AI845	13	17	0				
AI890	13	17	0				
AI893	15	17	0				
AI895	13	17	0				
AO801	17	1	16				
AO810/ AO810V2	17	1	16				
AO820	11	1	8				
AO845/ AO845A	18	1	16				
AO890	17	1	16				
AO895	17	1	16				
DI801	7	4	0				
DI802	6	2	0				

Table 15. Calculation of Number of Modules on CI801 (Continued)

Module Type	User Parameters	Input Bytes	Output Bytes	Number of Modules	Sum User Parameters	Sum Input Bytes	Sum Output Bytes
DI803	6	2	0				
DI810	7	4	0				
DI811	7	4	0				
DI814	7	4	0				
DI820	6	2	0				
DI821	6	2	0				
DI840	13	4	0				
DI890	7	2	0				
DO801	10	2	2				
DO802	7	1	1				
DO810	10	2	2				
DO814	10	2	2				
DO815	8	1	1				
DO820/ DO821	7	1	1				
DO840	11	2	2				
DO890	6	1	1				
DP820	12	18	13				
DP840	10	34	0				
Standard Drives	4	13	12				
Total sum	-	-	-		ParamSize	InSize	OutSize

Calculation of Bus Cycle Time

How to calculate the Bus Cycle Time, see documentation for current master.

To calculate the Bus Cycle Time the following parameters for the I/O station shall be used:

Number of input and output bytes. See Calculation of Number of S800 I/O Modules per Station on page 125.

MAX T_{SDR} Maximum Station Delay of Responder in T_{BIT} (Bit Time).
See GSD file.

PROFIBUS CI830

Number of S800 I/O Stations

Maximum number of S800 I/O stations per bus: 79 stations

Supported communication speed: 9.6 kbit/s to 12 Mbit/s

Maximum number of S800 I/O stations per Profibus segment: 32 stations

Maximum number of S800 I/O modules in a station: 24 modules

Maximum number of S800 I/O modules per cluster: 12 modules

Calculation of Number of S800 I/O Modules per Station

Due to the PROFIBUS-DP specification it is not possible to always connect 24 I/O modules to one FCI. The reason is that the S800 I/O system includes more data and user parameters than PROFIBUS-DP can handle. Table 16 shows maximum number of modules that can be connected to one CI830.

Table 16. Maximum Number of Modules on CI830

Module Type	Number of Modules
AI801, AI810, AI830, AI830A, AI835, AI890, AI893	12
AI820	20
AO801, AO810, AO810V2, AO890	13
AO820	21
DP820	11
DP840	6
All DI and DO modules(1)	24
Standard Drives	17/24(1)

(1) See Table 17.

In order to find out if a given configuration of analog and digital modules can be used the following method should be used:

- Fill in number of modules in Table 17.
- Calculate the sum in the three columns:
  - Sum User Parameters
  - Sum Input Bytes
  - Sum Output Bytes.
- Calculate the three total sums for:
  - ParamSize
  - InSize
  - OutSize.

- Check that:
  - ParamSize is less than or equal to 237
  - InSize is less than or equal to 244
  - OutSize is less than or equal to 244.

  If any of these three values is too high then the configuration can **not** be used.
- Round up the values **InSize**, **OutSize** and the sum of **ParamSize+15** to the nearest multiple of eight (8), for example, 233 is rounded to 240.
- Finally calculate the memory size with the formula:

  MemSize =a + 2xRoundParamSize + 3x(RoundInSize +RoundOutSize).

  a=656 for firmware release 1.0 and 1.1.
  a=728 for firmware release 1.2 or later.

Check that MemSize is less than or equal to 2048. If not, the configuration can **not** be used.

Table 17. Calculation of Number of Modules on CI830

Module Type	User Parameters	Input Bytes	Output Bytes	Number of Modules	Sum User Para-meters	Sum Input Bytes	Sum Output Bytes
CI830	3	4	0	1	3	4	0
AI801	7	20	4				
AI810	11	20	4				
AI820	7	12	4				
AI830/ AI830A	11	20	4				
AI835	13	20	4				
AI890	7	20	4				
AI893	13	20	4				
AO801	16	4	18				
AO810/ AO810V2	16	4	18				
AO820	10	4	10				
AO890	16	4	18				
DI801	4	6	4				
DI802	4	6	2				
DI803	4	6	2				
DI810	4	6	4				
DI811	4	6	4				
DI814	4	6	4				
DI820	4	6	2				

Table 17. Calculation of Number of Modules on CI830 (Continued)

Module Type	User Parameters	Input Bytes	Output Bytes	Number of Modules	Sum User Para-meters	Sum Input Bytes	Sum Output Bytes
DI821	4	6	2				
DI890	4	6	4				
DO801	8	4	4				
DO802	6	4	4				
DO810	8	4	4				
DO814	8	4	4				
DO815	6	4	4				
DO820/ DO821	6	4	4				
DO890	5	4	4				
DP820	11	22	16				
DP840	7	36	4				
Standard Drives	3* (4)	14* (8)	12* (6)				
Total sum	-	-	-		ParamSize	InSize	OutSize
Rounded sum	-	-	-		Round ParamSize	Round InSize	Round OutSize

Data with * are valid for CI830 firmware version 1.3.
Data inside parenthesis ( ) are valid for CI830 firmware versions 1.0 to 1.2.

Calculation of Bus Cycle Time

How to calculate the Bus Cycle Time, see documentation for current master.

To calculate the Bus Cycle Time the following parameters for the I/O station shall be used:

Number of input and output bytes. See Calculation of Number of S800 I/O Modules per Station on page 129.

MAX T_{SDR} Maximum Station Delay of Responder in T_{BIT} (Bit Time).
See GSD file.

PROFIBUS CI840

Number of S800 I/O Stations

Maximum number of S800 I/O stations per bus:

- Redundant CI840: 62 stations.
- Single CI840: 99 stations

Supported communication speeds: 93.75 kbit/s to 12 Mbit/s

Maximum number of S800 I/O stations per PROFIBUS segment:

- Communication speed 12 Mbit: 20 stations.
- Communication speed 1,5 Mbit: 32 stations.

Maximum number of S800 I/O modules in a station: 24 modules

Maximum number of S800 I/O modules per cluster: 12 modules

Switch over time at failure in a redundant CI840 configuration is typical <100 ms and maximum 150 ms.

Calculation of Number of S800 I/O Modules per Station

Due to the PROFIBUS-DP specification it is not possible to connect 24 analog I/O modules to one FCI. The reason is that the S800 I/O system includes more data and user parameters than PROFIBUS-DP can handle. Table 18 shows maximum number of modules that can be connected to one CI840.

Table 18. Maximum Number of Modules on CI840

Module Type	Number of Modules
AI801, AI810, AI830, AI830A, AI835, AI890, AI893, AI895	14 (11)
AI820, AI825	24 (22)
AI843	11 (9)
AI845	14 (11)
AO801, AO810, AO810V2, AO845, AO845A, AO890, AO895	7 (5)
AO820	14 (11)
DI801, DI802, DI803, DI810, DI811, DI820, DI821	24 (24)
DI840	16 (16)
DO801, DO810, DO814	22 (21)
DO802, DO815, DO820, DO821	24 (24)
DO840	20 (19)
DP820	8 (6)
DP840	7 (5)

The values in brackets are in Extended HART mode and HCIR.

In order to find out if a given configuration of analog and digital modules can be used the following method should be used:

- Fill in number of modules in Table 19.
- Calculate the sum in the three columns:
  - Sum User Parameters
  - Sum Input Bytes
  - Sum Output Bytes
- Calculate the three total sums for:
  - ParamSize
  - InSize
  - OutSize.
- Check that:
  - ParamSize is less than or equal to 221 (220 if HCIR is used)
  - InSize is less than or equal to 239 in normal mode, 199 in Extended HART mode
  - OutSize is less than or equal to 112 in normal mode, 90 in Extended HART mode

  If any of these three values is too high then the configuration can **not** be used.

Table 19. Calculation of Number of Modules on CI840

Module Type	User Parameters	Input Bytes	Output Bytes	Number of Modules	Sum User Parameters	Sum Input Bytes	Sum Output Bytes
AI801	13	17	0				
AI810	13	17	0				
AI820	9	9	0				
AI825	9	9	0				
AI830/ AI830A	12	17	0				
AI835	15	17	0				
AI843	16	20	2				
AI845	13	17	0				
AI890	13	17	0				
AI893	15	17	0				
AI895	13	17	0				
AO801	17	1	16				
AO810/ AO810V2	17	1	16				
AO820	11	1	8				
AO845/ AO845A	18	1	16				
AO890	17	1	16				
AO895	17	1	16				
DI801	7	4	0				
DI802	6	2	0				

Table 19. Calculation of Number of Modules on CI840 (Continued)

Module Type	User Parameters	Input Bytes	Output Bytes	Number of Modules	Sum User Parameters	Sum Input Bytes	Sum Output Bytes
DI803	6	2	0				
DI810	7	4	0				
DI811	7	4	0				
DI814	7	4	0				
DI820	6	2	0				
DI821	6	2	0				
DI840	13	4	-				
DI890	7	2	0				
DO801	10	2	2				
DO802	7	1	1				
DO810	10	2	2				
DO814	10	2	2				
DO815	8	1	1				
DO820/ DO821	7	1	1				
DO840	11	2	2				
DO890	6	1	1				
DP820	12	18	13				
DP840	10	34	0				
Total sum	-	-	-		ParamSize	InSize	OutSize

Calculation of Bus Cycle Time

How to calculate the Bus Cycle Time, see documentation for current master.

To calculate the Bus Cycle Time the following parameters for the I/O station shall be used:

Number of input and output bytes. See Calculation of Number of S800 I/O Modules per Station on page 129.

MAX T_{SDR} Maximum Station Delay of Responder in T_{BIT} (Bit Time).
See GSD file.

S800 I/O Station Data Scanning

The ModuleBus data is scanned (read or written) cyclically, depending on the I/O module configuration. To calculate the I/O scan cycle time in the FCI do as follows:

Totalize (number of module type x) * (used execution time for type x) (see Table 20) if the value is a multiple of 2, add 2 to the value. Otherwise increase the total value to the nearest higher multiple of 2 to get the I/O scan cycle time.

If CI810A or C1810B is used the scan cycle time is increased by 25% and for CI820 it is increased by 50%. If the value is a multiple of 2, add 2 to the value. Otherwise increase the value to the nearest higher multiple of 2, to get the I/O cycle time.

Table 20. I/O Scan Cycle Time in the FCI

Module Type	Execution Time Used in ms				
	CI801	CI810, CI820	CI830	CI840	
				Single I/O	Redundant I/O pair
AI801, AI810, AI890, AI895	3.00	3.00	3.00	3.00	-
AI820	1.50	1.50	1.50	1.50	-
AI825	1.50	-	-	1.50	-
AI830, AI830A, AI835	0.40	0.40	0.40	0.40	-
AI893	0.40	-	0.40	0.40	-

Table 20. I/O Scan Cycle Time in the FCI (Continued)

Module Type	Execution Time Used in ms				
	CI801	CI810, CI820	CI830	CI840	
				Single I/O	Redundant I/O pair
AI843	0.40	-	-	0.40	0.80
AI845	3.00	-	-	3.00	6.00
AO801, AO810, AO810V2, AO890, AO895	1.20	1.20	1.20	1.20	-
AO820	0.60	0.60	0.6	0.60	-
AO845, AO845A	1.20	-	-	1.20	2.40
DI801, DI810, DI811, DI814, DI820, DI821, DI890	0.43	0.43	0.43	0.50	-
DI802, DI803	0.43	-	0.43	0.50	-
DI840	0.43	-	-	0.50	1.00
DI830, DI831, DI885	-	0.43	-	-	-
DO801, DO810, DO814, DO815, DO820, DO821	0.43	0.43	0.43	0.50	-
DO802	0.43	-	0.43	0.50	-
DO840	0.43	-	-	0.50	1.00
DO890	0.43	0.43	0.43	0.50	-
DP820	1.72	1.72	1.72	2.09	-
DP840	3.00	-	3.00	3.00	6.00
Engineered drives	-	1.72	-	-	-
Standard drives	0.71	0.86	0.86	-	-
FCI CI801	1.18	-	-	-	-

Table 20. I/O Scan Cycle Time in the FCI (Continued)

Module Type	Execution Time Used in ms				
	CI801	CI810, CI820	CI830	CI840	
				Single I/O	Redundant I/O pair
FCI CI810	-	1.40	-	-	-
FCI CI820 redundant	-	1.40	-	-	-
FCI CI830 firmware 1.0 to 1.2	-	-	1.40	-	-
FCI CI830 firmware 1.3 or later	-	-	2.24	-	-
FCI CI840	-	-	-	2.10	

Analog modules will be scanned every fourth I/O scan cycle time except for AI830/AI830A, AI835, AI843 and AI893 modules which will be scanned every tenth time.
DI and DO modules will be scanned each I/O scan cycle time.

For example, a non redundant station with a CI810A, two AO810/AO810V2, three DI810, two AI810, three DO810, two AI830/AI830A and one DP820 will give the following I/O scan cycle time:

1 CI810A =>	1*1.40 ms =	1.40
2 AO810/AO810V2 =>	2*1.20 ms =	2.40
3 DI810 =>	3*0.43 ms =	1.29
2 AI810 =>	2*3.00 ms =	6.00
3 DO810 =>	2*0.43 ms =	1.29
2 AI830/AI830A =>	2*0.40 ms =	0.80
1 DP820 =>	1*1.72 ms =	1.72

		14.9 ms

14.9 ms is not a multiple of 2, so an increase of the value to the nearest multiple of 2 gives 16 ms.

CI810A/CI810B compensation 1.25*16 ms=20 ms.

20 ms is a multiple of 2, so add 2 to the value 20. 20+2=22.

That will give an I/O scan cycle time of 22 ms between the FCI and its I/O modules. This means that the DIs and DOs will be scanned every 22 ms, the AI810s and the AO810/AO810V2 every (4*22 ms) 88ms and the AI830/AI830A every (10*22 ms) 220 ms.

Minimum I/O scan cycle time = 4 ms single FCI (CI810), and CI830 with firmware 1.0 to 1.2
Minimum I/O scan cycle time = 6 ms redundant FCI (CI820), and CI830 with firmware 1.3 or later.

For example, a redundant station with CI840, two AI810, one AO810/AO810V2, two DI810, two DO820 and one AI830/AI830A will give the following I/O scan cycle time:

```
2 AI810 =>                2*3.00 ms = 6.00 ms
1 AO810/AO810V2 =>        1*1.20 ms = 1.20 ms
2 DI810 =>                2*0.50 ms = 1.00 ms
2 DO810 =>                2*0.50 ms = 1.00 ms
1 AI830/AI830A =>         1*0.40 ms = 0.40 ms
1 CI840 =>                1*2.10 ms = 2.10 ms
-----------------------------------------------------
                                      11.7 ms
```

11.7 ms is not a multiple of 2, so increase of the value to the nearest multiple of 2 gives 12 ms.

That will give an I/O scan cycle time of 12 ms between the FCI and its I/O modules. This means that the DIs, DOs, DPs and Standard Drives will be scanned every 12 ms, the AIs and AOs every (4*12 ms) 48 ms and the AI830/AI830A, AI835, AI843 and AI893 every (10*12 ms) 120 ms.

Minimum I/O scan cycle time = 4 ms.

Calculation of Maximum Distance of an Optical ModuleBus Configuration

The maximum signal delay should be calculated in the configuration using Optical ModuleBus Media Converter. This is calculated using the signal path from the controller to the point in the configuration that has the longest delay. The maximum delay in a optical ModuleBus configuration must be ≤42 µs.

The delay values in Table 21 can be used to calculate the maximum delay in an optical ModuleBus configuration.

Table 21. Delay Values Optical ModuleBus Components

Opto-to-opto delay in TB825(1)	2.4 µs
Opto-to-opto delay in TB820(1)	4.0 µs
Opto-to-electrical delay in TB820(1)	6.5 µs
Opto-to-opto delay in TB840/TB840A(1)	2.0 µs
Opto-to-electrical delay in TB840/TB840A(1)	5.5 µs
Delay in optical fiber(1)(2)	(0.01 x length) µs

(1) Notice that the delays in the table is the sum of the communication delay in both directions, i.e. (delay of master frame) + (delay of slave frame).
(2) Total fiber length = total local fiber length + field fiber length

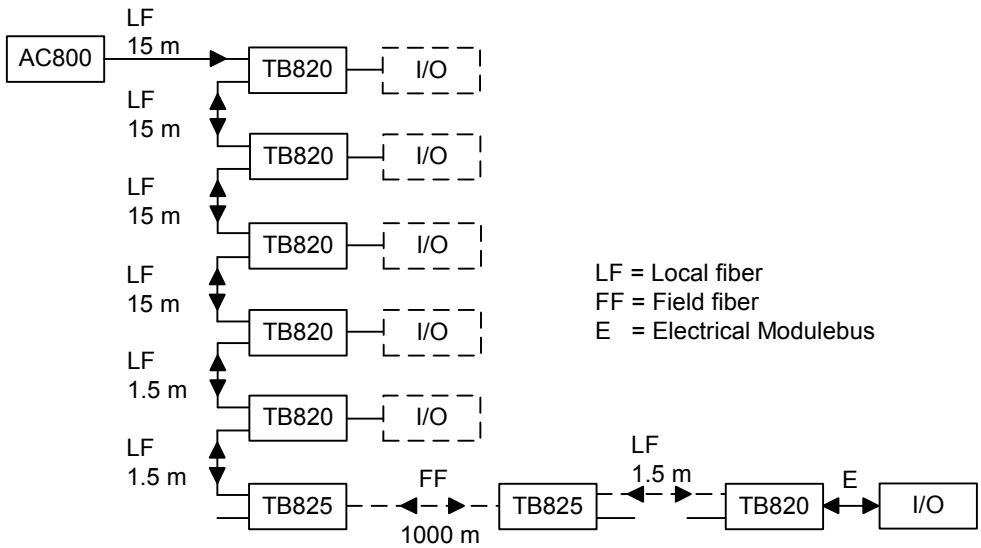

Figure 58. Example of worst case delay configuration

Calculation of the ModuleBus delay for the configuration in Figure 58:

ModuleBus delay = (total delay in optical fiber) + 5 x (opto-to-opto delay in TB820) + 2 x (delay in TB825) + (opto-to electrical delay in TB820) = (4 x 15 + 3 x 1.5 + 1000) x 0.01 + 5 x 4 + 2 x 2.4 + 6.5 = 42 µs.

Power Supply and Cooling Requirements

A quick guide for power consumption to be used in a preliminary phase of a project work or whenever you need estimated figures is provided in Table 22.

Table 22. Estimated System Power Consumption

S800 I/O Station	24 V d.c. Power Consumption (A)
Base cluster, single FCI, with six (6) I/O Modules	0.5
Base cluster, single FCI, with twelve (12) I/O Modules	1.0
Base cluster, redundant FCIs (2), with six (6) I/O Modules	1.0
Base cluster, redundant FCIs (2), with twelve (12) I/O Modules	1.5
Base cluster, redundant FCIs (2), with six (6) pairs of redundant I/O Modules	1.5
Additional I/O cluster with six (6) I/O Modules	0.5
Additional I/O cluster with twelve (12) I/O Modules	1.0
Additional I/O cluster, redundant Optical ModuleBus modem (2), with six (6) pairs of redundant I/O Modules(1)	1.0
Additional I/O cluster, redundant Optical ModuleBus modem (2), with twelve (12) I/O Modules	1.5
Additional I/O cluster, redundant Optical ModuleBus modem (2), with six (6) I/O Modules	1

(1) One pair of redundant I/O Modules counts as two I/O Modules.

The estimates are based on fully loaded I/O Stations with a mixed configuration of DI/DO and AI/AO.
Only power distributed via the ModuleBus are included. External 24 V connected directly to the I/O modules for external loads and transmitters are not included. When using AO820 and/or DO820/DO821, these load figures may be exceeded and a load calculation can be useful to do, see Table 23.

Power and Cooling

Table 23 shows the typical power and cooling values that can be used when designing the S800 I/O. (Calculation of 24V d.c. Power Consumption.)

Table 23. I/O Station Power and Cooling (Typical) Values

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
AI801	70 mA	-	30 mA	1.1	3.7	55/40° C (131/104° F)(2)
AI810	70 mA	40 mA	-	1.5	5.1	55/40° C (131/104° F)(2)
AI820	80 mA	70 mA	-	1.7	5.8	55/40° C (131/104° F)(2)
AI825	100 mA	110 mA	-	3.2	11	55/40° C (131/104° F)(2)
AI830/ AI830A	70 mA	50 mA	-	1.6	7.5	55/40° C (131/104° F)(2)
AI835	75 mA	50 mA	-	1.6	5.4	55/40° C (131/104° F)(2)
AI843	60 mA	50 mA	-	1.5	5.1	55/40° C (131/104° F)(2)
AI845	100 mA	50 mA	150 mA(5)	3.5	12	55/40° C (131/104° F)(2)
AI880/ AI880A	10 mA	50 mA	0(5)	2.4	8.2	55/40° C (131/104° F)(2)
AI890	150 mA	-	300 mA	3.3	11	55/40° C (131/104° F)(2)
AI893	125 mA	-	-	0.6	2.0	55/40° C (131/104° F)(2)

Table 23. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load [1] (BTU/H Typical)	Maximum Ambient Temperature
AI895	130 mA	-	370 mA	4.75	16	55/40° C (131/104° F)[2]
AO801	70 mA	-	200 mA	3.8	13	55/40° C (131/104° F)[2]
AO810	70 mA	-	200 mA	3.0	10	55/40° C (131/104° F)[2]
AO810V2	70 mA	-	245 mA	4.0	14	55/40° C (131/104° F)[2]
AO820	100 mA	260 mA	-	5.5	18	55/40° C (131/104° F)[2]
AO845/ AO845A	125 mA	-	165 mA	3.5	12	55/40° C (131/104° F)[2]
AO890	150 mA	-	300 mA	3.5	12	55/40° C (131/104° F)[2]
AO895	130 mA	-	330 mA	4.25	14.5	55/40° C (131/104° F)[2]
CI801	-	-	140 mA	5.4 W[3]	19	55/40° C (131/104° F)[11]
CI810	-	-	110 mA	2.6	8.9	55° C/(131° F)
CI820	-	-	250 mA [4]	6.0	20	55° C/(131° F)
CI830	-	-	110 mA	2.6	8.9	55° C/(131° F)
CI840	-	-	190 mA[4]	7.7	26	55/40° C (131/104° F)[11]

Table 23. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
DI801	70 mA	-	-	2.2	7.5	55/40° C (131/104° F)(2)
DI802	50 mA	-	-	2.8	9.6	55/40° C (131/104° F)(2)
DI803	50 mA	-	-	2.8	9.6	55/40° C (131/104° F)(2)
DI810	50 mA	-	-	1.8	6.1	55/40° C (131/104° F)(2)
DI811	50 mA	-	-	2.7	9.2	55/40° C (131/104° F)(2)
DI814	50 mA	-	-	1.8	6.1	55/40° C (131/104° F)(2)
DI820	50 mA	-	-	2.8	9.6	55/40° C (131/104° F)(2)
DI821	50 mA	-	-	2.8	9.6	55/40° C (131/104° F)(2)
DI825	90 mA	-	-	4.4	15	55/40° C (131/104° F)(2)
DI830	120 mA	-	-	2.3	7.8	55/40° C (131/104° F)(2)
DI831	120 mA	-	-	3.2	11	55/40° C (131/104° F)(2)
DI840	100 mA	-	15 mA(5)	2.7	9.0	55/40° C (131/104° F)(2)
DI880	125 mA	-	15 mA(5)	2.4	8.2	55/40° C (131/104° F)(2)

Table 23. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load [1] (BTU/H Typical)	Maximum Ambient Temperature
DI885	160 mA	91 mA[6]	91 mA[6]	3.0	10	55/40° C (131/104° F)[2]
DI890	150 mA	-	70 mA	1.6	5.4	55/40° C (131/104° F)[2]
DO801	80 mA	-	[7]	2.1	7.2	55/40° C (131/104° F)[2]
DO802	70 mA	80 mA	-	2.2	7.5	55/40° C (131/104° F)[2]
DO810	80 mA	-	[7]	2.1	7.2	55/40° C (131/104° F)[2]
DO814	80 mA	-	[7]	2.1	7.2	55/40° C (131/104° F)[2]
DO815	120 mA	-	[8]	4.0	14	55/40° C (131/104° F)[2]
DO820	60 mA	140 mA	-	2.9	9.9	55/40° C (131/104° F)[2]
DO821	60 mA	140 mA	-	2.9	9.9	55/40° C (131/104° F)[2]
DO840	130 mA	-	200 mA + channel load[7]	4.3	14	55/40° C (131/104° F)[2]
DO880	10 mA	55 mA	10 mA + channel load[7][9]	5.6[10]	19	55/40° C (131/104° F)[2]
DO890	150 mA	-	360 mA	4.4	15	55/40° C (131/104° F)[2]

Table 23. I/O Station Power and Cooling (Typical) Values (Continued)

Device	5 Volts ModuleBus	24 Volts ModuleBus	24 Volts External	Power Dissipation (Watts)	Cooling Load (1) (BTU/H Typical)	Maximum Ambient Temperature
DP820	120 mA	-	(7)	2.5	8.5	55/40° C (131/104° F)(2)
DP840	125 mA	-	70 mA(5)	4.0	14	55/40° C (131/104° F)(2)
TB810	100 mA	20 mA	-	0.5	1.7	55° C/(131° F)
TB811	100 mA	20 mA	-	0.5	1.7	55° C/(131° F)
TB820	-	-	100 mA	2.4	8.2	55° C/(131° F)
TB840	-	-	120 mA(4)	6.0	20	55/40° C (131/104° F)(11)
TB842	100 mA	20 mA	-	0.5	1.7	55° C/(131° F)
SD821	-	-	-	8.6	29	55° C/(131° F)(12)
SD822	-	-	-	13.3	45	55° C/(131° F)(12)
SD823	-	-	-	26.7	90	55° C/(131° F)(12)
SS822	-	-	-	2.5(13)	8.5	55° C/(131° F)(12)
SS823	-	-	-	24	82	55° C/(131° F)(12)

(1) Cooling load is the heat (BTU/H) produced by the equipment that may be required to meet room or enclosure cooling specifications.
(2) 40° C (104° F) applies to Compact MTUs with I/O modules or S800L mounted on a vertical DIN rail.
(3) With maximum load at ModuleBus 24 V and 5V
(4) In redundant configuration twice
(5) + transducer power
(6) 24 V from ModuleBus (91 mA) or 24 V external (91 mA) or 48 V external (22 mA).
(7) 500 mA per channel with maximum load per channel.
(8) 2 A per channel with maximum load per channel.
(9) Short circuit current ≤15 A during 20 ms.
(10) With maximum channel load
(11) 40° C (104° F) mounter on a vertical DIN rail.
(12) Horizontal mounting only.

(13) 2,5 W at 5A, for calculation use W=0,5 V x Output current.

Calculation of 24V d.c. Power Consumption

Total 24 V d.c. current consumption = Σ 24 V load ModuleBus + Σ 5 V load ModuleBus*0.3 + Σ 24 V external load.

The calculated 5 V ModuleBus load should not exceed 1.5 A.

If many of the modules has a power consumption >125 mA at 5 V, the maximum load could be exceeded. See Table 23 for data.

The calculated 24 V ModuleBus load should not exceed 1.4 A.

If many of the modules has a power consumption >125 mA at 24 V, the maximum load could be exceeded.

To ensure bumpless performance of the I/O system including DO880, the power supply for the I/O field power should be able to support at least short circuit on one DO880 channel in addition to the total nominal load. Short circuit current for DO880 see technical data in S800 I/O Modules and Termination Units.

The following rules must be considered if ABB power supply units are being used together with DO880.

- When using power supply SD823 and the base load ≤16 A, two SD823 must be used in parallel.
- When using of SS823 the base load must not exceed 16 A.
- With a redundant power supply configuration consisting of two SD823 + one SS823 in parallel with two SD823 + one SS823, the base load must not exceed 16 A.

I/O Module MTU Combination and Key Setting

Each MTU is used with certain types of I/O Modules. Refer to Table 24 and Table 25 for a cross-reference between MTU and I/O Modules. Each MTU has two mechanical keys that have to be set for the type of I/O module that will be installed on it.

Table 24. MTU Usage and Key Settings

Module Type	TU810 TU812 TU814 Compact	TU811 TU813 Compact	TU830 TU833 Extended	TU831 Extended	TU835 Extended	TU836 TU837 Extended	TU838 Extended	TU842 TU843 Redundant	TU844 TU845 Redundant	Mech. Key Setting	
										Key 1	Key 2
AI810	X	-	X	-	X	-	X	-	-	A	E
AI820	X	-	X	-	-	-	-	-	-	B	B
AI825	-	X	-	X	-	-	-	-	-	D	A
AI830/ AI830A	X	-	X	-	-	-	-	-	-	A	F
AI835	X	-	X	-	-	-	-	-	-	B	A
AI843	-	-	X	-	-	-	-	X	-	B	A
AI845	X	-	X	-	X	-	X	-	X	C	C
AI880	-	-	-	-	-	-	-	-	X	F	F
AI880A	-	-	-	-	-	-	-	-	X	F	D
AO810/ AO810V2	X	-	X	-	-	-	-	-	-	A	E
AO820	X	-	X	-	-	-	-	-	-	B	C
AO845	X	-	X	-	-	-	-	X	-	C	C
AO845A	X	-	X	-	-	-	-	X	-	D	B
DI810	X	-	X	-	-	-	X	-	-	A	A
DI811	X	-	X	-	-	-	X	-	-	B	D
DI814	X	-	X	-	-	-	X	-	-	B	E

Table 24. MTU Usage and Key Settings (Continued)

Module Type	TU810 TU812 TU814 Compact	TU811 TU813 Compact	TU830 TU833 Extended	TU831 Extended	TU835 Extended	TU836 TU837 Extended	TU838 Extended	TU842 TU843 Redundant	TU844 TU845 Redundant	Mech. Key Setting	
										Key 1	Key 2
DI820	-	X	-	X	-	-	-	-	-	A	B
DI821	-	X	-	X	-	-	-	-	-	A	C
DI825	-	X	-	X	-	-	-	-	-	A	B
DI830	X	-	X	-	-	-	X	-	-	A	A
DI831	X	-	X	-	-	-	X	-	-	B	D
DI840	X	-	X	-	-	-	X	X	-	C	D
DI880	X	-	X	-	-	-	X	X	-	F	F
DI885	X	-	X	-	-	-	-	-	-	B	F
DO810	X	-	X	-	-	-	-	-	-	A	A
DO814	X	-	X	-	-	-	-	-	-	B	E
DO815	X (1)	-	X	-	-	-	-	-	-	A	A
DO820	-	X	-	X	-	X	-	-	-	A	D
DO821	-	X	-	X	-	X	-	-	-	C	A
DO840	X	-	X	-	-	-	-	X	-	C	E
DO880	X	-	X	-	-	-	-	X	-	F	E
DP820	X	-	X	-	-	-	-	-	-	C	B
DP840	X	-	X	-	-	-	-	X	X	C	F

(1) TU812 can only be used for 5 A per group of channels. Propriate cable must be used.

Table 25. MTU Usage and Key Settings for Intrinsic Safety Interfacing Units

Module Type	TU890/TU891 Compact	Mech. Key Setting(1)	
		Key 1	Key 2
AI890	X	A	C
AI893	X	B	A
AI895	X	A	E
AO890	X	A	D
AO895	X	A	F
DI890	X	A	A
DO890	X	A	B

(1) Note that the shape and style of the key on the TU890/TU891 MTUS is different from the standard MTU's.

Table 26. MTU Usage and Key Settings for CI840 and TB840

Module Type	TU840/ TU841	TU846/ TU847	Mech. Key Settings	
			Key1	Key 2
CI840		X	A	A
TB840	X		A	B

Supported I/O Modules and Drives via Advant Fieldbus 100

The following I/O modules are supported by the Advant Fieldbus 100 Field Communication Interface module CI810 and CI820.

- AI801, AI810, AI820, AI830, AI830A, AI835, AI890, AI895
- AO801, AO810, AO810V2, AO820, AO890, AO895
- DI801, DI810, DI811, DI814, DI820, DI821, DI830, DI831, DI885, DI890
- DO801, DO810, DO814, DO815, DI820, DO821, DO890
- DP820
- ABB Standard Drives
- ABB Engineered Drives

Supported I/O Modules and Drives via PROFIBUS and CI801

The following I/O modules are supported by the PROFIBUS Field Communication Interface module CI801:

- AI801, AI810, AI820, AI825, AI830, AI830A, AI835, AI843, AI845, AI890, AI893, AI895
- AO801, AO810, AO810V2, AO820, AO845, AO845A, AO890, AO895
- DI801, DI802, DI803, DI810, DI811, DI814, DI820, DI821, DI840 (SOE handling not supported), DI890
- DO801, DO802, DO810, DO814, DO815, DI820, DO821, DO840, DO890
- DP820, DP840
- ABB Standard Drives (Equipped with opto transmitter/receiver for up to 10 Mbit/s on the ModuleBus.)
  - ACS600/ACS800 with standard application
  - ACS600/ACS800/DCS600 with crane application

– ACS600/ACS800 with pump and fan application (PFC)
– ACS400/DCS500/DCS400 with standard drive

Supported I/O Modules and Drives via PROFIBUS and CI830

The following I/O modules are supported by the PROFIBUS Field Communication Interface module CI830. Check the controller documentation for information about I/O module support implemented in the controller:

- AI801, AI810, AI820, AI830, AI830A, AI835, AI890, AI893
- AO801, AO810, AO810V2, AO820, AO890
- DI801, DI802, DI803, DI810, DI811, DI814, DI820, DI821, DI890
- DO801, DO802, DO810, DO814, DO815, DI820, DO821, DO890
- DP820, DP840
- ABB Standard Drives

Supported I/O Modules and Drives via PROFIBUS and CI840

The following I/O modules are supported by the PROFIBUS Field Communication Interface module CI840. Check the controller documentation for information about I/O module support implemented in the controller:

- AI801, AI810, AI820, AI825, AI830, AI830A, AI835, AI843, AI845, AI890, AI893, AI895
- AO801, AO810, AO810V2, AO820, AO845, AO845A, AO890, AO895
- DI801, DI802, DI803, DI810, DI811, DI814, DI820, DI821, DI840 (SOE handling not supported), DI890
- DO801, DO802, DO810, DO814, DO815, DI820, DO821, DO840, DO890
- DP820, DP840

Intrinsic Safety Parameters

The following Intrinsic Safety parameters apply for AI890 Table 27, AI893 Table 28, AI895 Table 29, AO890 and AO895 Table 30, DI890 Table 31 and DO890 Table 32.

Table 27. AI890 Analog Input Module Intrinsic Safety Parameters

Terminals	Safety Description	Maximum External Parameters				
		Groups CENELEC USA		C_0 (uF)	L_0 (mH)	L/R (uH/O)
Powered transmitter terminals	U_0 = 27 V	IIC	AB	0.089	4.1	55
	I_0 = 92 mA	IIB	CE	0.74	16.4	221
	P_0 = 621 mW	IIA	DFG	2.23	32.8	445
Passive input terminals(1)	U_0 = 30 V	IIC	AB	-	-	-
	I_0 = 1.25 mA	IIB	CE	-	-	-
	P_0 = 937 mW	IIA	DFG	-	-	-

(1) Non energy-storing apparatus connection

Table 28. AI893 Analog Input Module Intrinsic Safety Parameters

Terminals	Safety description	Maximum external parameters				
		Groups CENELEC USA		C_0 (uF)	L_0 (mH)	L/R (uH/O)
Input terminals	U_0 = 12 V	IIC	AB	1.41	88	586
	I_0 = 20 mA	IIB	CE	9	352	2347
	P_0 = 60 mW	IIA	DFG	36	706	4707

Table 29. AI895 Analog Input Module Intrinsic Safety Parameters

Terminals	Safety Description	Maximum External Parameters				
		Groups CENELEC USA		C_0 (uF)	L_0 (mH)	L/R (uH/O)
1-10, 2-11 3-12, 4-13 5-14, 6-15 7-16, 8-17	U_0 = 27 V	IIC	AB	0.087	4.1	55
	I_0 = 93 mA	IIB	CE	0.702	16.4	222
	P_0 = 630 mW	IIA	DFG	2.23	32.8	443

Table 30. AO890/AO895 Analog Output Module Intrinsic Safety Parameters

Terminals	Safety description	Maximum external parameters				
		Groups CENELEC USA		C_0 (uF)	L_0 (mH)	L/R (uH/O)
Powered output terminals	U_0 = 27 V	IIC	AB	0.097	4.1	58
	I_0 = 93 mA	IIB	CE	0.74	16.5	230
	P_0 = 620 mW	IIA	DFG	2.51	33	470

Table 31. DI890 Digital Input Module Intrinsic Safety Parameters

Terminals	Safety description	Maximum external parameters				
		Groups CENELEC USA		C_0 (uF)	L_0 (mH)	L/R (uH/O)
Input terminals	U_0 = 11V	IIC	AB	1.97	80	595
	I_0 = 21 mA	IIB	CE	13.8	320	2382
	P_0 = 0.058 mW	IIA	DFG	60	640	4765

Table 32. DO890 Digital Input Module Intrinsic Safety Parameters

Terminals	Safety description	Maximum external parameters				
		Groups CENELEC USA		C_0 (uF)	L_0 (mH)	L/R (uH/O)
Powered output terminals	U_0 = 26 V	IIC	AB	0.099	4.1	58
	I_0 = 93 mA	IIB	CE	0.77	16.4	234
	P_0 = 605 mW	IIA	DFG	2.6	32.8	469

Certifications

The S800 I/O system is continuously enhanced with additional certificates. The table below describes the situation at the printing of this Product Guide.

Table 33. Current Certifications for S800 Modules

Module Type	CE	El. safety Zone 2 EEx nA group II T5	cULus El. safety Haz loc C1 Zone 2	FM El. safety Haz loc C1, Div 2	CSA El. safety Haz loc C1, Div 2	ATEX 100A Zone 2 Category 3 (1) G	SIL1-3 CAT 1-4 AK 1-6
Analog Input Modules							
AI801	X		X	X	X		
AI810	X		X	X	X		
AI820	X		X	X	X		
AI825	X		X				
AI830	X		X	X	X		
AI830A	X		X	X	X		
AI835	X		X	X	X		
AI843	X		X				
AI845	X		X				
AI880	X	X	X				X
AI880A	X	X	X				X
AI890	X			X(1)	X(1)	X	
AI893	X					X	
AI895	X			X(1)	X(1)	X	

Table 33. Current Certifications for S800 Modules (Continued)

Module Type	CE	El. safety Zone 2 EEx nA group II T5	cULus El. safety Haz loc C1 Zone 2	FM El. safety Haz loc C1, Div 2	CSA El. safety Haz loc C1, Div 2	ATEX 100A Zone 2 Category 3 (1) G	SIL1-3 CAT 1-4 AK 1-6
Analog Output Modules							
AO801	X		X	X	X		
AO810	X		X	X	X		
AO810V2	X		X	X	X		
AO820	X		X	X	X		
AO845	X		X				
AO890	X			X(1)	X(1)	X	
AO895	X			X(1)	X(1)	X	
Field Communication Interface							
CI801	X		X				
CI810B	X		X	X	X		
CI820V1	X		X	X	X		
CI830	X		X	X	X		
CI840	X		X				
CI840A	X		X				
TB815	X		X	X	X		
Advant Fieldbus 100							
TC501V150	X						

Table 33. Current Certifications for S800 Modules (Continued)

Module Type	CE	El. safety Zone 2 EEx nA group II T5	cULus El. safety Haz loc C1 Zone 2	FM El. safety Haz loc C1, Div 2	CSA El. safety Haz loc C1, Div 2	ATEX 100A Zone 2 Category 3 (1) G	SIL1-3 CAT 1-4 AK 1-6
TC506	X						
TC513V1	X						
TC514V2	X						
TC515V2	X						
Digital Input Modules							
DI801	X		X	X	X		
DI802	X		X	X	X		
DI803	X		X(2)	X	X		
DI810	X		X	X	X		
DI811	X		X	X	X		
DI814	X		X	X	X		
DI820	X		X	X	X		
DI821	X		X(2)	X	X		
DI825	X		X				
DI830	X		X	X	X		
DI831	X		X	X	X		
DI840	X		X				
DI880	X	X	X				X
DI885	X		X	X	X		

Table 33. Current Certifications for S800 Modules (Continued)

Module Type	CE	El. safety Zone 2 EEx nA group II T5	cULus El. safety Haz loc C1 Zone 2	FM El. safety Haz loc C1, Div 2	CSA El. safety Haz loc C1, Div 2	ATEX 100A Zone 2 Category 3 (1) G	SIL1-3 CAT 1-4 AK 1-6
DI890	X			X(1)	X(1)	X	
Digital Output Modules							
DO801	X		X	X	X		
DO802	X		X(3)	X	X		
DO810	X		X	X	X		
DO814	X		X	X	X		
DO815	X		X	X	X		
DO820	X		X(3)	X	X		
DO821	X		X(3)	X	X		
DO840	X		X				
DO880	X	X	X				X
DO890	X			X(1)	X(1)	X	
SD821(4)	X		X		X		
SD822(4)	X		X		X		
SD823(4)	X		X		X		
SS822(4)	X		X		X		
Pulse Counting Modules							
DP820	X		X	X	X		

Table 33. Current Certifications for S800 Modules (Continued)

Module Type	CE	El. safety Zone 2 EEx nA group II T5	cULus El. safety Haz loc C1 Zone 2	FM El. safety Haz loc C1, Div 2	CSA El. safety Haz loc C1, Div 2	ATEX 100A Zone 2 Category 3 (1) G	SIL1-3 CAT 1-4 AK 1-6
DP840	X		X				
Module Termination Units							
TU801	X						
TU807	X		X				
TU810V1	X		X	X	X		
TU811V1	X		X(3)	X	X		
TU812V1	X		X	X	X		
TU813	X		X(5)				
TU814V1	X		X	X	X		
TU830V1	X		X	X	X		
TU831V1	X		X(3)	X	X		
TU833	X		X				
TU834	X		X				
TU835V1	X		X	X	X		
TU836V1	X		X(3)				
TU837V1	X		X(3)	X	X		
TU838	X		X	X	X		
TU840	X	X	X				
TU841	X		X				

Table 33. Current Certifications for S800 Modules (Continued)

Module Type	CE	El. safety Zone 2 EEx nA group II T5	cULus El. safety Haz loc C1 Zone 2	FM El. safety Haz loc C1, Div 2	CSA El. safety Haz loc C1, Div 2	ATEX 100A Zone 2 Category 3 (1) G	SIL1-3 CAT 1-4 AK 1-6
TU842	X	X	X				
TU843	X	X	X				
TU844	X	X	X				
TU845	X	X	X				
TU846	X		X				
TU847	X		X				
TU848	X		X				
TU849	X		X				
TU890	X			X(1)	X(1)	X	
TU891	X						
TY801	X	X	X				
TY804	X						
ModuleBus Communication Parts							
TB805	X		X	X	X		
TB806	X		X	X	X		
TK801V003	X						
TK801V006	X						

Table 33. Current Certifications for S800 Modules (Continued)

Module Type	CE	El. safety Zone 2 EEx nA group II T5	cULus El. safety Haz loc C1 Zone 2	FM El. safety Haz loc C1, Div 2	CSA El. safety Haz loc C1, Div 2	ATEX 100A Zone 2 Category 3 (1) G	SIL1-3 CAT 1-4 AK 1-6
TK801V0 012	X						
TB807	X		X	X	X		
TB810	X		X	X	X		
TB811	X		X	X	X		
TB820V2	X	X	X	X	X		
TB825	X		X				
TB840/ TB840A	X	X	X				
TB842	X		X				
TB845	X		X				
TB846	X		X				

(1) Provides Intrinsically safe circuit for Cl. I, Div 1; Cl. II, Div. 1; Cl. III, Div 1 or Cl. I, Zone 0 group IIc
(2) Can not be used in installations at hazardous locations C1 Zone 2
(3) Maximum 160 V is allowed to be connected to these modules in installations at hazardous locations
(4) cULus; UL508, UL1950, CSA 22.2 No 950
(5) Maximum 200 V is allowed to be connected to these modules in installations at hazardous locations

Section 4 Ordering

General

This Product Guide aims to help ABB sales representatives when ordering the S800 I/O product and licenses.

This section describes the price lists needed when ordering and provides ordering examples.

However, it is outside the scope of this Product Guide to give a complete description of all ordering procedures and tools, as well as licensing conditions for other Industrial^{IT} products. Each ABB sales representative is assumed to know how to use price lists, CAST and other tools to order.

Product and Price List Structure

S800 I/O is ordered as separate parts. From the current price list you order the modules you need for your system.

Please see the valid S800 I/O Price List.

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