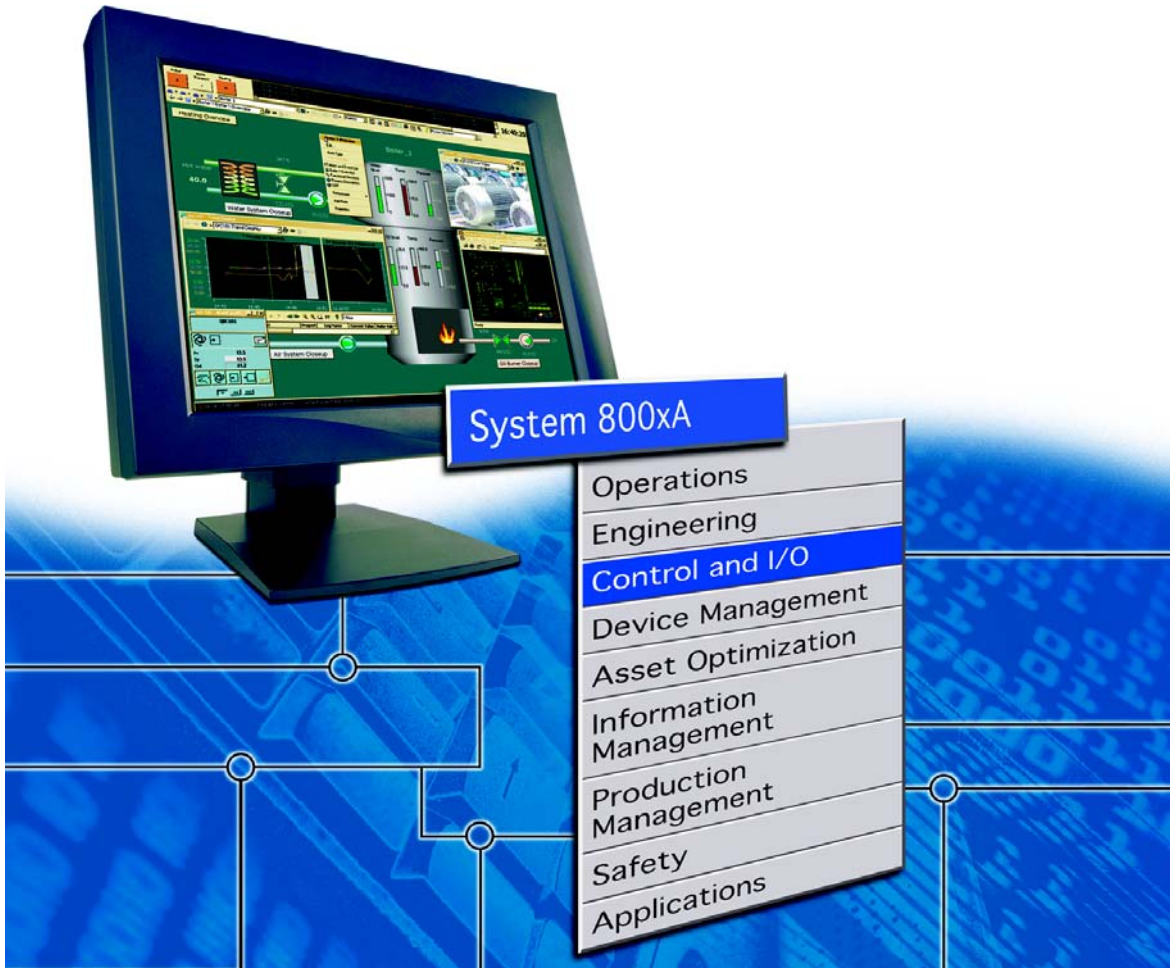


Industrial^{IT}
800xA - Control and I/O
S800 I/O
Version 4.1

Modules and Termination Units



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S800 I/O
Version 4.1

Modules and Termination Units

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About This Book

0.1 General

This book provides a description of S800 I/O modules and termination units. It provides instructions for site planning and installation, start-up and shutdown procedures, and information regarding capacity and performance. This book is not intended to be the sole source of instruction for the S800 I/O system.

This section provides introductory and background information including guidelines how to find information in the manual related documentation.

[Section 1, Introduction](#) provides a product and functional overview.

[Section 2, Configuration](#) will give you the information needed to obtain the desired function. The main information is structured as follow:

- Design considerations and guidelines are given.
- Capacity and performance.

[Section 3, Maintenance](#) focus is on fault finding supported by built in diagnostics and use of system status displays in operator station and LEDs on I/O modules.

In [Appendix A, Specifications](#) you will find data sheets of all components of S800 I/O. They are listed in alphabetical order.

In general, the data sheet contains the following information:

- Features
- Description
- Front view
- Technical data
- Process connections.

[Index](#) will offer you an easy way of finding information.



Those people involved in system engineering should attend the applicable system engineering or maintenance courses offered by ABB Automation University.

0.2 Use of 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, comply fully with all **Warning** and **Caution** notices.

0.3 Terminology

The following is a list of terms associated with S800 I/O that you should be familiar with. The list contains terms and abbreviations that are unique to ABB or have a usage or definition that is different from standard industry usage.

Term	Description
FCI	The Fieldbus Communication Interface (FCI) device contains the interface to the fieldbus (for example PROFIBUS or AF100).
G3 compliant	The module withstand more severe environmental conditions according to ISA-S71.04.
I/O cluster	An I/O cluster can have up to 12 I/O devices.
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.
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 master	ModuleBus master can be a controller (AC 800M) or a FCI. A ModuleBus master contains a ModuleBus interface and power regulators. The FCI module can manage 24 I/O devices and the controller up to 96 I/O modules (up to 12 directly and to the others in 1 to 7 I/O clusters).
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

RTD	Resistance Temperature Detector
SOE	Sequence of events. Time stamping of status changes for digital inputs.
TC	Thermocouple

0.4 Applicable Specifications

This product meets the requirements specified in EMC Directive 89/336/EEC and in Low Voltage Directive 72/23/EEC.

0.5 Related Documentation

The following is a listing of all documentation related to the S800 I/O system.

Title	Description
S800 I/O General Information and Installation	Describes the general installation and configuration information for the S800 I/O system
S800 I/O Modules and Termination Units with Intrinsic Safety Interface	Describes I/O modules and termination units with I.S. interface in the S800 I/O system
S800 I/O Fieldbus Communication Interface for AF100 User's Guide	Describes the AF100 FCI in the S800 I/O system
S800 I/O Fieldbus Communication Interface for PROFIBUS-DP/DPV1	Describes the PROFIBUS-DP FCI in the S800 I/O system
S800 I/O PROFIBUS-DP Fieldbus Communication Interface Reference Manual	Describes the memory mapping on PROFIBUS for the S800 I/O system
Interference-free Electronics	Describes the rule for the installation of equipment to ensure the correct operation of equipment in environments where disturbance are present

Section 1 Introduction

The S800 I/O is distributed modular I/O which communicates with numerous controllers over a Advant Fieldbus 100 (AF100), PROFIBUS-DP or directly. The S800 I/O provides easy installation of the I/O modules and process cabling. It is highly modularized and flexible so that I/O modules can be combined to suit many applications. The S800 I/O can be mounted in many configurations to fit most requirements.

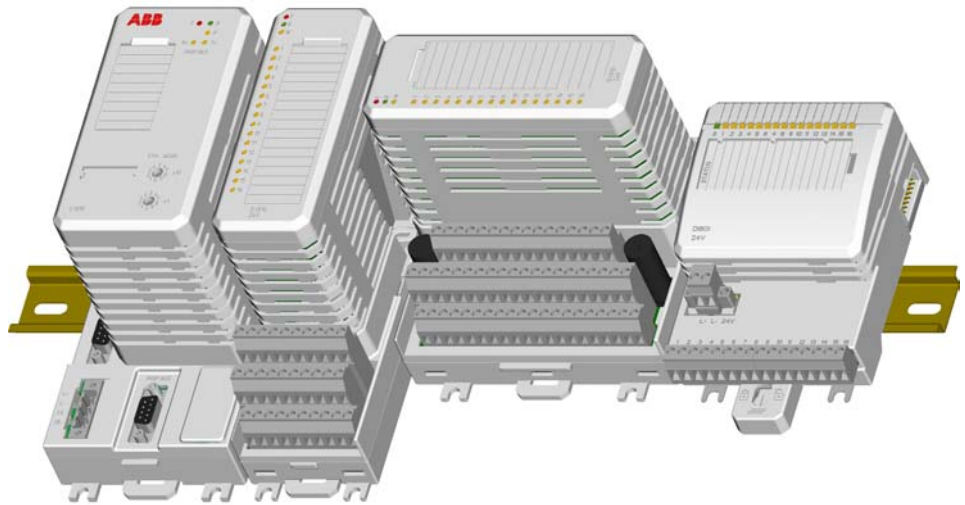


Figure 1-1 S800 I/O Fieldbus Communication Interface with an I/O Module on Compact and Extended MTUs and an S800L Module

1.1 Product Overview

The S800 I/O provides easy installation of the I/O modules and process cabling. It is highly modularized and flexible so that the I/O modules can be combined to suit many applications. The S800 I/O modules and a Fieldbus Communication Interface (FCI) are combined to form an I/O Station. The S800 I/O can be used in both single and redundant applications.

For more overview information please see *S800 I/O General Information and Installation*.

Module Termination Units (MTU) and two types of I/O modules; S800 I/O and S800L I/O modules.

S800 I/O modules are designed to be used together with a Module Termination Unit.

S800L I/O modules are designed to be directly mounted on a standard DIN rail.

The module also contains terminals for connections.

1.1.1 Module Termination Units and Terminal Units

The Module Termination Units (MTU) are passive base units used to house the I/O modules. They contain the process wiring terminals and a section of the ModuleBus.

The Module Termination Units (MTU) distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The top part of the MTU can be removed to replace the termination board even with the system running. Such a need can be caused by a damaged terminal screw.

The MTUs are available in three versions (Compact, Extended and Redundant).

The Compact MTU version typically provides for a compact installation of the I/O modules using 1 wire connections.

The Extended MTU version provides for a more complete installation on the MTU, including 3 wire connection, fuses and field circuit power distribution. See [Figure 1-3](#) and [Figure 1-4](#) for an illustration of the MTUs together with the I/O modules.

The Redundant MTUs are used in redundant I/O applications. There is space on the MTU for two I/O modules on separate ModuleBuses. See [Figure 1-5](#).

The Terminal Unit is a passive unit that enables 2- and 3-wire connections of process signals. The Terminal Unit is mounted direct on an S800L I/O module. See [Figure 1-2](#), S800L I/O module with terminal unit TU805.

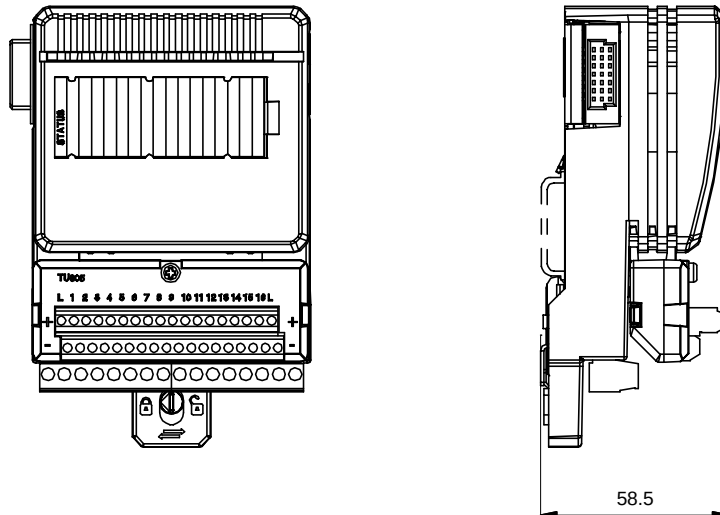


Figure 1-2 S800L Module with TU805

See [Table 2-1](#) for information about the combination between MTU and I/O modules and to specifications in [Appendix A, Specifications](#) for more information.

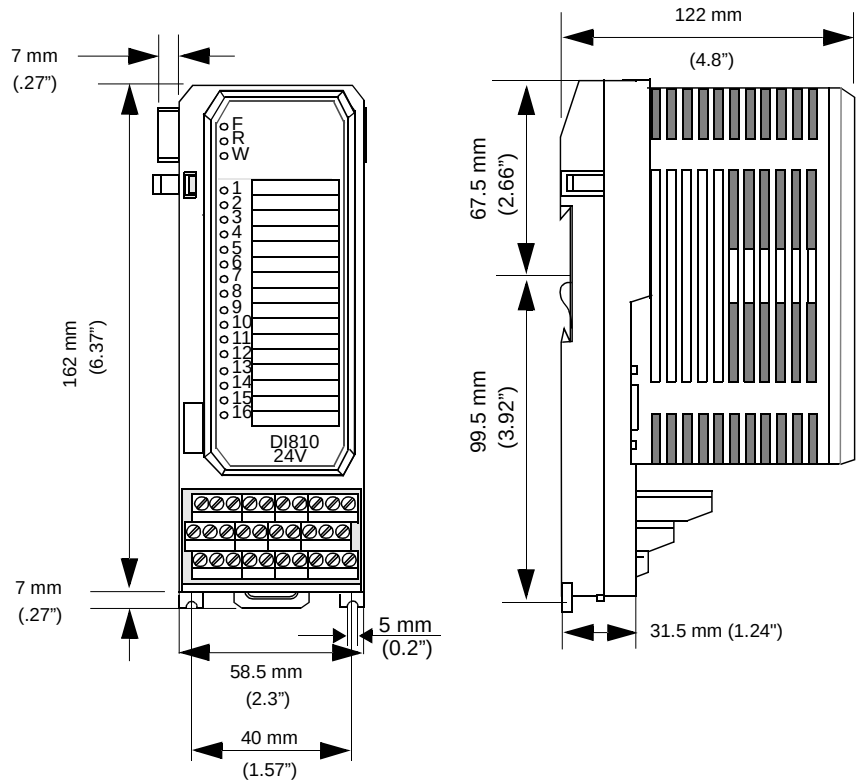


Figure 1-3 Typical Compact MTU with I/O Module

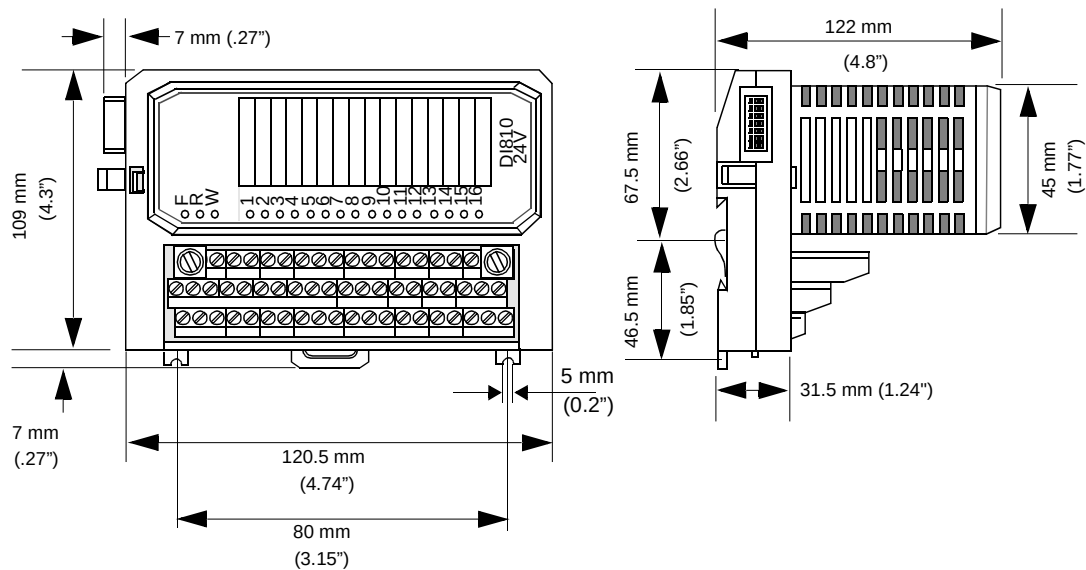


Figure 1-4 Typical Extended MTU with I/O Module

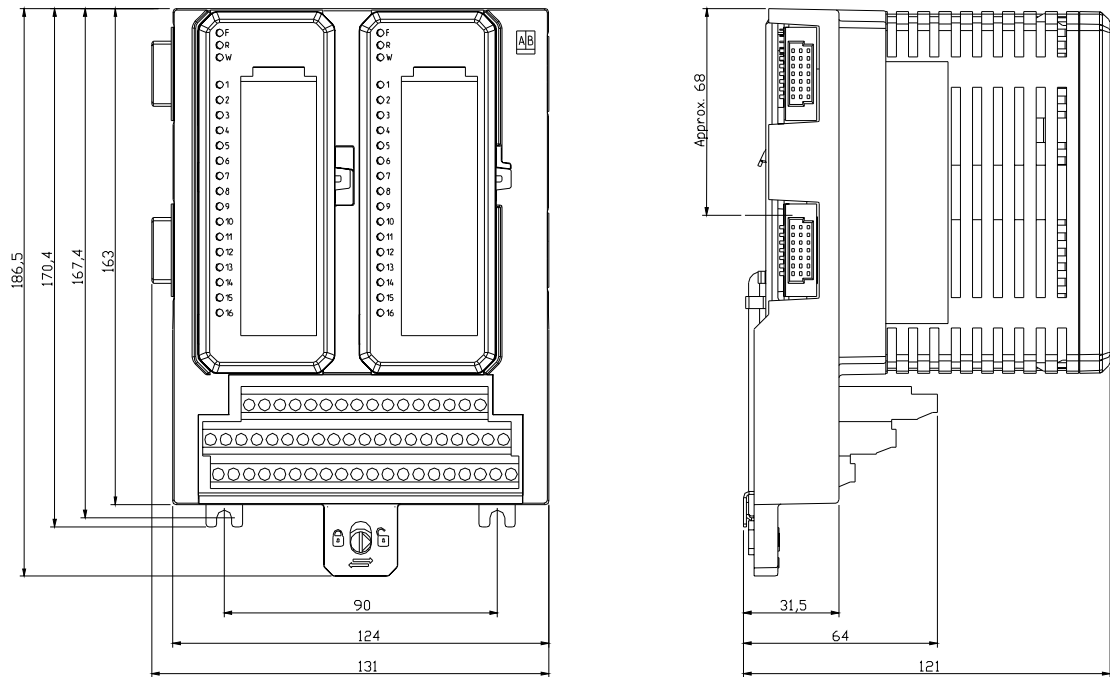


Figure 1-5 Typical Redundant MTU with I/O Module

1.1.1.1 TU805 Terminal Unit for 50 Volt Applications

The TU805 is a 16 channel terminal unit. Used to enable 2- and 3-wire connections on DI801 or DO801. The Terminal Unit is mounted direct on DI801 or DO801.

1.1.1.2 TU810 Compact MTU for 50 Volt Applications

The TU810 is a 16 channel compact module termination unit. The TU810 has three rows of terminals for field signals and process power connections.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.1.3 TU811 Compact MTU for 250 Volt Applications

The TU811 is an 8 channel compact module termination unit. The TU811 has three rows of terminals for field signals and process power connection.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.1.4 TU812 Compact MTU for 50 Volt Applications and 25 pin D-sub for Process Connections

The TU812 is a 16 channel compact module termination unit. The TU812 has a 25 pin D-Sub connector for signals and process power connections.

1.1.1.5 TU813 Compact MTU for 250 V Applications

The TU813 is a 8 channel compact module termination unit. The TU813 has three rows of crimp snap-in connectors for field signals and process power connections.

1.1.1.6 TU814 Compact MTU for 50 Volt Applications

The TU814 is a 16 channel compact module termination unit. The TU814 has three rows of crimp snap-in connectors for field signals and process power connections.

1.1.1.7 TU830 Extended MTU for 50 Volt Applications

The TU830 is a 16 channel extended module termination unit. The TU830 has three rows of terminals for field signals and process power connection.

1.1.1.8 TU831 Extended MTU for 250 Volt Applications

The TU831 is an 8 channel extended module termination unit. TU831 has two rows of terminals for field signals and process power connection.

1.1.1.9 TU833 Extended MTU for 50 Volt Applications

The TU833 is a 16 channel extended module termination unit. The TU833 has three rows of spring-case terminals for field signals and process power connection.

1.1.1.10 TU835 Extended MTU, Individually Fused per Channel for 50 Volt Applications

The TU835 is an 8 channel extended module termination unit. The TU835 has two rows of terminals for process power connection and a single row of process signal connections. Each channel has one fused (3 A max.) transmitter power terminal and one signal connection. Process voltage can be connected to 2 individually isolated groups.

1.1.1.11 TU836 Extended MTU, Individually Fused per Channel for 250 Volt Applications

The TU836 is an 8 channel extended module termination unit. The TU836 has two rows of terminals for field signals and process power connection. Each channel has one fused (3 A max.) power outlet terminal and one signal return connection. Process voltage can be connected to 2 individually isolated groups.



The standard fuse holder that comes with the TU836 can be changed to an indicating fuse holder. This indicating fuse holder can be ordered from Phoenix Contact:

15-30 VDC type, order 3118119

110-250 VAC type, order 3118106.

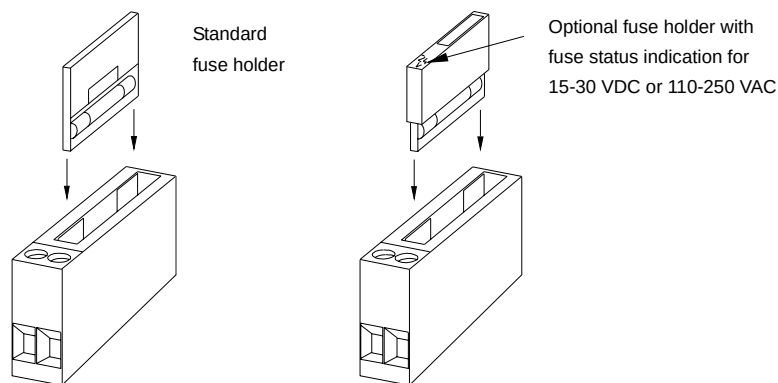


Figure 1-6 Exchange of Standard Fuse Holder for Indication Type

1.1.1.12 TU837 Extended MTU, Individually Fused per Channel for 250 Volt Applications

The TU837 is an 8 channel extended module termination unit. The TU837 has two rows of terminals for field signals and process power connection. Each channel has one fused (3 A max.) power outlet terminal and one process power connection. Process voltage return can be connected to 2 individually isolated groups.

1.1.1.13 TU838 Extended MTU, Individually Fused per Channel for 50 Volt Applications

The TU838 is an 16 channel extended module termination unit. The TU838 has two rows of terminals for process power connection. Each channel has one fused (3 A max.) transmitter power terminal and one signal connection. Process voltage can be connected to 2 individually isolated groups.

1.1.1.14 TU842 Redundant Horizontal MTU for 50 V Applications

The TU842 is a 16 channel, 50 V, redundant module termination unit. It is a passive unit used for connection of the field wiring to the I/O modules and intended for mounting on a horizontal DIN rail. The Redundant MTUs are used in redundant I/O applications. There is space on the MTU for two I/O modules on separate ModuleBuses.

1.1.1.15 TU843 Redundant Vertical MTU for 50 V Applications

The TU843 is a 16 channel, 50 V, redundant module termination unit. It is a passive unit used for connection of the field wiring to the I/O modules and intended for mounting on a vertical DIN rail. The Redundant MTUs are used in redundant I/O applications. There is space on the MTU for two I/O modules on separate ModuleBuses.

1.1.1.16 TU844 Redundant Horizontal MTU for 50 V Applications

The TU844 is a 8 channel, 50 V, redundant module termination unit. It is a passive unit used for connection of the field wiring to the I/O modules and intended for mounting on a horizontal DIN rail. 8 shunt sticks are needed for configuration of signal type. The Redundant MTUs are used in redundant I/O applications. There is space on the MTU for two I/O modules on separate ModuleBuses.

1.1.1.17 TU845 Redundant Vertical MTU for 50 V Applications

The TU845 is a 8 channel, 50 V, redundant module termination unit. It is a passive unit used for connection of the field wiring to the I/O modules and intended for mounting on a vertical DIN rail. 8 shunt sticks are needed for configuration of signal type. The Redundant MTUs are used in redundant I/O applications. There is space on the MTU for two I/O modules on separate ModuleBuses.

1.1.1.18 TY801 Shunt Stick

The TY801 is a shunt stick for current or voltage signals together with AI845 or AI880 and TU844 or TU845.

1.1.1.19 TY804 Shunt Stick

The TY804 is a shunt stick for NAMUR signals together with DP840 and TU844 or TU845.

1.1.2 S800 I/O Modules

The I/O modules have open ventilated plastic enclosures. On the front of all I/O modules there are at least three LEDs (FAULT, RUN and WARNING) indicating the module status. Additionally some modules have LEDs indicating OSP or PRIMARY, see [Table 3-1](#) and [Table 3-2](#).

I/O modules may be replaced in a fully operational I/O station. Mechanical keying on modules and MTUs protect I/O modules from being inserted in positions where they could be damaged by excessive voltage or current. An electronic type designation ID in each module keeps the I/O module from being taken into operation by the ModuleBus master, if a module's ID doesn't match the configured module type definition. There are modules for both single and redundant applications.

Please refer to specifications in [Appendix A, Specifications](#) for more information.

1.1.2.1 AI810 Analog Input Module, 0...20 mA, 0...10 V

The AI810 Analog Input Module has 8 current and voltage inputs. The inputs are independent for each channel, in that either voltage or current can be measured.

The current input is able to handle a short circuit to the transmitter supply without damage. The input withstand HART communication.

Nominal input ranges are: 0(4)... +20 mA, 0(2)... +10 V.

1.1.2.2 AI820 Differential Analog Input Module, +/- 20 mA, +/- 10 V, +/- 5 V

The AI820 Differential Analog Input Module has 4 differential, bipolar current/voltage inputs. This module is suitable for applications requiring high common mode rejection ratings, and/or bipolar voltage or current inputs. Nominal input ranges are: -20...+20 mA, 0(4)...+20 mA, -10...+10 V, 0(2)...+10 V, -5...+5 V and 0(1)...+5 V.

The current input is able to handle a short circuit to the transmitter supply without damage. The input withstand HART communication.

1.1.2.3 AI825 Galvanic Isolated Analog Input Module, -20...+20 mA, 0(4)...+20 mA, -10...+10 V, 0(2)...+10 V

The AI825 Galvanic Isolated Analog Input Module has 4 individually galvanic isolated channels. This module is suitable for applications requiring galvanic isolated channels, and/or bipolar voltage or current inputs. Nominal input ranges are: -20...+20 mA, 0(4)...+20 mA, -10...+10 V, 0(2)...+10 V.

The current input is able to handle a short circuit to the transmitter supply without damage. The input withstand HART communication.

1.1.2.4 AI830 RTD Input Module

The AI830 Analog Input, RTD Module has 8 RTD (Pt100, Cu10, Ni100 and Ni120 and resistor) inputs. The inputs allow 3-wire connection to RTDs. Inputs are monitored for open-circuit, short-circuit. Reference channel and internal supply are also monitored.

1.1.2.5 AI835 Thermocouple/mV Input Module

The AI835 Analog Input, Thermocouple/mV Module has 8 differential inputs for TC/mV measurements. One channel (channel 8) can be configured for “Cold Junction” (ambient) temperature measurement, thus serving as the CJ-channel for the other channels on the module. All 8 channels can be used if no CJ-temperature measurement is needed. The inputs can be connected to a variety of thermocouples with the following characteristics: B, C, E, J, K, N, R, S and T.

1.1.2.6 AI843 Thermocouple/mV Input Module, for Single or Redundant Applications

The AI843 Analog Input, Thermocouple/mV Module has 8 differential inputs for TC/mV measurements. A separate channel is used for Cold Junction (ambient) temperature measurement. The input can be connected to a variety of thermocouples with the following characteristics: B, C, E, J, K, L, N, R, S, T and U.

1.1.2.7 AI845 Analog Input Module, for Single or Redundant Applications

The AI845 Analog Input Module has 8 analog inputs. Each channel can be either a voltage or current input. Nominal input range is 0...20 mA, 4...20 mA, 0...5 V,

1...5 V. The module has advanced on-board diagnostics and HART pass-through functionality. It can be used in both single and redundant application.

1.1.2.8 AI880/AI880A High Integrity Analog Input Module for Single or Redundant Configuration

The AI880/AI880A High Integrity Analog Input Module is TÜV certified for EN 61508-SIL3, DIN V 19250/DIN V VDE 0801- AK6 and EN954-1 Category 4.

The AI880/AI880A has 8 analog inputs. The channels are for current input. Nominal input range is 0...20 mA, 4...20 mA. The module has advanced on-board diagnostics. It can be used in both single and redundant configuration.

The AI880/AI880A complies with the NAMUR recommendation NE43, and supports configurable over- and under range limits.

AI880A has support for HART pass-through communication.

1.1.2.9 AO810 Analog Output Module, 0...20 mA

The AO810 Analog Output Module has 8 current outputs. State of outputs can be set to a predetermined (OSP) value if a communication error is detected. Nominal output range is: 0(4)... 20 mA.

1.1.2.10 AO820 Bipolar Analog Output Module, -20 mA...+20 mA, -10 V...+10 V

The AO820 Bipolar Analog Output Module has 4 bipolar current or voltage outputs. The choice of either current or voltage output is configurable per channel. Outputs are individually galvanically isolated. State of outputs can be set to a predetermined (OSP) value if a communication error is detected. Nominal output range are: -20... +20 mA, 0(4)... +20 mA, -10... +10 V, 0(2)... +10 V.

1.1.2.11 AO845 Analog Output Module, for Single or Redundant Applications

The AO845 Analog Output Module has 8 analog outputs. Nominal output range is 4...20 mA. State of outputs can be set to a predetermined (OSP) value if a communication error is detected. The module has advanced on-board diagnostics and HART pass-through functionality. It can be used in both single and redundant applications.

1.1.2.12 DI810 Digital Input Module, 24 V, Current Sinking

The DI810 Digital Input Module has 16 channels for 24 volt d.c. digital inputs. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.2.13 DI811 Digital Input Module, 48 V, Current Sinking

The DI811 Digital Input Module has 16 channels for 48 volt d.c. digital inputs. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

1.1.2.14 DI814 Digital Input Module, 24 V, Current Sourcing

The DI814 Digital Input Module has 16 channels for 24 volt d.c. current source digital inputs. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

1.1.2.15 DI820 Digital Input Module, 120 V a.c./d.c.

The DI820 Digital Input Module has 8 channels for 120 volt a.c./d.c. digital inputs. The inputs are individually isolated. Channel 1 can be used as voltage supervisor for channels 2 - 4, and channel 8 can be used for channels 5 - 7. If voltage supervision is disabled, channels 1 and 8 can be used as normal inputs. Each input channel provides current limiting, EMC protection, input state LED indicator, noise filter and optical isolation from the ModuleBus.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.2.16 DI821 Digital Input Module, 230 V a.c./d.c.

The DI821 Digital Input Module has 8 channels for 230 volt a.c./d.c. digital inputs. The inputs are individually isolated. Channel 1 can be used as voltage supervisor for channels 2 - 4, and channel 8 can be used for channels 5 - 7. If voltage supervision is disabled, channels 1 and 8 can be used as normal inputs. Each input channel provides current limiting, EMC protection, input state LED indicator, noise filter and optical isolation from the ModuleBus.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.2.17 DI825 Digital Input Module, 125 V d.c. with SOE

The DI825 Digital Input Module had 8 channels for 125 V d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 0.4 ms for each input channel. The inputs are individually isolated. Channel 1 can be used as voltage supervisor for channels 2 - 4, and channel 8 can be used for channels 5 - 7. If voltage supervision is disabled, channels 1 and 8 can be used as normal inputs. Each input channel provides current limiting, EMC protection, input state LED indicator, noise filter and optical isolation from the ModuleBus.

1.1.2.18 DI830 Digital Input Module, 24 V d.c. with SOE, Current Sinking

The DI830 Digital Input Module has 16 channels for 24 volt d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 0.4 ms for each input channel. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

1.1.2.19 DI831 Digital Input Module, 48 V d.c. with SOE, Current Sinking

The DI831 Digital Input Module has 16 channels for 48 volt d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 0.4 ms for each input channel. The inputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

1.1.2.20 DI840 Digital Input Module, for Single or Redundant Applications

The DI840 Digital Input Module has 16 channels for 24 V d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 1 ms for each input channel. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus. The module has advanced on-board diagnostics. It can be used in both single and redundant applications.

1.1.2.21 DI880 High Integrity Digital Input Module, for Single or Redundant Configuration

The DI880 High Integrity Digital Input Module is TÜV certified for EN 61508-SIL3, DIN V 19250/DIN V VDE 0801-AK6 and EN954-1 Category 4 for normally closed signal loops.

The DI880 has 16 channels for 24 V d.c. digital inputs and sequence of events (SOE) handling capabilities. The sequence of events time stamp has a resolution of 1 ms for each input channel. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus. The input voltage range is 18 to 30 V d.c. and the input current is 7 mA at 24 V d.c. The module has advanced on-board diagnostics. It can be used in both single and redundant configuration.

1.1.2.22 DI885 Digital Input Module, 24 V/48 V d.c. with SOE, Current Sinking

The DI885 Digital Input Module has 8 channels for 48 volt d.c. digital inputs with or without open-circuit monitoring (wire break supervision), or 24 volt d.c. electronic inputs without open-circuit monitoring; and sequence of events (SOE)

handling capabilities. The sequence of events time stamp has a resolution of 1 ms for each input channel. The inputs are arranged in one group of 8 channels.

Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus. The DI885 also has the capability to monitor an internal or external sensor power supply (60 V d.c. max.).

1.1.2.23 DO810 Digital Output Module, 24 V, 0.5 A, Current Sourcing

The DO810 Digital Output Module has 16 channels for 24 volt d.c., 0.5 A, digital outputs. The outputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each output channel provides protection against short circuits to ground, over-voltage, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.2.24 DO814 Digital Output Module, 24 V, 0.5 A

The DO814 Digital Output Module has 16 channels for 24 volt d.c., 0.5 A, current sinking digital outputs. The outputs are divided into two isolated groups of eight channels with a voltage supervision input for each group. Each output channel provides protection against short circuits to power supply, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

1.1.2.25 DO815 Digital Output Module, 24 V, 2 A, Current Sourcing

The DO815 Digital Output Module has 8 channels, 24 volt d.c., 2 A, digital outputs. The outputs are divided into two isolated groups of four channels with a voltage supervision input for each group. Each output channel provides protection against short circuits to ground, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.2.26 DO820 Digital Output Module, Relay Normally Open

The DO820 Digital Output Module has 8 channels for 230 volt a.c./d.c. relay outputs. The outputs are individually isolated. Each output channel provides a relay contact (NO - Normal Open), EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected. Internal voltage is supervised.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.2.27 DO821 Digital Output Module, Relay Normally Closed

The DO821 Digital Output Module has 8 channels for 230 volt a.c./d.c. relay outputs. The outputs are individually isolated. Each output channel provides a relay contact (NC - Normal Closed), EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected. Internal voltage is supervised.

1.1.2.28 DO840 Digital Output Module, for Single or Redundant Applications

The DO840 Digital Output Module has 16 channels for 24 V d.c. The maximum continuous output current is 0.5 mA. The module has advanced on-board diagnostics. It can be used in both single and redundant applications.

1.1.2.29 DO880 High Integrity Digital Output Module, for Single or Redundant Configuration

The DO880 High Integrity Digital Output Module is TÜV certified for EN 61508-SIL3, DIN V 19250/DIN V VDE 0801-AK6 and EN954-1 Category 4.

The DO880 has 16 channels for 24 V d.c. The maximum continuous output current is 0.5 A. The module has advanced on-board diagnostics. It can be used in both single and redundant configuration.

The DO880 is suitable for both NE (Normally Energized) and ND (Normally De-energized) outputs, in both high demand, low demand and Continuous Control (CC) applications.

1.1.2.30 DP820 Incremental Pulse Counter Module

DP820 is an two-channel pulse counting module for incremental pulse transmitters up to 1.5 MHz. Each channel contains counters and registers for position/length and speed/frequency measurement. Each channel provides three balanced inputs for connection of a pulse transmitter, one digital input and one digital output.

Pulse transmitters with RS422, +5 V, +12 V, +24 V and 13 mA interfaces can be connected to DP820.

1.1.2.31 DP840 Incremental Pulse Counter Module, for Single or Redundant Applications

DP840 has 8 channels and each channel can be configured for pulse count or frequency measurement. The maximum frequency of input signals is 20 kHz. The inputs can also be read as digital input signals.

Input signal range NAMUR, 12 V and 24 V.

The module is also available in a version that withstand more severe environmental conditions according to ISA-S71.04. This is indicated with a “Z” in the type designation.

1.1.3 S800L I/O Modules

The I/O modules have open ventilated plastic enclosures and a bottom of sheet metal. On the front of each I/O module there is one LED (STATUS) indicating the module status and digital I/O modules have one status LED for each channel. Refer to [Hardware Indicators](#) on page 55 for the status indication of the LEDs.

An electronic type designation ID in each module keeps the I/O module from being taken into operation by the ModuleBus master, if a module's ID doesn't match the configured module type definition.

Please refer to specifications in s for more information.

The module can be mounted on a standard DIN rail. The module is locked to the DIN rail by using the locking screw.

The process connection is done via detachable connectors.

The I/O module distributes the ModuleBus to the next module. It also generate the correct address to the next module by shifting the outgoing position signals.

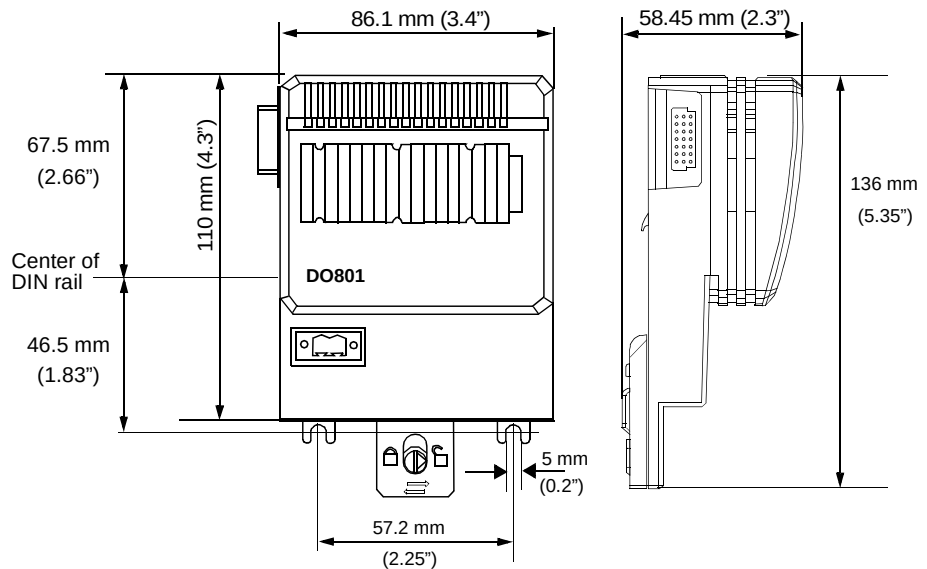


Figure 1-7 Dimensions for S800L Modules

1.1.3.1 AI801 Analog Input Module, 0...20 mA

The AI801 Analog Input Module has 8 current inputs.

The current input is able to handle a short circuit to the transmitter supply without damage. The input withstand HART communication.

Nominal input ranges are: 0(4)... +20 mA.

1.1.3.2 AO801 Analog Output Module, 0...20 mA

The AO801 Analog Output Module has 8 current outputs. State of outputs can be set to a predetermined (OSP) value if a communications error is detected. Nominal output range is: 0(4)... 20 mA.

1.1.3.3 DI801 Digital Input Module, 24 V, Current Sinking

The DI801 Digital Input Module has 16 channels for 24 volt d.c. digital inputs.

One input channel can be used for sensor voltage supervision. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

1.1.3.4 DI802 Digital Input Module, 120 V a.c./d.c., Current Sinking

The DI802 Digital Input Module has 8 channels for 120 volt a.c./d.c. digital inputs. Channel 8 can be used for sensor voltage supervision. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

1.1.3.5 DI803 Digital Input Module, 230 V a.c./d.c., Current Sinking

The DI803 Digital Input Module has 8 channels for 230 volt a.c./d.c. digital inputs. Channel 8 can be used for sensor voltage supervision. Each input channel provides current limiting, EMC protection, input state LED indicator and optical isolation from the ModuleBus.

1.1.3.6 DO801 Digital Output Module, 24 V, 0.5 V, Current Sinking

The DO801 Digital Output Module has 16 channels for 24 volt d.c., 0.5 A, digital outputs. Each output channel provides protection against short circuits to ground, over-voltage, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

1.1.3.7 DO802 Digital Output Module, 24-250 V, Relay Normally Open

The DO802 Digital Output Module has 8 channels for 24-250 volt d.c., digital outputs. Each output channel provides protection against short circuits to ground, over-voltage, over-temperature, EMC protection, output state LED indicator and optical isolation from the ModuleBus. State of outputs can be set to a predetermined (OSP) value if a communications lost error is detected.

1.2 Prerequisites and Requirements

When the S800 I/O is used with controllers as part of their I/O system, the controllers need to have an interface to the fieldbus network. The fieldbus network will connect to a Fieldbus Communications Interface (FCI) with S800 I/O installed.

Section 2 Configuration

2.1 Module Termination Units (MTU)

Each MTU is used with certain types of I/O Modules. Refer to [Table 2-1](#) 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 2-1 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	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
AO810	X	-	X	-	-	-	-	-	-	A	E
AO820	X	-	X	-	-	-	-	-	-	B	C
AO845	X	-	X	-	-	-	-	X	-	C	C
DI810	X	-	X	-	-	-	X	-	-	A	A

Table 2-1 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
DI811	X	-	X	-	-	-	X	-	-	B	D
DI814	X	-	X	-	-	-	X	-	-	B	E
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 not recommended due to the maximum rated current.

Connecting an MTU to the ModuleBus master, cluster modem or to another MTU automatically sets-up the address selection of that MTU. There are no jumpers or switches that need to be set before installing an I/O module.

MTUs are placed on the DIN rails and then connected to the preceding MTU, ModuleBus master or cluster modem. Once connected, the MTU is locked in place by the bottom latch which also bonds it to the chassis ground.

2.2 I/O Modules

2.2.1 S800 I/O Modules

Each I/O module is installed onto an MTU. See [Table 2-1](#) for which MTU to use with each I/O module type. I/O modules do not have any jumpers or switches that need to be set before installing on an MTU. Refer to [Appendix A, Specifications](#) for more information.

I/O modules are installed by aligning the connectors of the MTU and I/O module and then pushing the units together. After connected to the MTU, the I/O module is then locked in place by the I/O Module Lock/Switch which also activates a switch to enable power to the I/O module.

2.2.2 S800L I/O Modules

The I/O modules are installed directly on the DIN rail and locked with the locking screw. The process signal are connected to a pluggable connector on the module.

There are no jumpers or switches that need to be set.

The I/O module automatically set up the address for the next I/O module.

To enable 2- and 3-wire connection to 16 channels DI and DO modules, TU805 is used. TU805 is mounted direct on the module.

Section 3 Maintenance

3.1 Preventive Maintenance

Please see the *S800 I/O General Information and Installation* manual.

3.2 Hardware Indicators

3.2.1 S800 I/O Module LEDs

[Figure 3-1](#) shows examples of front panels for different types of I/O modules. On the front of all I/O modules there are at least three LEDs (FAULT, RUN and WARNING) indicating the module status. Additionally some modules have LEDs indicating OSP or PRIMARY, see description below and [Table 3-1](#) and [Table 3-2](#).

The FAULT LED shall indicate when the I/O module detect a fatal error or before first access after power up. The RUN LED shall indicate when the I/O module is operational. The WARNING LED shall indicate when a non-fatal error is detected and the module continues to run. The OSP LED shall indicate when the I/O module is in OSP state, that is, when the module is commanded to OSP or when automatically set to OSP state due to communication error.

The PRIMARY LED shall indicate when the I/O module is primary (in a redundant pair). In a redundant configuration, the primary module is scanned at the specified cycle time to supply input values to the application, while the backup module is scanned at a low cycle for diagnostic purpose. The input values from the backup module is not used by the application.

Each digital channel has one LED indicating current state (on/off).

Table 3-1 Standard LEDs on I/O Modules

Marking	Color	Description
F (Fault)	Red	Internal fault in the module affecting all channels ⁽¹⁾
R (Run)	Green	Operational state
W (Warning)	Yellow	External fault or internal channel error
O (OSP)	Yellow	OSP state (Outputs Set as Predetermined)
P (Primary)	Yellow	LED indicating that the module is operating as primary in a redundant pair.
Channel status	Yellow (+red)	This LED shows both value (Yellow ON/OFF) and error (red)

- (1) Modules without self test function: The F-LED will switch on at power up or restart of the module and switch off after the first successful access to the module.
 Modules with self test function: The F-LED will switch on at power up, restart of the module or when the module goes to Error state. If the module has not gone to Error state it will switch off the F-LED after the first successful access to the module.

Table 3-2 I/O Module LED Indications in Different States

Module state	Run	Fault	Warning	OSP	Primary	Channel status
Init	Off	On	Off	Off	Off	DI On/Off ⁽¹⁾ , DO Off
Not Configured	Flashing/ Off	On/Off ⁽²⁾	On/Off	Off	Off	DI On/Off ⁽¹⁾ , DO Off
Ready	Flashing/ Off	Off	On/Off	Off	Off	DI On/Off, DO Off
Operational	On	Off	On/Off	Off	On/Off	On/Off

Table 3-2 I/O Module LED Indications in Different States (Continued)

Module state	Run	Fault	Warning	OSP	Primary	Channel status
OSP	On	Off	On/Off	On	On/Off	On/Off
Error	Off	On	On/Off	Off	Off	DI On/Off, DO Off

- (1) The DI signal status for module DI830, DI831, DI880, DI885, DP820 is only OFF.
 (2) Will be switched off after the first successful access to the module.

Normally when an I/O module has been removed from the configuration, the ModuleBus master will do a restart of the module. The module will end up in the NOT CONFIGURED state.



Figure 3-1 Examples of S800 I/O Module LED Locations

3.2.2 S800L I/O Module LED

Figure 3-2 shows examples of front panels for different types of I/O modules. On the front of each I/O module there is one LED indicating the module status.

See Table 3-3 and Table 3-4 for information on the meaning and indications for these modules. For modules with special LED indications see respectively module in Appendix A, Specifications.

The LED shall indicate red when the I/O module detect a fatal error or before first access after power up. The LED shall indicate green when the I/O module is operational.

Each digital channel has one LED indicating current state (on/off).

Table 3-3 Standard LED on I/O Modules

Marking	Color	Description
S (Status)	Red	Fault in the module ⁽¹⁾
	Green	Operational state

(1) Modules without self test function, for example, DI/DO modules: The S-LED will switch on to red at power up or restart of the module and switch off after the first successful access to the module.

Modules with self test function for example, AI/AO modules: The S-LED will switch on to red at power up, restart of the module or when the module goes to Error state. If the module has not gone to Error state it will switch off the S-LED after the first successful access to the module.

Table 3-4 I/O Module LED Indications in Different States

Module state	Status	Channel status
Init	Red	Off
Not Configured	Red/off ⁽¹⁾	Off
Ready	Off	DI On/Off, DO Off
Operational	Green	On/Off

Table 3-4 I/O Module LED Indications in Different States (Continued)

Module state	Status	Channel status
OSP	Green	On/Off
Error	Red	DI On/Off, DO Off

- (1) Will be switched off after the first successful access to the module.

Normally when an I/O module has been removed from the configuration, the ModuleBus master will do a restart of the module. The module will end up in the NOT CONFIGURED state.

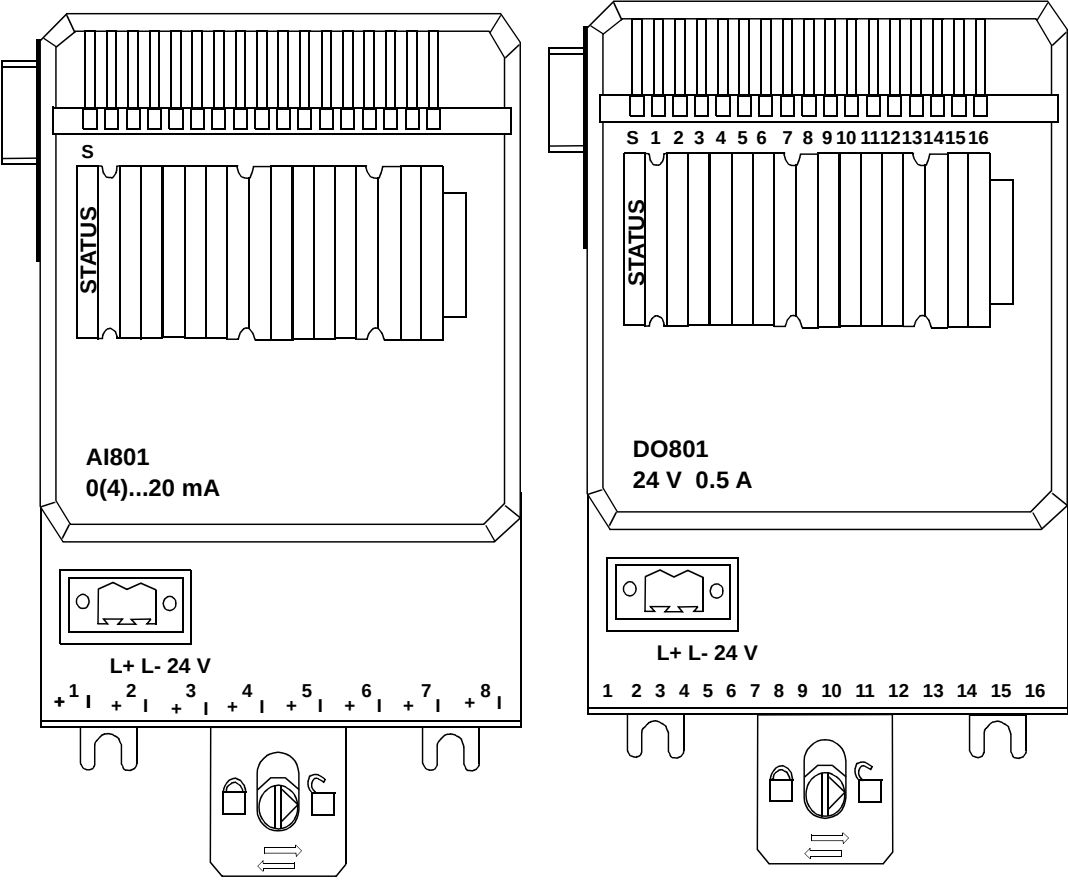


Figure 3-2 Examples of S800L I/O Module LED Locations

3.3 Error Messages

Please see the relevant controller manuals.

3.4 Fault Finding and User Repair

3.4.1 S800 I/O Module Replacement

3.4.1.1 General

All I/O modules can be exchanged on-line and with the process power supply connected, except for relay outputs with normally closed contacts. This is possible because the module deactivates when the I/O module lock switch is turned to unlock.

It is important to understand the consequences of a module exchange on-line and how it affects the process. Replacement of an S800 I/O module affects all channels on the module. It also sometimes indirectly affects the outputs via some application function, on another module.

The system software in the ModuleBus master checks automatically that all I/O modules function correctly. In the event of module fault, and module exchange, the module and associated signals are marked as faulty.

The system software checks that the module is inserted and correct. If this is the case, the Fault-indicator (LED) extinguishes and RUN LED is activated and the module resumes its normal function.

The following headings include general instructions for replacement of modules and aspects on the handling of individual modules are presented in [Table 3-5](#).

3.4.1.2 Practical Execution

Replace faulty or suspect I/O modules in the following way:

1. Read *S800 I/O General Information and Installation*.
2. Special restrictions apply to each module type. See descriptions in [Table 3-5](#) for useful information on individual module types.
3. Check that the new module can replace the old.
4. Provide access to the module by loosening the module locking.
5. Grip the module firmly and extract the module.
6. Insert the new module carefully.
7. Store extracted modules in envelopes.
8. Ensure that the module contacts mate properly with the contacts in the MTU and activate the locking mechanism in place.
9. Modules initialized automatically by the system and the fault indicating LED extinguishes and RUN LED is activated.
10. Perform a function test on the new module.

3.4.1.3 Additional Aspects on Individual S800 I/O Modules

Table 3-5 lists S800 I/O modules. Descriptions of these types are referred individually in the table below.

Table 3-5 Replacement Aspects of S800 I/O Modules

Module Type - Settings		Comments
AI810, AI820, AI825, AI830, AI835, AI843, AI845, AI880, AI890, AI895 Analog Input	No settings	Replacement with power applied is possible. Turning locking mechanism deactivates the module.
AO810, AO820, AO845, AO890, AO895 Analog Output	No settings	Replacement with power applied is possible. It may be necessary to set the process device manually to a safe state before the module is extracted. Turning locking mechanism deactivates the module.
DI810, DI811, DI814, DI820, DI821, DI890 Digital Input	No settings	Replacement with power applied is possible. Turning locking mechanism deactivates the module.
DI825, DI830, DI831, DI840, DI880, DI885 Digital Input with SOE	No settings	Replacement with power applied is possible. Turning locking mechanism deactivates the module.

Table 3-5 Replacement Aspects of S800 I/O Modules (Continued)

Module Type - Settings		Comments
DO810, DO814 DO815, DO840, DO880, DO890 Digital Output	No settings	Replacement with power applied is possible. It may be necessary to set the process device manually to a safe state before the module is extracted. Turning locking mechanism deactivates the module. If DO880 is removed from the MTU, the connected outputs is automatically turned to safe state (de-energized).
DO820 Digital Output	No settings	Replacement with power applied is possible. It may be necessary to set the process device manually to a safe state before the module is extracted. Turning locking mechanism deactivates the module.
DO821 Digital Output	No settings	Replacement with system power applied is possible.  Caution! Since the module has normally closed relay contacts the field power must be removed before replacement. It may be necessary to set the process device manually to a safe state before the module is extracted. Turning locking mechanism deactivates the module, that is, relay contacts will close.

Table 3-5 Replacement Aspects of S800 I/O Modules (Continued)

Module Type - Settings	Comments
DP820, DP840 No settings Pulse Counter	Replacement with power applied is possible. It may be necessary to set the process device manually to a safe state before the module is extracted. Turning locking mechanism deactivates the module.
TU810, TU811, No settings TU812, TU813, TU814, TU830, TU831, TU833, TU835, TU836, TU837, TU838, TU842, TU843, TU844, TU845 MTUs	Cannot be replaced or repaired with power applied. Disconnecting an MTU breaks the ModuleBus communications bus and removes power to the MTUs that follow. MTUs mounted in the middle (between the ModuleBus master, cluster modem and the number 12 MTU) need to have the preceding or following MTUs moved in order to disconnect the ModuleBus connector.

3.4.2 S800L I/O Module Replacement

3.4.2.1 General

I/O modules can not be exchanged on-line. The power must be switched off to the I/O station and the module before exchanging the I/O module.

It is important to understand the consequences of a power switch off to an I/O station and how it affects the process. A power switch off to an I/O station affects all modules and channels in the station. It also sometimes indirectly affects outputs in other I/O stations via some application functions.

The system software checks that the module is inserted and correct. If this is the case, the Fault indication extinguishes and after configuration and enter operation mode the Run indication is activated and the module resumes its normal function.

The following headings include general instructions for replacement of modules and aspects on the handling of individual modules are presented in [Table 3-6](#).

3.4.2.2 Practical Execution

Replace faulty or suspect I/O modules in the following way:

1. Read *S800 I/O General Information and Installation*.
2. Special restrictions apply to each module type. See descriptions in [Table 3-6](#) for useful information on individual module types.
3. Check that the new module can replace the old.
4. Switch off the power to the I/O station.
5. Remove the power supply connector from the I/O module.
6. Remove the process connector from the I/O module.
7. Provide access to the module by loosening the module locking.
8. Slide the module to the right and extract the module.
9. Insert the new module.
10. Store extracted modules in envelopes.

11. Ensure that the module contacts properly mate with the module to the left and lock the module with the locking screw.
12. Switch on the power to the I/O station.
13. Connect the power supply to the I/O module.
14. Connect the process connector to the I/O module.
15. Modules are automatically initialized by the system and the status indicating LED extinguishes from red to off and to green when the module is in normal operation.
16. Perform a function test on the new module.

3.4.2.3 Additional Aspects on Individual S800L I/O Modules

[Table 3-6](#) lists S800L I/O modules. Descriptions of these types are referred individually in the table below.

Table 3-6 Replacement Aspects of S800L I/O Modules

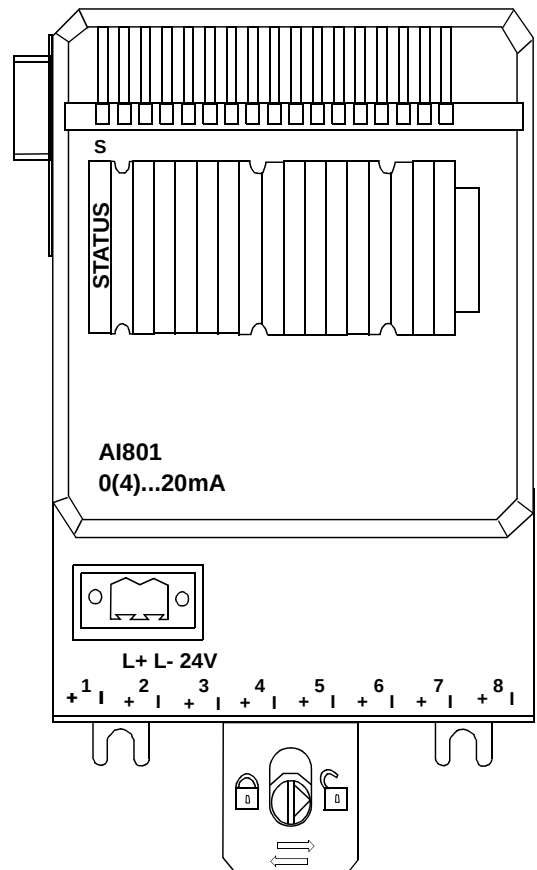
Module Type - Settings		Comments
AI801, DI801, DI802, DI803	No settings	Switch the power off before replacement.
AO801, DO801, DO802	No settings	Switch the power off before replacement. It may be necessary to set the process device manually to a safe state before the the power switch off.
TU805	No settings	Can be replaced with power applied. It may be necessary to set the process device manually to a safe state before replacing the TU805.

Appendix A Specifications

A.1 AI801 Analog Input Module, 0(4)...20 mA

A.1.0.1 Features

- 8 channels for 0...20 mA, 4...20 mA d.c., single ended unipolar inputs
- 1 group of 8 channels isolated from ground
- 12 Bit resolution
- Input shunt resistors protected to 30 V by PTC resistor
- Analog inputs are short circuit secured to ZP or +24 V
- EMC protection
- DIN rail mounting
- The input withstand HART communication.
- Process and power connections via detachable connectors



A.1.0.2 Description

The AI801 Analog Input Module has 8 channels for current input.

The current input is able to handle a short circuit to the transmitter supply at least 30 V d.c without damage. Current limiting is performed with a PTC resistor. The input resistance of the current input is 250 ohm, PTC included.

The EMC protection is placed on the module.

The module distributes the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2-wire transmitters. There are no current limiting on the transmitter power terminals. All eight channels are isolated from the ModuleBus in one group. Power to the input stages is converted from the external 24 V.

One STATUS LED indicates module status. The STATUS LED can be Green, off or Red. The STATUS LED Green indicates normal operation. The STATUS LED Red indicates that the module is in Init state or Not configured state. In Not configured state the STATUS LED is turned off after the first valid access to the module.

The reset circuitry gives a reset signal when the POWOK signal is active. The POWOK comes from the ModuleBus master after power is applied.

A.1.0.3 Technical Data*Table A-1 AI801 Analog Input Module Specifications at 25°C*

Feature	AI801 Analog Input Module
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA, 4... 20 mA ⁽¹⁾
Under/over range	-0% / +15%
Input impedance (at current input) (including PTC)	$\geq 230 \Omega$, $\leq 270 \Omega$
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	30 V d.c.
NMRR, 50 Hz, 60 Hz	>40 dB
Error	Max. 0.1%
Resolution	12 bit
Temperature drift	Typ. 50 ppm/°C Max. 80 ppm/°C
Update cycle time	1 ms
Current consumption 24 V external	30 mA
Current consumption 5 V	70 mA
Power dissipation	1.1 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Input filter cut off frequency Second order filter	3.5Hz
Input filter (rise time 0-90%)	140 ms

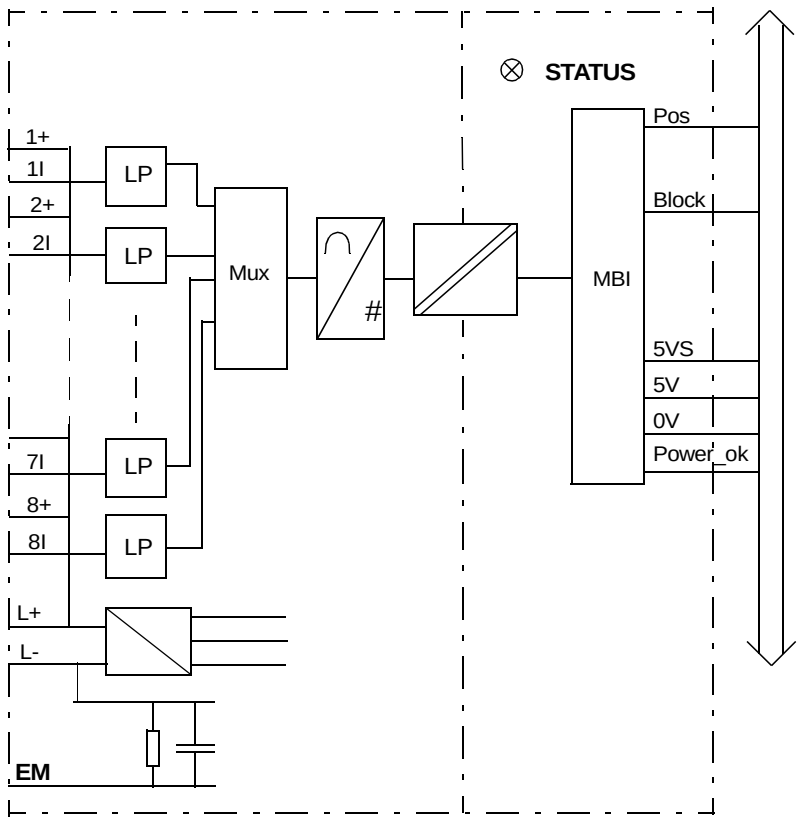
Table A-1 AI801 Analog Input Module Specifications at 25°C (Continued)

Feature	AI801 Analog Input Module
Isolation	Groupwise isolated from ground (RIV=50 V)
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm ² , 30-12 AWG Stranded: 0.05-1.5mm ² , 30-12 AWG Recommended torque: 0.8 Nm Stripping length: 6-7.5 mm, 0.24-0.30 in
Width	86.1 mm (3.4")
Depth	58.5 mm (2.3")
Height	110 mm (4.33")
Weight	0.24 kg (0.53 lbs.)

(1) 4...20 mA handled by the FCI or controller

(2) 40° C (104 ° F) applies to compact MTUs with I/O modules or S800L modules mounted on vertical DIN rail.

A.1.0.4 Block Diagram AI801



A.1.0.5 Process Connections*Table A-2 AI801 Process Connections*

Process Connection	Process Terminal
Ch1, L1+	1+
Ch1, Current Input	1I
Ch 2, L1+	2+
Ch 2, Current Input	2I
Ch 3, L1+	3+
Ch 3, Current Input	3I
Ch 4, L1+	4+
Ch 4, Current Input	4I
Ch 5, L2+	5+
Ch 5, Current Input	5I
Ch 6, L2+	6+
Ch 6, Current Input	6I
Ch 7, L2+	7+
Ch 7, Current Input	7I
Ch 8, L2+	8+
Ch 8, Current Input	8I

Figure A-1 shows the process connections for the AI801.

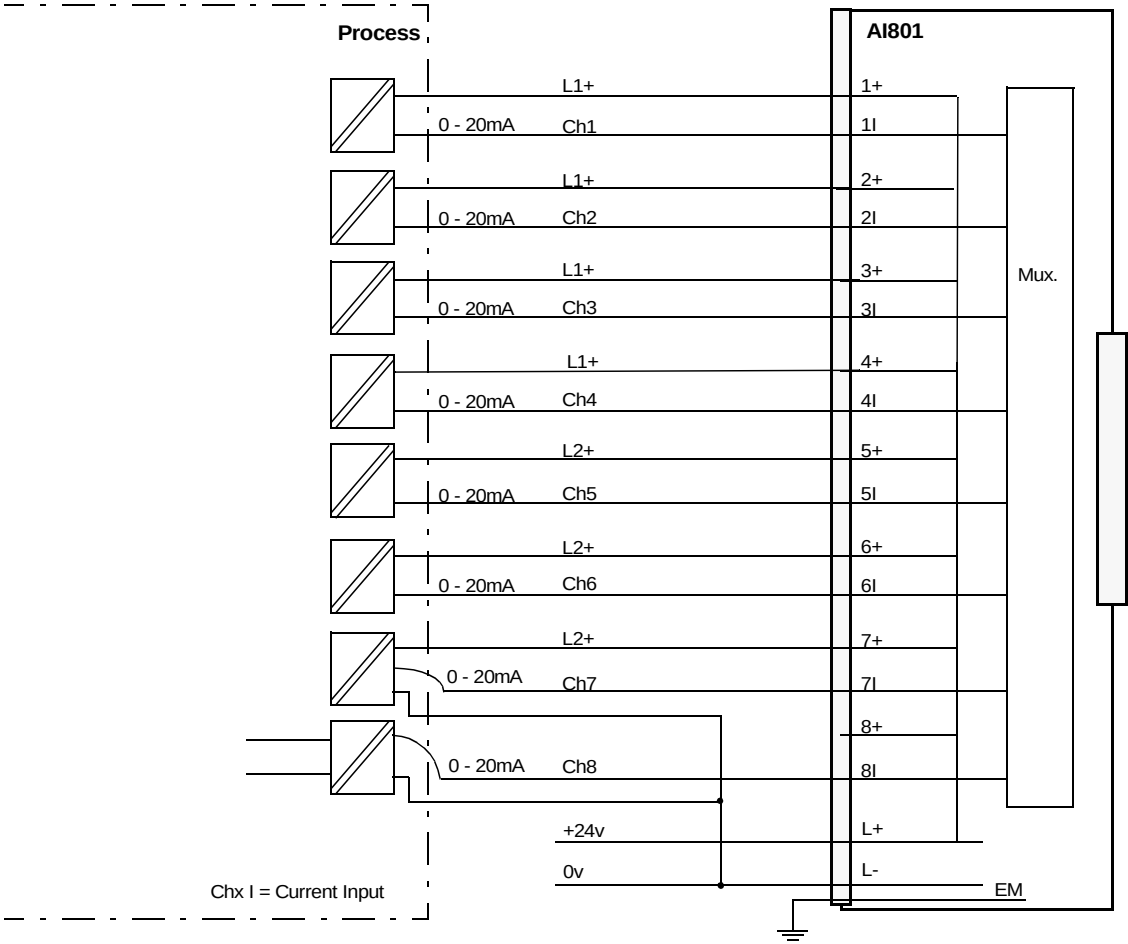


Figure A-1 AI801 Process Connections

A.2 AI810 Analog Input Module, 0(4)...20 mA, 0(2)...10 V

A.2.0.1 Features

- 8 channels for 0...20 mA, 4...20 mA, 0...10 V or 2...10 V d.c., single ended unipolar inputs
- 1 group of 8 channels isolated from ground
- 12 Bit resolution
- Input shunt resistors protected to 30 V by PTC resistor
- Analog inputs are short circuit secured to ZP or +24 V
- EMC protection
- DIN rail mounting
- The input withstand HART communication.

A.2.0.2 Description

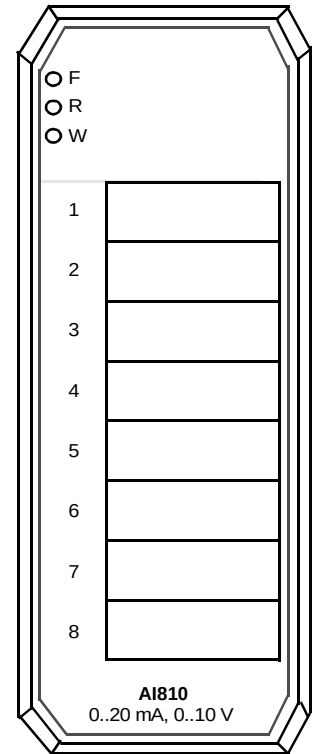
The AI810 Analog Input Module has 8 channels. Each channel can be either a voltage or current input.

The current input is able to handle a short circuit to the transmitter supply at least 30 V d.c without damage. Current limiting is performed with a PTC resistor. The input resistance of the current input is 250 ohm, PTC included.

The voltage input is able to withstand an over or undervoltage of at least 30 V d.c. Input resistance is 290 kohm. The EMC protection is placed on the module.

Transmitter supply can be connected to L1+, L1- and/or L2+, L2-.

The module distributes the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2- or 3-wire transmitters. There are no current limiting on the transmitter power terminals. Fused MTUs TU830, TU835 and TU838 provides groupwise and channelwise fusing.



All eight channels are isolated from the ModuleBus in one group. Power to the input stages is converted from the 24 V on the ModuleBus.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not configured state the FAULT LED is turned off after the first valid access to the module.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Five different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage inputs, but requires external terminals for distribution of 24 V power supply to the field devices. The extended MTU, TU835, and TU838 provides a fuse (3 A max.) per channel for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.2.0.3 Technical Data*Table A-3 AI810 Analog Input Module Specifications at 25°C*

Feature	AI810 Analog Input Module
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA, 0...10 V, 4... 20 mA ⁽¹⁾ , 2... 10 V ⁽¹⁾
Under/over range	-5% / +15%
Input impedance (at voltage input)	290K Ω
Input impedance (at current input) (including PTC)	$\geq 230 \Omega$, $\leq 275 \Omega$
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	30 V d.c.
NMRR, 50 Hz, 60 Hz	>40 dB
Error	Max. 0.1%
Resolution	12 bit
Temperature drift Current	Typ. 50 ppm/°C Max. 80 ppm/°C
Temperature drift Voltage	Typ. 70 ppm/°C Max. 100 ppm/°C
Update cycle time	8 ms
Current consumption 24 V	40 mA
Current consumption 5 V	70 mA
Power dissipation	1.5 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾

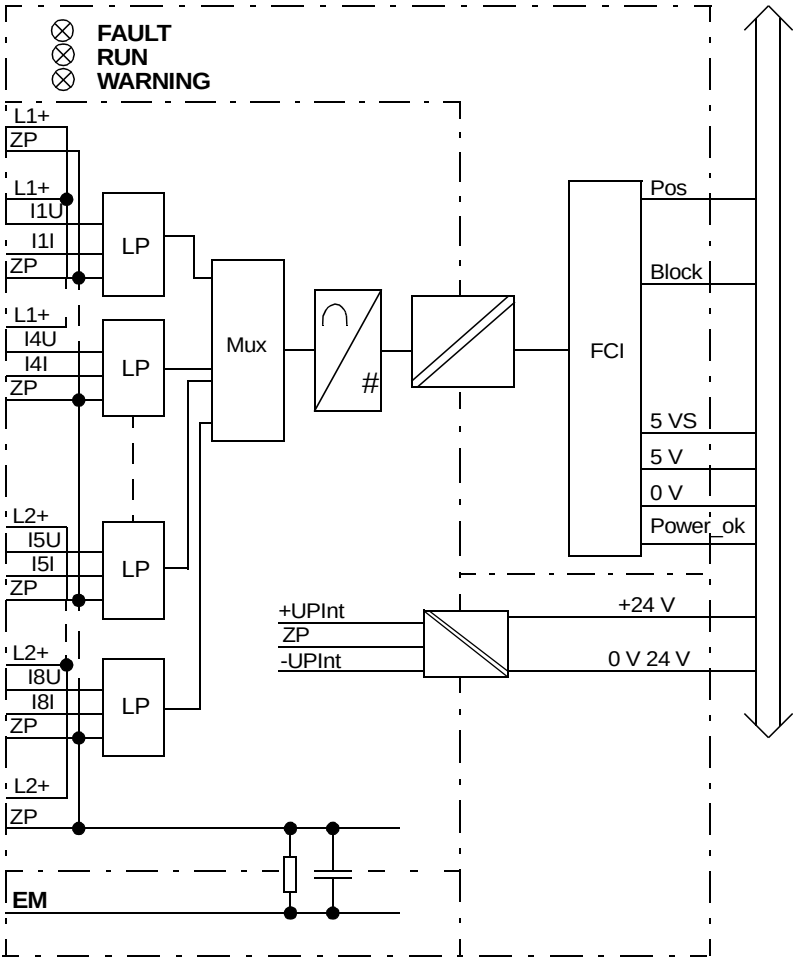
Table A-3 AI810 Analog Input Module Specifications at 25°C (Continued)

Feature	AI810 Analog Input Module
Voltage supervision	Internal power supply
Fusing of transmitter supply	on MTU (TU830 max 1 AT per group)
Sensor power distribution	Max 1 A per connection
Input filter (rise time 0-90%)	140 ms
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812, TU814, TU830, TU835 or TU838
MTU keying code	AE
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.2 kg (0.44 lbs.)

(1) Handled by the FCI or controller.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.2.0.4 Block Diagram AI810



A.2.0.5 Process Connections*Table A-4 AI810 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)
Ch1, L1+	-	-	B1, B2	11 (F1)	A1 (F1)
Ch1, Voltage Input	C1	3	C1	-	B1
Ch1, Current Input	B1	16	C2	12	B2
Ch1, Return (ZP)	A1	-	A1, A2	-	A2
Ch 2, L1+	-	-	B3, B4	21 (F2)	A3 (F2)
Ch 2, Voltage Input	C2	4	C3	-	B3
Ch 2, Current Input	B2	17	C4	22	B4
Ch 2, Return (ZP)	A2	-	A3, A4	-	A4
Ch 3, L1+	-	-	B5, B6	31 (F3)	A5 (F3)
Ch 3, Voltage Input	C3	5	C5	-	B5
Ch 3, Current Input	B3	18	C6	32	B6
Ch 3, Return (ZP)	A3	-	A5, A6	-	A6
Ch 4, L1+	-	-	B7, B8	41 (F4)	A7 (F4)
Ch 4, Voltage Input	C4	6	C7	-	B7
Ch 4, Current Input	B4	19	C8	42	B8
Ch 4, Return (ZP)	A4	-	A7, A8	-	A8
Ch 5, L2+	-	-	B9, B10	51 (F5)	A9 (F5)
Ch 5, Voltage Input	C5	7	C9	-	B9

Table A-4 AI810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal
Ch 5, Current Input	B5	20	C10	52	B10
Ch 5, Return (ZP)	A5	-	A9, A10	-	A10
Ch 6, L2+	-	-	B11, B12	61 (F6)	A11 (F6)
Ch 6, Voltage Input	C6	8	C11	-	B11
Ch 6, Current Input	B6	21	C12	62	B12
Ch 6, Return (ZP)	A6	-	A11, A12	-	A12
Ch 7, L2+	-	-	B13, B14	71 (F7)	A13 (F7)
Ch 7, Voltage Input	C7	9	C13	-	B13
Ch 7, Current Input	B7	22	C14	72	B14
Ch 7, Return (ZP)	A7	-	A13, A14	-	A14
Ch 8, L2+	-	-	B15, B16	81 (F8)	A15 (F8)
Ch 8, Voltage Input	C8	10	C15	-	B15
Ch 8, Current Input	B8	23	C16	82	B16
Ch 8, Return (ZP)	A8	-	A15, A16	-	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)
0 V d.c. (ZP)	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-2 shows the process connections for the Analog Input Module AI810 when installed on a TU830 Extended MTU.

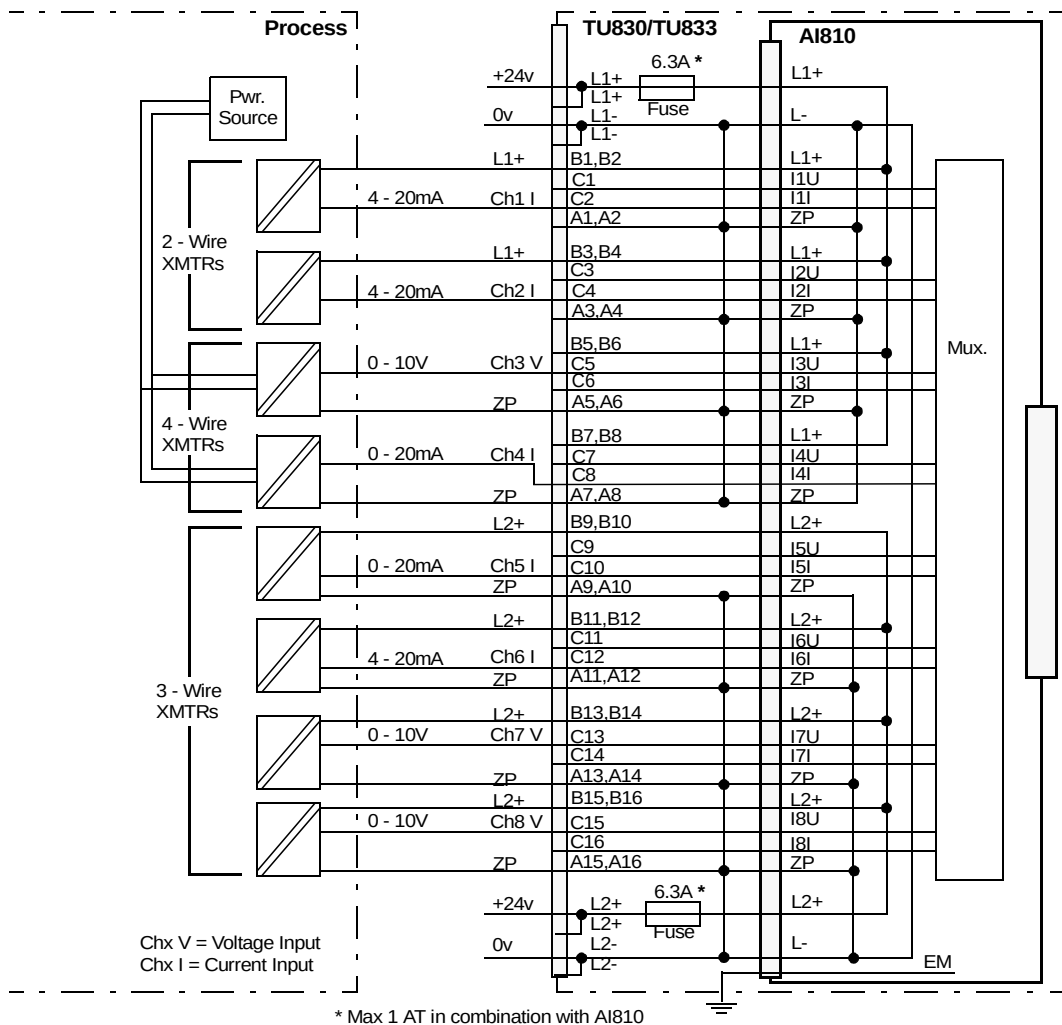


Figure A-2 AI810 with TU830 Extended MTU Process Connections

Figure A-3 shows the process connections for the AI810 when installed on a TU810 or TU814 Compact MTU.

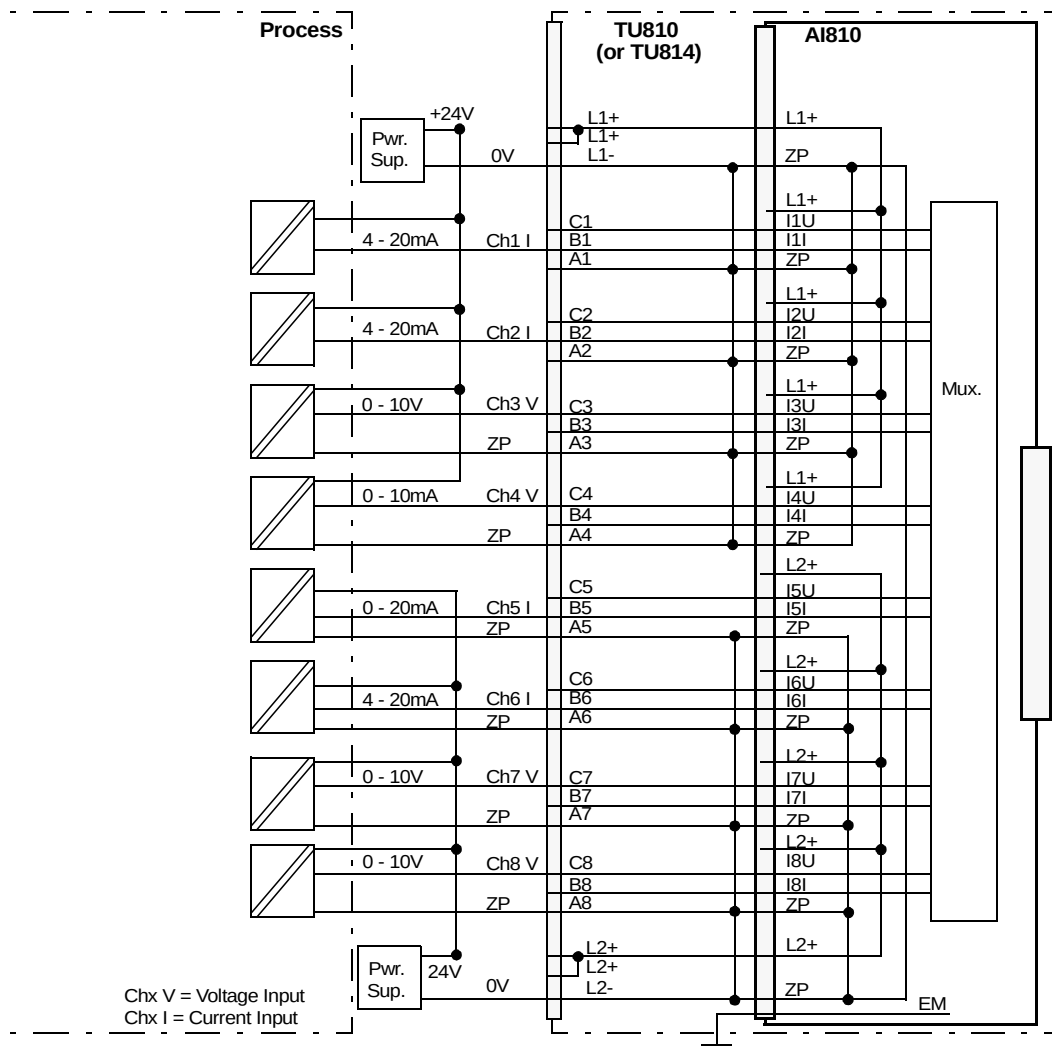


Figure A-3 AI810 with TU810 or TU814 Compact MTU Process Connections

Figure A-4 shows the process connections for the AI810 when installed on a TU835 Extended MTU.

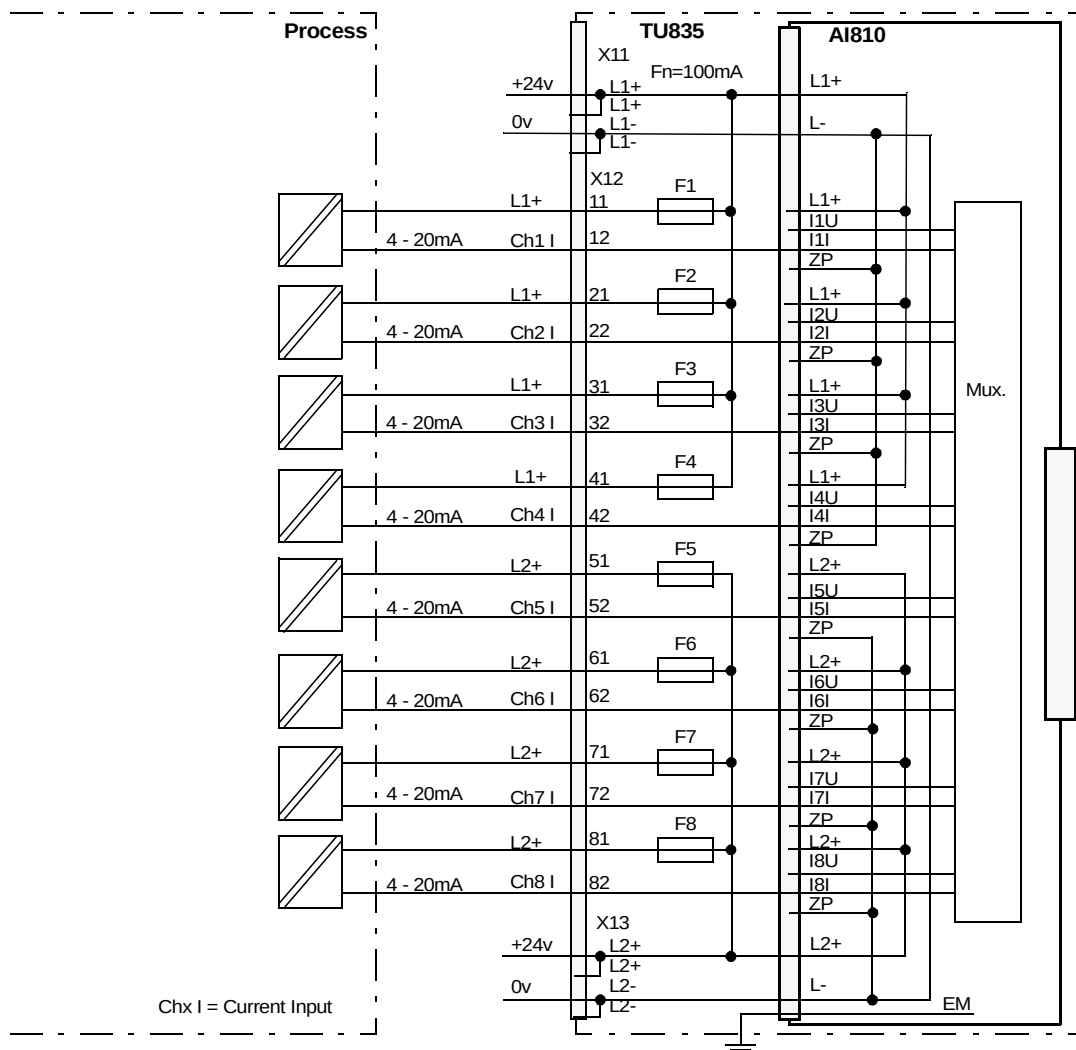


Figure A-4 AI810 with TU835 Extended MTU Process Connections

Figure A-5 shows the process connections for the AI810 when installed on a TU838 Extended MTU.

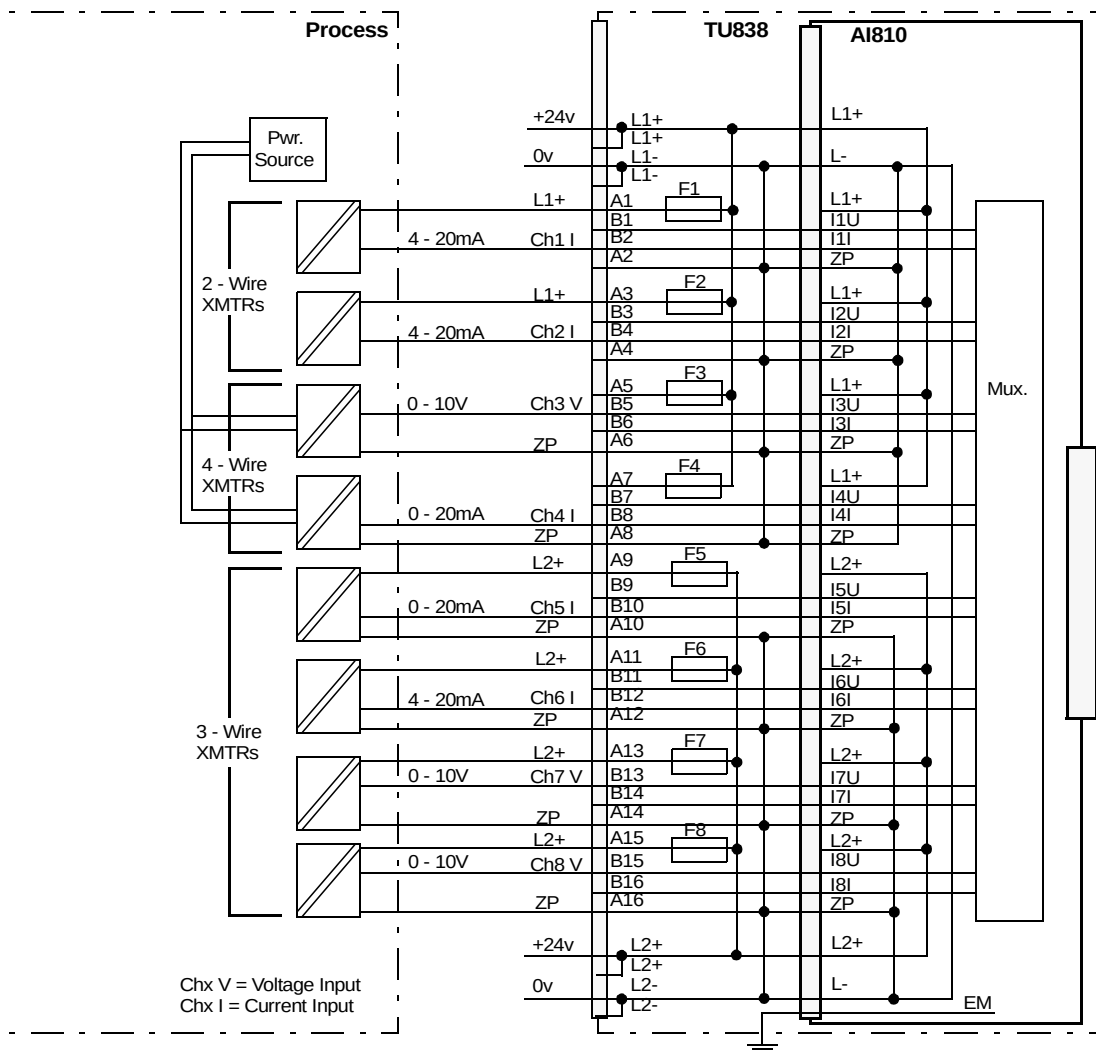


Figure A-5 AI810 with TU838 Extended MTU Process Connections

Figure A-6 shows the process connections for the AI810 when installed on a TU812 Compact MTU.

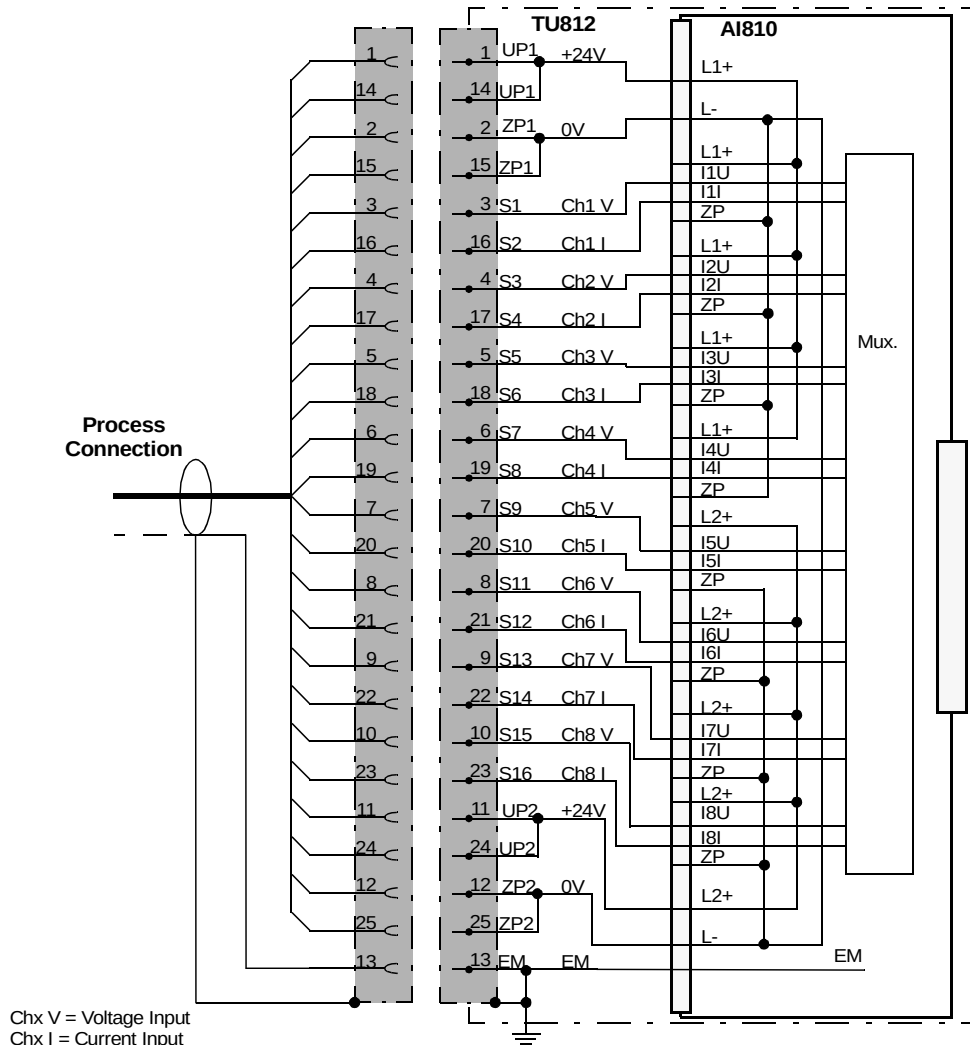


Figure A-6 AI810 with TU812 Compact MTU Process Connections

A.3 AI820 Differential Analog Input Module, +/- 20 mA, +/- 10 V, +/- 5 V (4...20 mA, 2...10 V, 1...5 V)

A.3.0.1 Features

- 4 channels for -20...+20 mA, 0...20 mA, 4...20 mA, -10...+10 V, 0...10 V, 2...10 V, -5...+5 V, 0...5 V, 1...5 V d.c. bipolar differential inputs
- One group of 4 channels isolated from ground
- Configurable on a per channel basis
- 14 Bit resolution plus sign
- Input shunt resistors protected to 30 V d.c.
- EMC protection
- DIN rail mounting
- The input withstand HART communication.

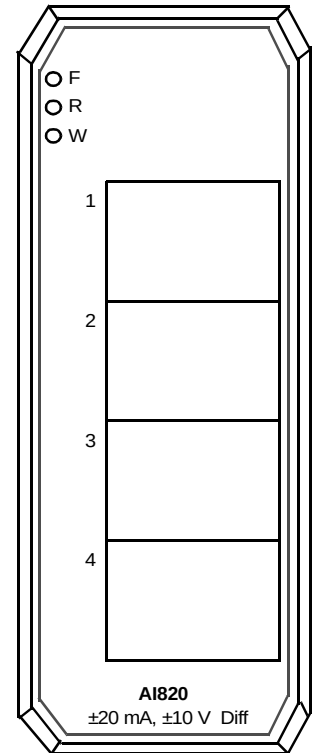
A.3.0.2 Description

The AI820 Analog Input Module has 4 differential, bipolar current/voltage inputs. Each channel can be either a voltage or current input.

The current inputs can withstand an accidental maximum normal mode 30 V d.c. connection. To protect the current input circuit against dangerous input levels, that is, by accidentally connecting a 24 V source, the resistor rating of the 250 Ω current sense resistors is about 5 Watts. This is intended only to temporarily protect one channel at a time.

The module distributes the external transmitter supply to each channel. This adds a simple connection (with extended MTUs) to distribute the supply to external 2 wire transmitters. There is no current limiting on the transmitter power terminals.

All 4 channels are isolated from the ModuleBus in one group. Power to the input stages is converted from the 24 V on the ModuleBus.



Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). The RUN LED indicates normal operation and the WARNING LED indicates if any diagnostic condition is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Four different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage inputs, but requires external terminals for distribution of 24 V power supply to the field devices. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.3.0.3 Technical Data

Table A-5 AI820 Differential Analog Input Module Specifications at 25°C

Feature	AI820 Analog Input Module
Number of channels	4
Type of input	Bipolar differential
Measurement ranges (nominal)	-20...+20 mA, 0...20 mA, 4...20 mA ⁽¹⁾ , -10...+10 V, 0...10 V, 2...10 V ⁽¹⁾ , -5...+5 V, 0...5 V, 1...5 V ⁽¹⁾ d.c.
Over/under range	± 15%
Input impedance (at voltage input)	200kΩ +/- 25% Common mode 800kΩ +/- 25% Normal mode
Input impedance (at current input)	250 Ω
Maximum field cable length	600 meters, (656 yd.)
Max. Differential d.c. input (Fault)	30 V
Common mode voltage input	50 V d.c.
CMRR, 50 Hz, 60 Hz	80 dB (>60 dB d.c.)
NMRR, 50 Hz, 60 Hz	33 dB
Error	Max. 0,1%
Resolution	14 bit plus sign
Temperature drift, Current	Max.50 ppm/°C
Temperature drift, Voltage	Max.70 ppm/°C
Update cycle time (all four channels)	<26 ms
Current consumption 24 V	70 mA
Current consumption 5 V	80 mA
Power dissipation	1.7W

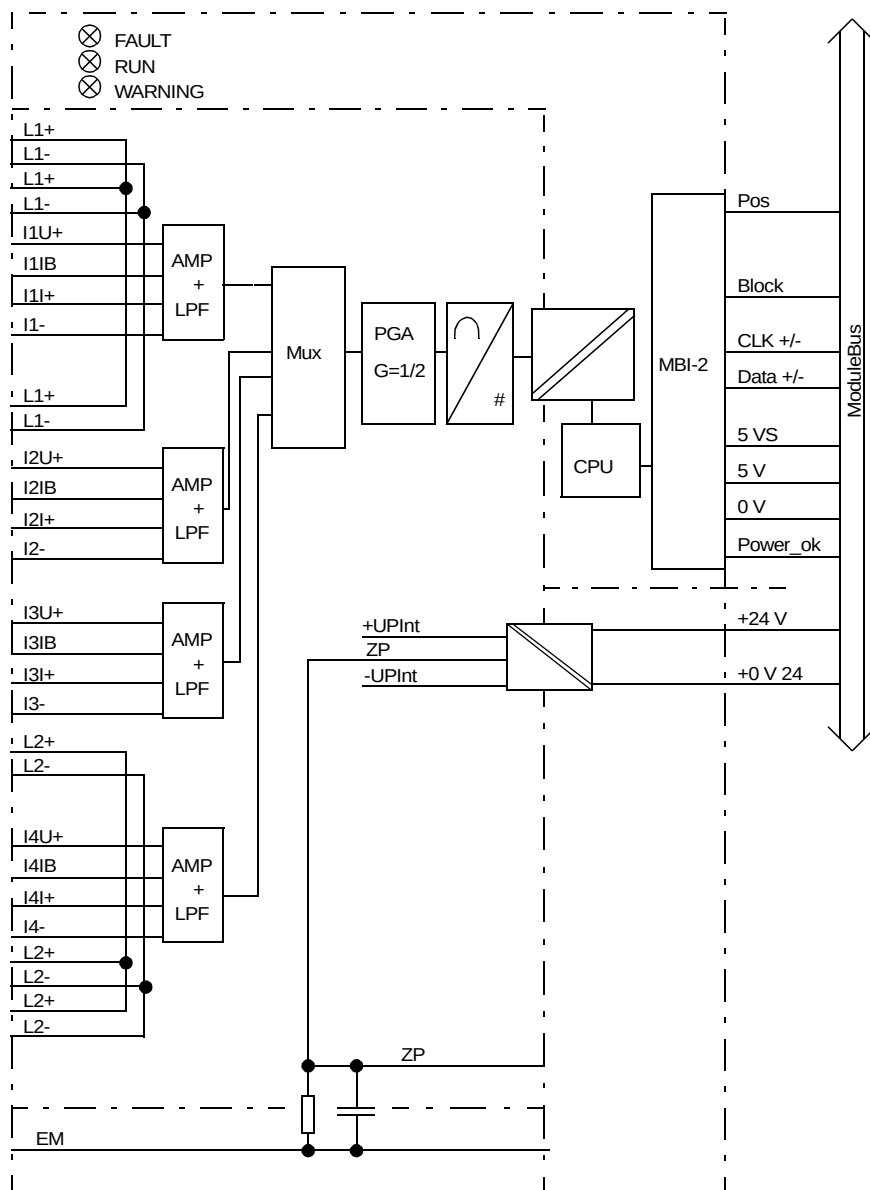
*Table A-5 AI820 Differential Analog Input Module Specifications at 25°C
(Continued)*

Feature	AI820 Analog Input Module
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Voltage supervision	Internal process supply
Input filter (rise time)	40 ms
Fusing of transmitter supply	on Extended MTU
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812, TU814 or TU830
MTU keying code	BB
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.2 kg (0.44 lbs.)

(1) Handled by the FCI or controller.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.3.0.4 Block Diagram AI820



A.3.0.5 Process Connections*Table A-6 AI820 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector⁽¹⁾	TU830/TU833 Terminal
+24 V d.c.	L1+	1, 14	L1+
0 V d.c. (ZP)	L1-	2, 15	L1-
Ch1, L1+	-	-	B1, B2
Ch1V, Voltage Input +	C1	3	C1
Ch1IB ⁽²⁾	B1	16	C2
Ch1, L1-	A1	-	A1, A2
Ch 1, L1+	-	-	B3, B4
Ch 1I, Current Input +	C2	4	C3
Ch 1-, Return - ⁽²⁾	B2	17	C4
Ch 1, L1-	A2	-	A3, A4
Ch 2, L1+	-	-	B5, B6
Ch 2V, Voltage Input +	C3	5	C5
Ch 2IB ⁽²⁾	B3	18	C6
Ch 2, L1-	A3	-	A5, A6
Ch 2, L1+	-	-	B7, B8
Ch 2I, Current Input +	C4	6	C7
Ch 2-, Return - ⁽²⁾	B4	19	C8
Ch 2, L1-	A4	-	A7, A8
Ch 3, L2+	-	-	B9, B10
Ch 3V, Voltage Input +	C5	7	C9

Table A-6 AI820 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
Ch 3IB ⁽²⁾	B5	20	C10
Ch 3, L2-	A5	-	A9, A10
Ch 3, L2+	-	-	B11, B12
Ch 3I, Current Input +	C6	8	C11
Ch 3-, Return - ⁽²⁾	B6	21	C12
Ch 3, L2-	A6	-	A11, A12
Ch 4, L2+	-	-	B13, B14
Ch 4V, Voltage Input +	C7	9	C13
Ch 4IB ⁽²⁾	B7	22	C14
Ch 4, L2-	A7	-	A13, A14
Ch 4, L2+	-	-	B15, B16
Ch 4I, Current Input +	C8	10	C15
Ch 4-, Return - ⁽²⁾	B8	23	C16
Ch 4, L2-	A8	-	A15, A16
+24 V d.c.	L2+	11, 24	L2+
0 V d.c. (ZP)	L2-	12, 25	L2-

(1) Pin 13 connected to connector body for EM.

(2) When connect current signal current bridge must be connected to the voltage Input. If 2-wire transmitter also connect Return- to L1- or L2-.

Figure A-7 shows the process connections for the Differential Analog Input Module AI820 when installed on a TU830 Extended MTU.

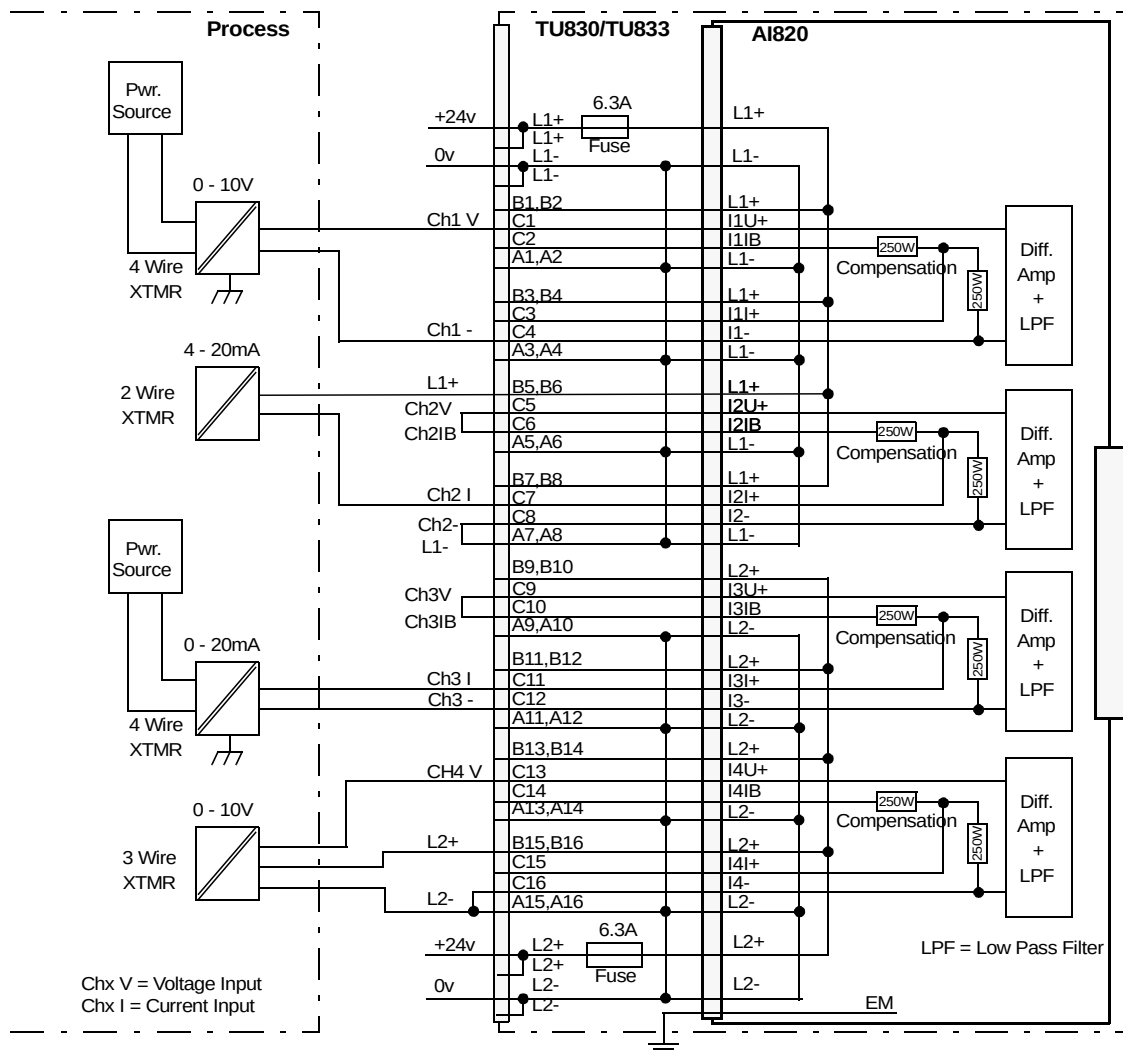


Figure A-7 AI820 with TU830 Extended MTU Process Connections

Figure A-8 shows the process connections for the AI820 when installed on a TU810 or TU814 Compact MTU.

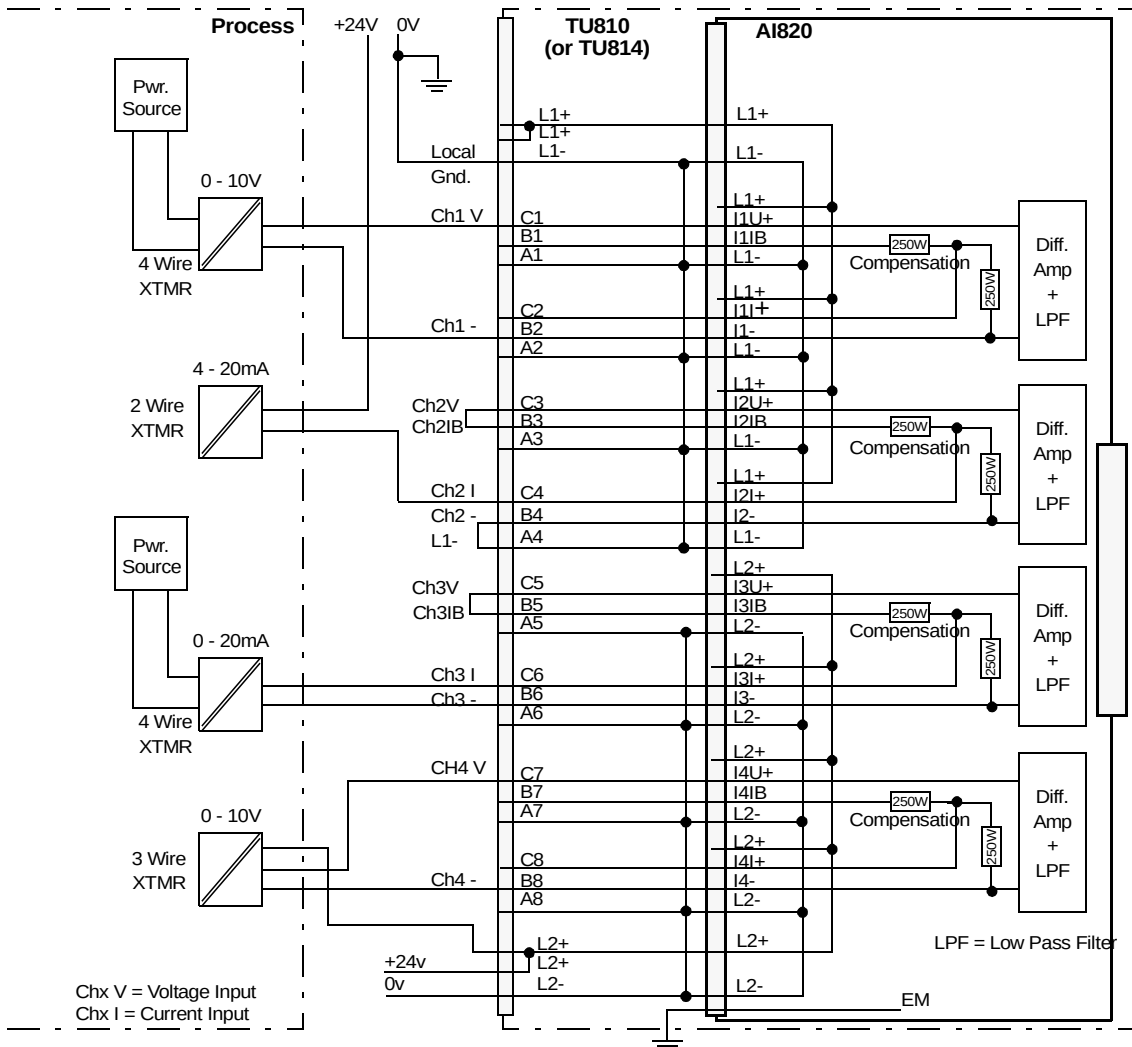


Figure A-8 AI820 with TU810 or TU814 Compact MTU Process Connections

Figure A-9 shows the process connections for the AI820 when installed on a TU812.

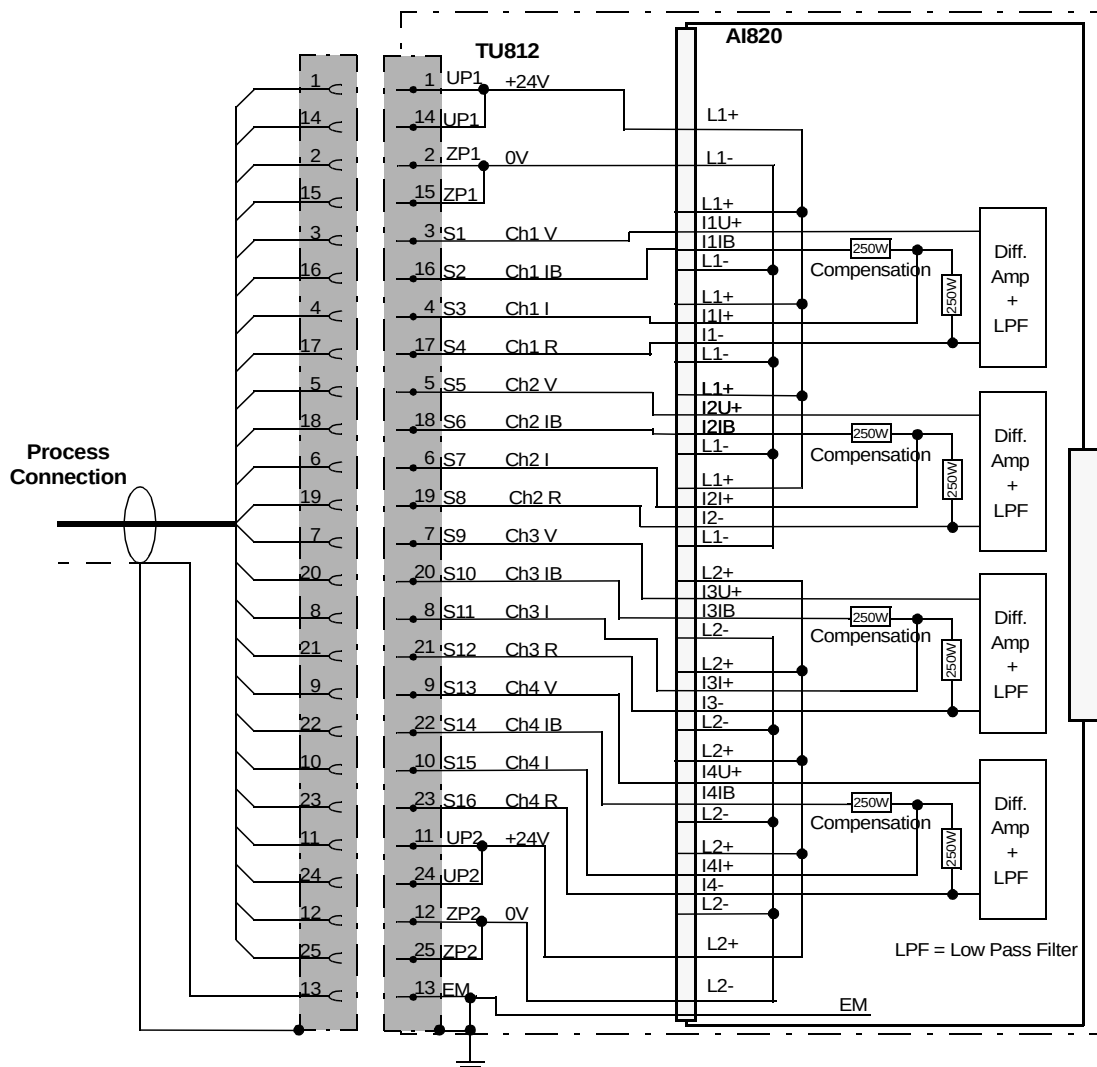


Figure A-9 AI820 with TU812 Compact MTU Process Connections

A.4 AI825 Galvanic Isolated Analog Input Module

A.4.0.1 Features

- 4 channels individually galvanic isolated inputs for ± 20 mA, 0...20 mA, 4...20 mA, ± 10 V, 0...10 V, 2...10 V
- 14 Bit resolution plus sign
- Input shunt resistors protected to 30 V d.c.
- EMC protection
- DIN rail mounting
- The input withstand HART communication.

A.4.0.2 Description

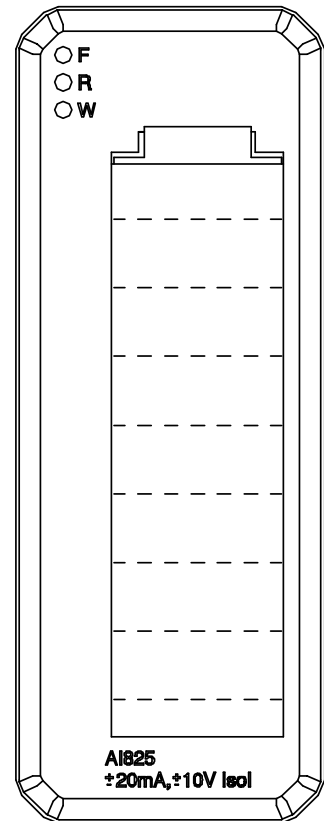
The AI825 Analog Input Module has 4 individually galvanic isolated, bipolar current/voltage inputs. Each channel can be either a voltage or current input.

The module has a direct current input that withstand up to 6.3 V and a over voltage protected current input that withstand up to +30 V d.c. The current is limited by a PTC resistor.

Power to the input stages is converted from the 24 V on the ModuleBus.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). The RUN LED indicates normal operation and the WARNING LED indicates if any diagnostic condition is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.



Three different types of MTUs can be used; TU831 Extended MTU, TU811 or TU813 Compact MTU. The TU813 Compact MTU has crimped snap-in connectors for connection to the process.

A.4.0.3 Technical Data*Table A-7 AI825 Galvanic Isolated Input Module Specifications at 25°C*

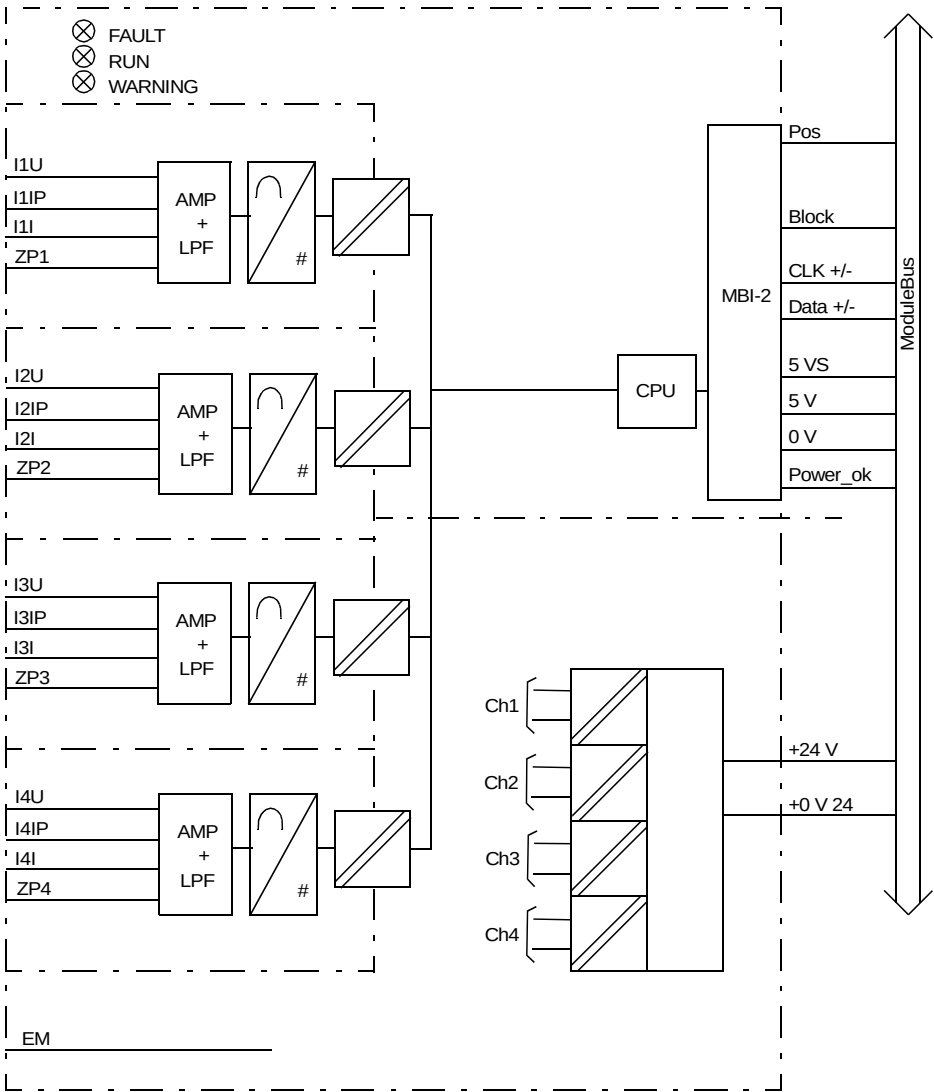
Feature	AI825 Analog Input Module
Number of channels	4
Type of input	Galvanic isolated channel to channel channel to ground
Measurement ranges (nominal)	-20...+20 mA, 0...20 mA, 4...20 mA, -10...+10 V, 0...10 V, 2...10 V d.c.
Over/under range	± 15%
Input impedance at voltage input (I x U)	10 MΩ
Input impedance at current input (I x I)	50 Ω
Over voltage protected current input (I x IP)	50 Ω + 125 Ω
Maximum field cable length	600 meters, (656 yd.)
Max. Differential d.c. input (Fault)	
Voltage input	30 V
Over voltage protected current input	30 V
Current input	6.3 V
CMRR, 50 Hz, 60 Hz	120 dB
NMRR	>40 dB at 50 Hz, >55 dB at 60 Hz
Error	Max. 0,1%
Resolution	14 bit plus sign
Temperature drift	Max 57 ppm/°C (± 20 mA) Max 34 ppm/°C (± 10 V) Max 78 ppm/°C (0...20 mA) Max 47 ppm/°C (0...10 V)
Update cycle time (all four channels)	<10 ms

*Table A-7 AI825 Galvanic Isolated Input Module Specifications at 25°C
(Continued)*

Feature	AI825 Analog Input Module
Current consumption 24 V	Typ 90 mA, max 110 mA
Current consumption 5 V	Typ 70 mA, max 100 mA
Power dissipation	Typ 2.5 W, max 3.2 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽¹⁾
Voltage supervision	Internal supplies
Input filter (0 to 90%)	130 ms at current input 115 ms at voltage input
Module termination units	TU811, TU813 or TU831
MTU keying code	DA
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage between channels channel to ground and MB24V MB24V to ground	1900 V d.c. 3250 V d.c. 720 V d.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.22 kg (0.48 lbs.)

(1) 40°C (104°F) applies to compact MTUs with I/O-modules mounted on vertical DIN rail.

A.4.0.4 Block Diagram AI825



A.4.0.5 Process Connections*Table A-8 AI825 Process Connections*

Process Connection	TU811 or TU813 Terminal	TU831 Terminal
Ch1V, Voltage Input +	B1	B1
Ch1 IP, Current input+ protected	C2	B2
Ch 1I, Current Input +	A2	A2
Ch 1-, Return - (ZP1)	A1	A1
Ch 2V, Voltage Input +	B3	B3
Ch2 IP, Current input+ protected	C4	B4
Ch 2I, Current Input +	A4	A4
Ch 2-, Return - (ZP2)	A3	A3
Ch 3V, Voltage Input +	B5	B5
Ch3 IP, Current input+ protected	C6	B6
Ch 3I, Current Input +	A6	A6
Ch 3-, Return - (ZP3)	A5	A5
Ch 4V, Voltage Input +	B7	B7
Ch4 IP, Current input+ protected	C8	B8
Ch 4I, Current Input +	A8	A8
Ch 4-, Return - (ZP4)	A7	A7

Figure A-7 shows the process connections for the Galvanic Isolated Analog Input Module AI825 when installed on a TU811 or TU813 Compact MTU.

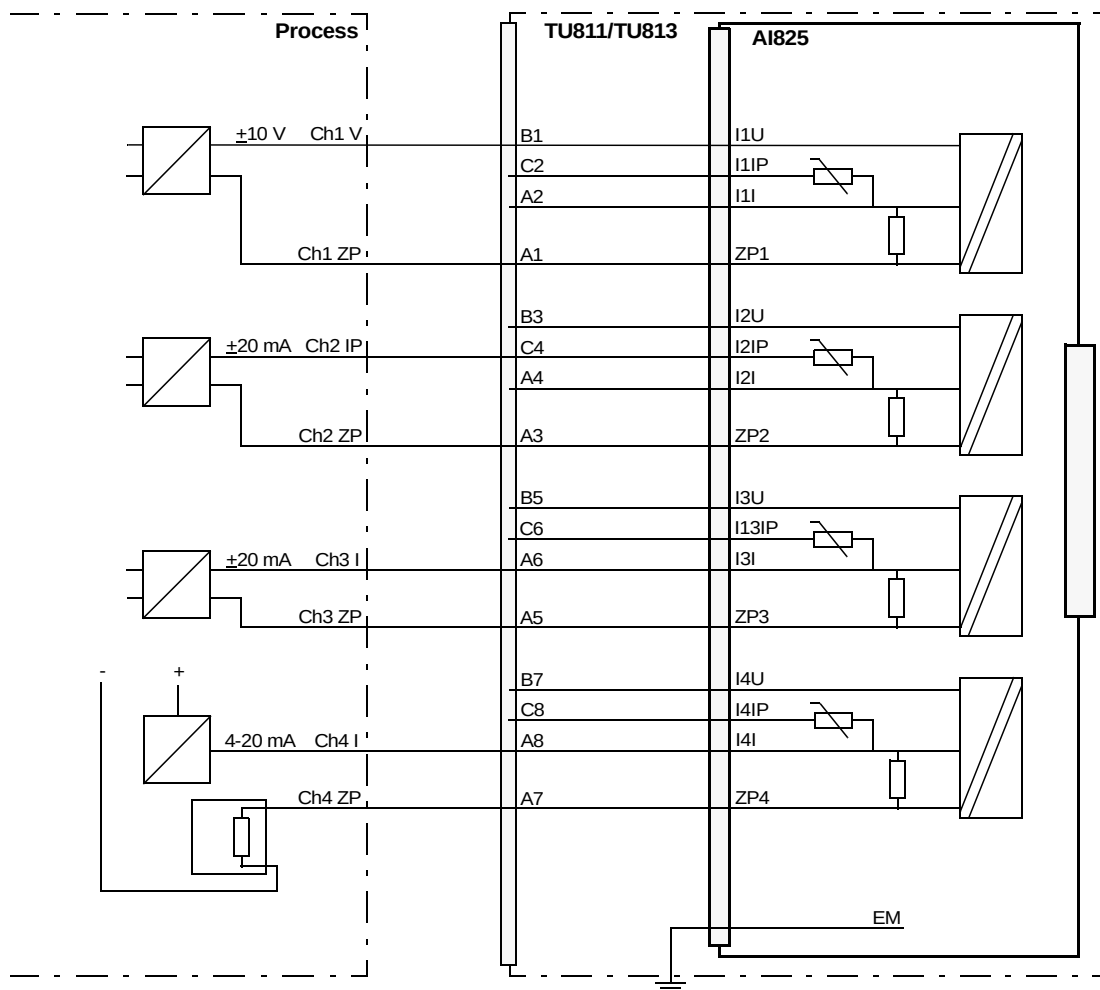


Figure A-10 AI825 with TU811 or TU813 Compact MTU Process Connections

Figure A-8 shows the process connections for the AI825 when installed on a TU831 Extended MTU.

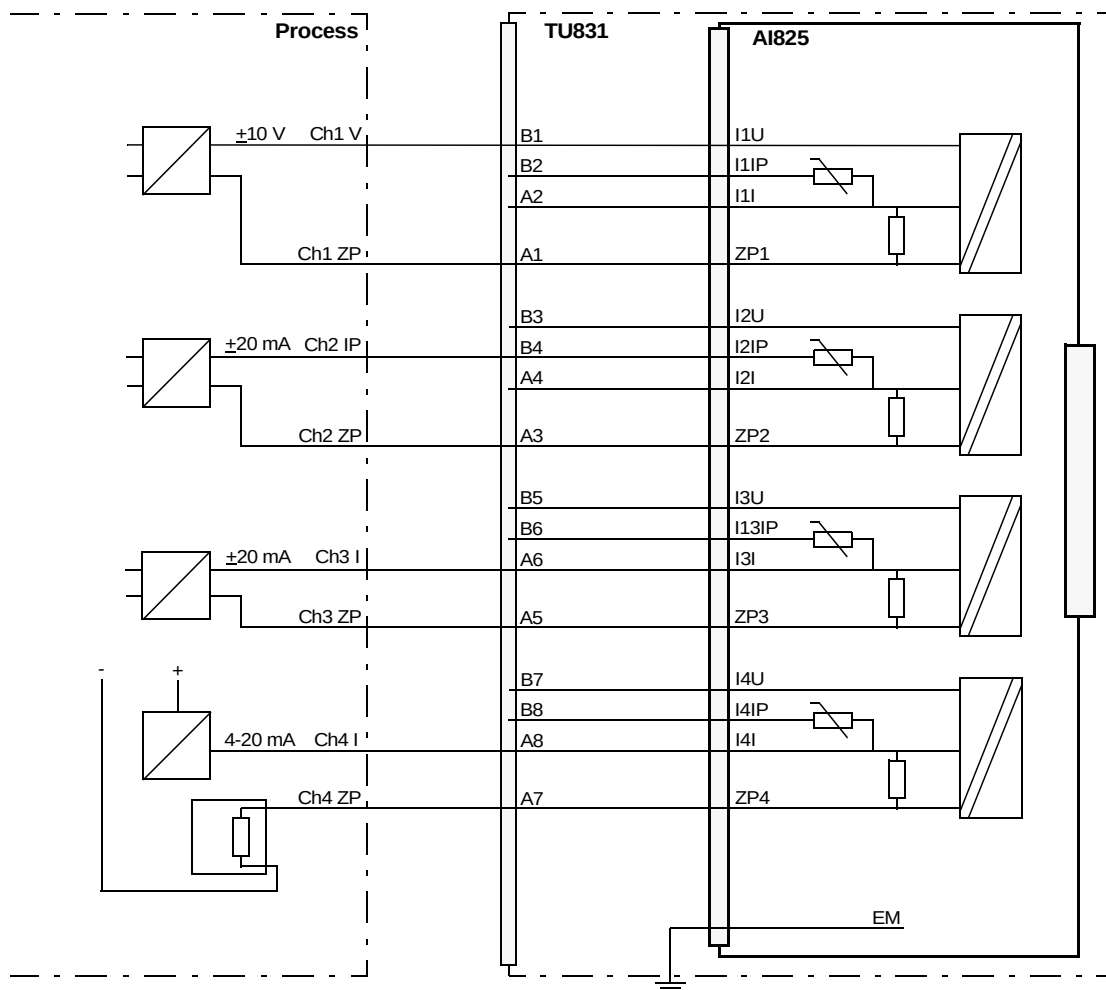


Figure A-11 AI825 with TU831 Extended MTU Process Connections

A.5 AI830 RTD Input Module

A.5.0.1 Features

- 8 channels for RTD (Pt100, Cu10, Ni100 and Ni120 and resistor) inputs
- 3-wire connection to RTDs
- 14 Bit resolution
- Inputs are monitored for open-circuit, short-circuit and has a input grounded sensor
- EMC protection
- DIN rail mounting.

A.5.0.2 Description

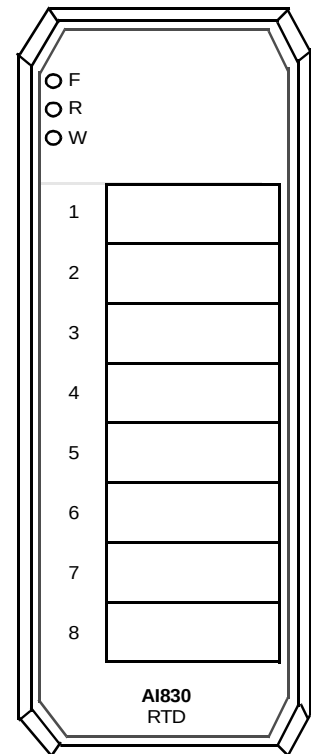
The AI830 RTD Input Module has 8 channels for measurement of temperature with resistive elements (RTDs). With 3-wire connections. All the RTDs must be isolated from ground.

The AI830 can be used with Pt100, Cu10, Ni100, Ni120 or resistive sensors. Linearization and conversion of the temperature to Centigrade or Fahrenheit is performed on the module. Every channel can be individually configured.

The MainsFreq parameter is used to set mains frequency filter cycle time. This will give a notch filter at the frequency specified (50 Hz or 60 Hz).

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state, Error state or Not configured state.

In Not configured state the FAULT LED is turned off after the first valid access to the module.



The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Four different types of MTUs can be used. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU enables three wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.5.0.3 Technical Data*Table A-9 AI830 RTD Input Module Specifications at 25°C*

Feature	AI830 RTD Input Module
Number of channels	8
Type of input	3-wire RTD: Pt100, Cu10, Ni100, Ni120 and resistive potentiometer
Measurement range	See Table A-10
Maximum field cable resistance	55 Ω
Error dependent of the field cable resistance R_{err} =Error in ohm R =Wire resistance ΔR =Difference in % between resistance in field cables, see Figure A-12 .	$R_{err} = R \times (0.005 + \Delta R/100)$ $T_{err}^{\circ C} = R_{err} / (R0 \times TCR)$ $T_{err}^{\circ F} = T_{err}^{\circ C} \times 1.8$
CMRR, 50 Hz, 60 Hz	>120 dB ⁽¹⁾
NMRR, 50 Hz, 60 Hz	>60 dB
Error (IEC 51-1) ⁽²⁾	See Table A-10
Resolution	See Table A-10
Temperature drift	See Table A-10
Update cycle time	150 ms + n x 95 ms ⁽³⁾
Current consumption 24 V	50 mA
Current consumption 5 V	70 mA
Power dissipation	1.6 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽⁴⁾
Supervision	Open-circuit, short-circuit ⁽⁵⁾ , reference channel, internal power supply

Table A-9 AI830 RTD Input Module Specifications at 25°C (Continued)

Feature	AI830 RTD Input Module
Isolation	Groupwise isolated from ground (RIV=50 V)
Mounting termination units	TU810, TU812, TU814 or TU830
MTU keying code	AF
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.22 kg (0.49 lbs.)

- (1) At 10 Ω load, e.g. Cu 10. CMMR is >80 dB at <400 Ω load and >110 dB at 100 Ω .
- (2) Without error dependent of the field cable resistance
- (3) n=Number of active channels
- (4) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.
- (5) For Cu10, not short circuit.

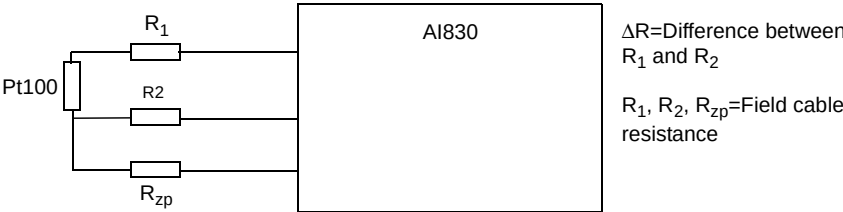


Figure A-12 Error dependency of the field cable resistance

Table A-10 AI830 Signal Range

Temperature Range	Sensor Type	Max Error		Resolution		MaxTemp Drift
		50 Hz	60 Hz	50 Hz	60 Hz	
-80...80°C	Pt100 ⁽¹⁾	0.095°C	0.11°C	0.025°C	0.030°C	0.0017°C/°C
-112...176°F	Pt100 ⁽¹⁾	0.17°F	0.19°F	0.046°F	0.055°F	0.003°F/°F
-200...250°C	Pt100 ⁽¹⁾	0.14°C	0.15°C	0.026°C	0.031°C	0.0025°C/°C
-328...482°F	Pt100 ⁽¹⁾	0.25°F	0.27°F	0.046°F	0.055°F	0.0045°F/°F
-200...850°C	Pt100 ⁽¹⁾	0.22°C	0.24°C	0.056°C	0.067°C	0.005°C/°C
-328...1562°F	Pt100 ⁽¹⁾	0.39°F	0.43°F	0.10°F	0.12°F	0.009°F/°F
-60...180°C	Ni100 ⁽²⁾	0.10°C	0.12°C	0.031°C	0.037°C	0.0021°C/°C
-76...356°F	Ni100 ⁽²⁾	0.19°F	0.21°F	0.056°F	0.067°F	0.0038°F/°F
-80...260°C	Ni120 ⁽³⁾	0.27°C	0.29°C	0.022°C	0.026°C	0.0029°C/°C
-112...500°F	Ni120 ⁽³⁾	0.49°F	0.51°F	0.039°F	0.046°F	0.0053°F/°F
-100...260°C	Cu10 ⁽⁴⁾	0.60°C	0.69°C	0.26°C	0.31°C	0.024°C/°C
-148...500°F	Cu10 ⁽⁴⁾	1.1°F	1.3°F	0.46°F	0.56°F	0.0043°F/°F
0...400 Ω	Resistor	0.083 Ω	0.091 Ω	0.020 Ω	0.024 Ω	0.0020 Ω/°C
0...400 Ω	Resistor	0.083 Ω	0.091 Ω	0.020 Ω	0.024 Ω	0.0036 Ω/°F

(1) According to IEC 751, TCR = 0.003850

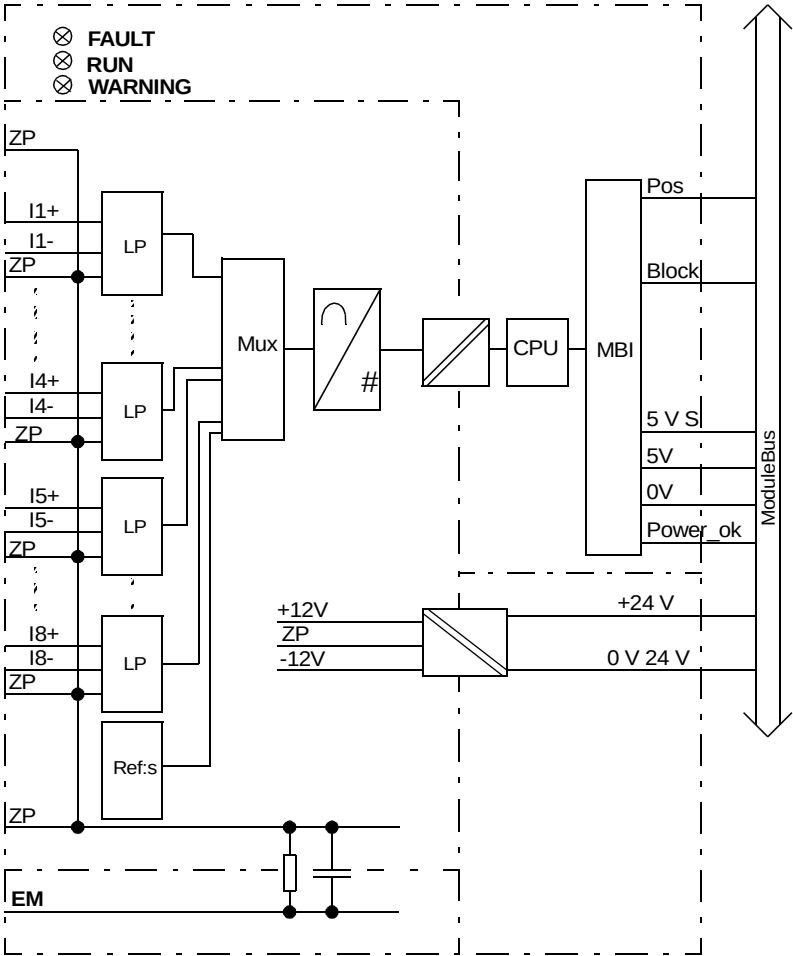
(2) According to DIN 43760, TCR = 0.00617

(3) According to MIL-T-24388C, TCR = 0.00672

$R_0 = 120 \Omega$ (MINCO)

(4) According to TCR = 0.00427, $R_{25} = 10 \Omega$ (MINCO)

A.5.0.4 Block Diagram AI830



A.5.0.5 Process Connections*Table A-11 AI830 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
-	L1+ (2)	1, 14	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)
-	-	-	B1, B2
Ch1, + Input	C1	3	C1
Ch1, - Input	B1	16	C2
Ch1, Return (ZP)	A1	-	A1, A2
-	-	-	B3, B4
Ch 2, + Input	C2	4	C3
Ch 2, - Input	B2	17	C4
Ch 2, Return (ZP)	A2	-	A3, A4
-	-	-	B5, B6
Ch 3, + Input	C3	5	C5
Ch 3, - Input	B3	18	C6
Ch 3, Return (ZP)	A3	-	A5, A6
-	-	-	B7, B8
Ch 4, + Input	C4	6	C7
Ch 4, - Input	B4	19	C8
Ch 4, Return (ZP)	A4	-	A7, A8
-	-	-	B9, B10
Ch 5, + Input	C5	7	C9

Table A-11 AI830 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
Ch 5, - Input	B5	20	C10
Ch 5, Return (ZP)	A5	-	A9, A10
-	-	-	B11, B12
Ch 6, + Input	C6	8	C11
Ch 6, - Input	B6	21	C12
Ch 6, Return (ZP)	A6	-	A11, A12
-	-	-	B13, B14
Ch 7, + Input	C7	9	C13
Ch 7, - Input	B7	22	C14
Ch 7, Return (ZP)	A7	-	A13, A14
-	-	-	B15, B16
Ch 8, + Input	C8	10	C15
Ch 8, - Input	B8	23	C16
Ch 8, Return (ZP)	A8	-	A15, A16
-	L2+ (2)	11, 24	L2+ (2)
0 V dc (ZP)	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-13 shows the process connections for the RTD Input Module AI830 when installed on a TU830 Extended MTU.

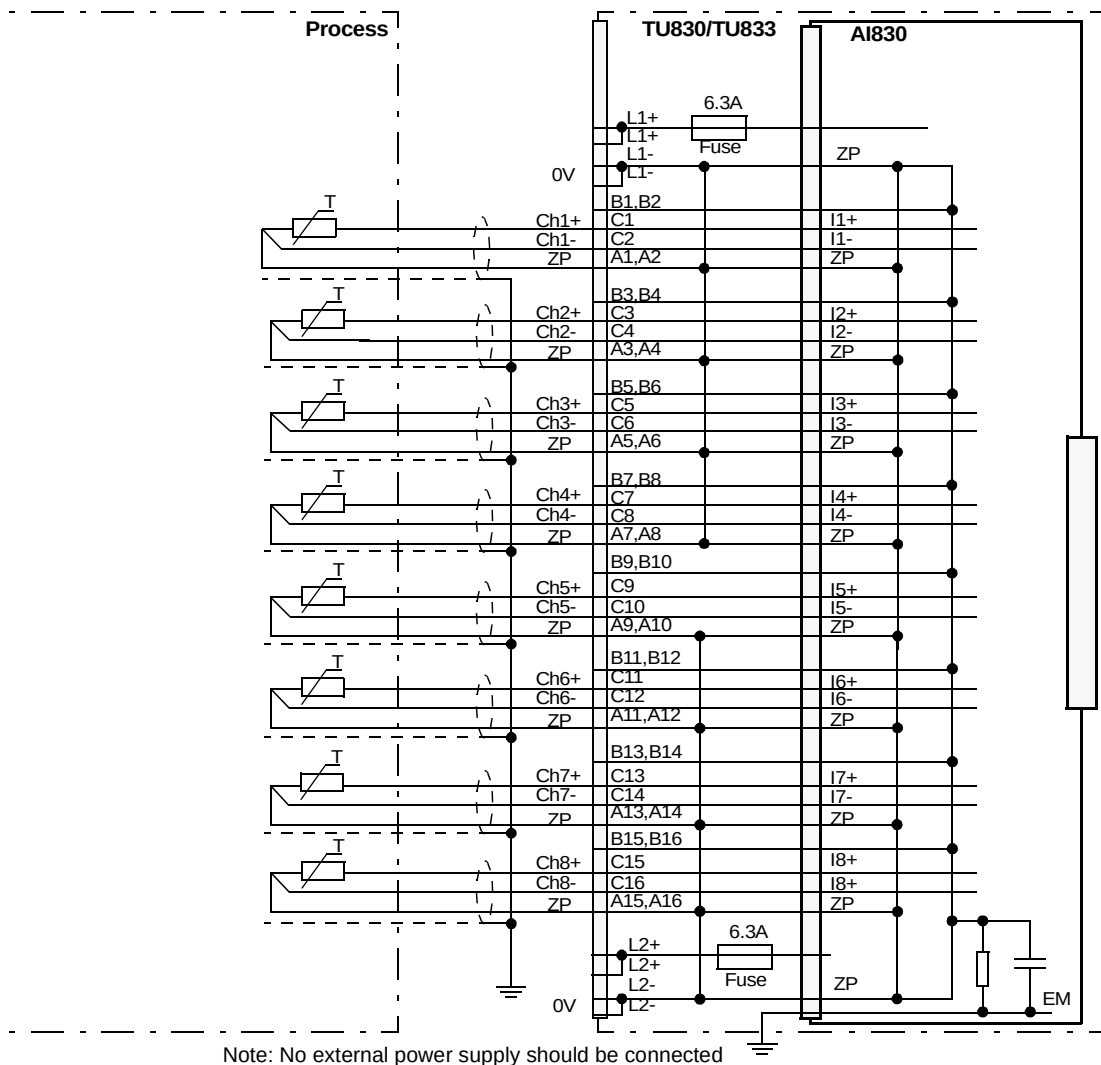


Figure A-13 AI830 with TU830 Extended MTU Process Connections

Figure A-14 shows the process connections for the AI830 when installed on a TU810 or TU814 Compact MTU.

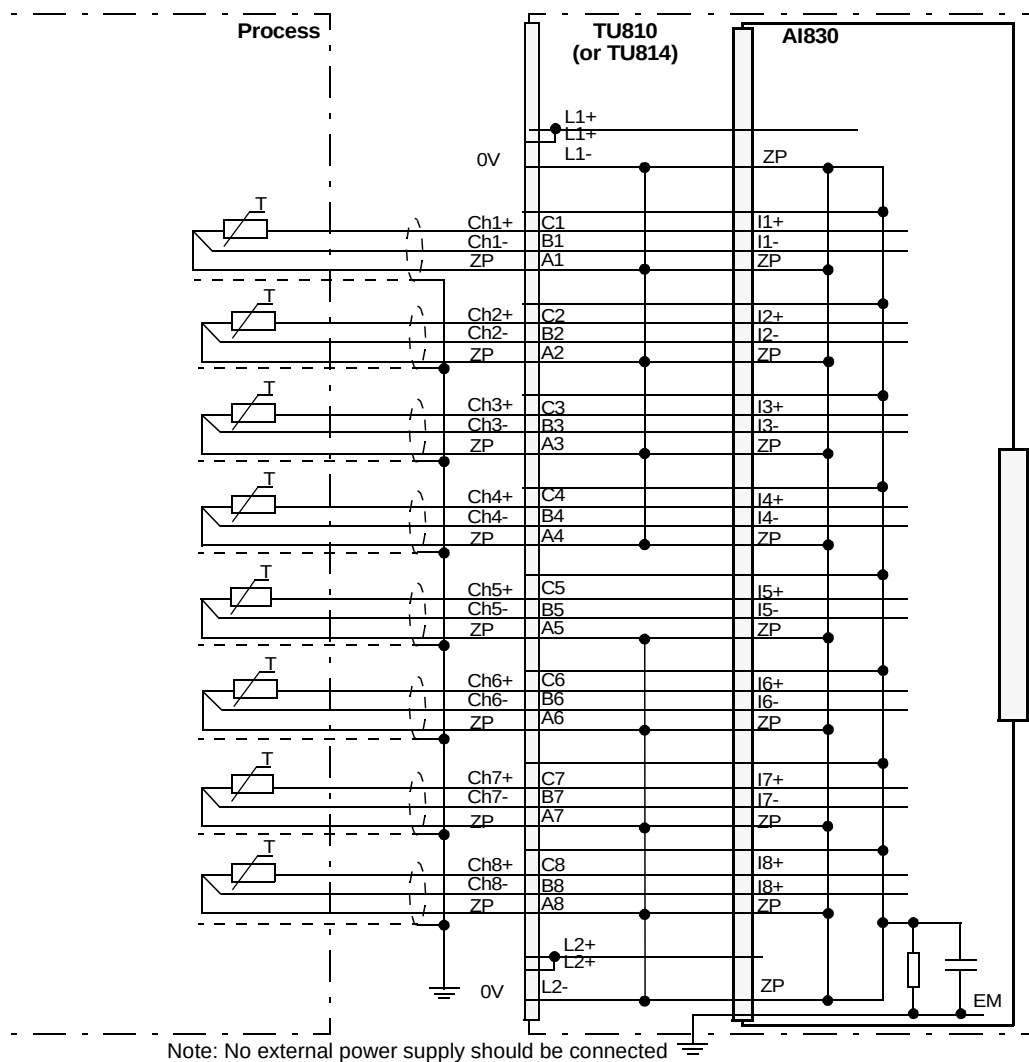


Figure A-14 AI830 with TU810 or TU814 Compact MTU Process Connections

Figure A-15 shows the connections for the AI830 when installed on a TU812.

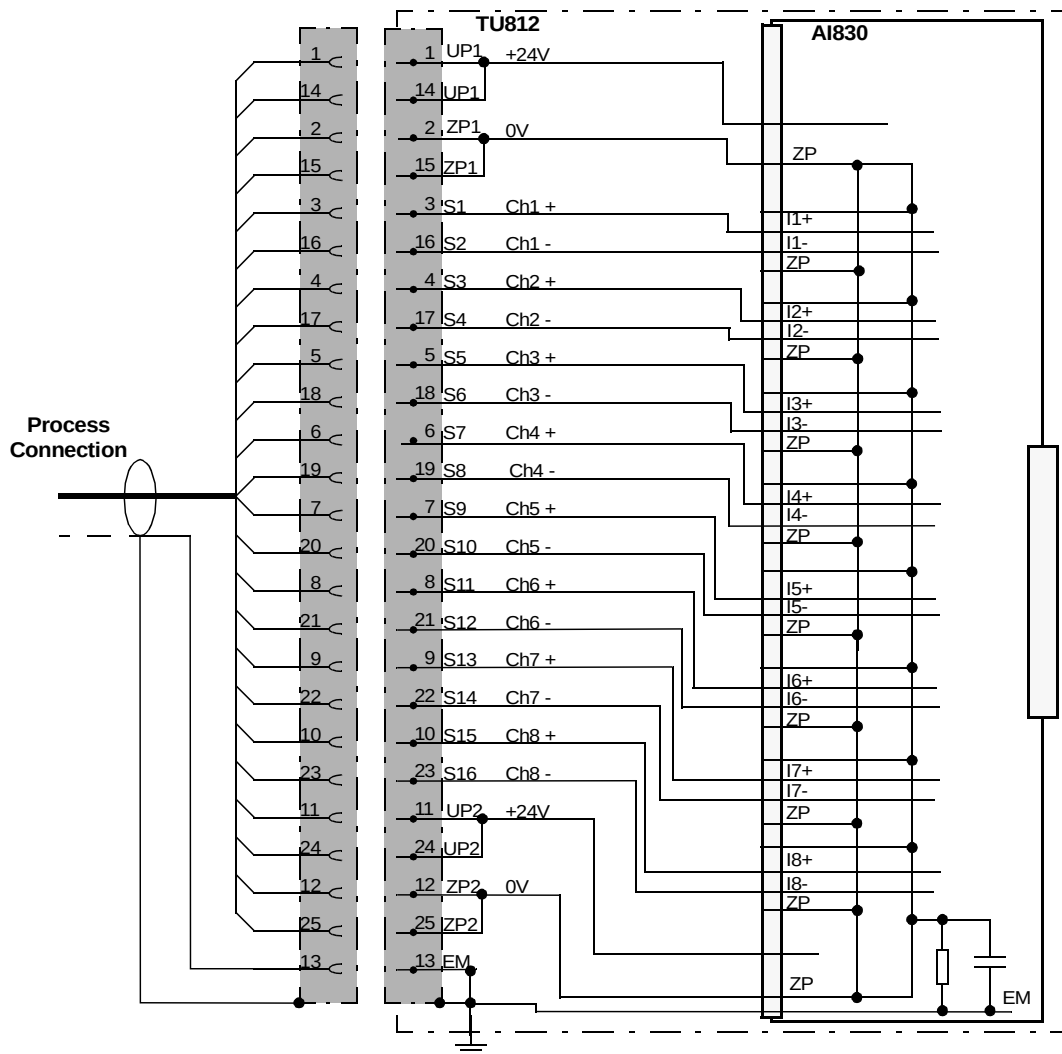


Figure A-15 AI830 with TU812 Compact MTU Process Connections

A.6 AI835 Thermocouple/mV Input Module

A.6.0.1 Features

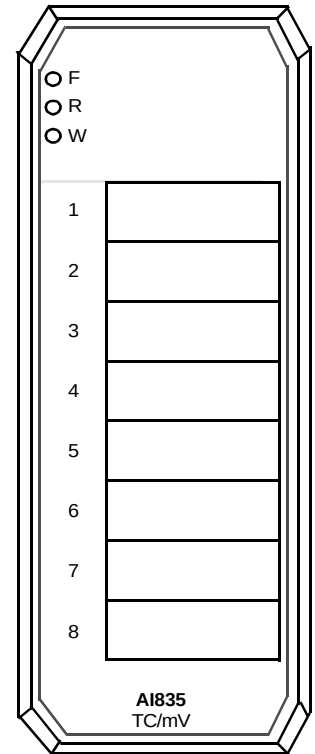
- 8 differential input channels for thermocouple/mV
- Channel 8 can be designated as the CJ-channel (4-wire Pt100 RTD)
- Variety of thermocouples with the following characteristics:
B, C, E, J, K, N, R, S and T
- 15 Bit resolution (A/D)
- Inputs are monitored for wire-break open-circuit
- EMC protection
- DIN rail mounting.

A.6.0.2 Description

The AI835 Thermocouple/mV Input Module is part of the S800 I/O. It provides 8 differential input channels for Thermocouple/mV measurements. Measurement ranges configurable per channel are:
-30 mV to +75 mV linear, or TC Types B, C, E, J, K, N, R, S and T.

One of the channels (Channel 8) may be configured for “Cold Junction” (ambient) temperature measurements, thus serving as CJ-channel for Ch. 1...7. The junction temperature may be measured locally on the MTUs screw terminals, or on a connection unit distant from the device. Alternatively, a fix junction temperature for the module may be set by the user (as parameter). Channel 8 may be used in the same manner as Ch. 1...7 when no CJ-temperature measurement is needed.

Each input-channel can measure a mV type of signal source (Thermocouple or linear), and may be grounded or ungrounded.



Full self-calibration is obtained by means of 0V, 50 mV and 100 ohm references, which are regularly updated.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state, Error state or Not configured state.

In Not configured state the FAULT LED is turned off after the first valid access to the module.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Four different types of MTUs can be used. The TU830 Extended MTU or the TU810 (or TU814) Compact MTU enables three wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.6.0.3 Technical Data*Table A-12 AI835 Thermocouple/mV Input Module Specifications at 25°C*

Feature	AI835 Thermocouple/mV Input Module
Number of channels	8 (Differential)
Type of input	-30 mV to 75 mV linear, or TC types B, C, E, J, K, N, R, S and T
Measurement range	See Table A-13
Input impedance	> 1 MΩ
CJ-temperature measurement reference	4-wire connected IEC-751/Pt100 RTD
Maximum field cable length	600 meters (656 yd.)
CMV between channels, max.	12 V d.c.
CMRR, 50 Hz, 60 Hz	120 dB
NMRR, 50 Hz, 60 Hz	>60 dB ⁽¹⁾
Resolution (A/D)	15 bits
Error	0.1%
Temperature drift	Typ. 15 ppm/°C Max. 35 ppm/°C
Filter, analog (1st order Low-pass)	10 Hz
Filter (integration)	50 Hz or 60 Hz
Update cycle time, max.	280 ms + n x 80 ms at 50 Hz 250 ms + n x 70 ms at 60 Hz (n = active channels)

*Table A-12 AI835 Thermocouple/mV Input Module Specifications at 25°C
(Continued)*

Feature	AI835 Thermocouple/mV Input Module
Supervision	Module: reference channels, power supply low Channel TC: open-circuit Linear: none Pt100 (CH8): <-40°C (-40°F) and >100°C (212°F)
Current consumption 24 V	50 mA
Current consumption 5 V	75 mA
Power dissipation	1.6 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812, TU814 or TU830
MTU keying code	BA
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector

Table A-12 AI835 Thermocouple/mV Input Module Specifications at 25°C
(Continued)

Feature	AI835 Thermocouple/mV Input Module
Height	119 mm (4.7")
Weight	0.22 kg (0.49 lbs.)

- (1) >40 dB at 50 Hz and 60 Hz $\pm 1\%$
(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

Table A-13 AI835 Range/Linearization

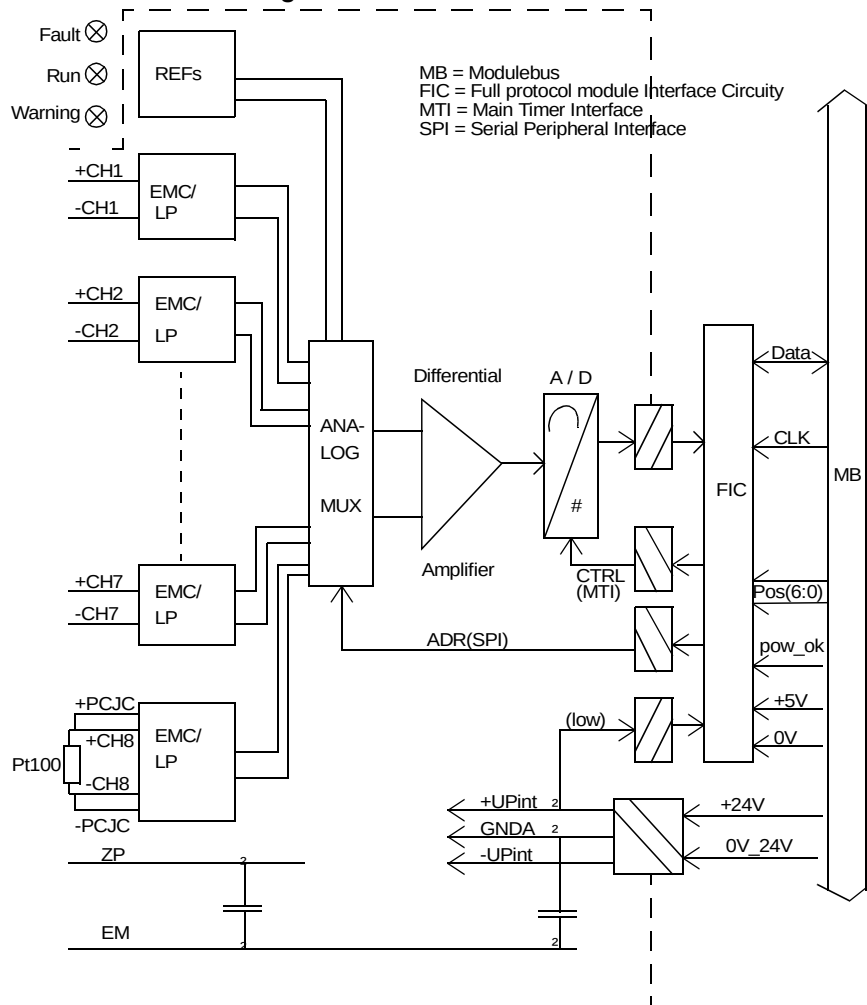
Input Type	Temperature Range
TC type B ⁽¹⁾	44...1820°C, 111...3308°F
TC type C	0...2300°C, 32...4172°F
TC type E ⁽¹⁾	-270...1000°C, -454...1832°F
TC type J ⁽¹⁾	-210...1200°C, -346...2192°F
TC type K ⁽¹⁾	-270...1372°C, -454...2501°F
TC type N ⁽¹⁾	-270...1300°C, -454...2372°F
TC type R ⁽¹⁾	-50...1768°C, -58...3214°F
TC type S ⁽¹⁾	-50...1768°C, -58...3214°F
TC type T ⁽¹⁾	-270...400°C, -454...752°F
Linear range	-30...75 mV
Pt100 RTD (for CJC) ⁽²⁾	-40...100°C, -40...212°F

(1) Linearization per IEC 584-1 1995, and following ITS 90 requirements.

(2) Sensor Type applies to Channel 8 only, for the measuring of the Cold Junction Compensation temperature.



From the 11 Sensor Types above, one choice is to be selected by the user **per channel**.

A.6.0.4 Block Diagram AI835

A.6.0.5 Process Connections*Table A-14 AI835 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
Pt100, PCJC-	L1+ (2)	1, 14	L1+ (2)
-	L1-	2, 15	L1- (2)
-	-	-	B1, B2
Ch1, + Input	C1	3	C1
Ch1, - Input	B1	16	C2
Ch1, Return (ZP)	A1	-	A1, A2
-	-	-	B3, B4
Ch 2, + Input	C2	4	C3
Ch 2, - Input	B2	17	C4
Ch 2, Return (ZP)	A2	-	A3, A4
-	-	-	B5, B6
Ch 3, + Input	C3	5	C5
Ch 3, - Input	B3	18	C6
Ch 3, Return (ZP)	A3	-	A5, A6
-	-	-	B7, B8
Ch 4, + Input	C4	6	C7
Ch 4, - Input	B4	19	C8
Ch 4, Return (ZP)	A4	-	A7, A8
-	-	-	B9, B10
Ch 5, + Input	C5	7	C9

Table A-14 AI835 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
Ch 5, - Input	B5	20	C10
Ch 5, Return (ZP)	A5	-	A9, A10
-	-	-	B11, B12
Ch 6, + Input	C6	8	C11
Ch 6, - Input	B6	21	C12
Ch 6, Return (ZP)	A6	-	A11, A12
-	-	-	B13, B14
Ch 7, + Input	C7	9	C13
Ch 7, - Input	B7	22	C14
Ch 7, Return (ZP)	A7	-	A13, A14
-	-	-	B15, B16
Ch 8, + Input	C8	10	C15
Ch 8, - Input	B8	23	C16
Ch 8, Return (ZP)	A8	-	A15, A16
Pt100, PCJC+	L2+ (2)	11, 24	L2+ (2)
-	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-16 shows the process connections for the TC/mV Input Module AI835 when installed on a TU830 Extended MTU.

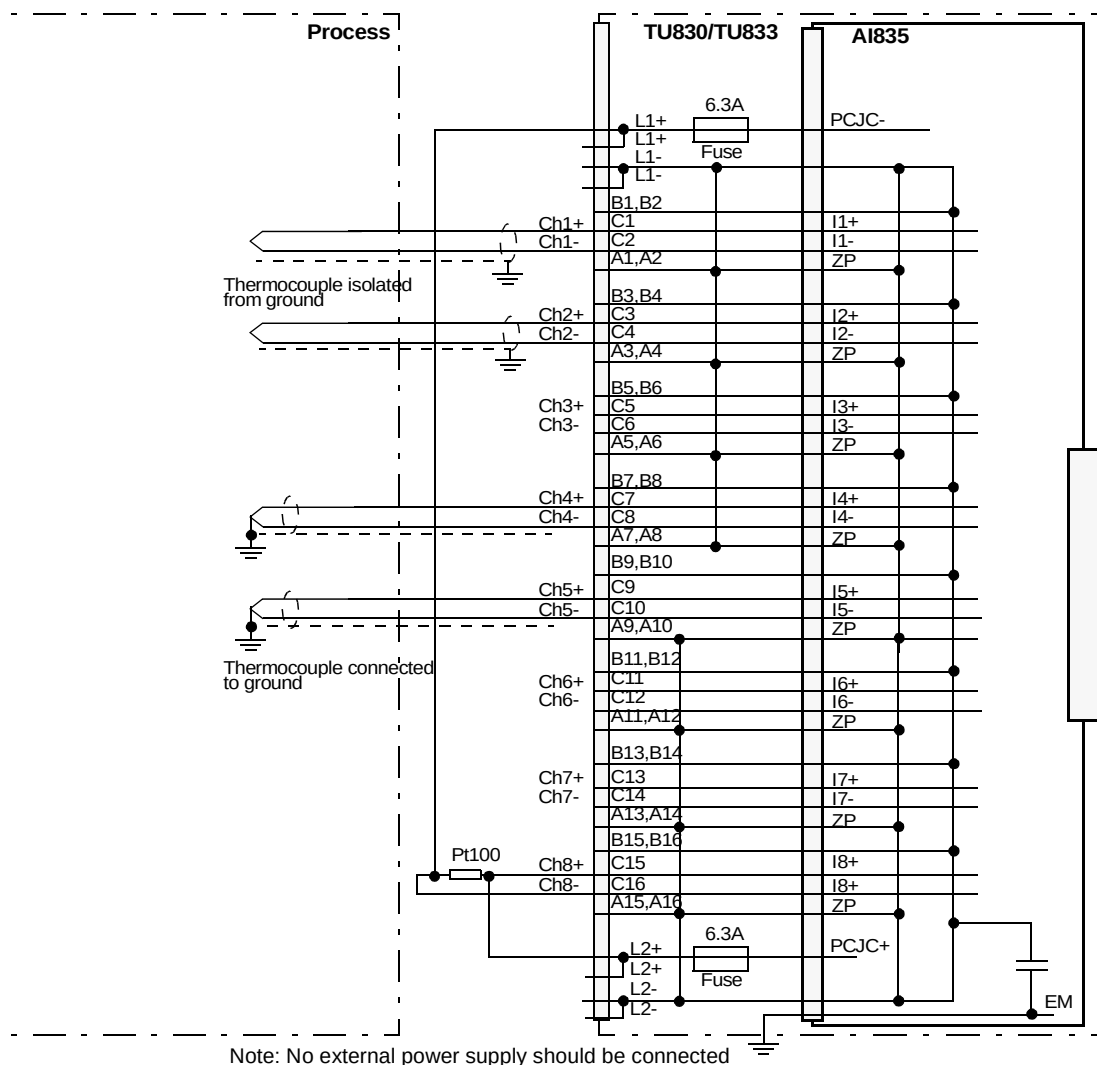


Figure A-16 AI835 with TU830 Extended MTU Process Connections

Figure A-17 shows the process connections for the AI835 when installed on a TU810 or TU814 Compact MTU.

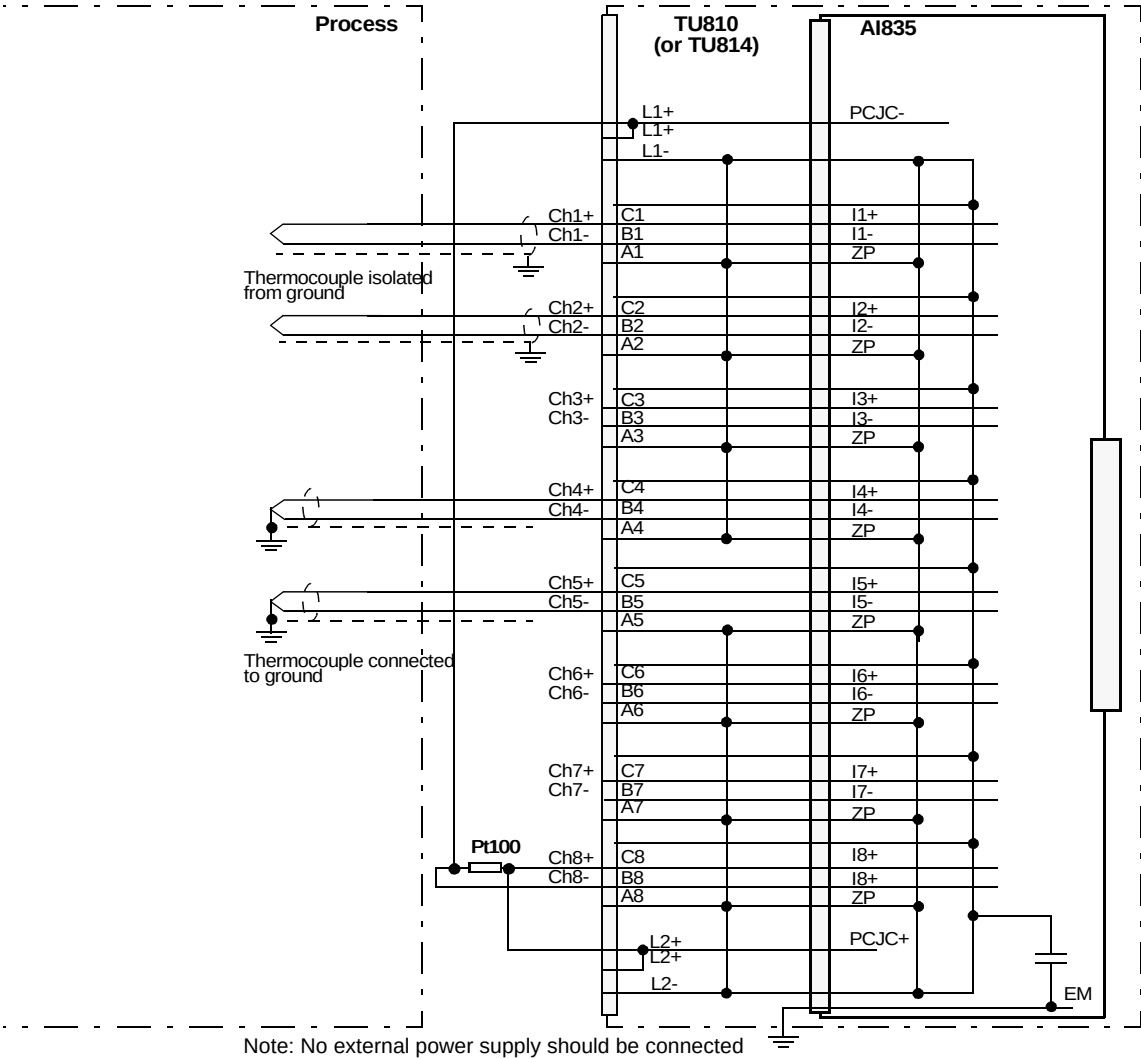


Figure A-17 AI835 with TU810 or TU814 Compact MTU Process Connections

Figure A-18 shows the AI835 connections through a remote junction box.

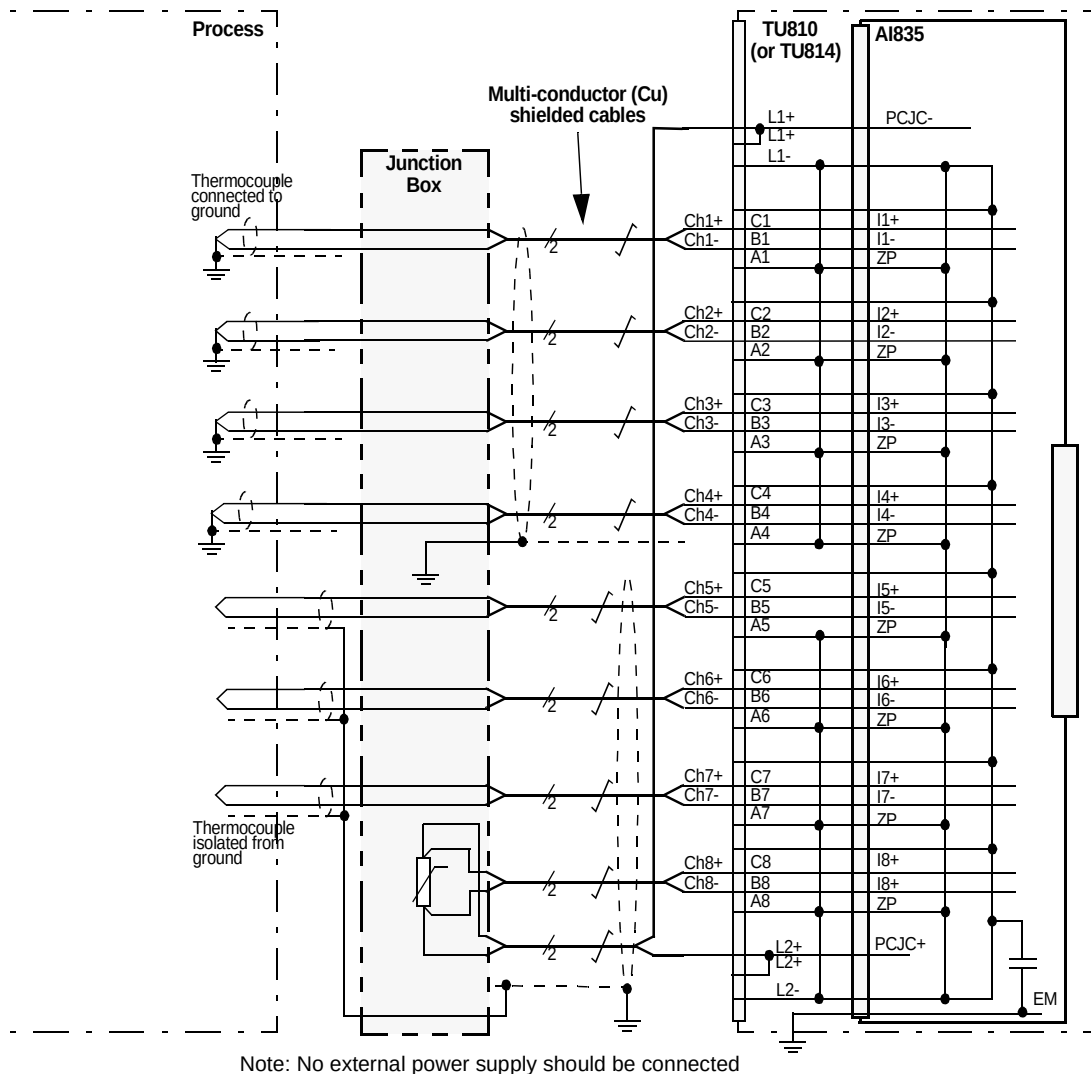


Figure A-18 AI835 with TU810 or TU814 Compact MTU Process Connections to Remote Junction Box

Figure A-19 shows the connections for the AI835 when installed on a TU812.

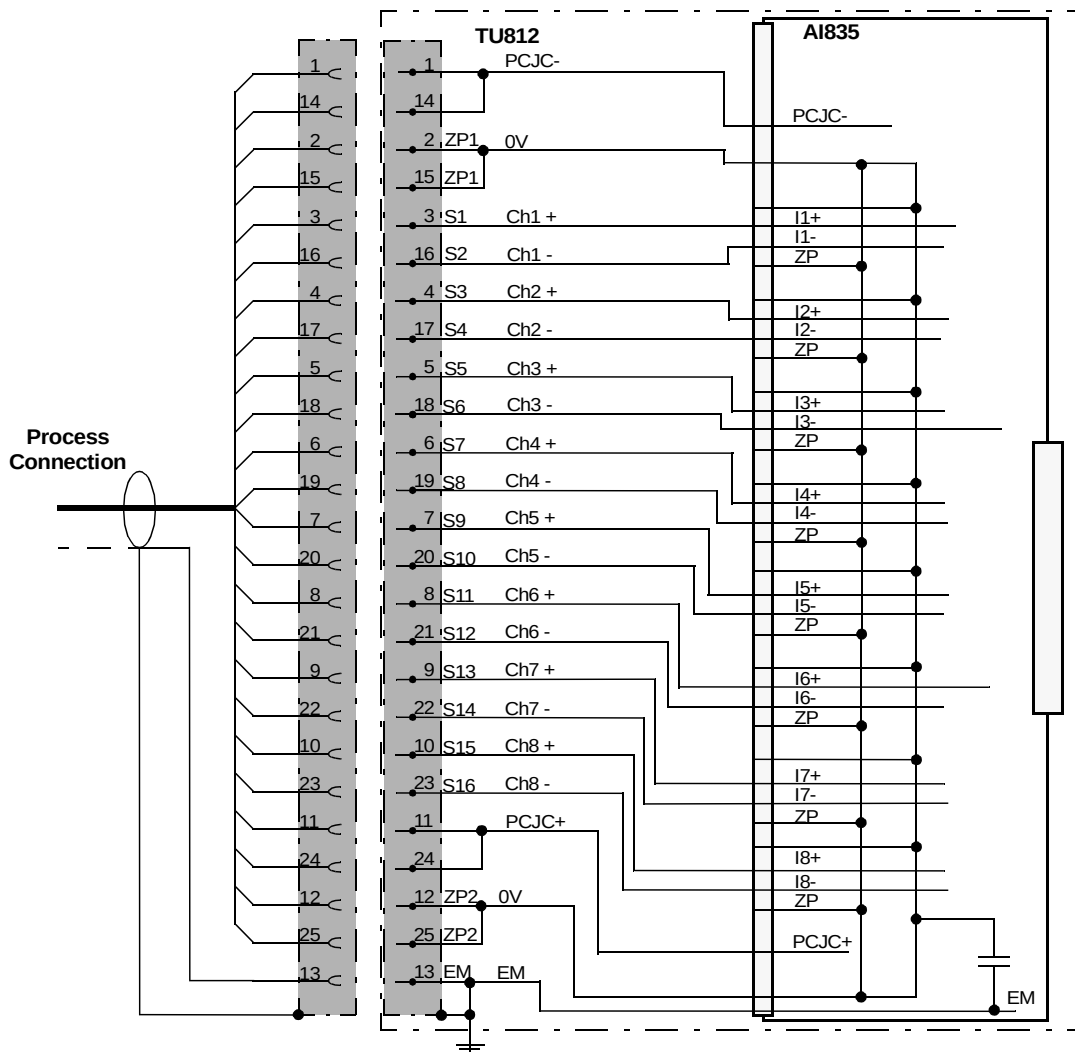


Figure A-19 AI835 with TU812 Compact MTU Process Connections

A.7 AI843 Thermocouple/mV Input Module

A.7.0.1 Features

- 8 differential input channels for thermocouple/mV.
- The module can be used in both single and redundant applications.
- A separate channel is used as CJ-channel (4-wire Pt100 RTD)
- Variety of thermocouples with the following characteristics: B, C, E, J, K, L, N, R, S, T and U
- 16 Bit resolution (A/D converter)
- Inputs are monitored for wire-break open-circuit
- EMC protection
- DIN rail mounting.

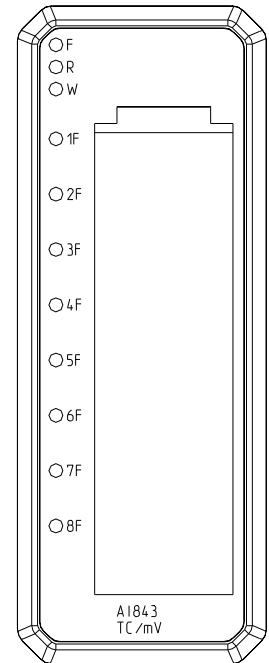
A.7.0.2 Description

The AI843 Thermocouple/mV Input Module is part of the S800 I/O. It provides 8 differential input channels for Thermocouple/mV measurements. Measurement ranges configurable per channel are:

-30 mV to +75 mV linear, or TC Types B, C, E, J, K, L, N, R, S, T and U.

A separate channel is used for “Cold Junction” (ambient) temperature measurements, thus serving as CJ-channel for Ch. 1...8. The junction temperature may be measured locally on the MTUs screw terminals, or on a connection unit distant from the device. Alternatively, a fix junction temperature for the module may be set by the user (as parameter) or a junction temperature set by the application.

Each input-channel can measure a mV type of signal source (Thermocouple or linear), and may be grounded or ungrounded.



Full self-calibration is obtained by means of 0V and 30 mV references, which are regularly updated.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state, Error state or Not configured state.

In Not configured state the FAULT LED is turned off after the first valid access to the module.

On each channel there is a Fault (Red) LED that indicate channel error.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master or controller after power is applied.

Three different types of MTUs can be used. In single applications TU830 Extended MTU enables three wire connection to the devices without additional terminals.

In redundant applications TU842 for horizontal mounting and TU843 for vertical mounting.

A.7.0.3 Technical Data*Table A-15 AI843 Thermocouple/mV Input Module Specifications at 25°C*

Feature	AI843 Thermocouple/mV Input Module
Number of channels	8 (Differential)
Type of input	-30 mV to 75 mV linear, or TC types B, C, E, J, K, L, N, R, S, T and U
Measurement range	See Table A-16
Input impedance	> 1 M Ω
CJ-temperature measurement reference	4-wire connected IEC-751/Pt100 RTD
Maximum field cable length	600 meters (656 yd.) or max. 500 Ω
CMV between channels, max.	5 V d.c.
CMRR, 50 Hz, 60 Hz	100 dB
NMRR, 50 Hz, 60 Hz	>40 dB
Resolution (A/D converter)	16 bits
Error	$\leq 0.1\%$
Temperature drift	Typ. 10 ppm/°C Max. 25 ppm/°C
Filter, analog (1st order Low-pass)	1.1 kHz
Filter (integration)	50 Hz or 60 Hz
Update cycle time, max.	320 ms + n x 80 ms at 50 Hz 267 ms + n x 67 ms at 60 Hz (n = active channels)

*Table A-15 AI843 Thermocouple/mV Input Module Specifications at 25°C
(Continued)*

Feature	AI843 Thermocouple/mV Input Module
Supervision	Module error if: reference channels outside limits, power supply low Channel error if: open-circuit, out of range <-40°C (-40°F) and >100°C (212°F) (only Cold Junction channel) Linear: none
Current consumption 24 V	50 mA
Current consumption 5 V	60 mA
Power dissipation	1.5 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽¹⁾
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units, single applications	TU830
Module termination unit, redundant application	TU842 and TU843
MTU keying code	B, A
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector

Table A-15 AI843 Thermocouple/mV Input Module Specifications at 25°C
(Continued)

Feature	AI843 Thermocouple/mV Input Module
Height	119 mm (4.7")
Weight	0.157 kg (0.35 lbs.)

(1) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

Table A-16 AI843 Range/Linearization

Input Type	Temperature Range
TC type B ⁽¹⁾	44...1820°C, 111...3308°F
TC type C	0...2300°C, 32...4172°F
TC type D	0...2300°C, 32...4172°F
TC type E ⁽¹⁾	-270...1000°C, -454...1832°F
TC type J ⁽¹⁾	-210...1200°C, -346...2192°F
TC type K ⁽¹⁾	-270...1372°C, -454...2501°F
TC type L	-200...900°C, -328...1652°F
TC type N ⁽¹⁾	-270...1300°C, -454...2372°F
TC type R ⁽¹⁾	-50...1768°C, -58...3214°F
TC type S ⁽¹⁾	-50...1768°C, -58...3214°F
TC type T ⁽¹⁾	-270...400°C, -454...752°F
TC type U	-200...600°C, -328...1112°F
Linear range	-30...75 mV
Pt100 RTD (for CJC) ⁽²⁾	-40...100°C, -40...212°F

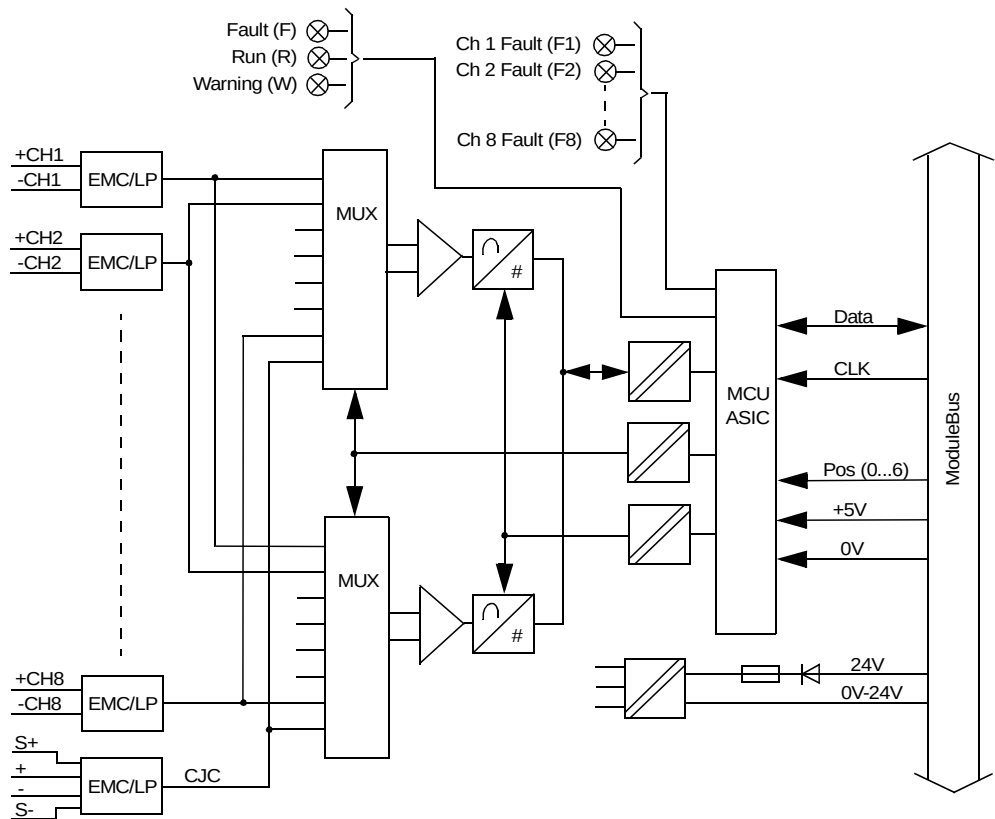
(1) Linearization per IEC 584-1 1995, and following ITS 90 requirements.

(2) Sensor Type applies to Cold Junction channel only, for the measuring of the Cold Junction Compensation temperature.



From the 11 Sensor Types above, one choice is to be selected by the user **per channel**.

A.7.0.4 Block Diagram AI843



A.7.0.5 Process Connections*Table A-17 AI843 Process Connections*

Process Connection	TU830, TU833, TU842, TU843 Terminal
-	L1+ (2)
-	L1- (2)
PCJC+	B1
Ch1, + Input	C1
Ch1, - Input	C2
Ch1, Return (ZP)	A1, A2
ICJC+	B2
ICJC-	B3
Pref	B4
Ch 2, + Input	C3
Ch 2, - Input	C4
Ch 2, Return (ZP)	A3, A4
PCJC-	B5
-	B6
Ch 3, + Input	C5
Ch 3, - Input	C6
Ch 3, Return (ZP)	A5, A6
-	B7, B8
Ch 4, + Input	C7
Ch 4, - Input	C8

Table A-17 AI843 Process Connections (Continued)

Process Connection	TU830, TU833, TU842, TU843 Terminal
Ch 4, Return (ZP)	A7, A8
-	B9, B10
Ch 5, + Input	C9
Ch 5, - Input	C10
Ch 5, Return (ZP)	A9, A10
-	B11
PCJC+	B12
Ch 6, + Input	C11
Ch 6, - Input	C12
Ch 6, Return (ZP)	A11, A12
ICJC+	B13
ICJC-	B14
Ch 7, + Input	C13
Ch 7, - Input	C14
Ch 7, Return (ZP)	A13, A14
Pref	B15
PCJC-	B16
Ch 8, + Input	C15
Ch 8, - Input	C16
Ch 8, Return (ZP)	A15, A16
-	L2+ (2)
-	L2- (2)

Figure A-20 shows the process connections for the TC/mV Input Module AI843 when installed on a TU830 Extended MTU.

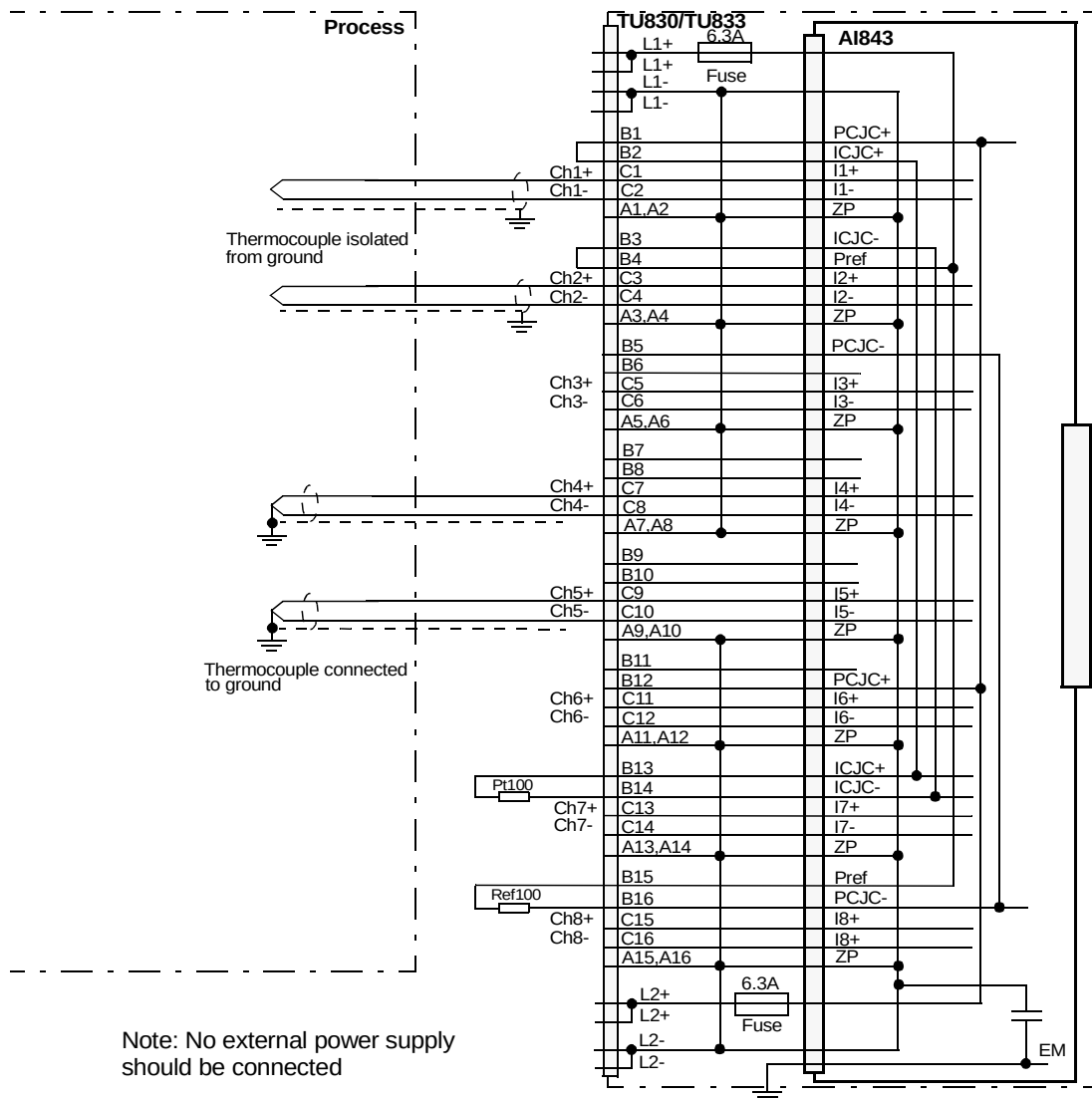


Figure A-20 AI843 with TU830 Extended MTU Process Connections

Figure A-21 shows the process connections for the TC/mV Input Module AI843 when installed on a TU830 Extended MTU.

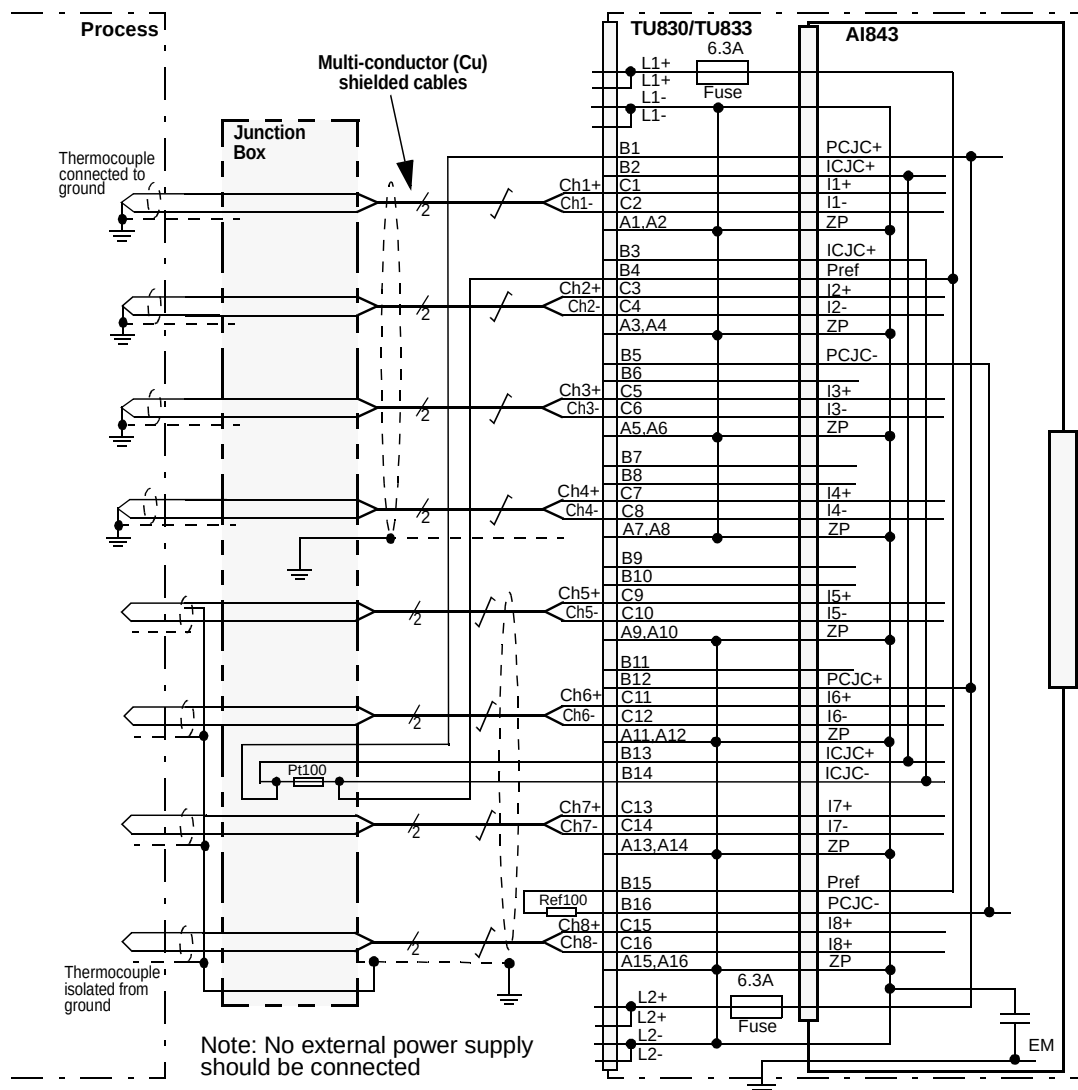


Figure A-21 AI843 with TU830 Extended MTU Process Connections to Remote Junction Box

Figure A-22 shows the process connections for the Thermocouple/mV Input Module AI843 when installed on a TU842 or TU843 Redundant MTU.

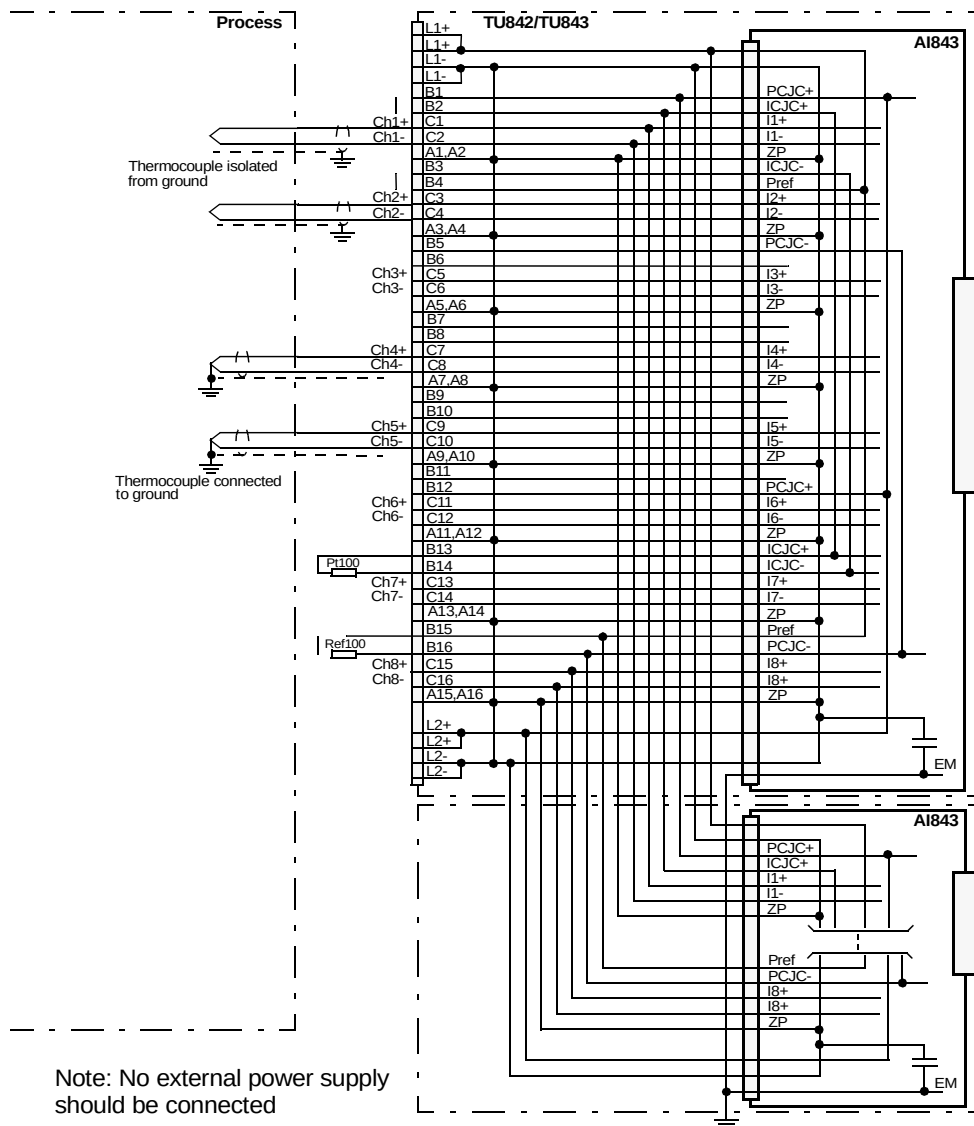


Figure A-22 AI843 with TU842 or TU843 Extended MTU Process Connections

A.8 AI845 Analog Input Module, single or redundant

A.8.0.1 Features

- 8 channels for 0...20 mA, 4...20 mA, 0...5 V or 1...5 V d.c., single ended unipolar inputs
- Single or redundant operation
- 1 group of 8 channels isolated from ground
- 12 Bit resolution
- Field power distribution
- Advanced on-board diagnostics
- EMC protection
- DIN rail mounting
- HART pass-through communication

A.8.0.2 Description

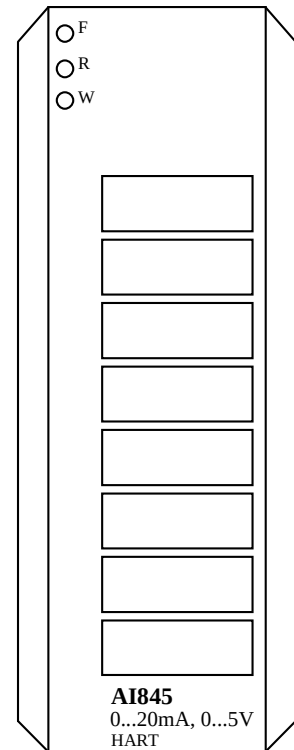
The AI845 Analog Input Module for single or redundant applications. The module has 8 channels. Each channel can be either a voltage or current input.

The voltage and current input is able to withstand an over or undervoltage of at least 11 V d.c. Input resistances are, for voltage > 10 M ohm and for current 250 ohm. The EMC protection is placed on the module.

The module distributes the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2- or 3-wire transmitters. The transmitter power is supervised and current limited.

The module perform self-diagnostic cyclically. Module diagnostics include:

- External power supply, Transmitter power and External shunt error. Error in these will be reported as External channel error.



- Low Pass Filter, Multiplexer and Test channels. Error in these will be reported as Internal channel error.
- Analog Read Back, Reference Voltage, Internal Power Supply, Checksum, Watchdog and Memory. Error in these will be reported as Module Error.

All eight channels are isolated from the ModuleBus in one group. Power to the input stages is converted from the 24 V on the ModuleBus.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not configured state the FAULT LED is turned off after the first valid access to the module.

The module has HART pass-through functionality. Only point to point communication is supported.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Five different types of MTUs can be used for single applications. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage inputs, but requires external terminals for distribution of 24 V power supply to the field devices. The extended MTU, TU835, and TU838 provides a fuse (3 A max.) per channel for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

Two types of MTUs can be used for redundant applications, one for mounting on a horizontal DIN rail and one for mounting on a vertical DIN rail.

A.8.0.3 Technical Data*Table A-18 AI845 Analog Input Module Specifications at 25°C*

Feature	AI845 Analog Input Module
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA, 0...5 V, 4... 20 mA, 1... 5V
Over range	+15%
Input impedance (at voltage input)	10 MΩ
Input impedance (at current input) (including PTC)	250 Ω
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	11 V d.c.
NMRR, 50 Hz, 60 Hz	>40 dB
Error	Max. 0.1%
Resolution	12 bit
Temperature drift	Max. 50 ppm/°C
Update cycle time	10 ms
Current consumption 24 V (ModuleBus)	50 mA
Current consumption 5 V (ModuleBus)	100 mA
Current consumption 24 V (external)	150 mA

Table A-18 AI845 Analog Input Module Specifications at 25°C (Continued)

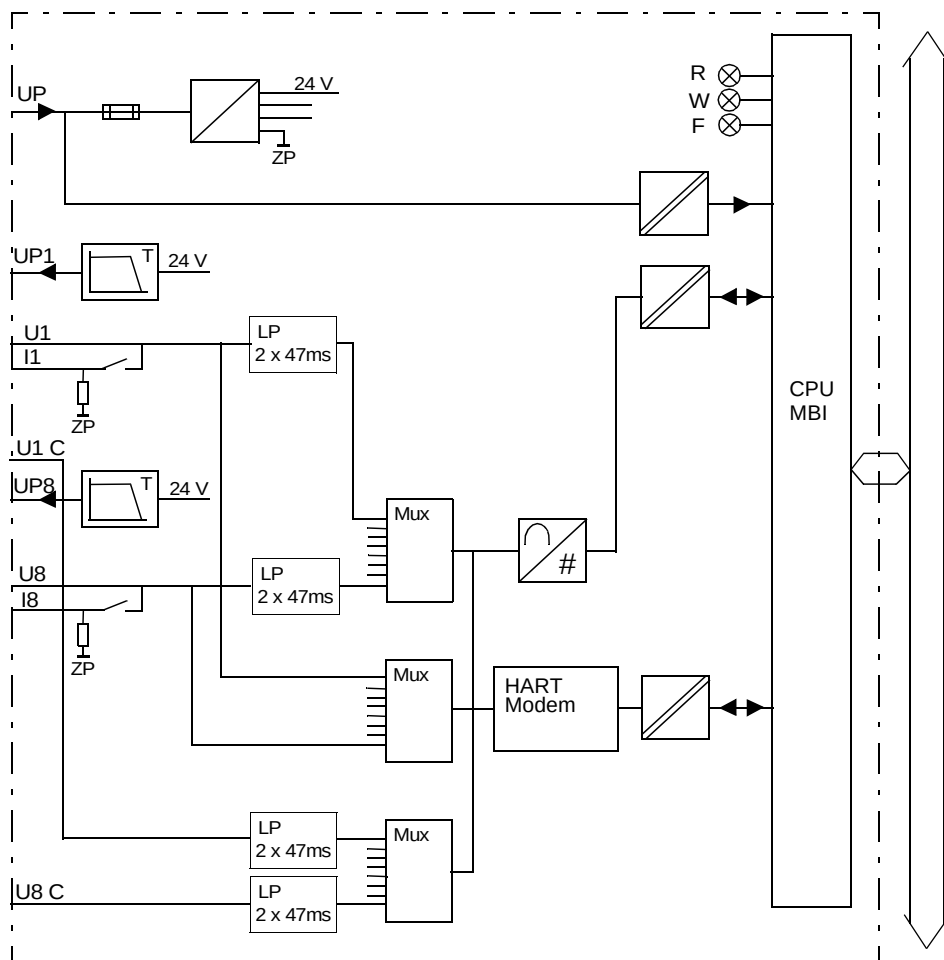
Feature	AI845 Analog Input Module
Power dissipation	3.5 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽¹⁾
Transmitter power: voltage current limit	24 V @ 23 mA 30 mA
Supervision	Module error if: analog read back, reference voltage, internal power supply, checksum, watchdog and memory error Internal channel error if: low pass filter, multiplexer and test channels error External channel error if: external power supply low, transmitter power and external shunt error
Input filter (rise time 0-90%)	290 ms
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812, TU814, TU830, TU835, TU838, TU844 or TU845
MTU keying code	CC
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

Table A-18 AI845 Analog Input Module Specifications at 25°C (Continued)

Feature	AI845 Analog Input Module
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.23 kg (0.51 lbs.)

(1) 40°C (104°F) applies to compact MTUs with I/O-modules mounted on vertical DIN rail.

A.8.0.4 Block Diagram AI845



A.8.0.5 Process Connections*Table A-19 AI845 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal	TU844 TU845 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)	L1+
0 V d.c. (ZP)	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)	L1-
U1	-	-	B1	11 (F1)	A1 (F1)	B1
Ch1, Voltage Input	C1	3	C1	-	B1	B2 ⁽²⁾
Ch1, Current Input	B1	16	C2	12	B2	B2 ⁽²⁾
Ch1, Return (ZP)	A1	-	A1, A2	-	A2	A1,A2
U2	-	-	B3	21 (F2)	A3 (F2)	B3
Ch 2, Voltage Input	C2	4	C3	-	B3	B4 ⁽²⁾
Ch 2, Current Input	B2	17	C4	22	B4	B4 ⁽²⁾
Ch 2, Return (ZP)	A2	-	A3, A4	-	A4	A3, A4
U3	-	-	B5	31 (F3)	A5 (F3)	B5
Ch 3, Voltage Input	C3	5	C5	-	B5	B6 ⁽²⁾
Ch 3, Current Input	B3	18	C6	32	B6	B6 ⁽²⁾
Ch 3, Return (ZP)	A3	-	A5, A6	-	A6	A5, A6
U4	-	-	B7	41 (F4)	A7 (F4)	B7
Ch 4, Voltage Input	C4	6	C7	-	B7	B8 ⁽²⁾
Ch 4, Current Input	B4	19	C8	42	B8	B8 ⁽²⁾
Ch 4, Return (ZP)	A4	-	A7, A8	-	A8	A7, A8
U5	-	-	B9	51 (F5)	A9 (F5)	B9
Ch 5, Voltage Input	C5	7	C9	-	B9	B10 ⁽²⁾

Table A-19 AI845 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/ TU833 Terminal	TU835 Terminal	TU838 Terminal	TU844 TU845 Terminal
Ch 5, Current Input	B5	20	C10	52	B10	B10 ⁽²⁾
Ch 5, Return (ZP)	A5	-	A9, A10	-	A10	A9, A10
U6	-	-	B11	61 (F6)	A11 (F6)	B11
Ch 6, Voltage Input	C6	8	C11	-	B11	B12 ⁽²⁾
Ch 6, Current Input	B6	21	C12	62	B12	B12 ⁽²⁾
Ch 6, Return (ZP)	A6	-	A11, A12	-	A12	A11, A12
U7	-	-	B13	71 (F7)	A13 (F7)	B13
Ch 7, Voltage Input	C7	9	C13	-	B13	B14 ⁽²⁾
Ch 7, Current Input	B7	22	C14	72	B14	B14 ⁽²⁾
Ch 7, Return (ZP)	A7	-	A13, A14	-	A14	A13, A14
U8	-	-	B15	81 (F8)	A15 (F8)	B15
Ch 8, Voltage Input	C8	10	C15	-	B15	B16 ⁽²⁾
Ch 8, Current Input	B8	23	C16	82	B16	B16 ⁽²⁾
Ch 8, Return (ZP)	A8	-	A15, A16	-	A16	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)	L2+
0 V d.c. (ZP)	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)	L2-

(1) Pin 13 connected to connector body for EM.

(2) Voltage or current input chosen by the shunt stick on TU844/TU845.

Figure A-23 shows the process connections for the Analog Input Module AI845 when installed on a TU830 Extended MTU.

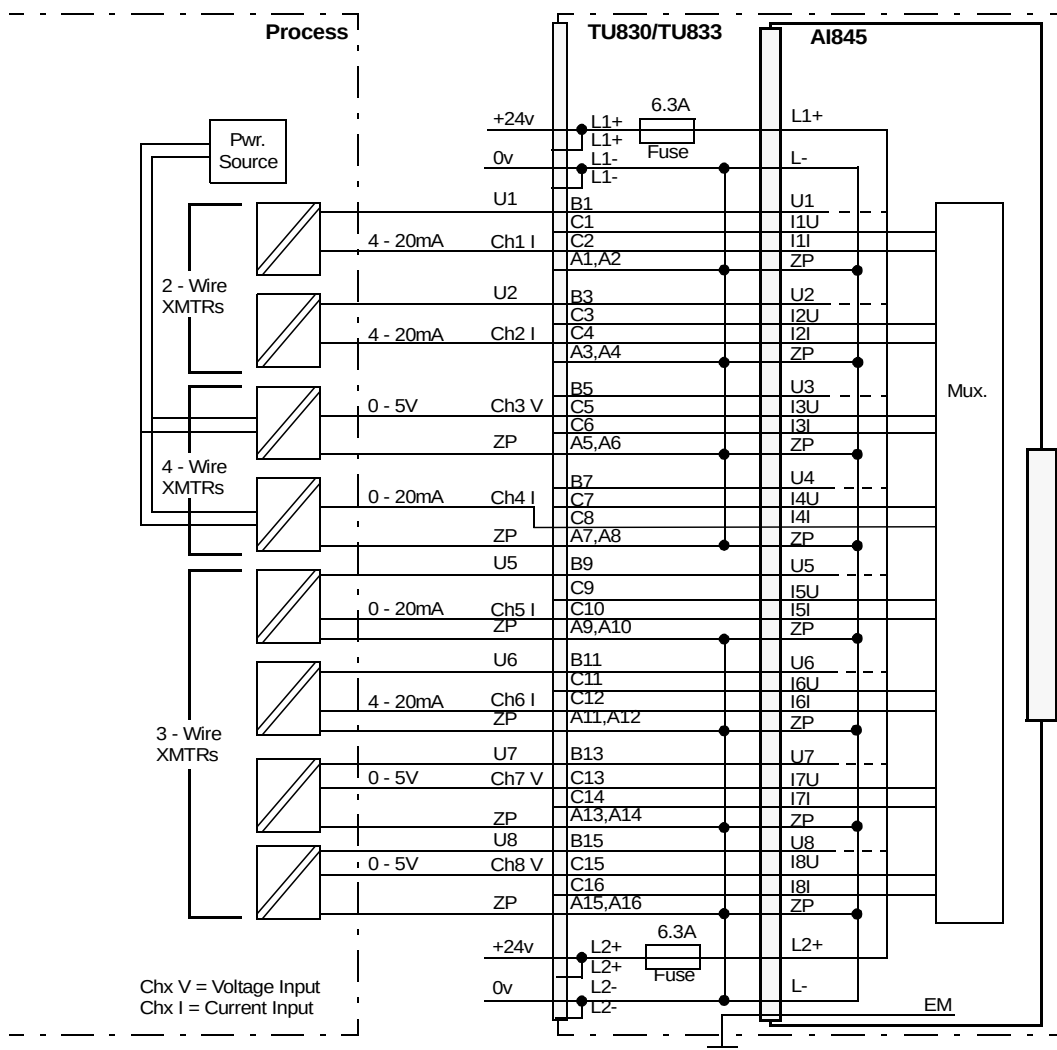


Figure A-23 AI845 with TU830 Extended MTU Process Connections

Figure A-24 shows the process connections for the Analog Input Module AI845 when installed on a TU835 Extended MTU.

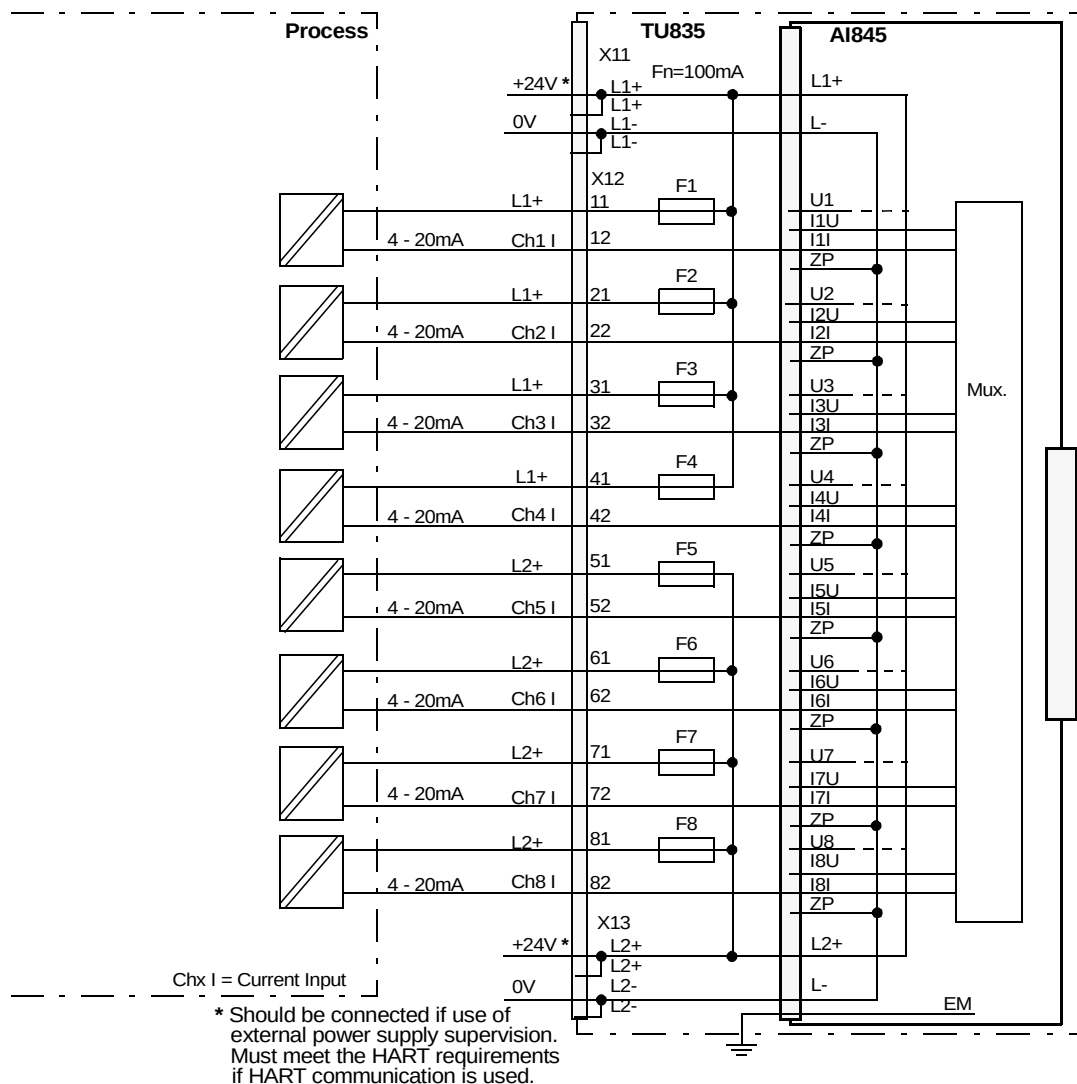


Figure A-24 AI845 with TU835 Extended MTU Process Connections

Figure A-25 shows the process connections for the Analog Input Module AI845 when installed on a TU838 Extended MTU.

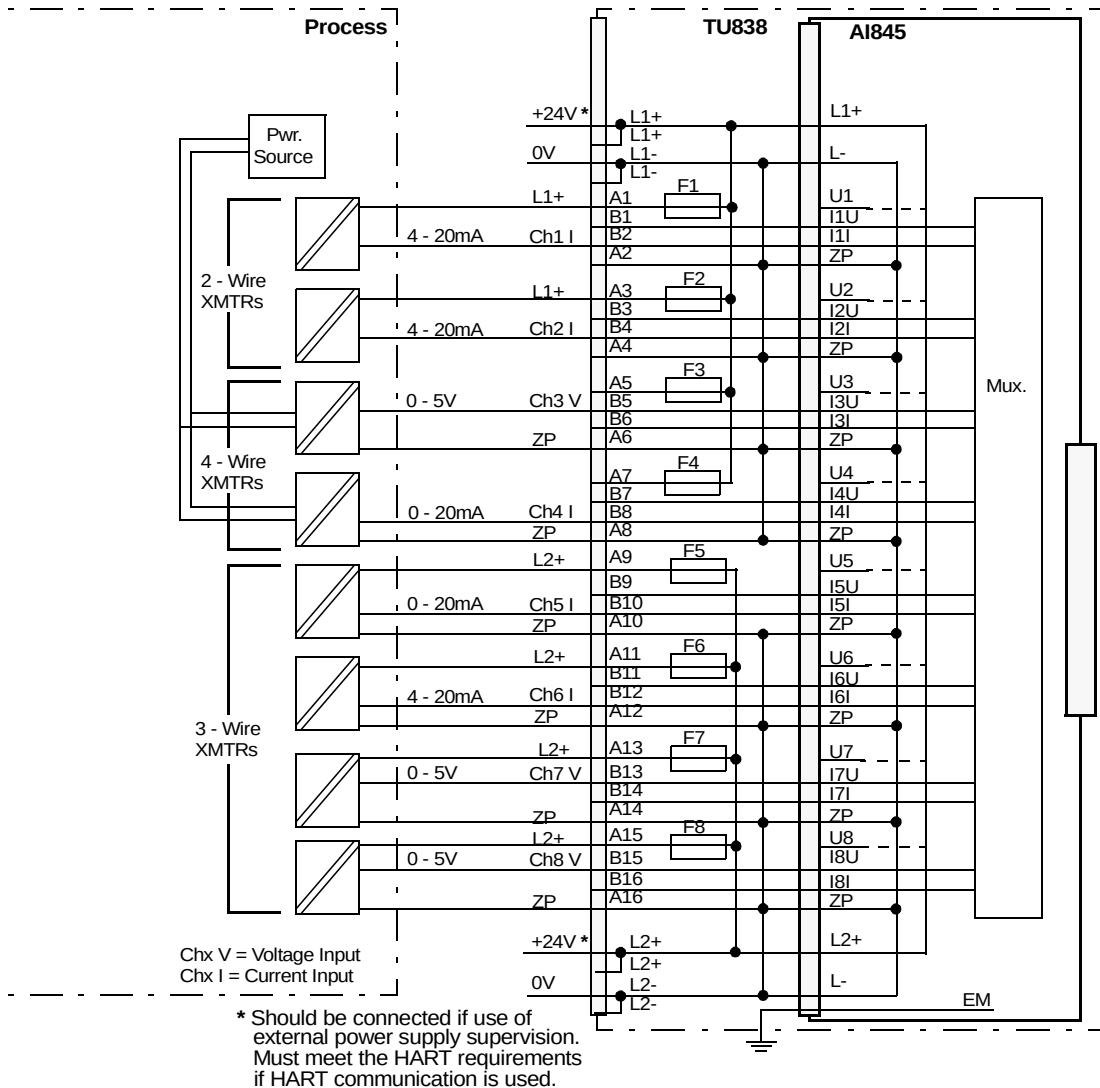


Figure A-25 AI845 with TU838 Extended MTU Process Connections

Figure A-26 shows the process connections for the Analog Input Module AI845 when installed on a TU810 or TU814 Compact MTU.

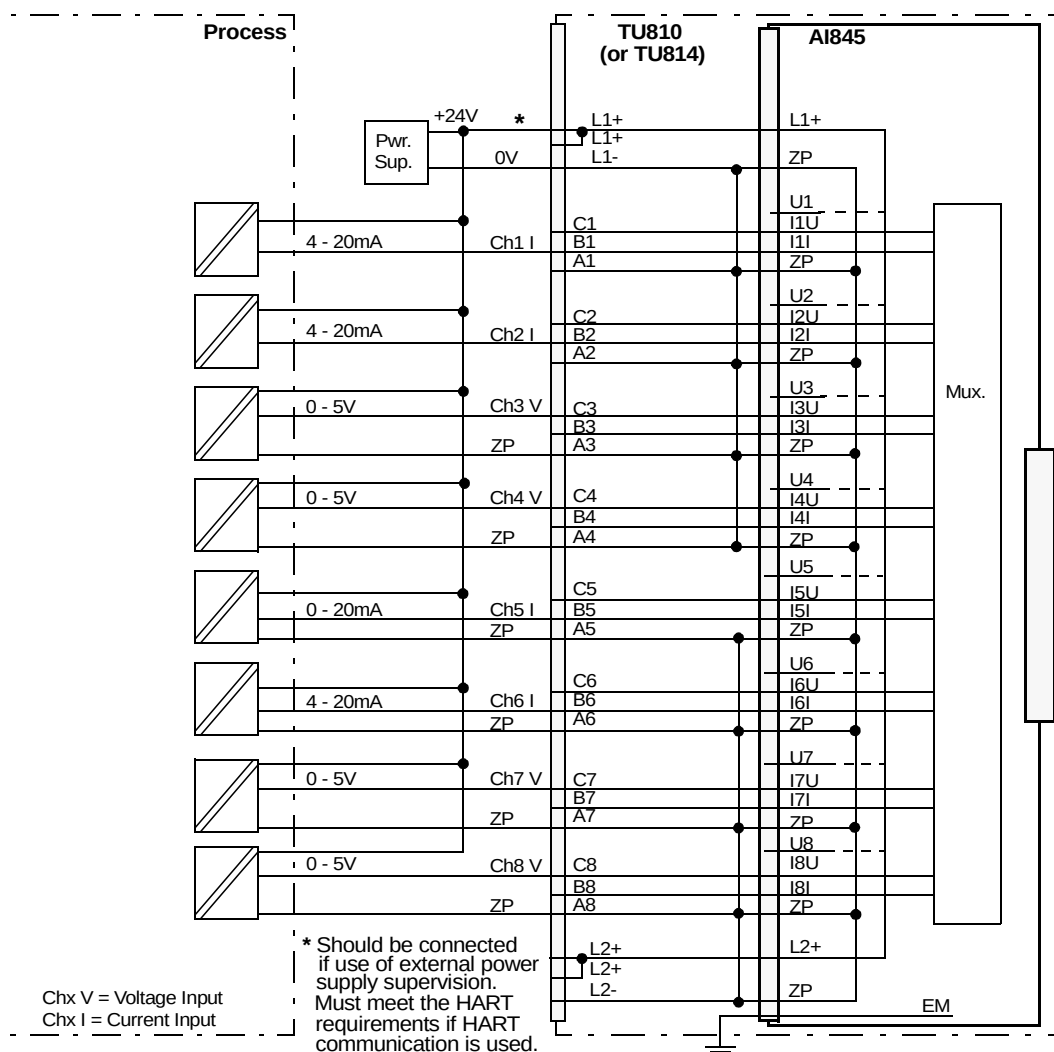


Figure A-26 AI845 with TU810 or TU814 Compact MTU Process Connections

Figure A-27 shows the process connections for the Analog Input Module AI845 when installed on a TU812 Compact MTU.

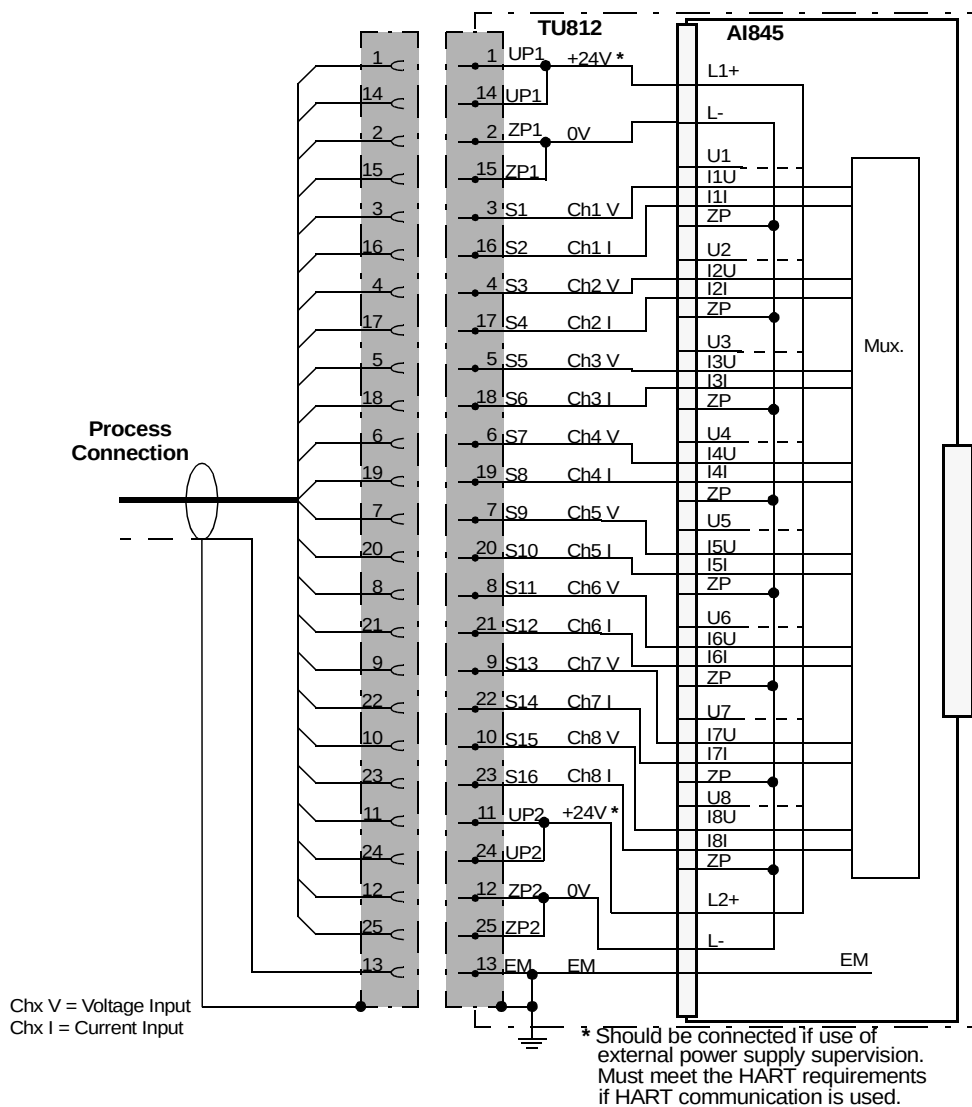


Figure A-27 AI845 with TU812 Compact MTU Process Connections

Figure A-28 shows the process connections for the Analog Input Module AI845 when installed on a TU844 or TU845 Redundant MTU.

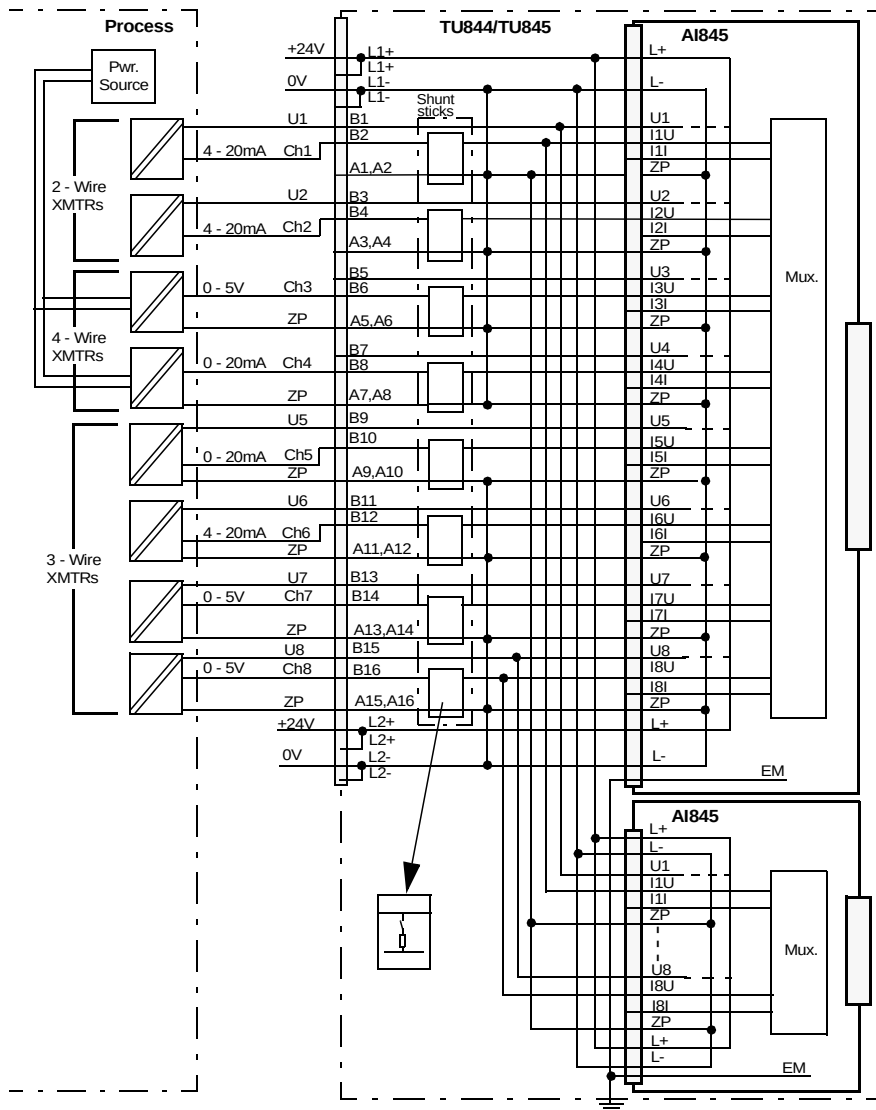
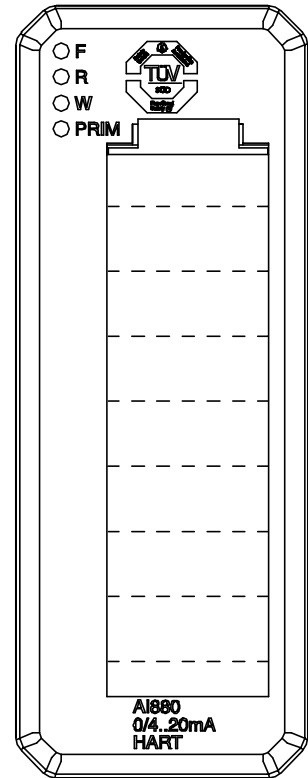


Figure A-28 AI845 with TU844 or TU845 Redundant MTU Process Connections

A.9 AI880/AI880A High Integrity Analog Input Module

A.9.0.1 Features

- 8 channels for 0...20 mA, 4...20 mA, single ended unipolar inputs.
- HART pass-through communication (AI880A)
- Single or redundant configuration.
- 1 group of 8 channels isolated from ground.
- 12 bit resolution.
- Configurable filter time per channel.
- Configurable alarm limit for field power outputs.
- Configurable over/under range for current inputs.
- Configurable safety accuracy 0,5 - 4%.
- Field power distribution, actively verified also in a redundant pair.
- Advanced on-board diagnostics.
- EMC protection.
- DIN rail mounting.
- Certified for SIL3 according to EN 61508 (high and low demand applications).
- Certified for AK6 according to DIN V 19250/DIN V VDE 0801-AK6.
- Certified for Category 4 according to EN 954-1.
- Complies with the NAMUR recommendation NE43, and supports configurable over- and under range limits.



A.9.0.2 Description

The AI880/AI880A High Integrity Analog Input Module is designed for single and redundant configuration. The module has 8 current input channels.

Input resistances is 250 ohm. The EMC protection is placed on the shunt-sticks.

The module distributes the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2- or 3-wire transmitters. The transmitter power is supervised and current limited.

All eight channels are isolated from the ModuleBus in one group. Power to the Module is generated from the 24 V on the ModuleBus.

The AI880/AI880A complies with the NAMUR recommendation NE43, and supports configurable over- and under range limits.

As AI880/AI880A needs external shunt sticks, the MTUs TU844 or TU845 is required.

AI880A has HART pass-through functionality. Only point-to-point communication is supported.

Self-diagnostic functions

- Errors in External power supply and External shunt error will be reported as External channel error.
- Errors in Low Pass Filter, Multiplexer and Test channels will be reported as Internal channel error.
- Errors in Analog to Digital converters, Analog references, Internal power supplies, Errors in micro controller, FPGA and Memory will be reported as Module Error.

Four LEDs indicate module status Fault (Red), Run (Green), Warning (Yellow) and Primary (Yellow):

- The RUN LED starts flashing when the module is ready to be configured and is steady lit when the module has reached operational state.
- The WARNING LED indicates external or internal channel errors.
- The FAULT LED indicates that there is Module errors present or that the module is in Init state.
- The PRIMARY LED indicates that the module is primary (in a redundant pair).

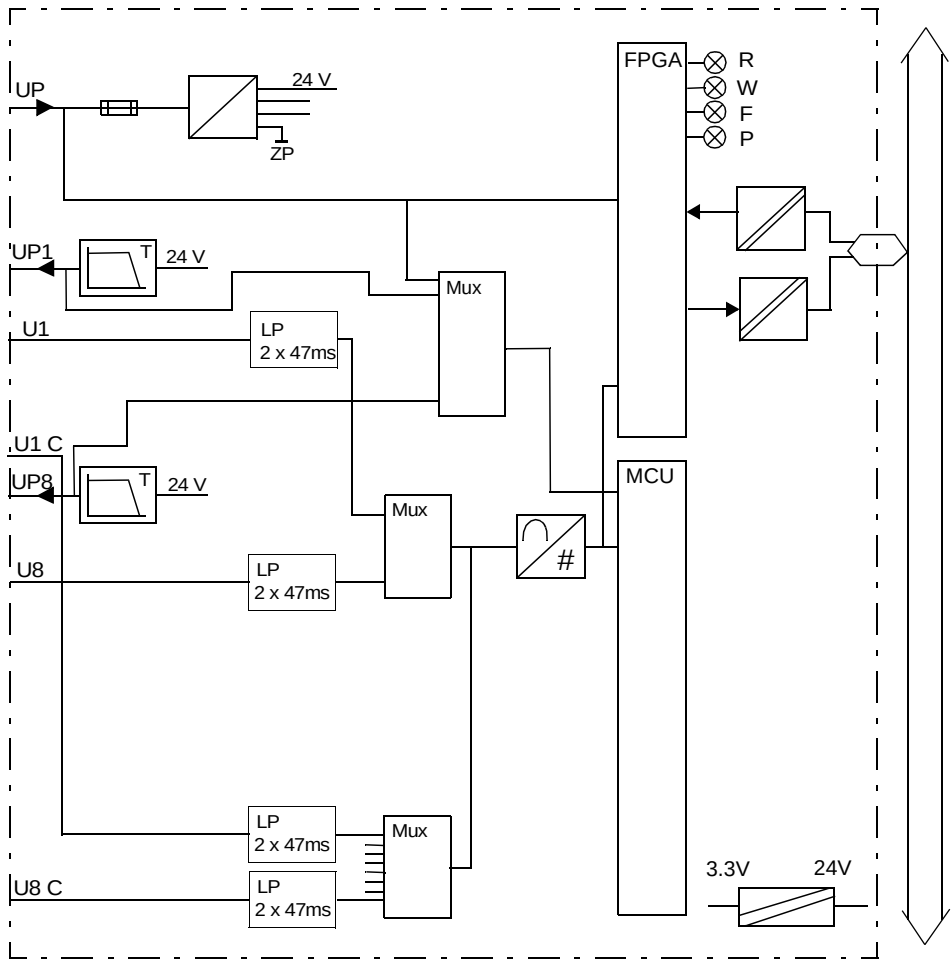
A.9.0.3 Technical Data*Table A-20 AI880/AI880A High Integrity Analog Input Module Specifications
at 25°C*

Feature	AI880 High Integrity Analog Input Module
Number of channels	8
Type of input	Unipolar single ended
Measurement range	0...20 mA 4... 20 mA
Over range	+15%
Input impedance (at current input)	250 Ω
Maximum field cable length	600 meters, (656 yd.)
Voltage input, maximum non-destructive	11 V d.c.
NMRR, 50 Hz, 60 Hz	>40 dB
Error	$\leq 0.1\%$
Safety accuracy	1.5% (configurable 0.5-4%)
Resolution	12 bit
Temperature drift	Max. 50 ppm/°C
Update cycle time	10 ms
Current consumption 24 V (ModuleBus)	50 mA (max)
Current consumption 5 V	10 mA
Power dissipation	2.4 W
Maximum ambient temperature	55/40°C (131/104°F)
Transmitter power: voltage current	Field supply - max 4.5 V 30 mA

*Table A-20 AI880/AI880A High Integrity Analog Input Module Specifications
at 25°C (Continued)*

Feature	AI880 High Integrity Analog Input Module
Voltage supervision	Internal voltage, field power input, field power output per channel
Input filter rise time (0-90%)	190 ms (HW filter)
Isolation	8 inputs isolated from ground in one group (RIV=50 V)
Module termination units	TU844, TU845
MTU keying code	FF (AI880), FD (AI880A)
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.15 kg (0.33 lbs.)

A.9.0.4 Block Diagram AI880/AI880A



A.9.0.5 Process Connections*Table A-21 AI880/AI880A Process Connections*

Process Connection	TU844 TU845 Terminal
+24 V d.c.	L1+
0 V d.c. (ZP)	L1-
U1	B1
Ch1, Voltage Input	B2
Ch1, Current Input	-
Ch1, Return (ZP)	A1,A2
U2	B3
Ch 2, Voltage Input	B4
Ch 2, Current Input	-
Ch 2, Return (ZP)	A3, A4
U3	B5
Ch 3, Voltage Input	B6
Ch 3, Current Input	-
Ch 3, Return (ZP)	A5, A6
U4	B7
Ch 4, Voltage Input	B8
Ch 4, Current Input	-
Ch 4, Return (ZP)	A7, A8
U5	B9
Ch 5, Voltage Input	B10

Table A-21 AI880/AI880A Process Connections (Continued)

Process Connection	TU844 TU845 Terminal
Ch 5, Current Input	-
Ch 5, Return (ZP)	A9, A10
U6	B11
Ch 6, Voltage Input	B12
Ch 6, Current Input	-
Ch 6, Return (ZP)	A11, A12
U7	B13
Ch 7, Voltage Input	B14
Ch 7, Current Input	-
Ch 7, Return (ZP)	A13, A14
U8	B15
Ch 8, Voltage Input	B16
Ch 8, Current Input	-
Ch 8, Return (ZP)	A15, A16
+24 V d.c.	L2+
0 V d.c. (ZP)	L2-

Figure A-29 shows the process connections for the High Integrity Analog Input Module AI880/AI880A when installed on a TU844 or TU845 Redundant MTU.

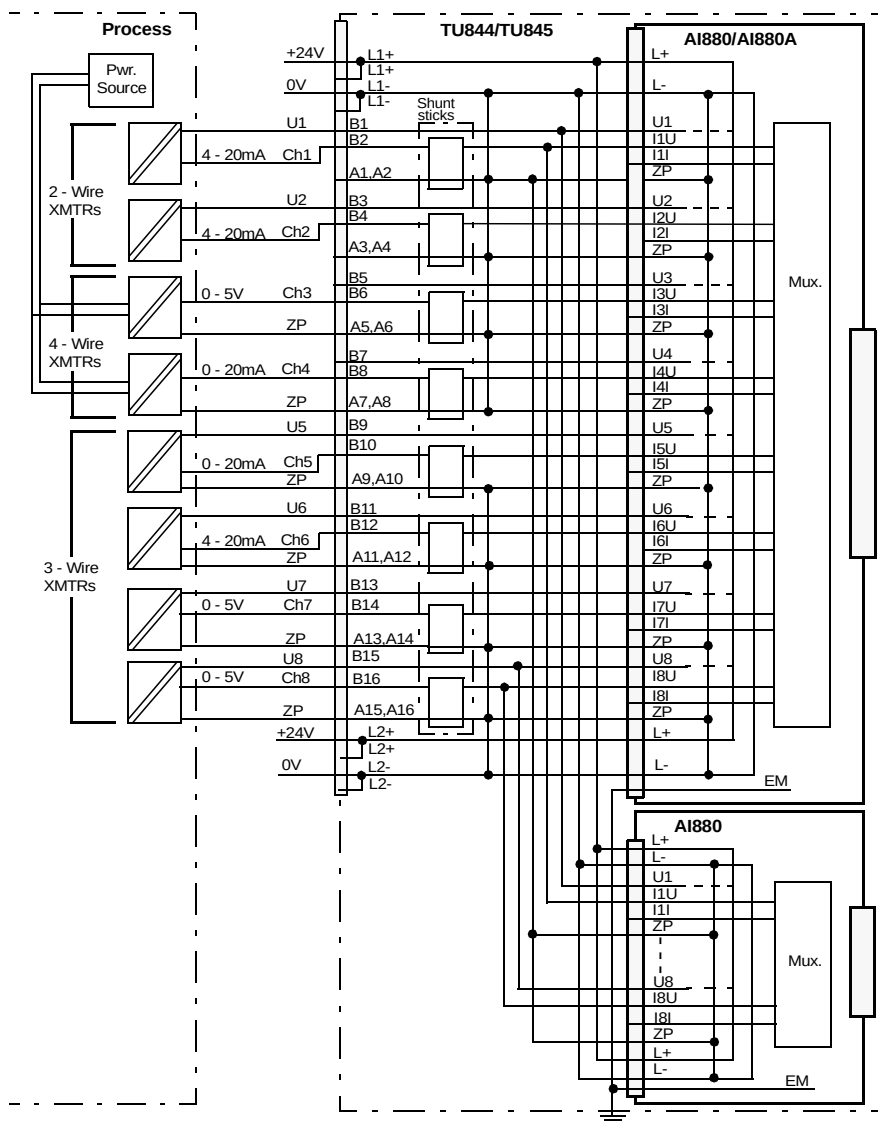


Figure A-29 AI880/AI880A with TU844 or TU845 Redundant MTU Process Connections

A.10 AO801 Analog Output Module, 0(4)...20 mA

A.10.0.1 Features

- 8 channels of 0...20 mA, 4...20 mA outputs
- OSP sets outputs to predetermined state upon error detection
- Analog Output is to be short circuit secured to ZP or +24 V
- EMC protection
- DIN rail mounting.
- Process and power connection via detachable connectors

A.10.0.2 Description

The AO801 Analog Output Module has 8 unipolar analog output channels.

One LED are used to indicate the state of the module. The STATUS LED green indicates that the device is in operational state.

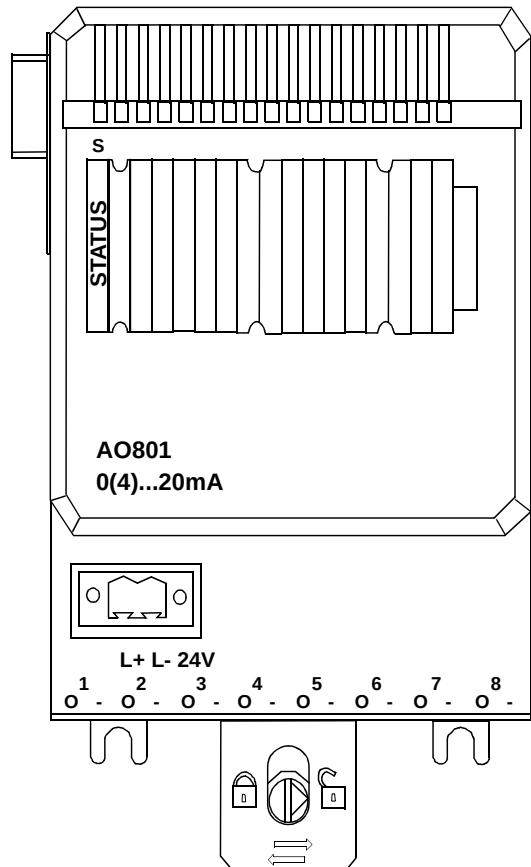
The STATUS LED red indicates that the device is in error state.

In Not configured state the

STATUS LED is turned off after the first valid access to the module.

The module performs self-diagnostic cyclically. Module diagnostics include:

- Low internal power supply will set module in INIT state (no answer from the module).



The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller (OSP timer) and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct module address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent. The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the POWOK signal is active. The POWOK comes from the ModuleBus master after power is applied.

A.10.0.3 Technical Data*Table A-22 AO801 Analog Output Module Specifications at 25°C*

Feature	AO801 Analog Output Module
Number of channels	8
Output rang	0... 20mA, 4...20mA ⁽¹⁾
Over range	15%
Output load	Max 850 ohms (external 24 V > 24 V) ⁽²⁾ (24 V external - 7) /0.02 (external 24 V < 24 V)
Maximum field cable length	600 meters (656 yd.)
Rise time	10µs
Cycle time	1 ms
Error	Max. 0.1%
Resolution	12 bit
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Typ. 30 ppm/°C Max. 60 ppm/°C
Current consumption 24 V (external supply), maximum	200 mA
Current consumption 5 V, maximum	70 mA
Power dissipation	3.8 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽³⁾
Isolation	Groupwise isolated from ground (RIV=50 V)
Equipment class	Class I according to IEC 61140; (earth protected)

Table A-22 AO801 Analog Output Module Specifications at 25°C (Continued)

Feature	AO801 Analog Output Module
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm ² , 30-12 AWG Stranded: 0.05-1.5mm ² , 30-12 AWG Recommended torque: 0.8 Nm Stripping length: 6-7.5 mm, 0.24-0.30 in
Width	86.1 mm (3.4")
Depth	58.5 mm (2.3")
Height	110 mm (4.33")
Weight	0.24 kg (0.53 lbs.)

(1) 4...20 mA handled by the FCI or controller

(2) See Power Dissipation Calculation below.

(3) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.10.0.4 Power Dissipation Calculation

If output load <250 ohms and high power supply can max. power dissipation be exceeded.

The total power dissipated in the output stages should be <1.2 W. Can be calculated according to:

UP <24 V

$$P_{output} = \sum_{i=1}^8 [(UP - 4.7 - (R_{Li} + 100) \times I_{CHi}) \times I_{CHi}]$$

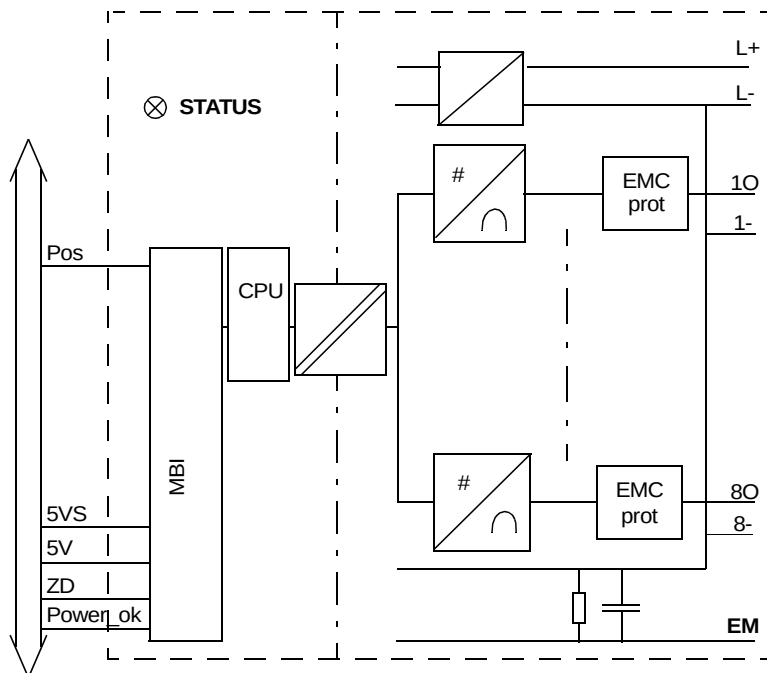
UP >24 V

$$P_{output} = \sum_{i=1}^8 [(19.3 - (R_{Li} + 100) \times I_{CHi}) \times I_{CHi}]$$

UP = Power supply to the output stages
 I_{CHi} = Average output current per channel
 R_{Li} = Output load per channel

Temporary overload or short circuit does not cause any damage but long term overload will decrease module MTBF.

A.10.0.5 Block Diagram AO801



A.10.0.6 Process Connections

Table A-23 AO801 Process Connections

Process Connection	Process Terminal
Ch1, + Output	10
Ch1 Return (ZP)	1-
-	-
Ch 2, + Output	20
Ch2 Return (ZP)	2-

Table A-23 A0801 Process Connections (Continued)

Process Connection	Process Terminal
-	-
Ch 3, + Output	3O
Ch3 Return (ZP)	3-
-	-
Ch 4, + Output	4O
Ch4 Return (ZP)	4-
-	-
Ch 5, + Output	5O
Ch5 Return (ZP)	5-
-	-
Ch 6, + Output	6O
Ch6 Return (ZP)	6-
-	-
Ch 7, + Output	7O
Ch7 Return (ZP)	7-
-	-
Ch 8, + Output	8O
Ch8 Return (ZP)	8-

Figure A-30 shows the process connections for the AO801.

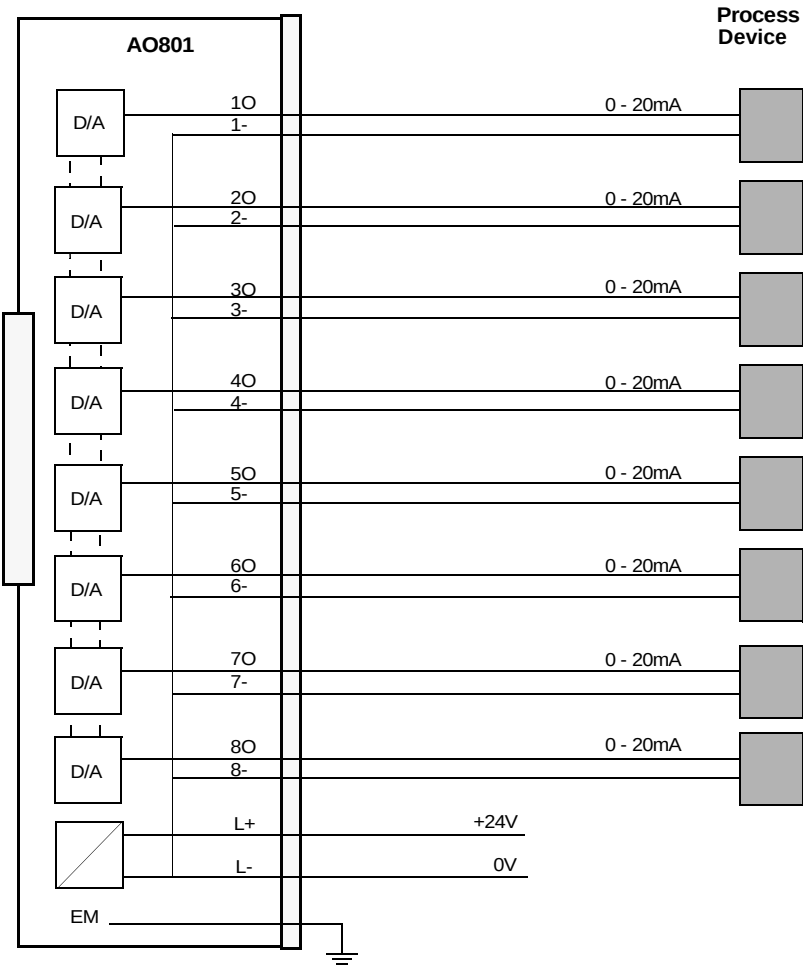


Figure A-30 AO801 Process Connections

A.11 AO810 Analog Output Module, 0(4)...20 mA

A.11.0.1 Features

- 8 channels of 0...20 mA, 4...20 mA outputs
- OSP sets outputs to predetermined state upon error detection
- Analog Output is to be short circuit secured to ZP or +24 V
- EMC protection
- DIN rail mounting.

A.11.0.2 Description

The AO810 Analog Output Module has 8 unipolar analog output channels.

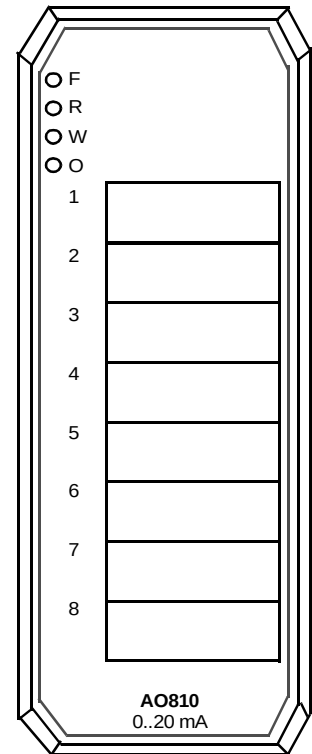
To supervise the communication to the D/A-converters the serial data is read back and verified. The open-circuit diagnostic is received during the readback.

Four LEDs are used to indicate the state of the device. The RUN (green) LED indicates that the device is in operational state. The FAULT (red) LED indicates that the device is in error state.

In Not configured state the FAULT LED is turned off after the first valid access to the module. The WARNING (yellow) LED indicates that there is some kind of process error such as an open circuit, or power supply fault. OSP (yellow) LED indicates that the output value is set to the OSP value.

The module performs self-diagnostic cyclically. Module diagnostics include:

- Process power supply supervision which is reported when supply voltage to output circuitry is to low. The error is reported as a channel error.



Channel diagnostic include:

- Fault detection of the channel. (Only reported on active channels). The error is reported if the output current is less than the output set value and the output set value > 1 mA.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller (OSP timer) and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct node address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Four different types of MTUs can be used. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU enables wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.11.0.3 Technical Data*Table A-24 AO810 Analog Output Module Specifications at 25°C*

Feature	AO810 Analog Output Module
Number of channels	8
Output range	0... 20 mA, 4...20 mA ⁽¹⁾
Over range	15%
Output load	≤500 ohms ⁽²⁾ , 250 - 850 ohms ⁽³⁾
Maximum field cable length	600 meters (656 yd.)
Rise time	4 ms
Cycle time	≤2 ms
Propagation delay	≤6 ms
Error	Max. 0.1% at 0 - 500 ohms
Resolution	14 bit
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Typ. 30 ppm/°C Max. 60 ppm/°C
Current consumption 24 V (external supply), maximum	200 mA
Supervision	Module: Output power low Channel: Open-circuit (for current > 1 mA)
Current consumption 5 V, maximum	70 mA
Power dissipation ⁽⁴⁾	3 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽⁵⁾

Table A-24 AO810 Analog Output Module Specifications at 25°C (Continued)

Feature	AO810 Analog Output Module
Isolation	Groupwise isolated from ground (RIV=50 V)
Mounting termination units	TU810, TU812, TU814 and TU830
MTU keying code	AE
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.18 kg (0.4 lbs.)

(1) Handled by the FCI or controller.

(2) With supply connected to L1+ only

(3) With supply connected to L2+ only.

Note: $R_L = 250...850$ ohms (with power supply connected to L2+)

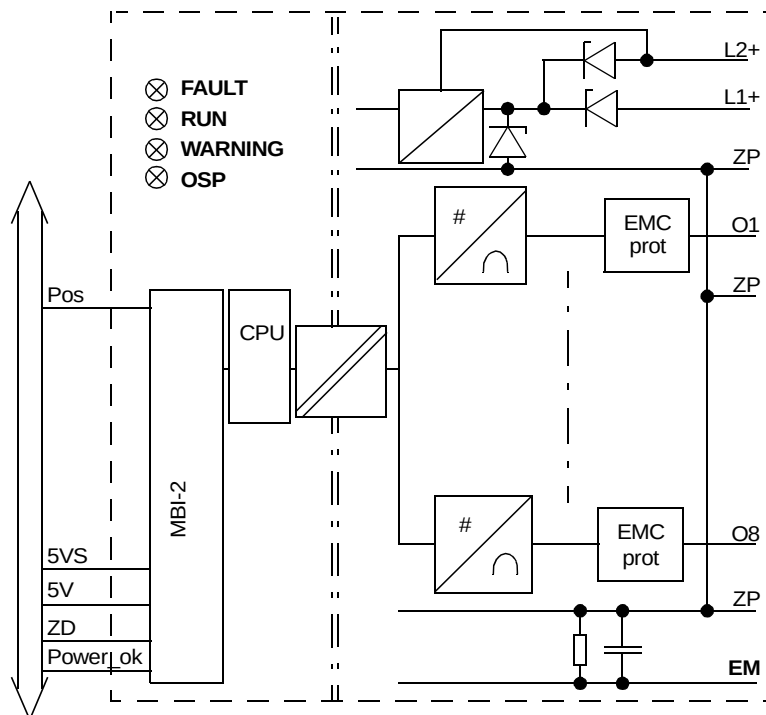
Power supply min.= U drop + I max. x $R_L = 7.7 \text{ V} + 0.023 \times R_L (\geq 19.2 \text{ V})$

Power Supply max. = 30 V

(4) 250 ohm load, 70% of nominal current, all channels activated. Supply L+ connected.

(5) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.11.0.4 Block Diagram AO810



A.11.0.5 Process Connections*Table A-25 A0810 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 DSub 25 male connector ⁽¹⁾	TU830/TU833 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)
-	-	-	B1, B2
Ch1, + Output	C1	3	C1
Ch1 Return (ZP)	A1	-	A1, A2
-	-	-	B3, B4
Ch 2, + Output	C2	4	C3
Ch2 Return (ZP)	A2	-	A3, A4
-	-	-	B5, B6
Ch 3, + Output	C3	5	C5
Ch3 Return (ZP)	A3	-	A5, A6
-	-	-	B7, B8
Ch 4, + Output	C4	6	C7
Ch4 Return (ZP)	A4	-	A7, A8
-	-	-	B9, B10
Ch 5, + Output	C5	7	C9
Ch5 Return (ZP)	A5	-	A9, A10
-	-	-	B11, B12
Ch 6, + Output	C6	8	C11
Ch6 Return (ZP)	A6	-	A11, A12

Table A-25 A0810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 DSub 25 male connector ⁽¹⁾	TU830/TU833 Terminal
-	-	-	B13, B14
Ch 7, + Output	C7	9	C13
Ch7 Return (ZP)	A7	-	A13, A14
-	-	-	B15, B16
Ch 8, + Output	C8	10	C15
Ch8 Return (ZP)	A8	-	A15, A16
+24 V dc	L2+ (2)	11, 24	L2+ (2)
0 V dc (ZP)	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-31 shows the process connections for the Analog Output Module AO810 when installed on a TU830 Extended MTU.

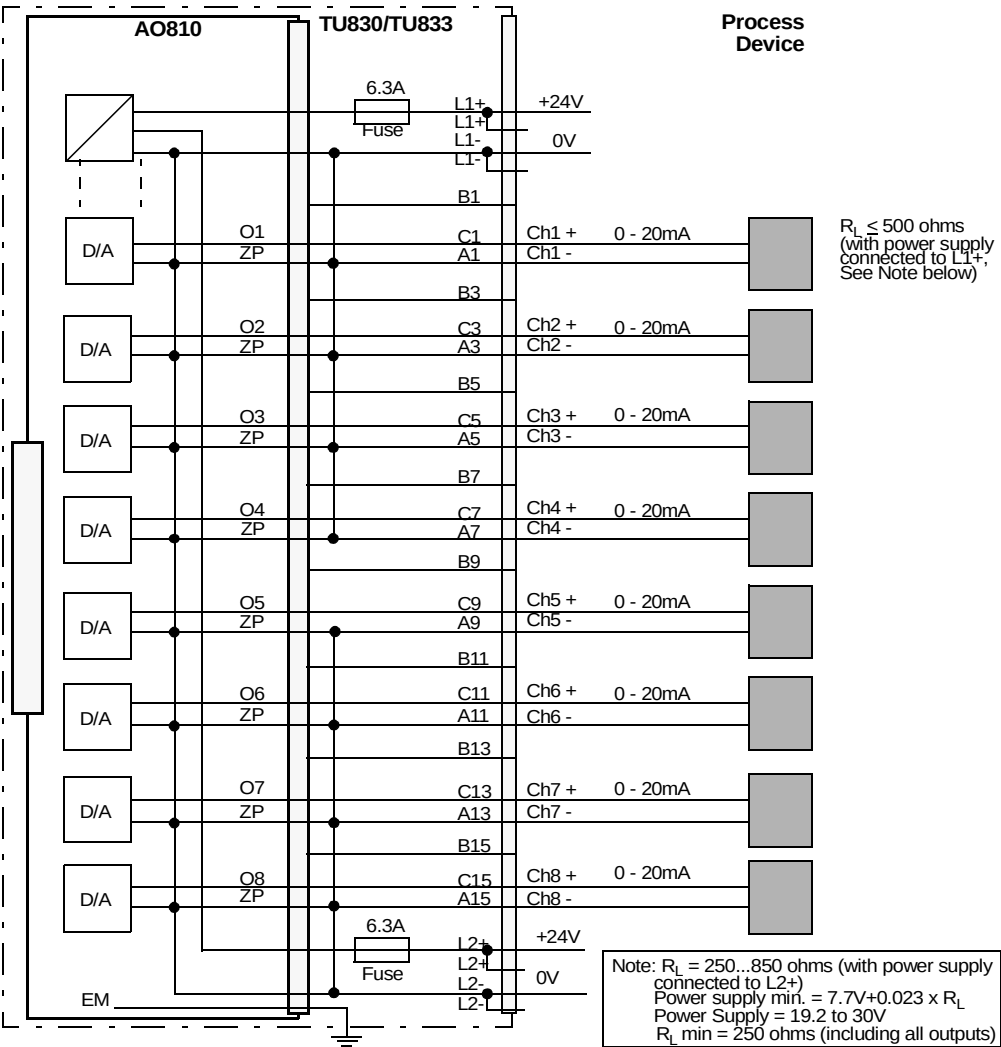


Figure A-31 AO810 with TU830 Extended MTU Process Connections

Figure A-32 shows the process connections for the AO810 when installed on a TU810 or TU814 Compact MTU.

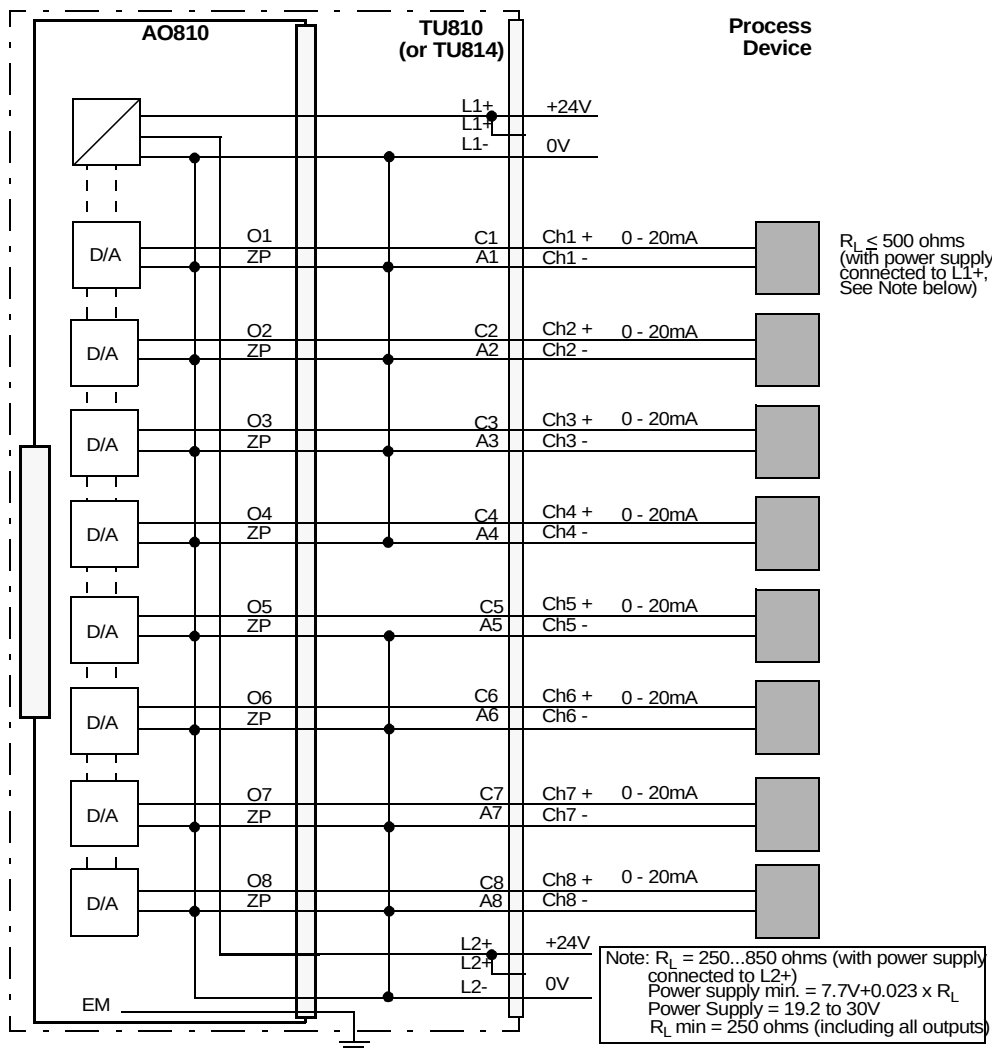


Figure A-32 AO810 with TU810 or TU814 Compact MTU Process Connections

Figure A-33 shows the process connections for the Analog Output Module AO810 when installed on a TU812 Compact MTU.

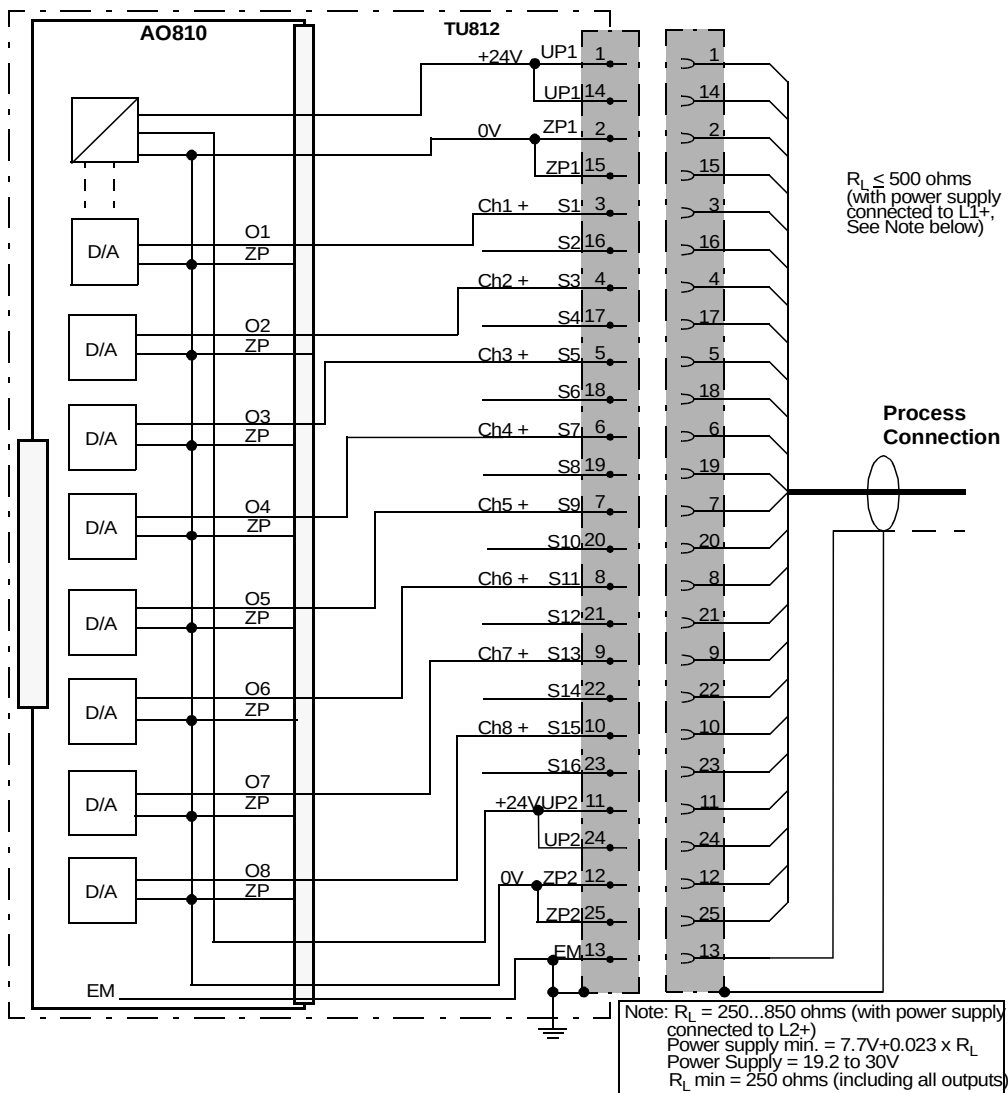


Figure A-33 AO810 with TU812 Compact MTU Process Connections

A.12 AO820 Galvanically Isolated Bipolar Analog Output Module

A.12.0.1 Features

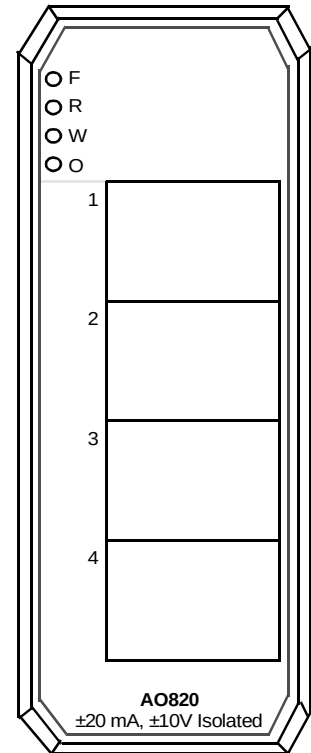
- 4 channels of -20 mA...+20 mA, 0...20 mA, 4...20 mA or -10 V...+10 V, 0...10 V, 2...10 V outputs
- Individually galvanically isolated channels
- OSP sets outputs to predetermined state upon error detection
- EMC protection
- DIN rail mounting.

A.12.0.2 Description

The AO820 Analog Output Module has 4 bipolar analog output channels. The choice of current or voltage output is configurable for each channel. There are separate sets of terminals for voltage and current outputs, and it is up to the user to wire outputs properly. The only differences between current or voltage channel configuration is in software settings.

To supervise the communication to the A/D-converters the output data is read back and verified. The open-circuit diagnostics are read continuously as well.

Four LEDs are used to indicate the state of the device. The RUN (green) LED indicates that the device is in operational state. The FAULT (red) LED indicates that the device is in an error state, or a power fault has been detected. In Not configured state the FAULT LED is turned off after the first valid access to the module. The WARNING (yellow) LED indicates that there is some kind of process error such as an open circuit. OSP (yellow) LED indicates that the output values are set to the OSP value.



The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus. Channel diagnostics include:

- Fault detection of the channel. (Only reported on active channels). The error is reported if the output current differ from the output set value (that is, open wire condition).

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct node address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or as the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Four different types of MTUs can be used. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU enables wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.12.0.3 Technical Data*Table A-26 AO820 Analog Output Module Specifications at 25°C*

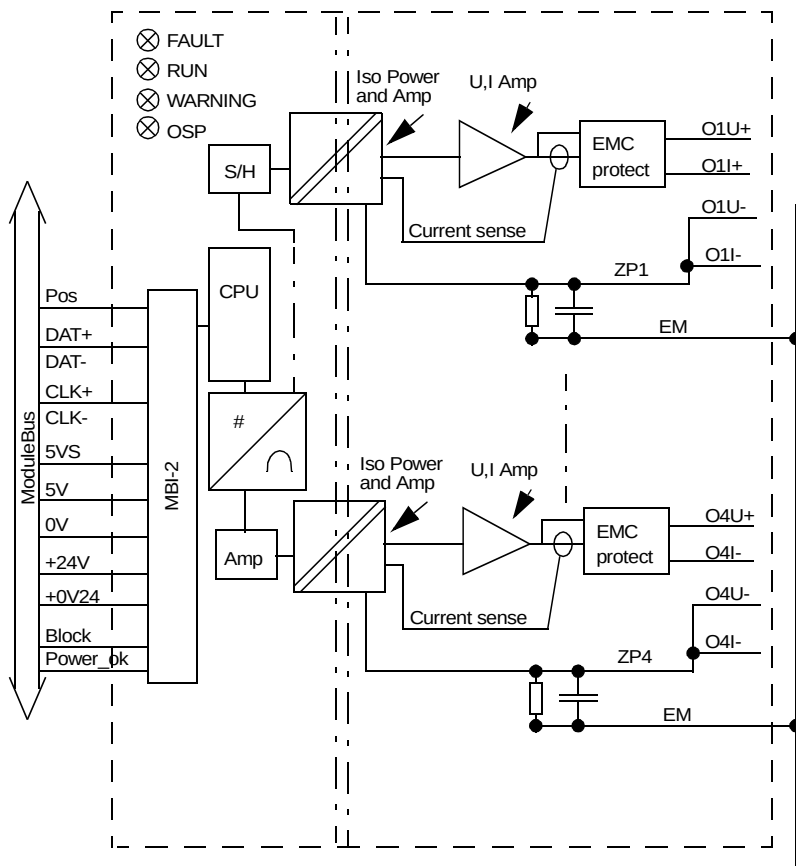
Feature	AO820 Analog Output Module
Number of channels	4
Output ranges (nominal)	-20 mA...+20 mA, 0...20 mA, 4...20 mA ⁽¹⁾ or -10 V...+10 V, 0...10 V, 2...10 V ⁽¹⁾
Over range	± 15%
Output load, current outputs Including wire resistance	≤550 ohms - Nominal ranges ≤510 ohms - Over-range
Output load, voltage outputs	≥5k ohms
Maximum field cable length	600 meters (656 yd.)
Rise time	<0.7 ms
Cycle time for all channels	≤1.5 ms
Error, Voltage	Max. 0.1%
Error, Current	at 250 ohms Max. 0.1%
Resolution	12 bits plus sign
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Max. 90 ppm/°C
Current consumption 24 V, maximum	260 mA
Current consumption 5 V, maximum	100 mA
Power dissipation ⁽²⁾	6 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽³⁾

Table A-26 AO820 Analog Output Module Specifications at 25°C (Continued)

Feature	AO820 Analog Output Module
Supervision	Module: Output power low Channel: Open circuit (for current > 1mA)
Isolation	Individually isolated, channel-to-channel and to circuit common (RIV=50 V)
Module termination units	TU810, TU812, TU814 or TU830
MTU keying code	BC
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.18 kg (0.4 lbs.)

- (1) Handled by the controller or FCI.
- (2) Power dissipation is calculated with 250 ohms load, 70 percent of nominal output current, all channels activated.
- (3) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.12.0.4 Block Diagram AO820



A.12.0.5 Process Connections*Table A-27 AO820 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
Not used	L1+ (2)	1, 14	L1+ (2)
Not used	L1-	2, 15	L1- (2)
-	-	-	B1, B2
Ch1, Current Output +	C1	3	C1
Ch1, Current Output -	B1	16	C2
-	A1	-	A1, A2
-	-	-	B3, B4
Ch1, Voltage Output +	C2	4	C3
Ch1, Voltage Output -	B2	17	C4
-	A2	-	A3, A4
-	-	-	B5, B6
Ch2, Current Output +	C3	5	C5
Ch2, Current Output -	B3	18	C6
-	A3	-	A5, A6
-	-	-	B7, B8
Ch2, Voltage Output +	C4	6	C7
Ch2, Voltage Output -	B4	19	C8
-	A4	-	A7, A8
-	-	-	B9, B10
Ch3, Current Output +	C5	7	C9

Table A-27 A0820 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
Ch3, Current Output -	B5	20	C10
-	A5	-	A9, A10
-	-	-	B11, B12
Ch3, Voltage Output +	C6	8	C11
Ch3, Voltage Output -	B6	21	C12
-	A6	-	A11, A12
-	-	-	B13, B14
Ch4, Current Output +	C7	9	C13
Ch4, Current Output -	B7	22	C14
-	A7	-	A13, A14
-	-	-	B15, B16
Ch4, Voltage Output +	C8	10	C15
Ch4, Voltage Output -	B8	23	C16
-	A8	-	A15, A16
Not used	L2+ (2)	11, 24	L2+ (2)
Not used	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-34 shows the process connections for the Bipolar Analog Output Module AO820 when installed on a TU830 Extended MTU.

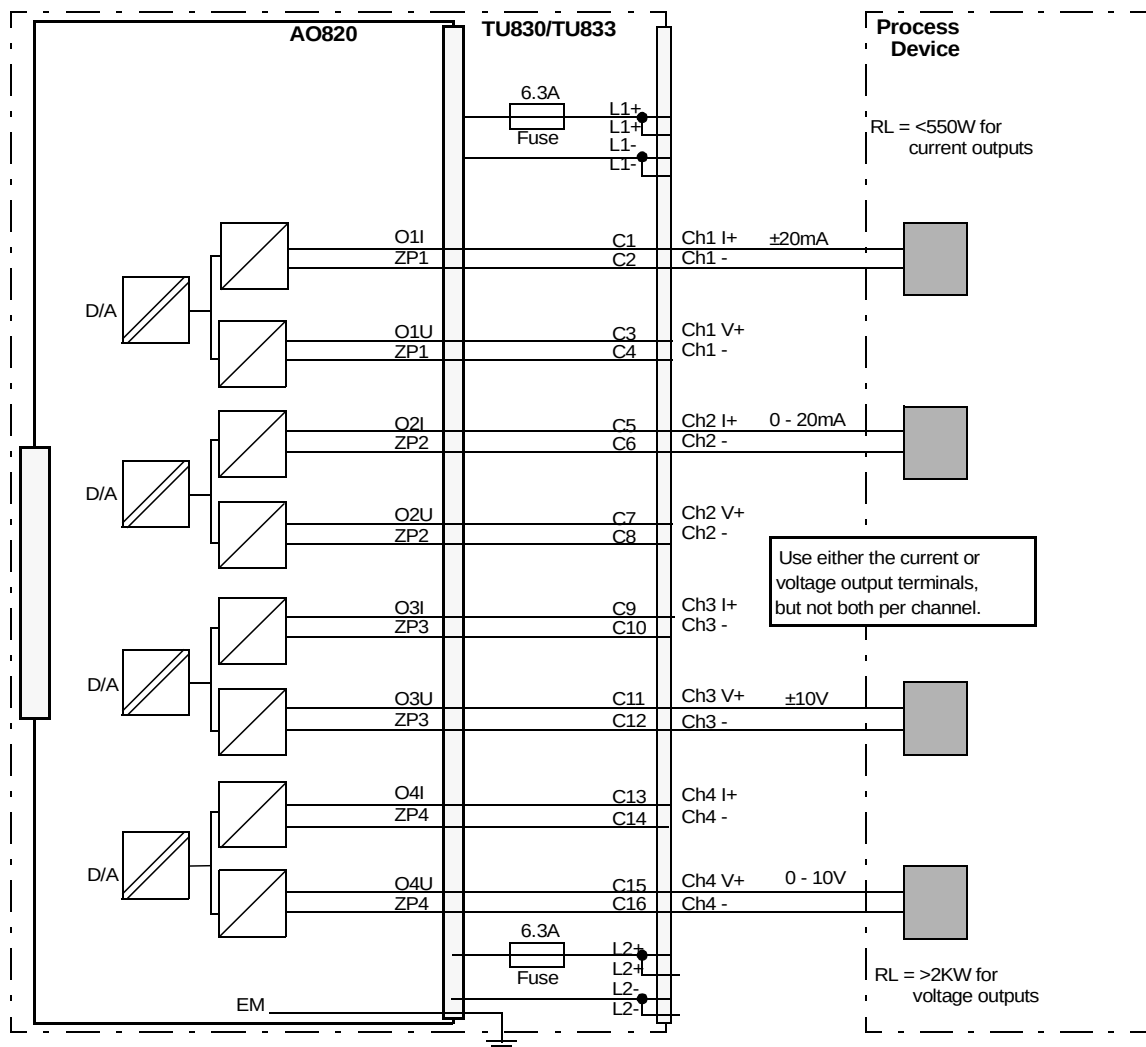


Figure A-34 AO820 with TU830 Extended MTU Process Connections

Figure A-35 shows the process connections for the AO820 when installed on a TU810 or TU814 Compact MTU.

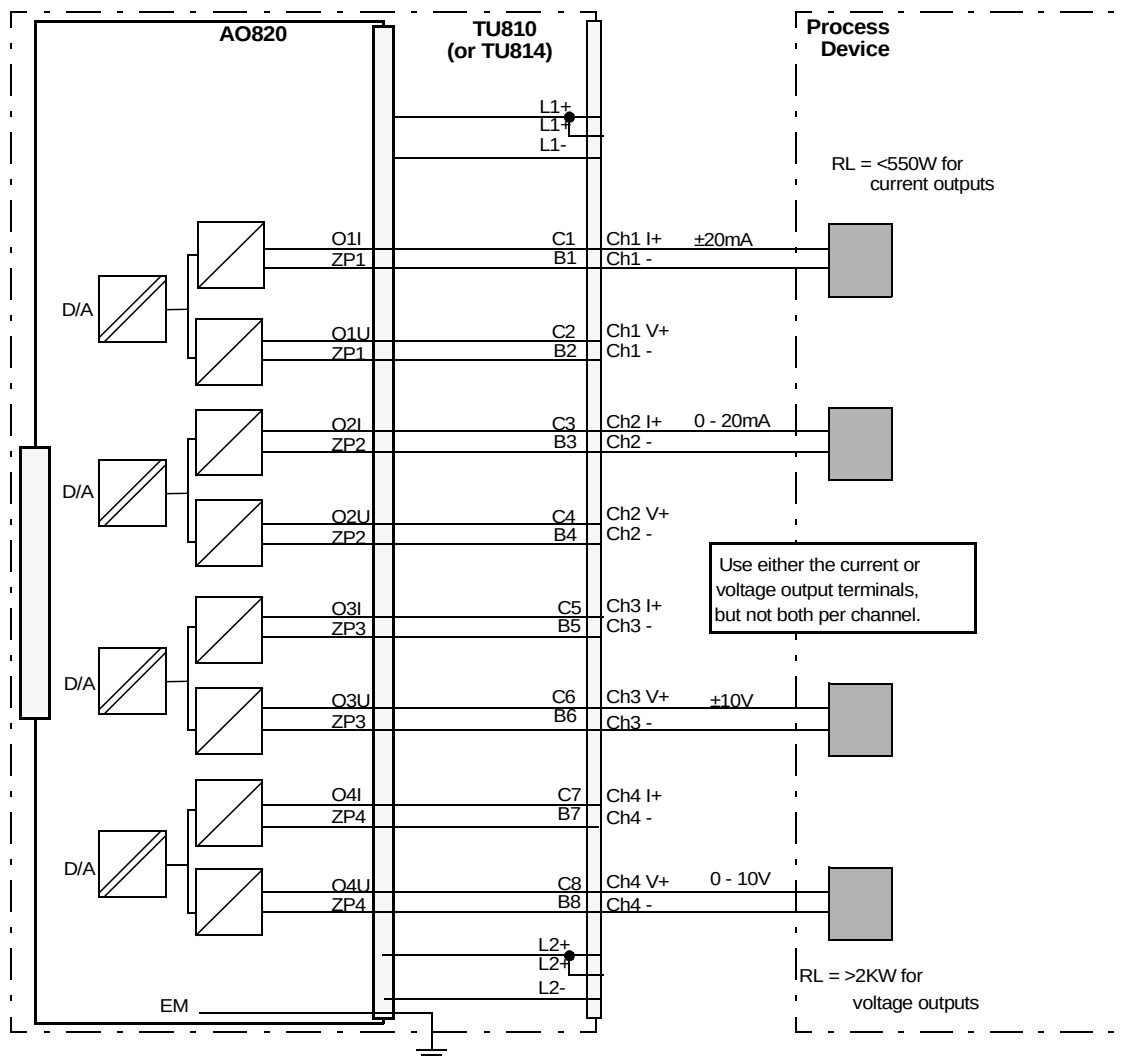


Figure A-35 AO820 with TU810 or TU814 Compact MTU Process Connections

Figure A-36 shows the process connections for the AO820 when installed on a TU812 Compact MTU

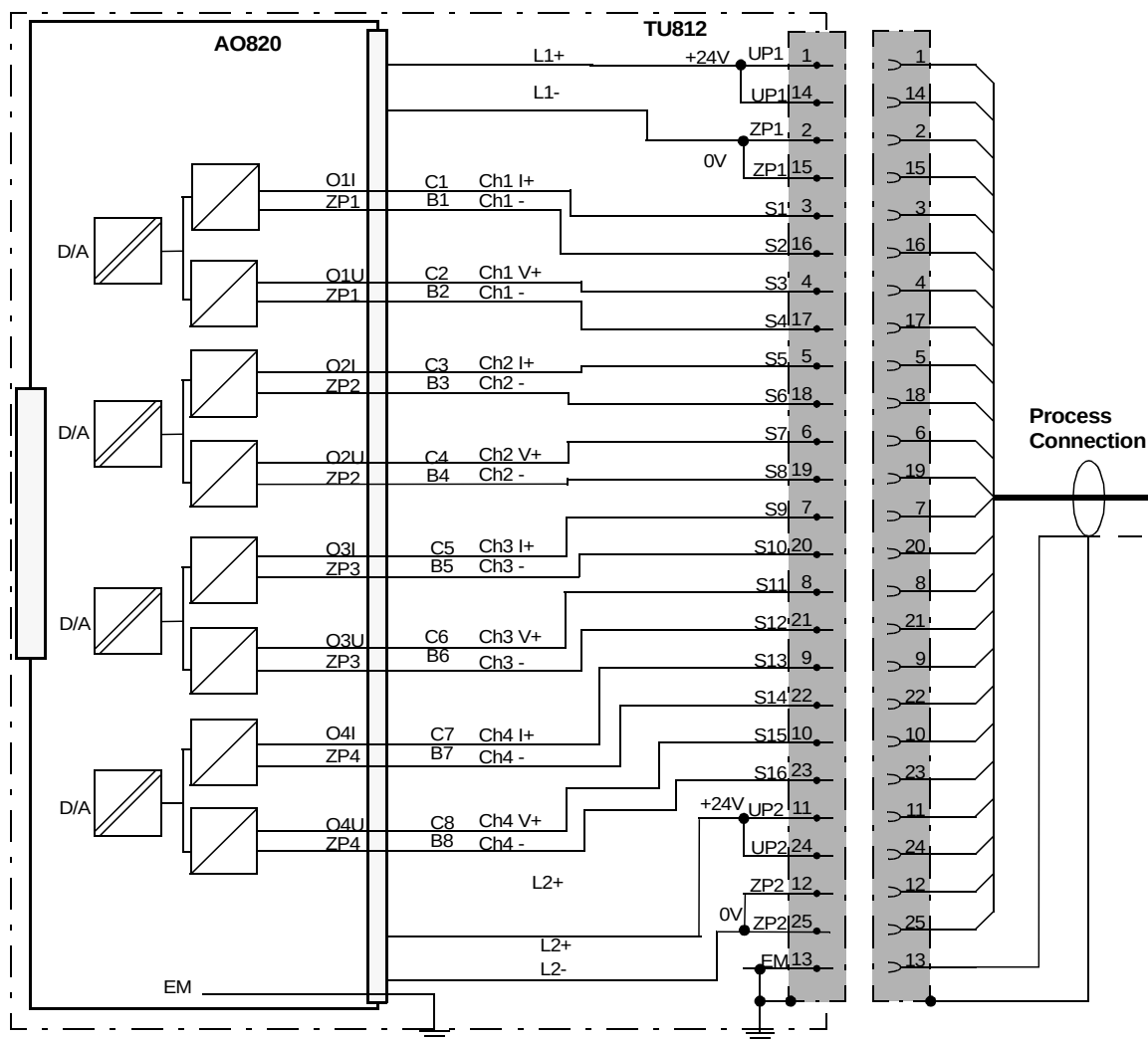


Figure A-36 AO820 with TU812

A.13 AO845 Analog Output Module, single or redundant

A.13.0.1 Features

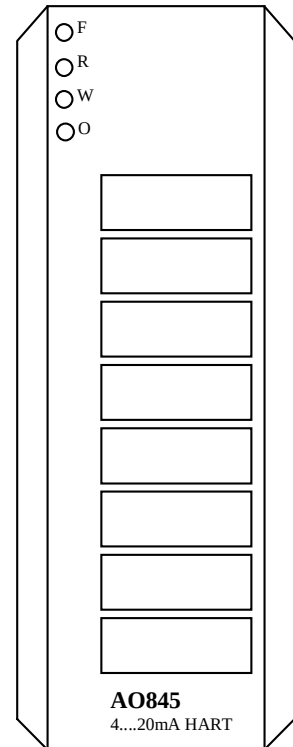
- 8 channels of 4...20 mA outputs
- For single or redundant applications
- OSP sets outputs to predetermined state upon error detection
- 1 group of 8 channels isolated from ground
- Analog Output is to be short circuit secured to ZP or +24 V
- Advanced on-board diagnostics
- EMC protection
- 12 bit resolution
- DIN rail mounting
- HART pass-through communication

A.13.0.2 Description

The AO845 Analog Output Module for single or redundant applications has 8 unipolar analog output channels.

Four LEDs are used to indicate the state of the device. The RUN (green) LED indicates that the device is in operational state. The FAULT (red) LED indicates that the device is in error state.

In Not configured state the FAULT LED is turned off after the first valid access to the module. The WARNING (yellow) LED indicates that there is some kind of process error such as an open circuit, or power supply fault. OSP (yellow) LED indicates that the output value is set to the OSP value.



The module performs self-diagnostic cyclically. Module diagnostics include:

- External Channel Error is reported (only reported on active channels) if the process power supply that supply voltage to output circuitry is too low, or the output current is less than the output set value and the output set value > 1 mA (open circuit).
- Internal Channel Error is reported if the output circuit can not give the right current value. In a redundant pair the module will be commanded to error state by the ModuleBus master.
- Module Error is reported in case of Output Transistor Error, Short Circuit, Checksum Error, Internal Power Supply Error, Status Link Error, Watchdog or Wrong OSP behavior.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller (OSP timer) and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct Read or Write access of dynamic data has been decoded. If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

In redundant applications both modules must have the OSP-conditions fulfilled to go to OSP.

The module has HART pass-through functionality. Only point to point communication is supported. The output filter must be enabled on channels used for HART communication.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Four different types of MTUs can be used for single applications. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU enables wire connection to the devices without additional terminals. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant applications there are two types of MTUs, TU842 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

A.13.0.3 Technical Data*Table A-28 AO845 Analog Output Module Specifications at 25°C*

Feature	AO845 Analog Output Module
Number of channels	8
Output range	4...20 mA
Over range	15%
Output load	Max 750 ohms
Maximum field cable length	600 meters (656 yd.)
Rise time output filter - disable - enable	23 ms (0-90%) max 4 mA / 12.5 ms
Cycle time	10 ms
Error	Max. 0.1%
Resolution	12 bit
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Temperature drift	Max. 50 ppm/°C
Current consumption 24 V (external supply), maximum	165 mA
Current consumption 5 V, maximum	125 mA
Power dissipation ⁽¹⁾	3.5 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Groupwise isolated from ground (RIV=50 V)
Mounting termination units	TU810, TU812, TU814, TU830, TU842 and TU843

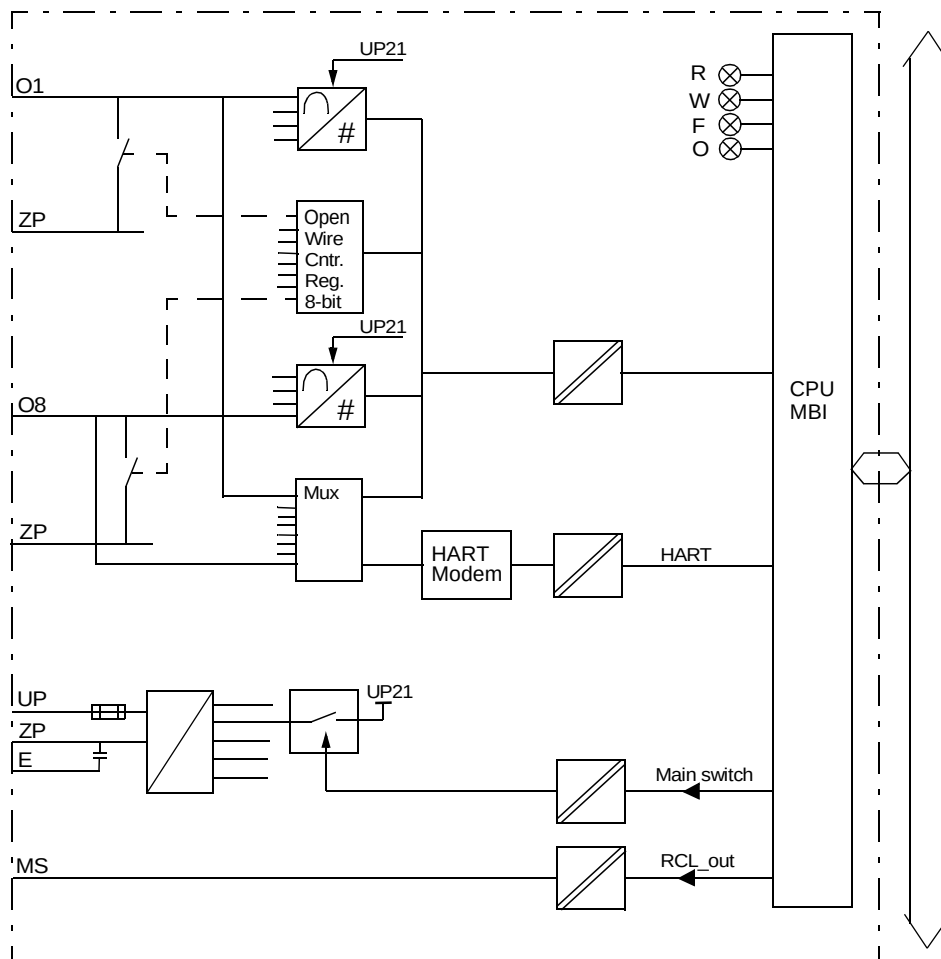
Table A-28 AO845 Analog Output Module Specifications at 25°C (Continued)

Feature	AO845 Analog Output Module
MTU keying code	CC
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.21 kg (0.46 lbs.)

(1) 250 ohm load, 70% of nominal current, all channels activated.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.13.0.4 Block Diagram AO845



A.13.0.5 Process Connections*Table A-29 A0845 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 DSub 25 male connector⁽¹⁾	TU830/TU833 Terminal	TU842/TU843 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+
0 V d.c. (ZP)	L1-	2, 15	L1- (2)	L1-
-	-	-	B1, B2	-
Ch1, + Output	C1	3	C1	C1, C2
Ch1 Return (ZP)	A1	-	A1, A2	A1, A2
-	-	-	B3, B4	-
Ch 2, + Output	C2	4	C3	C3, C4
Ch2 Return (ZP)	A2	-	A3, A4	A3, A4
-	-	-	B5, B6	-
Ch 3, + Output	C3	5	C5	C5, C6
Ch3 Return (ZP)	A3	-	A5, A6	A5, A6
-	-	-	B7, B8	-
Ch 4, + Output	C4	6	C7	C7, C8
Ch4 Return (ZP)	A4	-	A7, A8	A7,A8
-	-	-	B9, B10	-
Ch 5, + Output	C5	7	C9	C9, C10
Ch5 Return (ZP)	A5	-	A9, A10	A9, A10
-	-	-	B11, B12	-
Ch 6, + Output	C6	8	C11	C11, C12
Ch6 Return (ZP)	A6	-	A11, A12	A11, A12

Table A-29 AO845 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 DSUB 25 male connector ⁽¹⁾	TU830/TU833 Terminal	TU842/TU843 Terminal
-	-	-	B13, B14	-
Ch 7, + Output	C7	9	C13	C13, C14
Ch7 Return (ZP)	A7	-	A13, A14	A13, A14
-	-	-	B15, B16	-
Ch 8, + Output	C8	10	C15	C15, C16
Ch8 Return (ZP)	A8	-	A15, A16	A15, A16
+24 V dc	L2+ (2)	11, 24	L2+ (2)	L2+
0 V dc (ZP)	L2-	12, 25	L2- (2)	L2-

(1) Pin 13 connected to connector body for EM.

Figure A-37 shows the process connections for the AO845 when installed on a TU830 Extended MTU.

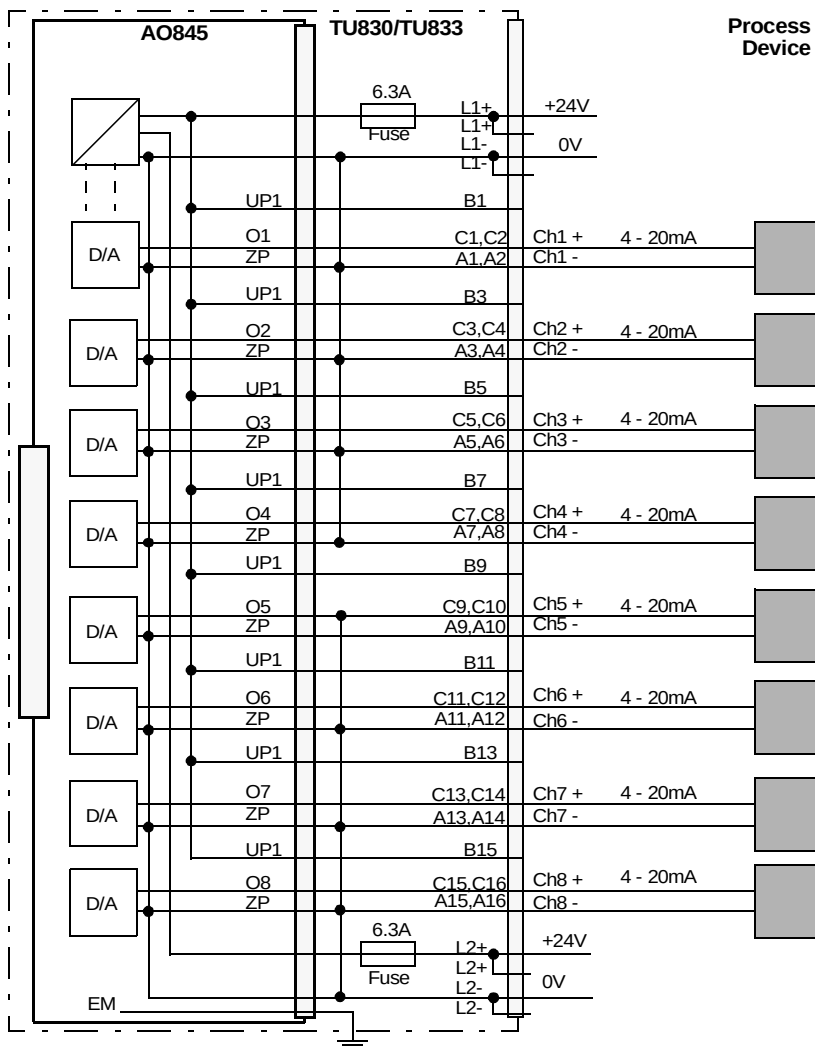


Figure A-37 AO845 with TU830 Extended MTU Process Connections

Figure A-38 shows the process connections for the AO845 when installed on a TU810 or TU814 Compact MTU.

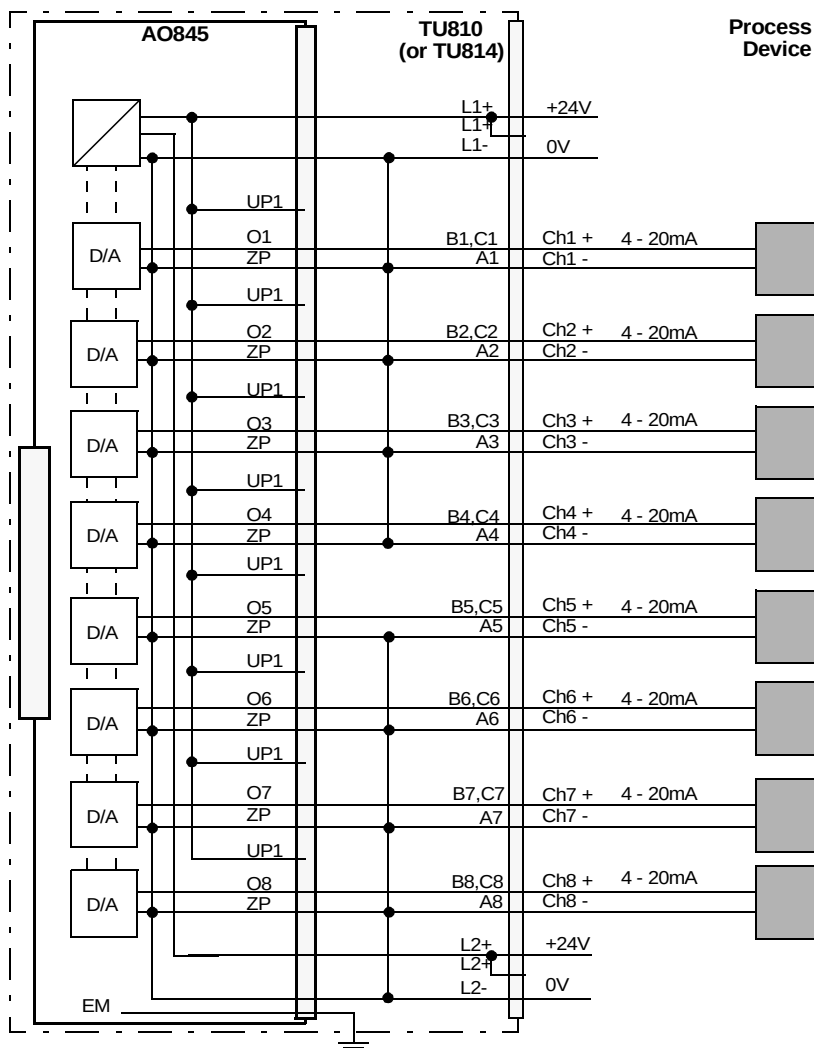


Figure A-38 AO845 with TU810 or TU814 Compact MTU Process Connections

Figure A-39 shows the process connections for the AO845 when installed on a TU812 Compact MTU.

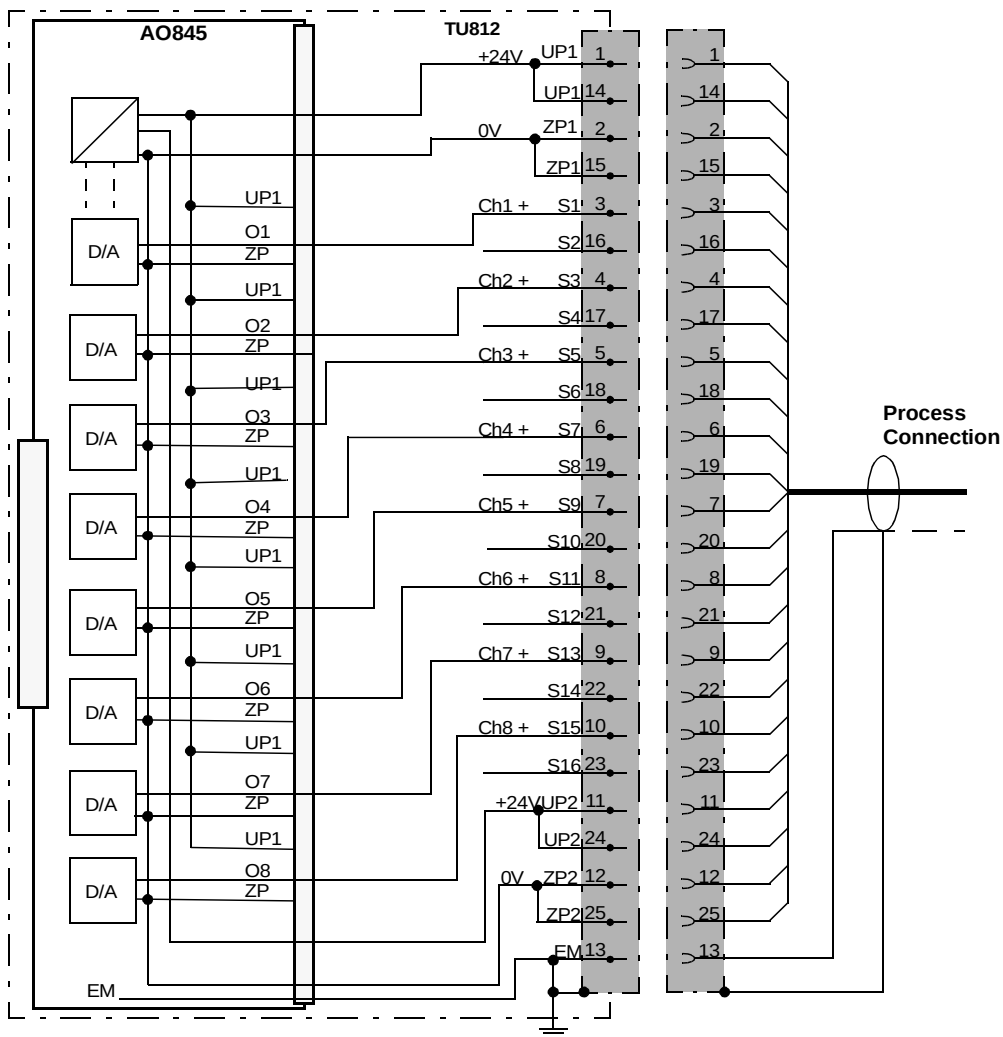


Figure A-39 AO845 with TU812 Compact MTU Process Connections

Figure A-40 shows the process connections for the AO845 when installed on a TU842 or TU843 Redundant MTU.

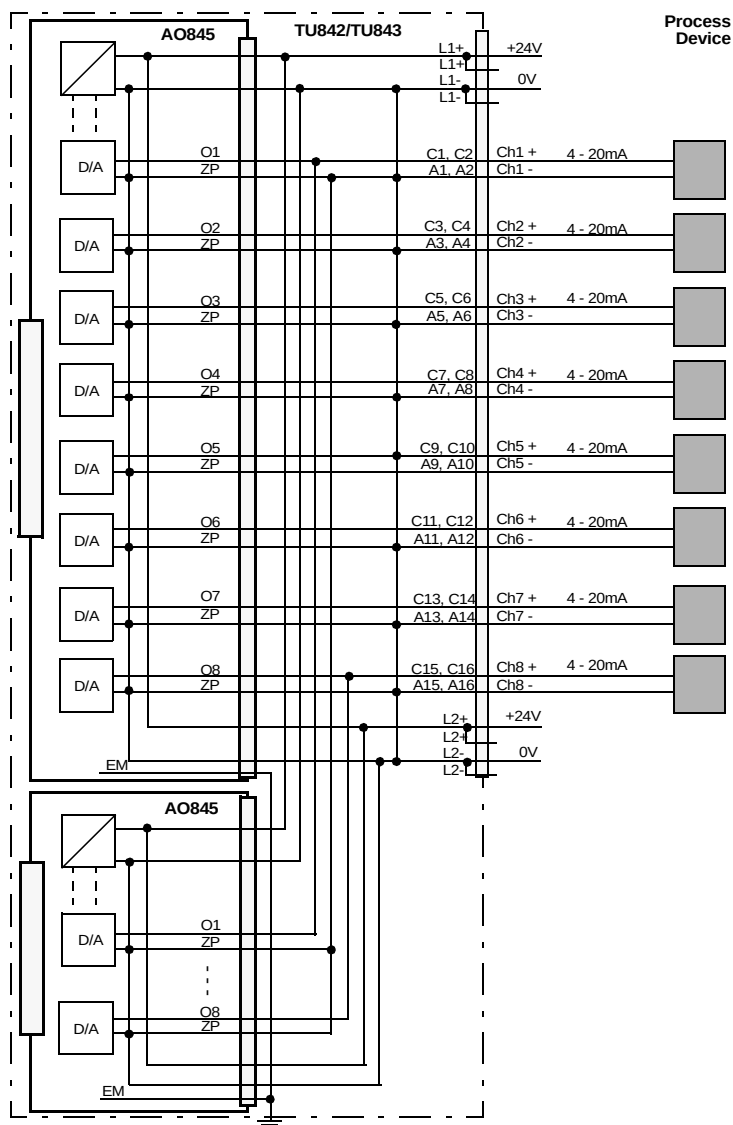


Figure A-40 AO845 with TU842 or TU843 Redundant MTU Process Connections

A.14 DI801 Digital Input Module, 24 V, Current Sinking

A.14.0.1 Features

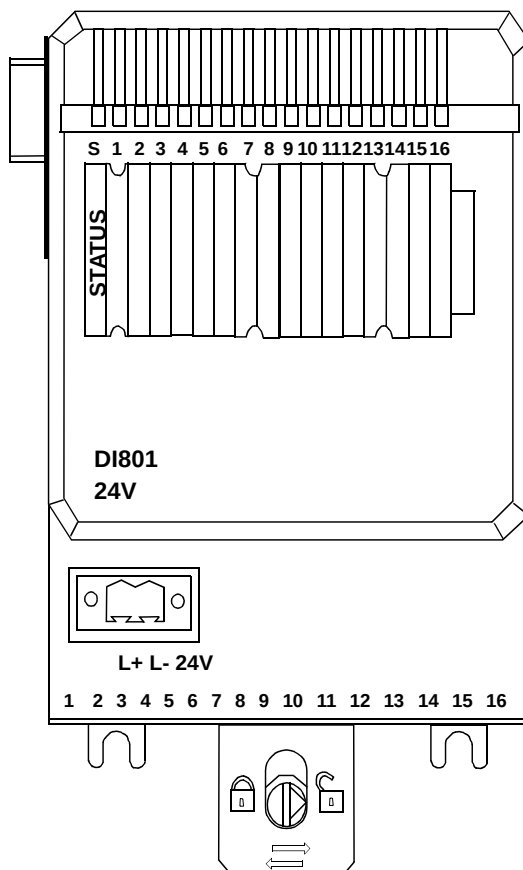
- 16 channels for 24 V d.c. inputs with current sinking
- 1 isolated groups of 16 with voltage supervision
- Input status indicators
- EMC protection
- DIN rail mounting
- Process and power connection via detachable connectors

A.14.0.2 Description

The DI801 is a 16 channel 24 V digital input module for the S800 I/O. This module has 16 digital inputs. The input voltage range is 18 to 30 volt d.c. and the input current is 6 mA at 24 V. The inputs are in one isolated group with sixteen channels and channel number sixteen can be used for voltage supervision input in the group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

One STATUS LED red or green indicate module status. One LED (Yellow) per channel (16) indicate input channel status (On = 1 and Off = 0). The STATUS LED green indicates normal operation. The STATUS LED red indicates that the module is in Init state or Not configured state. In Not Configured state the STATUS LED is turned off after the first valid access to the module.



Channel 16 can be used as voltage supervision input for channels 1-15. If the voltage connected to channel 16 disappears, the error inputs are activated. The error signal can be read from the ModuleBus. This supervision can be enabled/disabled with the “a” parameter. If the error inputs are disabled channel 16 can be used as normal input channels.

The reset circuitry gives a reset signal when the POWOK signal is active. The POWOK comes from the ModuleBus master after power is applied.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

A.14.0.3 Technical Data*Table A-30 DI801 Digital Input Module Specifications*

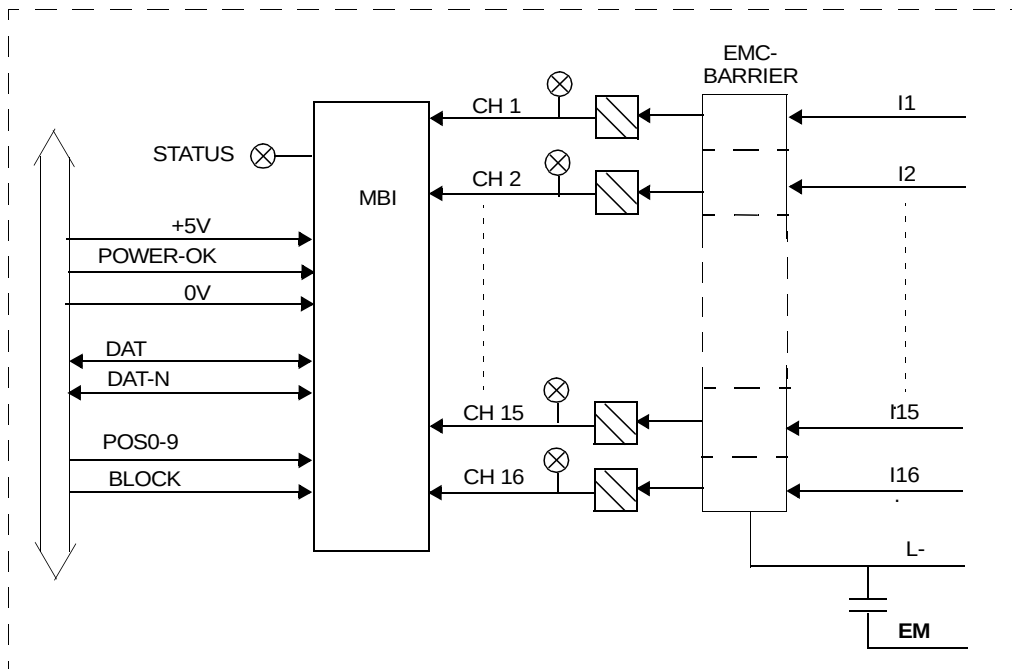
Feature	DI801 Digital Input Module
Number of channels	16 (1 x 16), current sinking
Rated voltage (process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	15 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	6.7 mA @ 24 V d.c.
Input Impedance	3.5 kΩ
Maximum field cable length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	channel 16
Current consumption +5 V	70 mA
Power dissipation ⁽¹⁾	2.2 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Groupwise isolated from ground (RIV=50 V)
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

Table A-30 DI801 Digital Input Module Specifications (Continued)

Feature	DI801 Digital Input Module
Acceptable wire sizes	Solid: 0.05-2.5mm ² , 30-12 AWG Stranded: 0.05-1.5mm ² , 30-12 AWG Recommended torque: 0.8 Nm Stripping length: 6-7.5 mm, 0.24-0.30 in
Width	86.1 mm (3.4")
Depth	58.5 mm (2.3")
Height	110 mm (4.33")
Weight	0.24 kg (0.53 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volts.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.14.0.4 Block Diagram DI801



A.14.0.5 Process Connections*Table A-31 DI801 Process Connections*

Process Connection	Process Terminal
Ch1 Input	1
Ch 2 Input	2
Ch 3 Input	3
Ch 4 Input	4
Ch 5 Input	5
Ch 6 Input	6
Ch 7 Input	7
Ch 8 Input	8
Ch 9 Input	9
Ch 10 Input	10
Ch 11 Input	11
Ch 12 Input	12
Ch 13 Input	13
Ch 14 Input	14
Ch 15 Input	15
Ch 16 Input	16

Figure A-41 shows the process connections for the DI801.

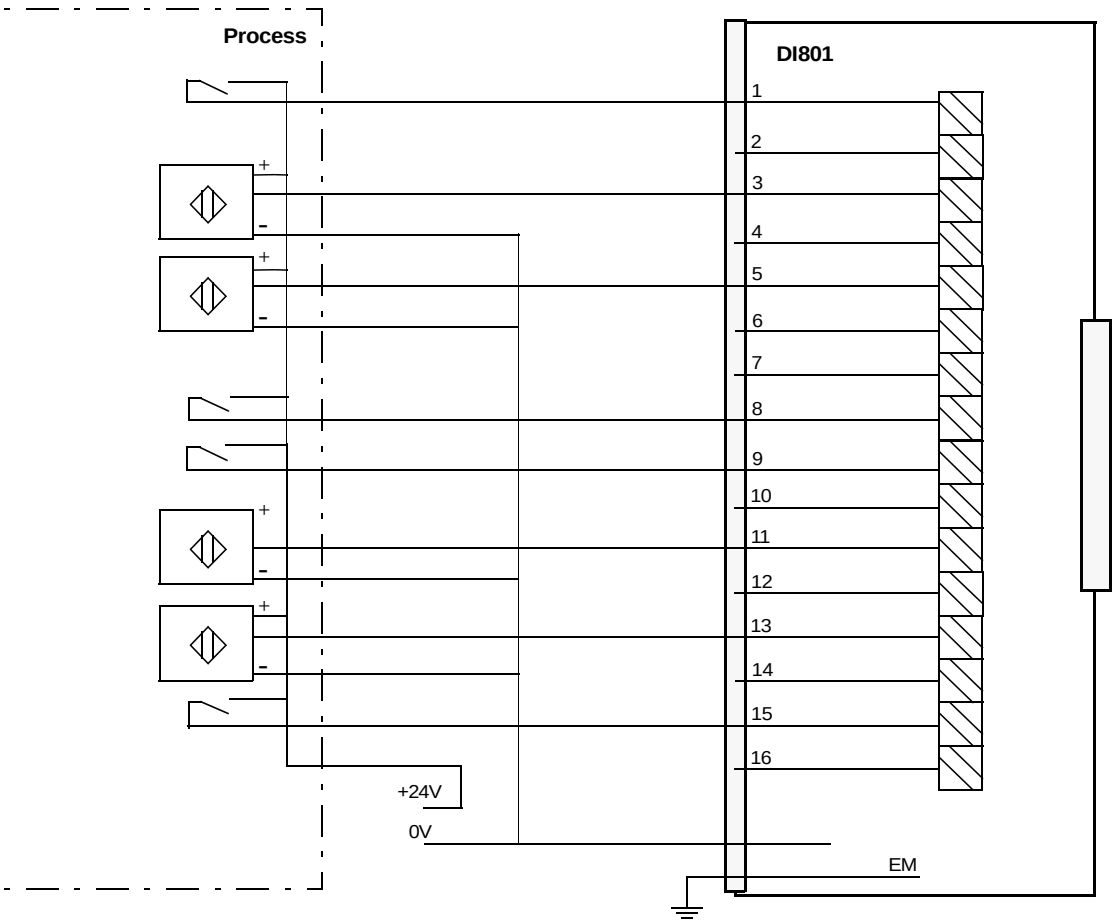


Figure A-41 DI801 Process Connections

A.15 DI802 Digital Input Module, 120 V a.c./d.c, Current Sinking

A.15.0.1 Features

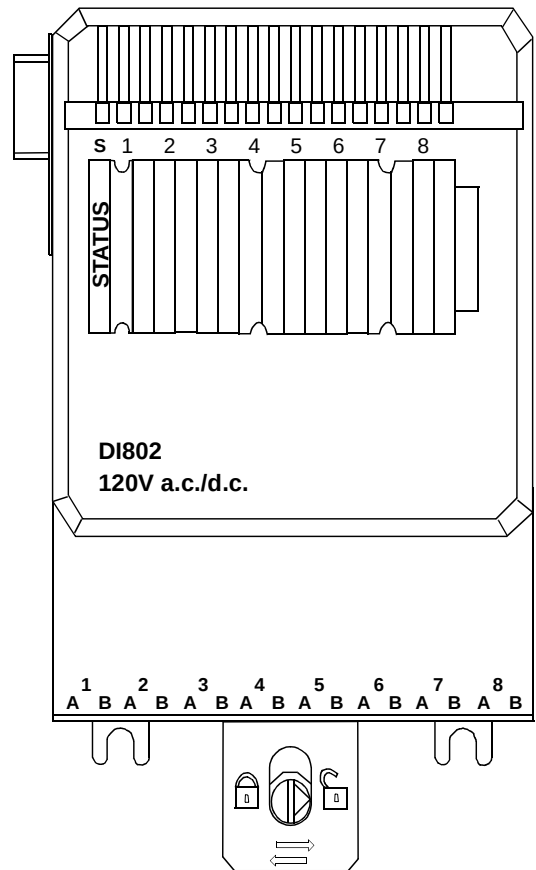
- 8 channels for 120 V a.c./d.c. inputs with current sinking
- Individually isolated channels
- Voltage supervision of field input power
- Input status indicators
- Signal filtering
- EMC protection
- DIN rail mounting
- Process connection via detachable connectors

A.15.0.2 Description

The DI802 is an 8 channel 120 V a.c./d.c.digital input module for the S800 I/O. This module has 8 digital inputs. The a.c. input voltage range is 77 - 130 volt and the input current is 10 mA at 120 V a.c. The d.c. input range is 75 - 145 V and the input current is 2.8 mA at 110 V. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

One STATUS LED red or green indicate module status. One LED (Yellow) per channel (8) indicate input channel status (On = 1 and Off = 0). The STATUS LED green indicates normal operation. The STATUS LED red indicates that the module



is in Init state or Not configured state. In Not Configured state the STATUS LED is turned off after the first valid access to the module.

Channel 8 can be used as voltage supervision input for channels 1-7.

If the voltage connected to channel 8 disappears, the error inputs are activated. The error signal can be read from the ModuleBus. This supervision can be enabled/disabled with parameter “a”. If the error inputs are disabled, channel 8 can be used as the normal input channel.

The reset circuitry gives a reset signal when the POWOK signal is active.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

A.15.0.3 Technical Data*Table A-32 DI802 Digital Input Module Specifications*

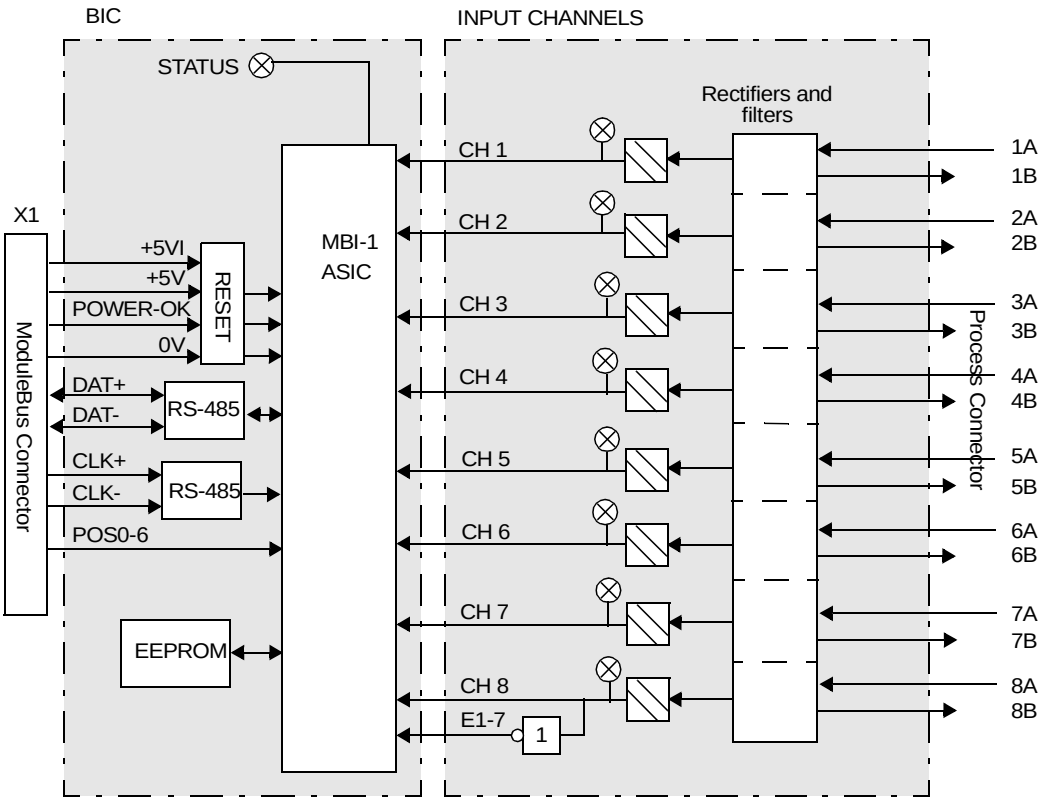
Feature	DI802 Digital Input Module
Number of channels	8, current sinking
Rated voltage (process power supply range)	120 V a.c. (77 to 130 V a.c.) 110 V d.c. (75 to 145 V d.c.)
Input voltage range, "1"	77 to 130 V a.c. 75 to 145 V d.c.
Input voltage range, "0"	0 to 30 V a.c. 0 to 20 V d.c.
Nominal input channel current	10 mA a.c. @ 120 V a.c. 2.8 mA d.c. @ 110 V d.c.
Input frequency range a.c.	47...63 Hz
Input Impedance	12 k Ω (a.c.) 39 k Ω (d.c.)
Maximum field cable length	200 meters (219 yd.) 100pF/m. for a.c. 600 meters (656 yd.) for d.c.
Filter times (digital, selectable)	2, 4, 8, 16 ms
Analog filter On/Off delay	5/18 ms
Process voltage supervision	Channel 8
Current consumption +5 V	50 mA
Power dissipation ⁽¹⁾	2.8 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾

Table A-32 DI802 Digital Input Module Specifications (Continued)

Feature	DI802 Digital Input Module
Isolation	Individually isolated channels (RIV=250 V)
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm ² , 30-12 AWG Stranded: 0.05-1.5mm ² , 30-12 AWG Recommended torque: 0.8 Nm Stripping length: 6-7.5 mm, 0.24-0.30 in
Width	86.1 mm (3.4")
Depth	58.5 mm (2.3")
Height	110 mm (4.33")
Weight	0.24 kg (0.53 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated.
 (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.15.0.4 Block Diagram DI802



A.15.0.5 Process Connections

Table A-33 DI802 Process Connections

Process Connection	Process Terminal
Ch1 Input	1A
	1B
Ch 2 Input	2A
	2B
Ch 3 Input	3A
	3B
Ch 4 Input	4A
	4B
Ch 5 Input	5A
	5B
Ch 6 Input	6A
	6B
Ch 7 Input	7A
	7B
Ch 8 Input	8A
	8B

Figure A-42 shows the process connections for the DI802.

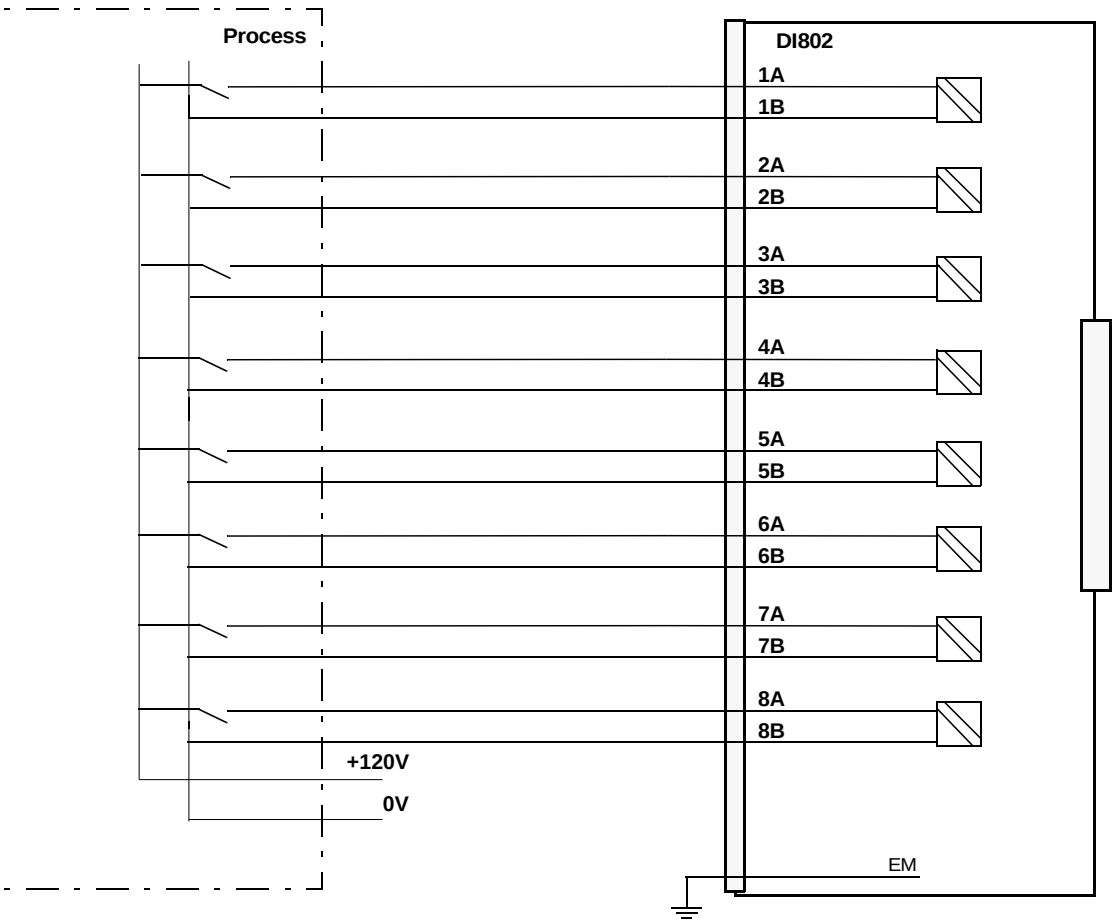


Figure A-42 DI802 Process Connections

A.16 DI803 Digital Input Module, 230 V a.c./d.c, Current Sinking

A.16.0.1 Features

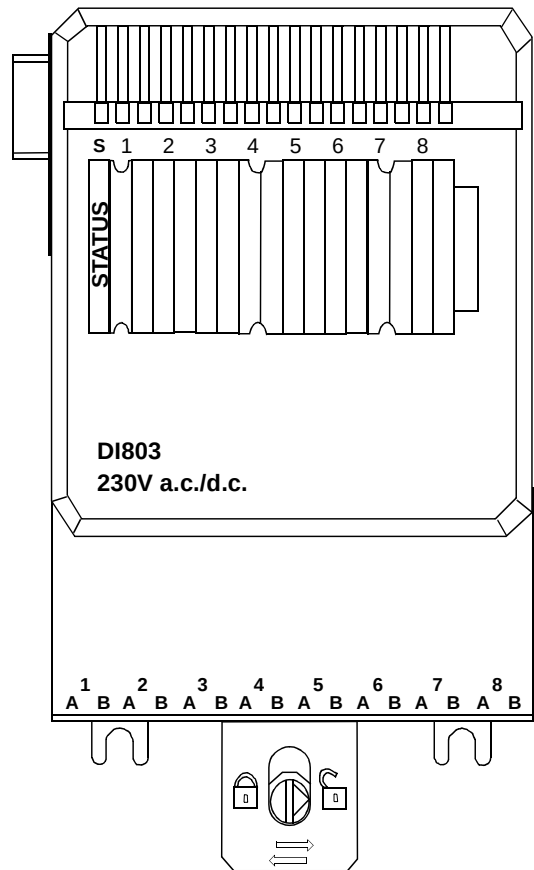
- 8 channels for 230 V a.c./d.c. inputs with current sinking
- Individually isolated channels
- Voltage supervision of field input power
- Input status indicators
- Signal filtering
- EMC protection
- DIN rail mounting
- Process connection via detachable connectors

A.16.0.2 Description

The DI803 is an 8 channel 230 V a.c./d.c.digital input module for the S800 I/O. This module has 8 digital inputs. The a.c. input voltage range is 164 - 264 volt and the input current is 7.6 mA at 230 V a.c. The d.c. input range is 175 - 275 V and the input current is 1.6 mA at 220 V. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

One STATUS LED red or green indicate module status. One LED (Yellow) per channel (8) indicate input channel status (On = 1 and Off = 0). The STATUS LED green indicates normal operation. The STATUS LED red indicates that the module



is in Init state or Not configured state. In Not Configured state the STATUS LED is turned off after the first valid access to the module.

Channel 8 can be used as voltage supervision input for channels 1-7.

If the voltage connected to channel 8 disappears, the error inputs are activated. The error signal can be read from the ModuleBus. This supervision can be enabled/disabled with the “a” parameter. If the error inputs are disabled channel 8 can be used as normal input channels.

The reset circuitry gives a reset signal when the POWOK signal is active.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

A.16.0.3 Technical Data*Table A-34 DI803 Digital Input Module Specifications*

Feature	DI803 Digital Input Module
Number of channels	8, current sinking
Rated voltage (process power supply range)	230 V a.c. (164 to 264 V a.c.) 220 V d.c. (175 to 275 V d.c.)
Input voltage range, "1"	164 to 264 V a.c. 175 to 275 V d.c.
Input voltage range, "0"	0 to 50 V a.c. 0 to 40 V d.c.
Nominal input channel current	7.6 mA @ 230 V a.c. 1.6mA @ 220 V d.c.
Input frequency range, a.c.	47...63 Hz
Input impedance	30 k Ω (a.c.) 134 k Ω (d.c.)
Maximum field cable length	200 meters (219 yd.) 100pF/m. for a.c. 600 meters (656 yd.) for d.c.
Filter times (digital, selectable)	2, 4, 8, 16 ms
Analog filter On/Off delay	5/28 ms
Process voltage supervision	Channel 8
Current consumption +5 V	50 mA
Power dissipation ⁽¹⁾	2.8 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾

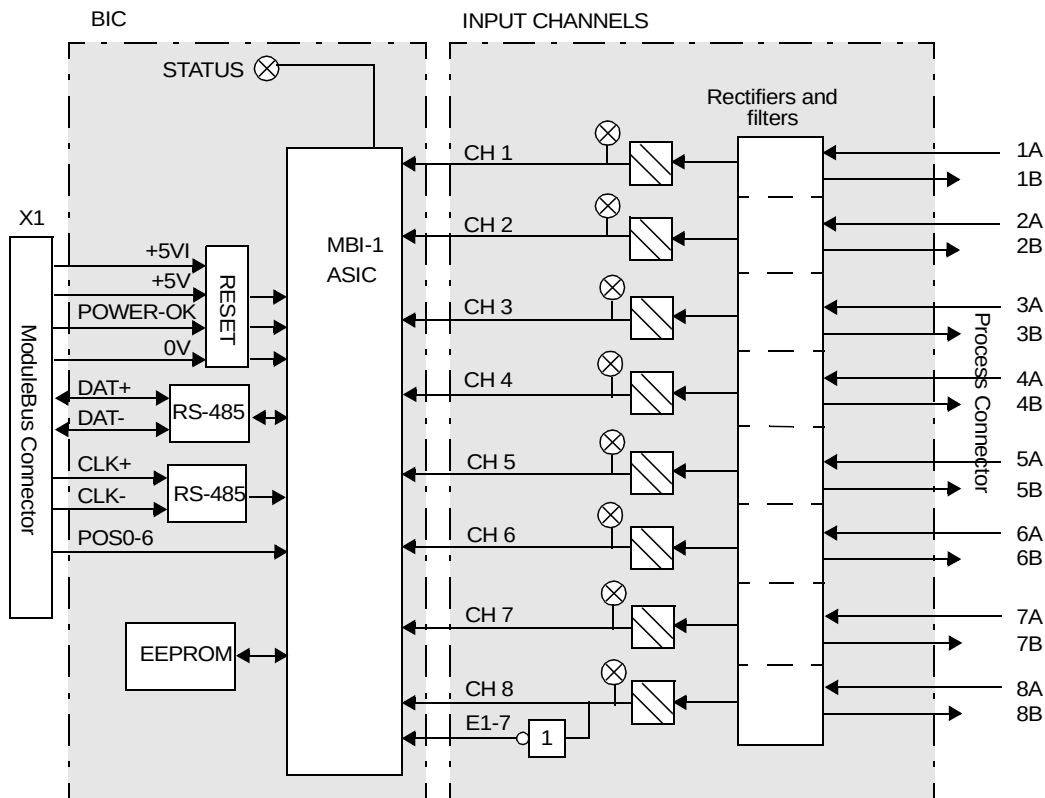
Table A-34 DI803 Digital Input Module Specifications (Continued)

Feature	DI803 Digital Input Module
Isolation	Individually isolated channels (RIV=250 V)
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm ² , 30-12 AWG Stranded: 0.05-1.5mm ² , 30-12 AWG Recommended torque: 0.8 Nm Stripping length: 6-7.5 mm, 0.24-0.30 in
Width	86.1 mm (3.4")
Depth	58.5 mm (2.3")
Height	110 mm (4.33")
Weight	0.24 kg (0.53 lbs.)

(1) Power dissipation is calculated with 70 percent of the channels activated.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.16.0.4 Block Diagram DI803



A.16.0.5 Process Connections*Table A-35 DI803 Process Connections*

Process Connection	Process Terminal
Ch1 Input	1A
	1B
Ch 2 Input	2A
	2B
Ch 3 Input	3A
	3B
Ch 4 Input	4A
	4B
Ch 5 Input	5A
	5B
Ch 6 Input	6A
	6B
Ch 7 Input	7A
	7B
Ch 8 Input	8A
	8B

Figure A-43 shows the process connections for the DI803.

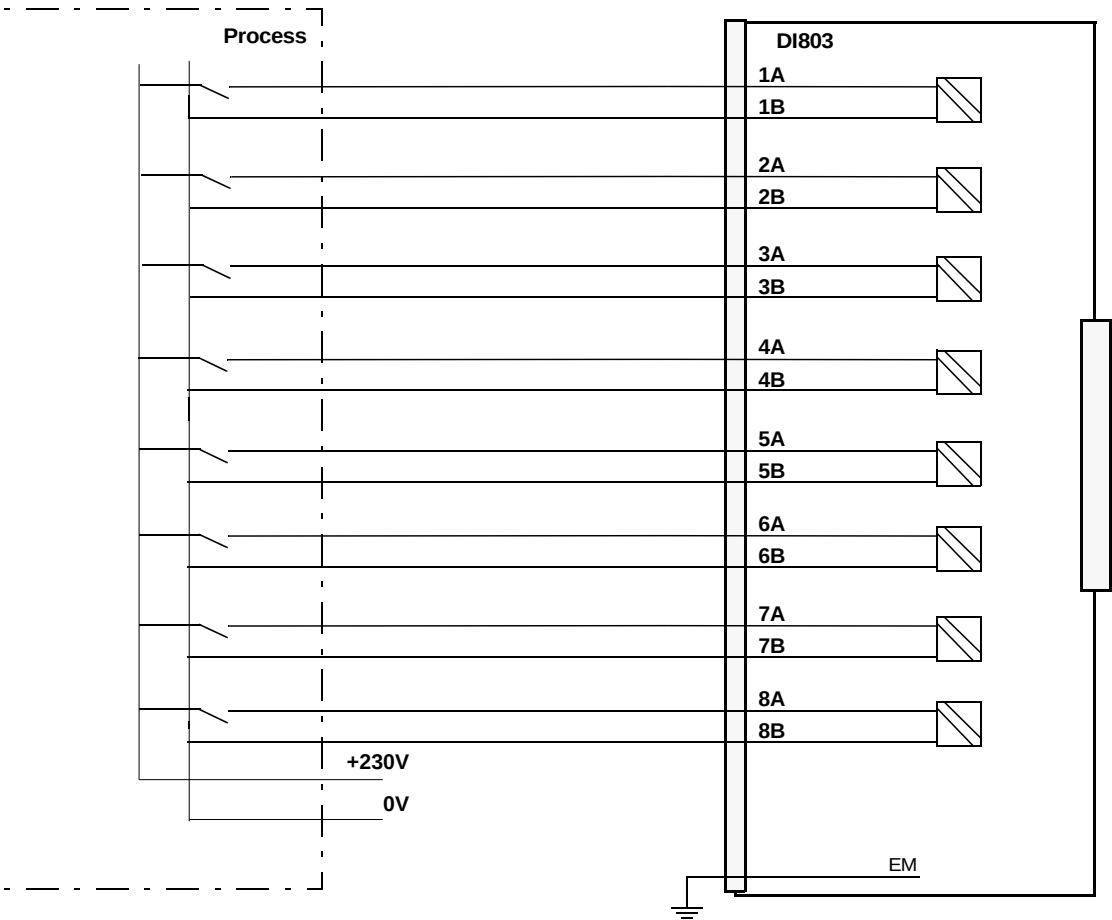


Figure A-43 DI803 Process Connections

A.17 DI810 Digital Input Module, 24 V, Current Sinking

A.17.0.1 Features

- 16 channels for 24 V d.c. inputs with current sinking
- 2 isolated groups of 8 with voltage supervision
- Input status indicators
- EMC protection
- DIN rail mounting.
- Also in a G3 compliant version

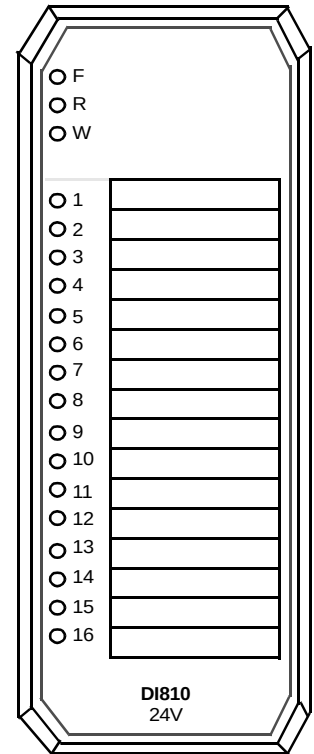
A.17.0.2 Description

The DI810 is a 16 channel 24 V digital input module for the S800 I/O. This module has 16 digital inputs. The input voltage range is 18 to 30 volt d.c. and the input current is 6 mA at 24 V. The inputs are divided into two individually isolated groups with eight channels and one voltage supervision input in each group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (16) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus.



The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

Five different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage supervision inputs, but requires external terminals for distribution of 24 V power supply to the devices. The extended MTU, TU838, provides a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.17.0.3 Technical Data*Table A-36 DI810 Digital Input Module Specifications*

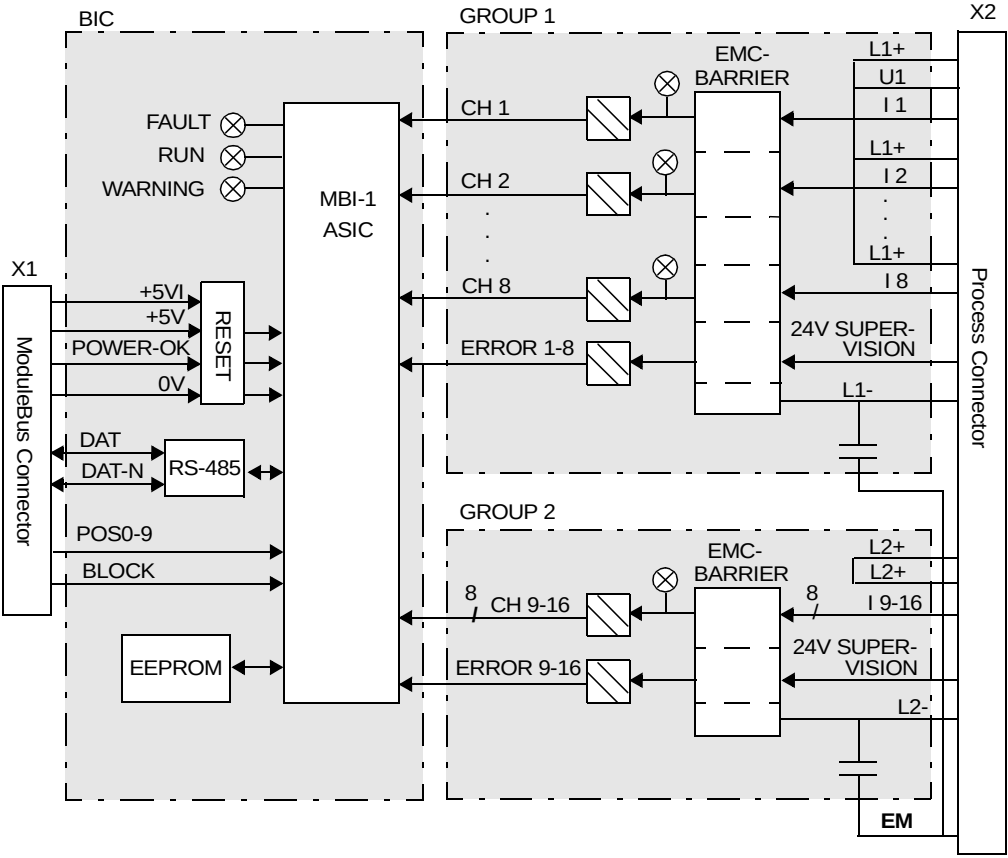
Feature	DI810 Digital Input Module
Number of channels	16 (2 x 8), current sinking
Rated voltage (process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	15 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	6 mA @ 24 V d.c.
Input Impedance	3.5 k Ω
Maximum field cable length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	2 channels (1 per group)
Current consumption +5 V	50 mA
Power dissipation ⁽¹⁾	1.8 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812, TU814, TU830 or TU838
MTU keying code	AA
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529

Table A-36 DI810 Digital Input Module Specifications (Continued)

Feature	DI810 Digital Input Module
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.15 kg (0.33 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volts.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.17.0.4 Block Diagram DI810



A.17.0.5 Process Connections*Table A-37 DI810 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	B1, B2	A1 (F1)
Ch1 Input	C1	3	C1	B1
Ch 2 Input	B1	16	C2	B2
Ch1/Ch2, L1-	A1	-	A1, A2	A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)
Ch 3 Input	C2	4	C3	B3
Ch 4 Input	B2	17	C4	B4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)
Ch 5 Input	C3	5	C5	B5
Ch 6 Input	B3	18	C6	B6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)
Ch 7 Input	C4	6	C7	B7
Ch 8 Input	B4	19	C8	B8
Ch 7/Ch8, L1-	A4	-	A7, A8	A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)
Ch 9 Input	C5	7	C9	B9

Table A-37 DI810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU830/TU833 Terminal	TU838 Terminal
Ch 10 Input	B5	20	C10	B10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)
Ch 11 Input	C6	8	C11	B11
Ch 12 Input	B6	21	C12	B12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)
Ch 13 Input	C7	9	C13	B13
Ch 14 Input	B7	22	C14	B14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)
Ch 15 Input	C8	10	C15	B15
Ch 16 Input	B8	23	C16	B16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-44 shows the process connections for the Digital Input Module DI810 when installed on a TU830 Extended MTU.

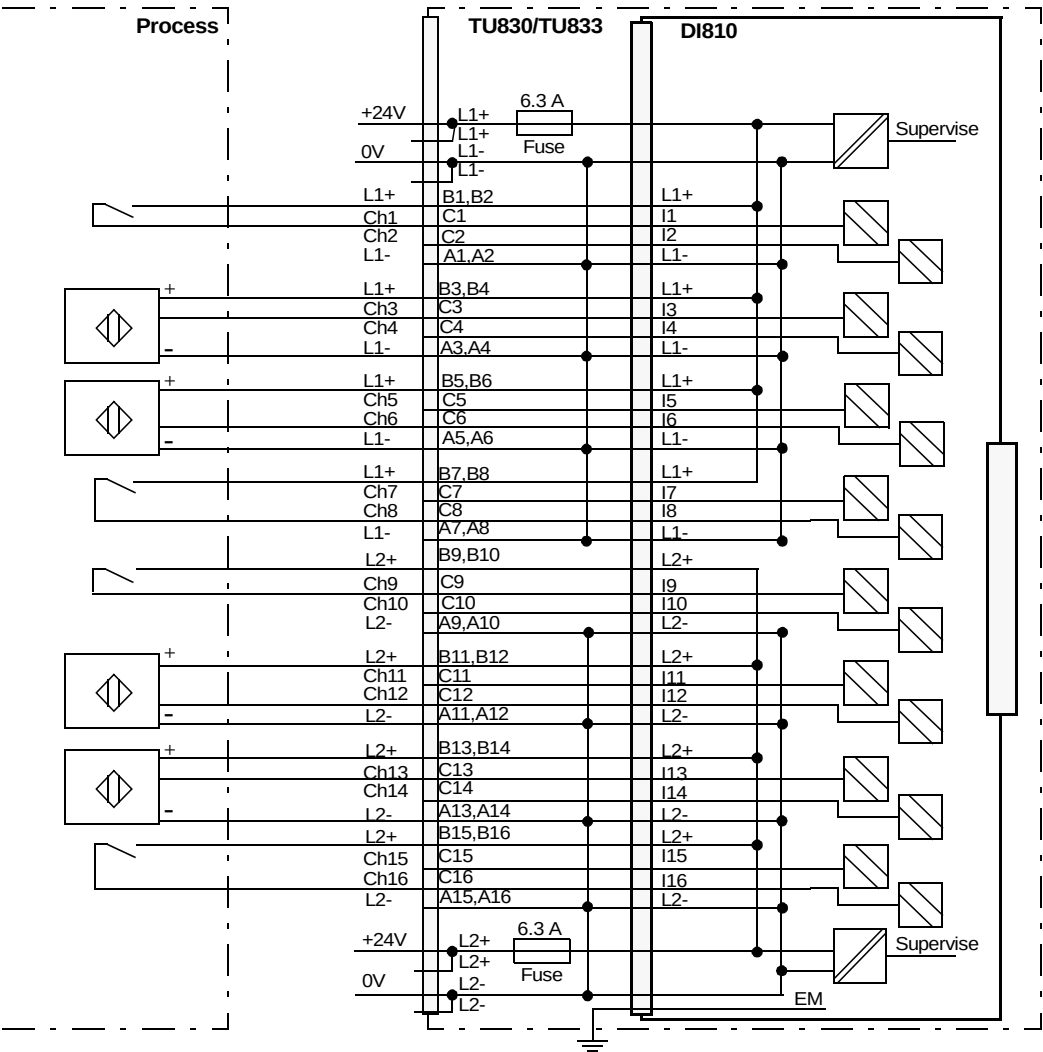


Figure A-44 DI810 with TU830 Extended MTU Process Connections

Figure A-45 shows the process connections for the Digital Input Module DI810 when installed on a TU838 Extended MTU.

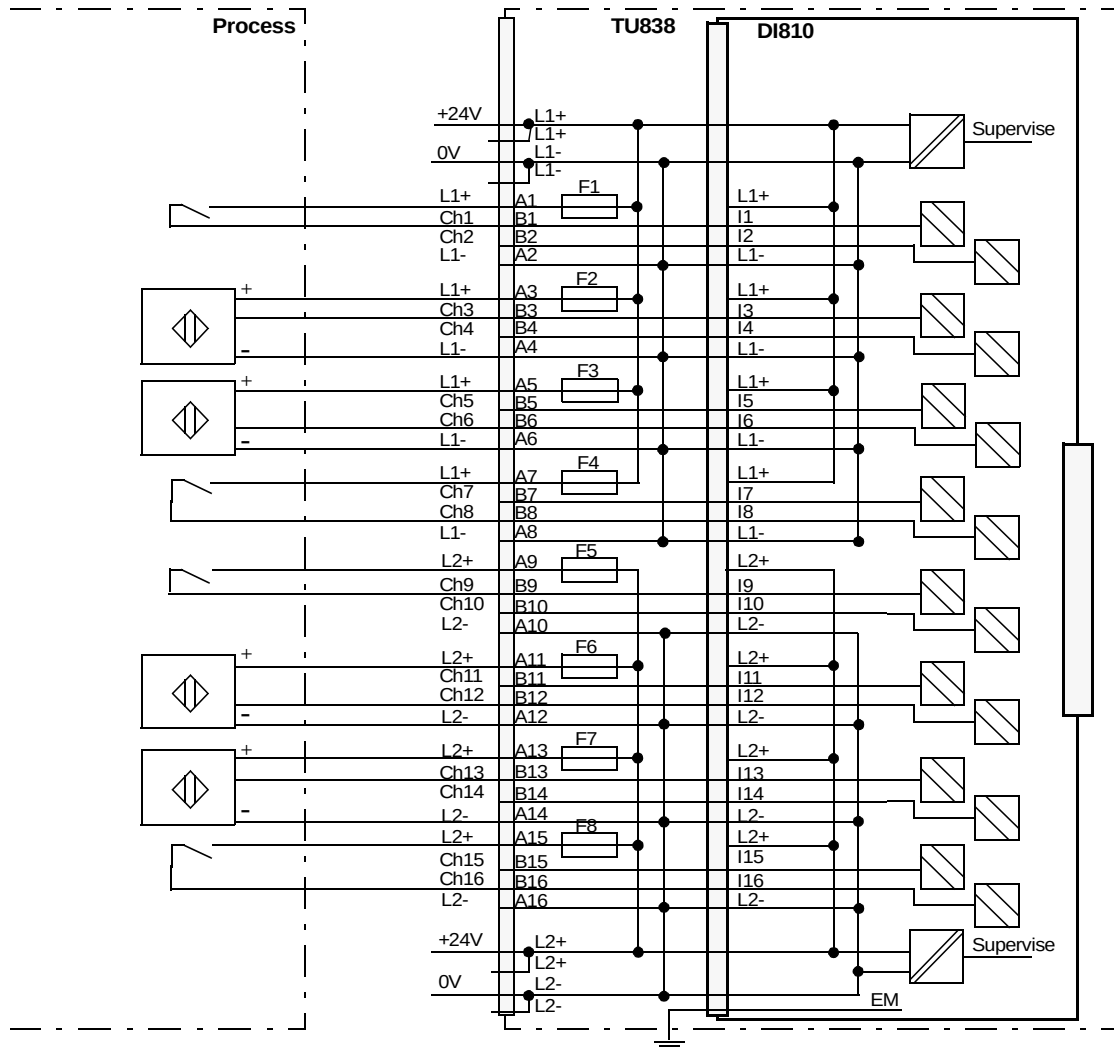


Figure A-45 DI810 with TU838 Extended MTU Process Connections

Figure A-46 shows the process connections for the DI810 when installed on a TU810 or TU814 Compact MTU.

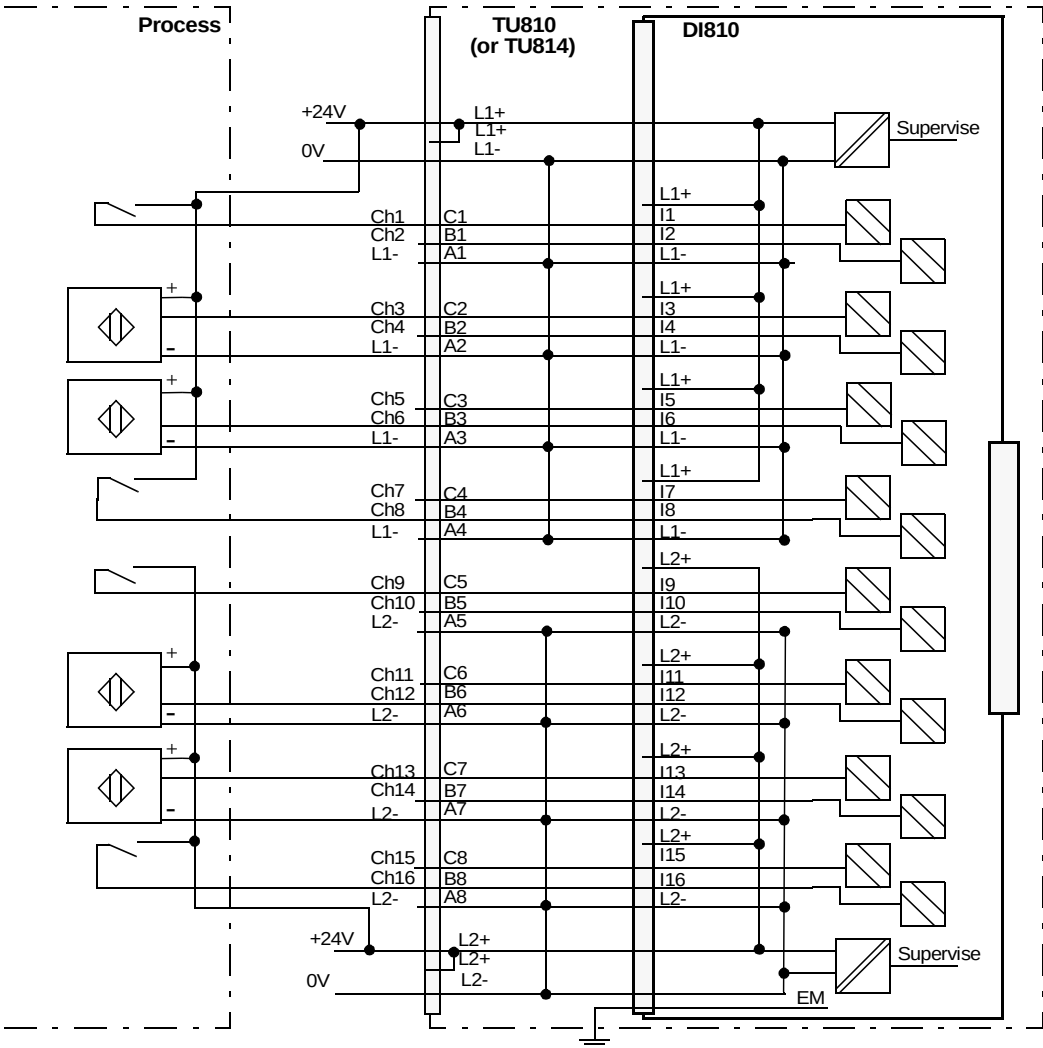


Figure A-46 DI810 with TU810 or TU814 Compact MTU Process Connections

Figure A-47 shows the process connections for the DI810 when installed on a TU812 Compact MTU.

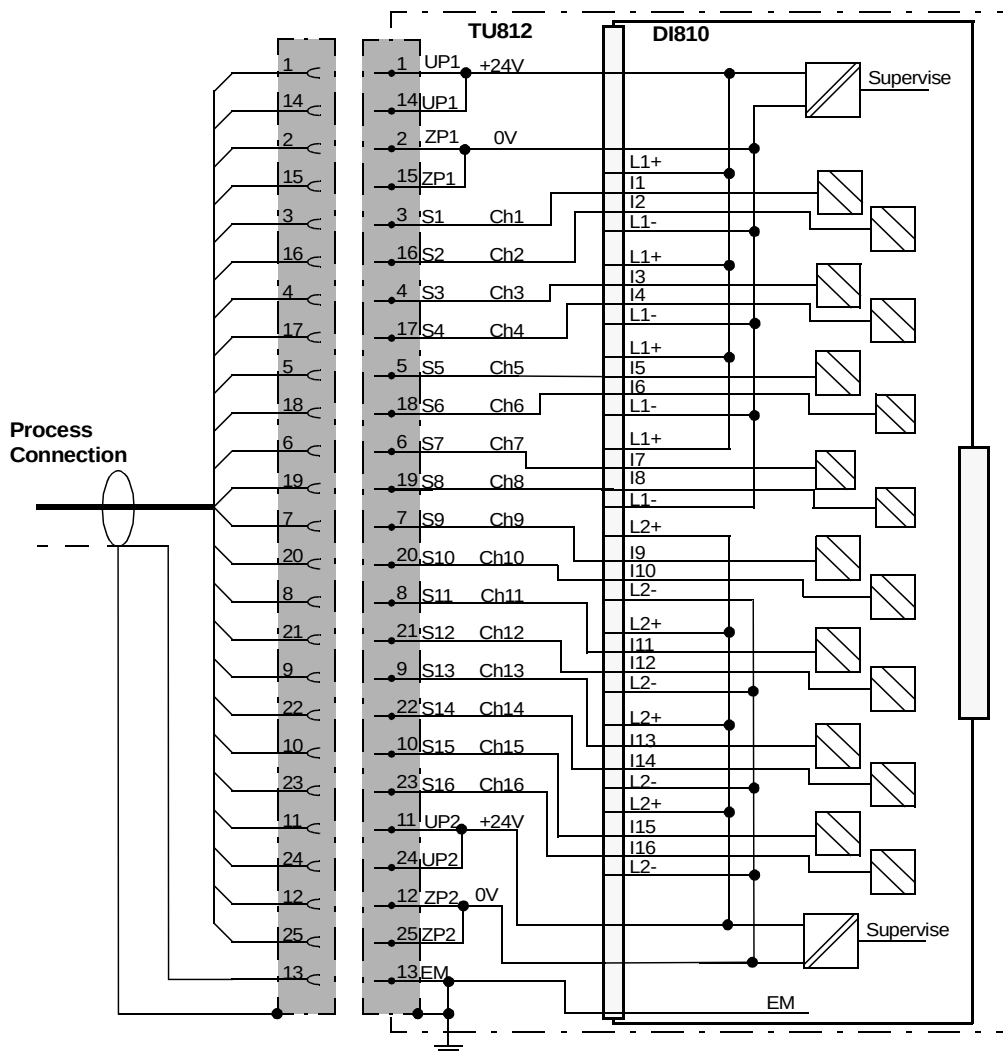


Figure A-47 DI810 with TU812 Compact MTU Process Connections

A.18 DI811 Digital Input Module, 48 V, Current Sinking

A.18.0.1 Features

- 16 channels for 48 V d.c. inputs with current sinking
- 2 isolated groups of 8 with voltage supervision
- Input status indicators
- EMC protection
- DIN rail mounting.

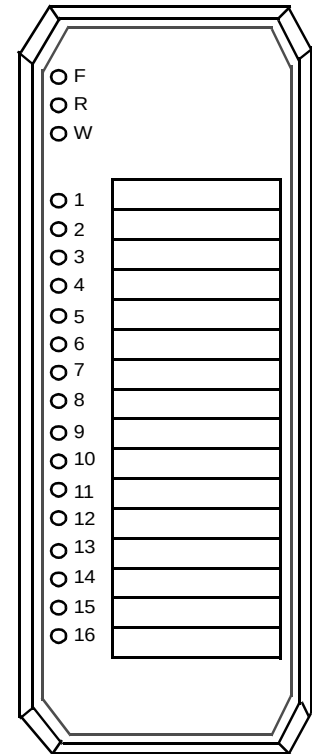
A.18.0.2 Description

The DI811 is a 16 channel 48 V digital input module for the S800 I/O. This module has 16 digital inputs. The input signal voltage range is 36 to 60 volt d.c. and the input current is 4 mA at 48 V. The inputs are divided into two individually isolated groups with eight channels and one voltage supervision input in each group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (16) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus.



The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

Five different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 48 V process voltage supervision inputs, but requires external terminals for distribution of 48 V power supply to the devices. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.18.0.3 Technical Data*Table A-38 DI811 Digital Input Module Specifications*

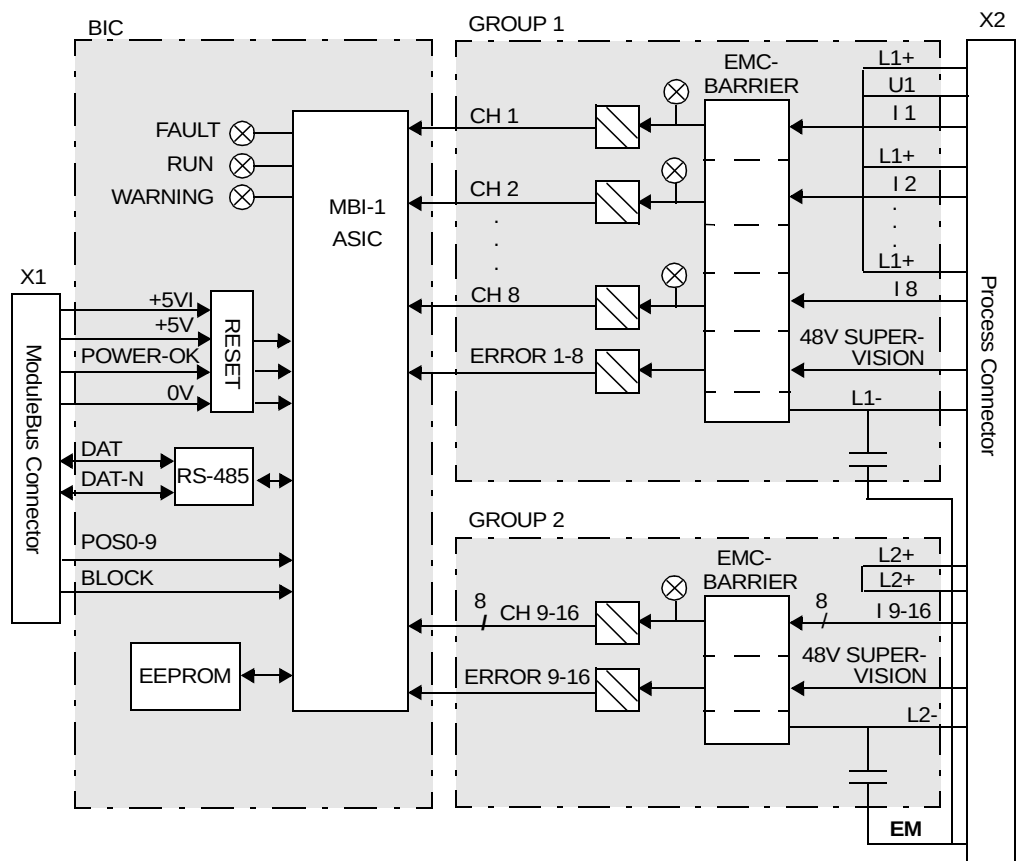
Feature	DI811 Digital Input Module
Number of channels	16 (2 x 8), current sinking
Rated voltage (process power supply range)	48 V d.c. (36 to 60 V d.c.)
Input signal voltage range, "1"	30 to 60 V
Input signal voltage range, "0"	-60 to +10 V
Nominal input channel current	4 mA @ 48 V d.c.
Input Impedance	11 kΩ
Maximum field cable length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	2 channels (1 per group)
Current consumption +5 V	50 mA
Power dissipation ⁽¹⁾	2.7 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812, TU814, TU830 or TU838
MTU keying code	BD
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V

Table A-38 DI811 Digital Input Module Specifications (Continued)

Feature	DI811 Digital Input Module
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.18 kg (0.4 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 48 Volts.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.18.0.4 Block Diagram DI811



A.18.0.5 Process Connections*Table A-39 DI811 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
+48 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	B1, B2	A1 (F1)
Ch1 Input	C1	3	C1	B1
Ch 2 Input	B1	16	C2	B2
Ch1/Ch2, L1-	A1	-	A1, A2	A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)
Ch 3 Input	C2	4	C3	B3
Ch 4 Input	B2	17	C4	B4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)
Ch 5 Input	C3	5	C5	B5
Ch 6 Input	B3	18	C6	B6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)
Ch 7 Input	C4	6	C7	B7
Ch 8 Input	B4	19	C8	B8
Ch 7/Ch8, L1-	A4	-	A7, A8	A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)
Ch 9 Input	C5	7	C9	B9

Table A-39 DI811 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
Ch 10 Input	B5	20	C10	B10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)
Ch 11 Input	C6	8	C11	B11
Ch 12 Input	B6	21	C12	B12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)
Ch 13 Input	C7	9	C13	B13
Ch 14 Input	B7	22	C14	B14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)
Ch 15 Input	C8	10	C15	B15
Ch 16 Input	B8	23	C16	B16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16
+48 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-48 shows the process connections for the Digital Input Module DI811 when installed on a TU830 Extended MTU.

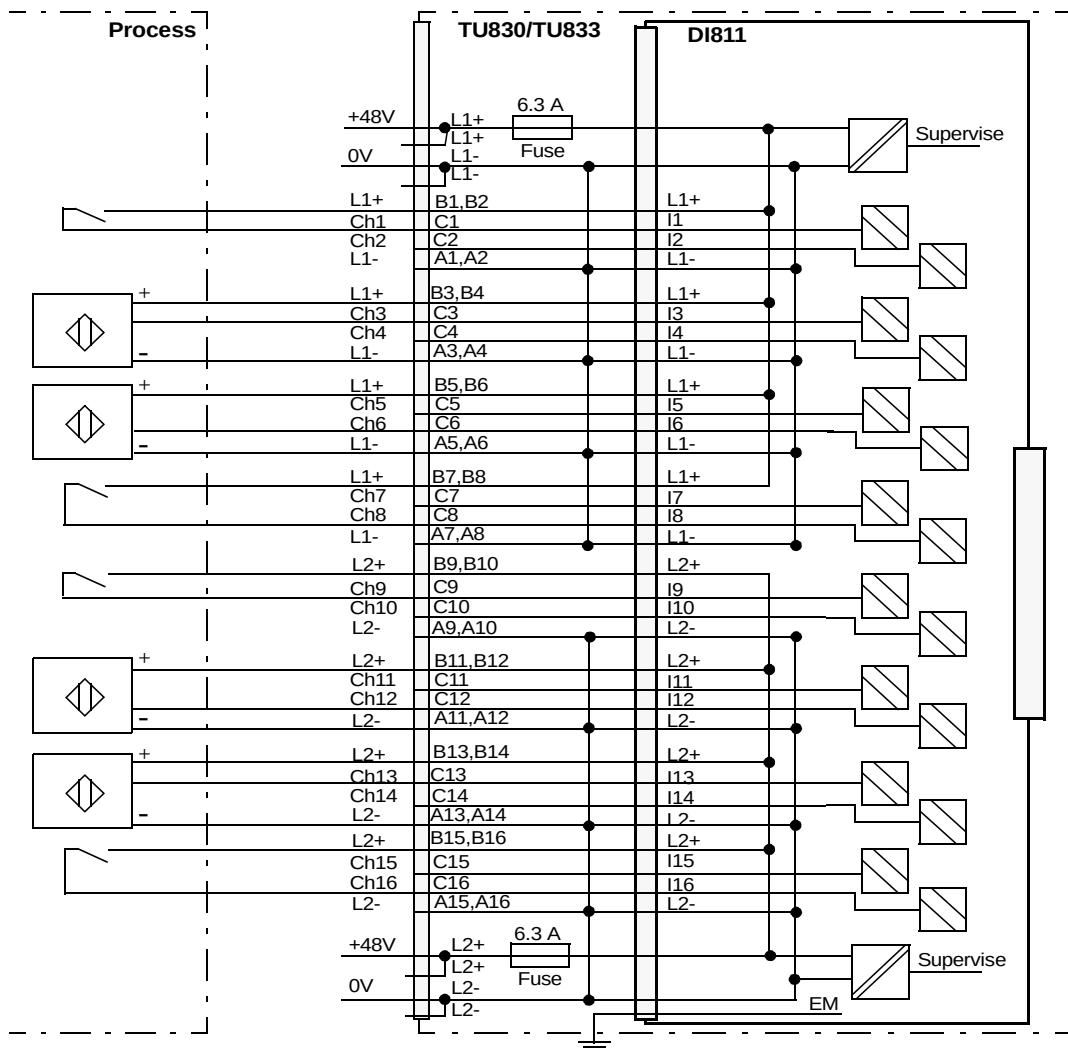


Figure A-48 DI811 with TU830 Extended MTU Process Connections

Figure A-49 shows the process connections for the Digital Input Module DI811 when installed on a TU838 Extended MTU.

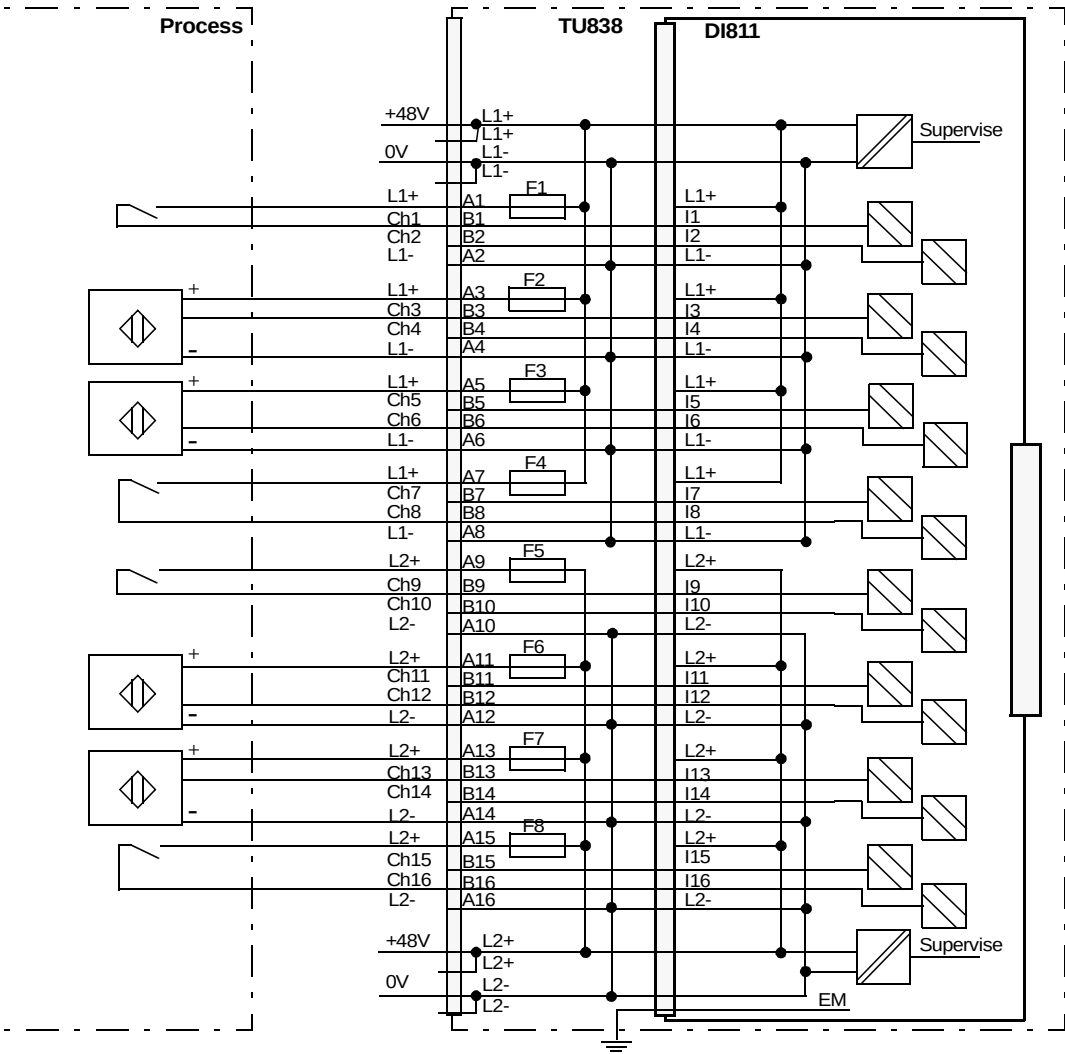


Figure A-49 DI811 with TU838 Extended MTU Process Connections

Figure A-50 shows the process connections for the DI811 when installed on a TU810 or TU814 Compact MTU.

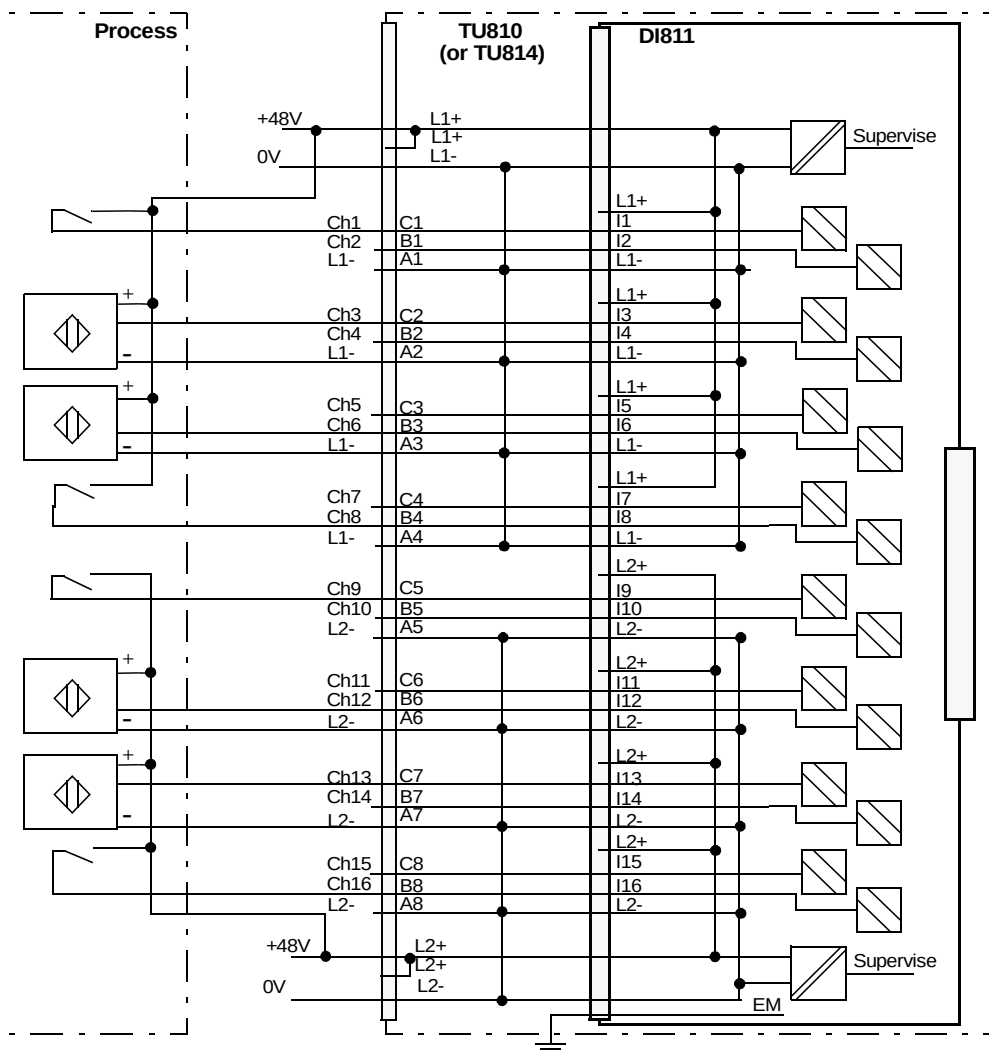


Figure A-50 DI811 with TU810 or TU814 Compact MTU Process Connections

Figure A-51 shows the process connections for the DI811 when installed on a TU812 Compact MTU

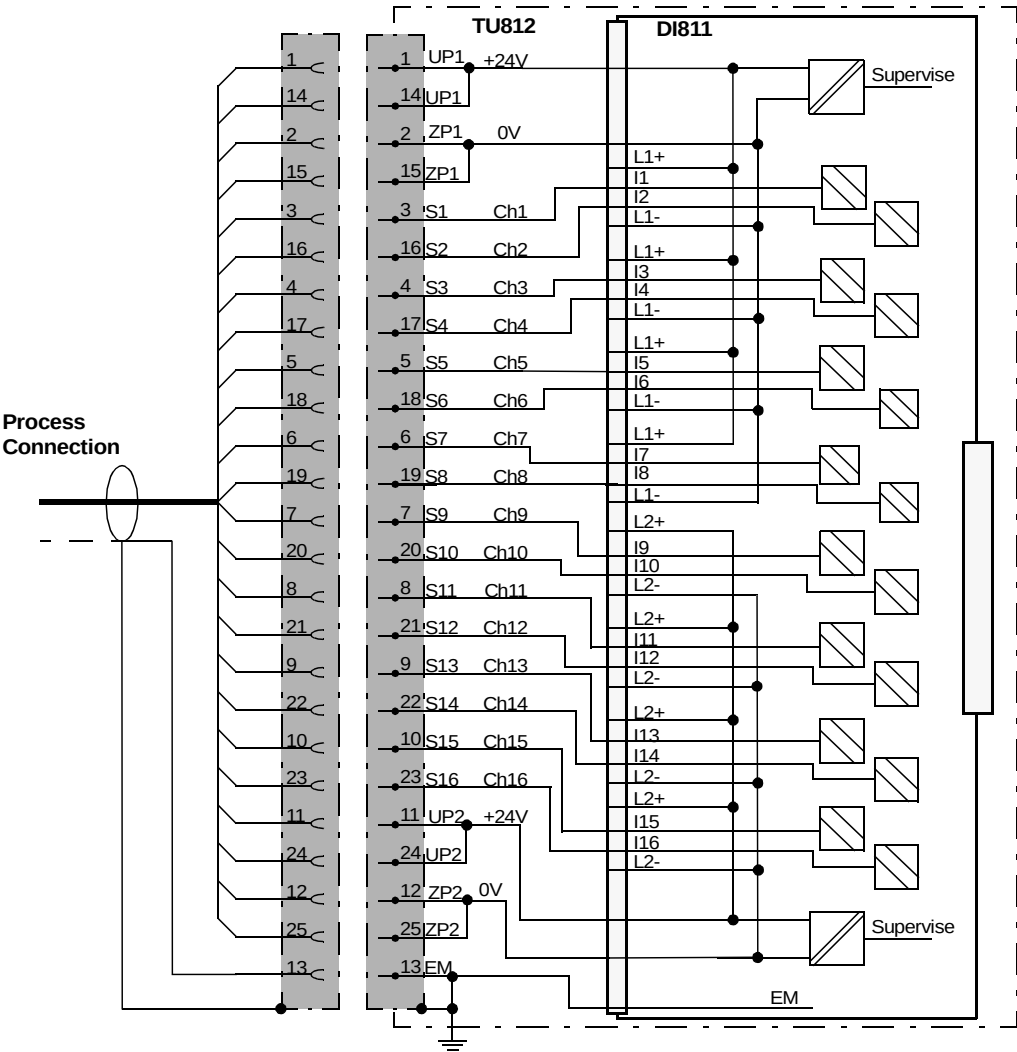


Figure A-51 DI811with TU812

A.19 DI814 Digital Input Module, 24 V, Current Sourcing

A.19.0.1 Features

- 16 channels for 24 V d.c. inputs with current sourcing
- 2 Isolated groups of 8 with voltage supervision
- Input status indicators
- EMC protection
- DIN rail mounting.

A.19.0.2 Description

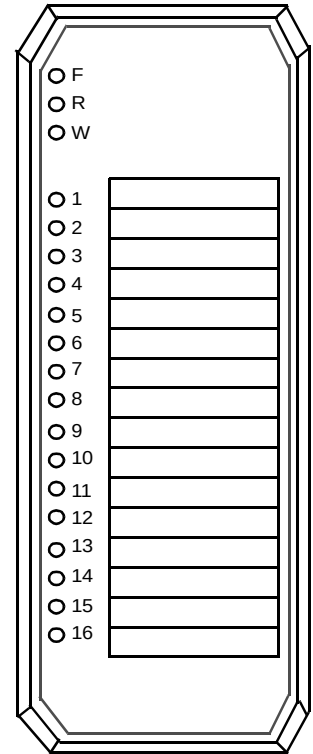
The DI814 is a 16 channel 24 V digital input module with current sourcing for the S800 I/O. The input voltage range is 18 to 30 volt dc and the input current source is 6 mA at 24 V. The inputs are divided into two individually isolated groups with eight channels and one voltage supervision input in each group.

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (16) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is



deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

Five different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V process voltage supervision inputs, but requires external terminals for distribution of 24 V power supply to the devices. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

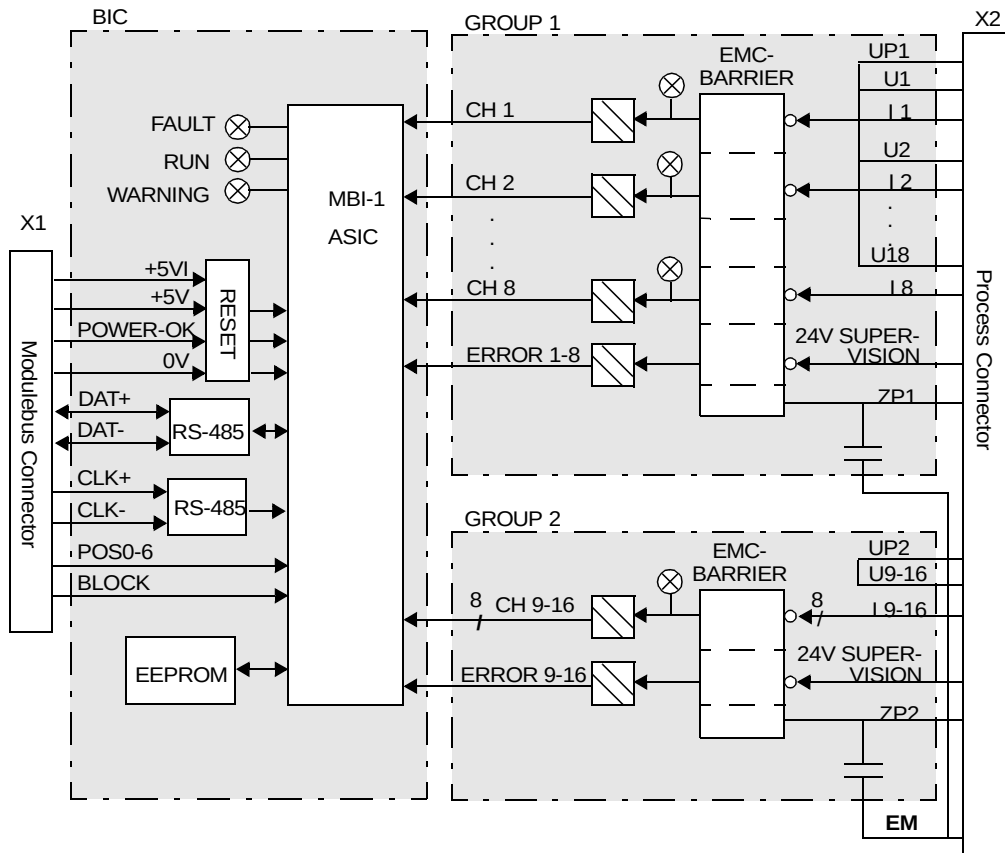
A.19.0.3 Technical Data*Table A-40 DI814 Digital Input Module Specifications*

Feature	DI814 Digital Input Module
Number of channels	16 (2 x 8), current sourcing
Rated voltage (process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	15 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	6 mA @ 24 V d.c.
Input Impedance	3.5 k Ω
Maximum Field Cable Length	600 meters (656 yd.)
Filter times (digital, selectable)	2, 4, 8, 16 ms
Process voltage supervision	2 channels (1 per group)
Current consumption +5 V	50 mA
Power dissipation ⁽¹⁾	1.8 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812, TU814, TU830 or TU838
MTU keying code	BE
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V

Table A-40 DI814 Digital Input Module Specifications (Continued)

Feature	DI814 Digital Input Module
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.15 kg (0.33 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volts.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.19.0.4 Block Diagram DI814

A.19.0.5 Process Connections*Table A-41 DI814 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	B1, B2	A1 (F1)
Ch1 Input	C1	3	C1	B1
Ch 2 Input	B1	16	C2	B2
Ch1/Ch2, L1-	A1	-	A1, A2	A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)
Ch 3 Input	C2	4	C3	B3
Ch 4 Input	B2	17	C4	B4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)
Ch 5 Input	C3	5	C5	B5
Ch 6 Input	B3	18	C6	B6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)
Ch 7 Input	C4	6	C7	B7
Ch 8 Input	B4	19	C8	B8
Ch 7/Ch8, L1-	A4	-	A7, A8	A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)
Ch 9 Input	C5	7	C9	B9

Table A-41 DI814 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector (1)	TU830/TU833 Terminal	TU838 Terminal
Ch 10 Input	B5	20	C10	B10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)
Ch 11 Input	C6	8	C11	B11
Ch 12 Input	B6	21	C12	B12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)
Ch 13 Input	C7	9	C13	B13
Ch 14 Input	B7	22	C14	B14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)
Ch 15 Input	C8	10	C15	B15
Ch 16 Input	B8	23	C16	B16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-52 shows the process connections for the Digital Input Module DI814 (current sourcing) when installed on a TU830 Extended MTU.

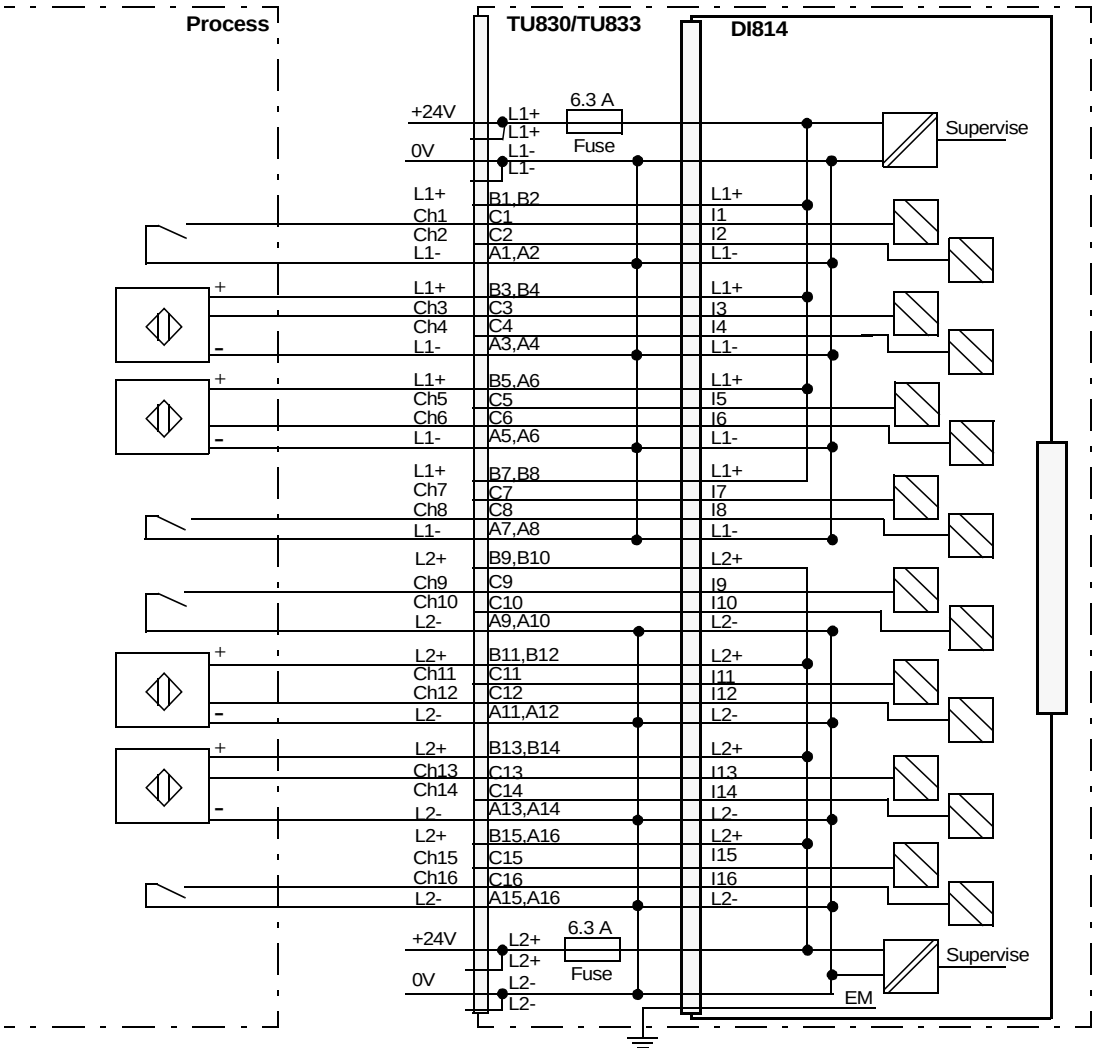


Figure A-52 DI814 with TU830 Extended MTU Process Connections

Figure A-53 shows the process connections for the Digital Input Module DI814 (current sourcing) when installed on a TU838 Extended MTU.

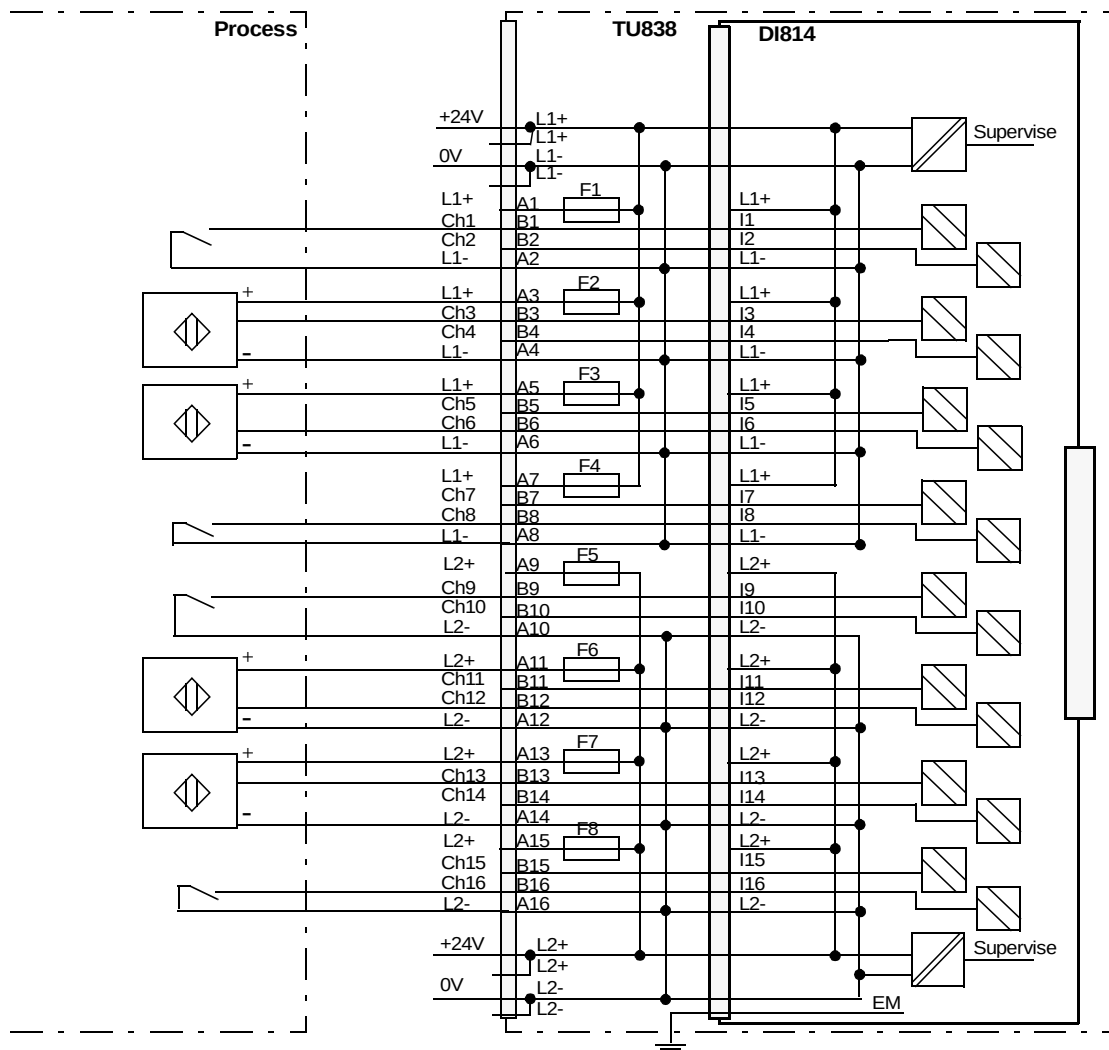


Figure A-53 DI814 with TU838 Extended MTU Process Connections

Figure A-54 shows the process connections for the DI814 when installed on a TU810 or TU814 Compact MTU.

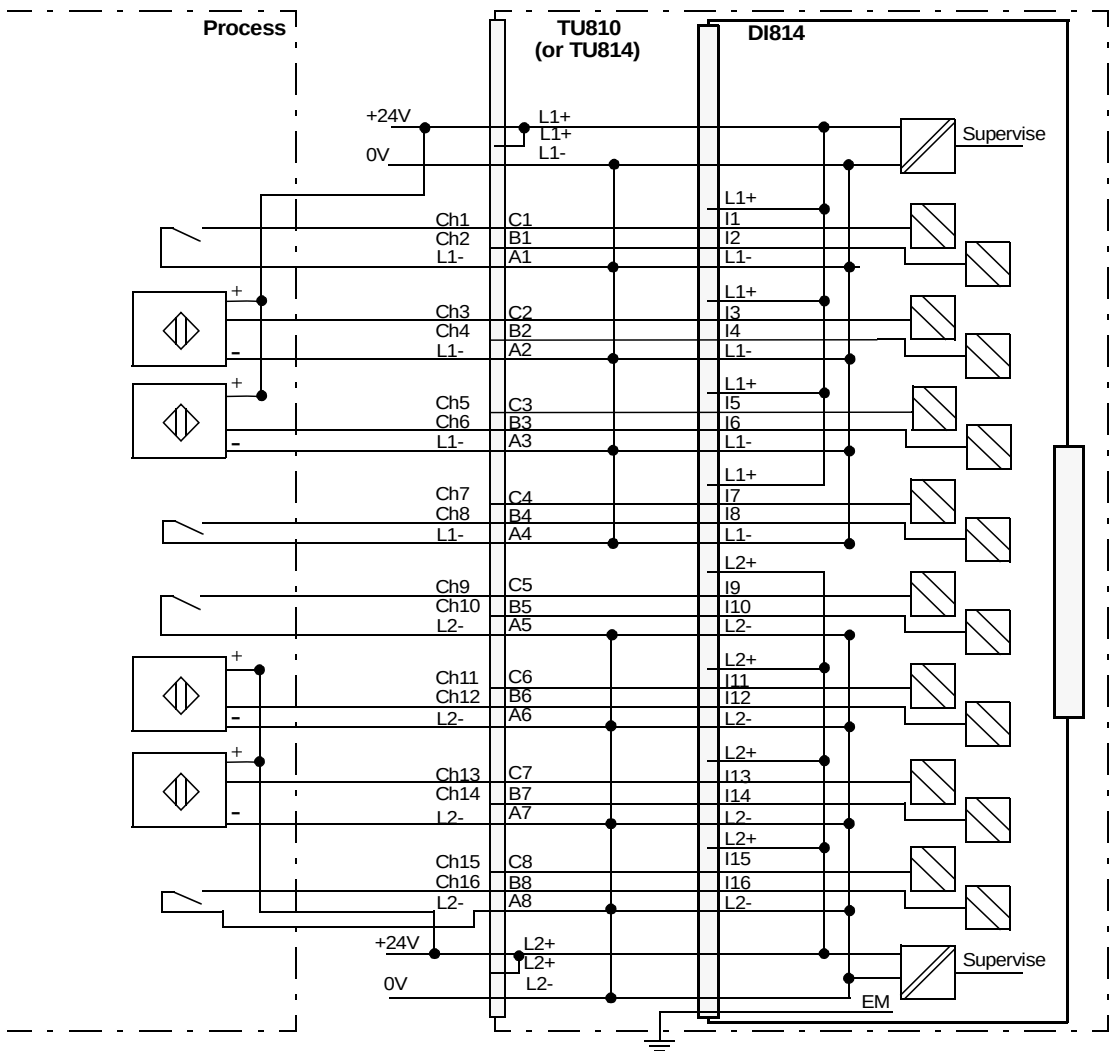


Figure A-54 DI814 with TU810 or TU814 Compact MTU Process Connections

Figure A-55 shows the process connections for the DI814 when installed on a TU812 Compact MTU.

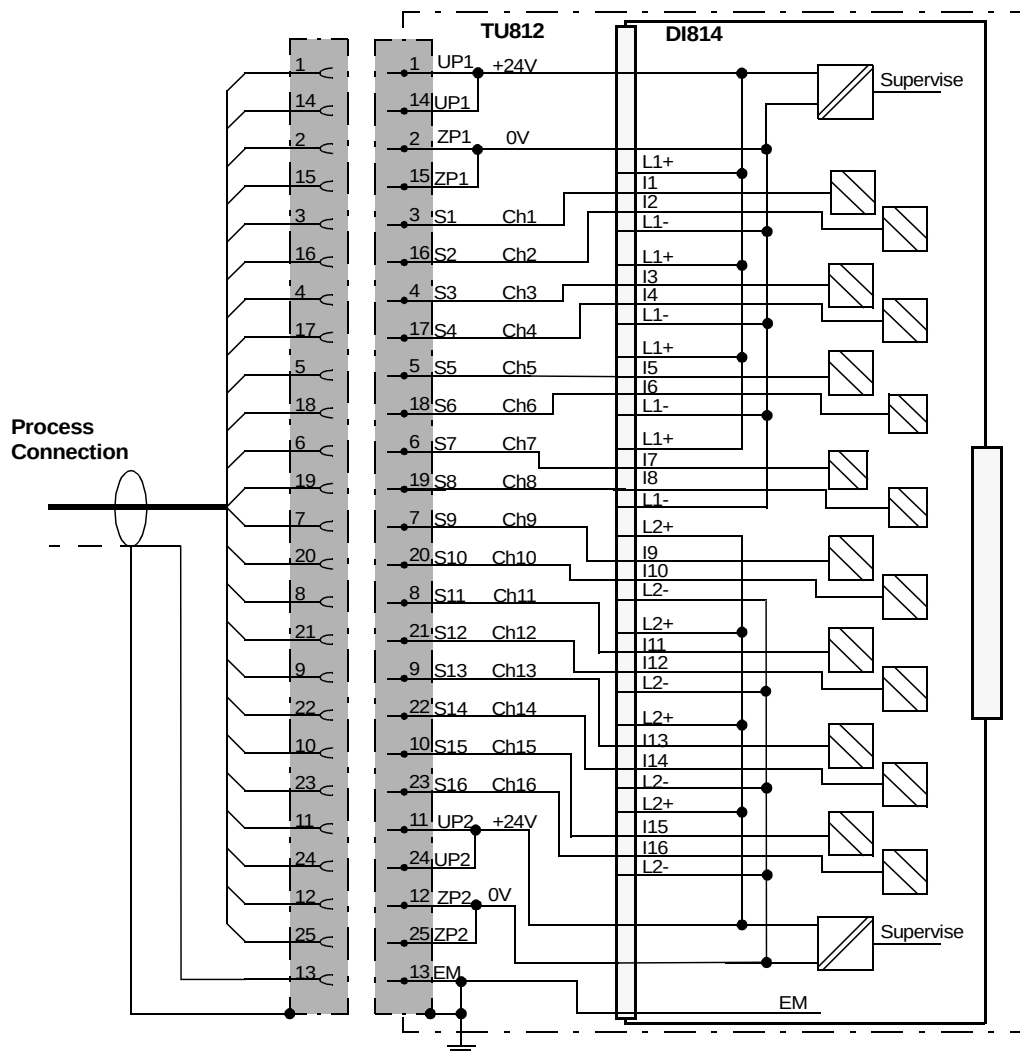


Figure A-55 DI814 with TU812 Compact MTU Process Connections

A.20 DI820 Digital Input Module, 120 V a.c./d.c

A.20.0.1 Features

- 8 channels for 120 V a.c./d.c. inputs
- Individually isolated channels
- Voltage supervision of field input power
- Input status indicators
- Signal filtering
- EMC protection
- DIN rail mounting.
- Also in a G3 compliant version

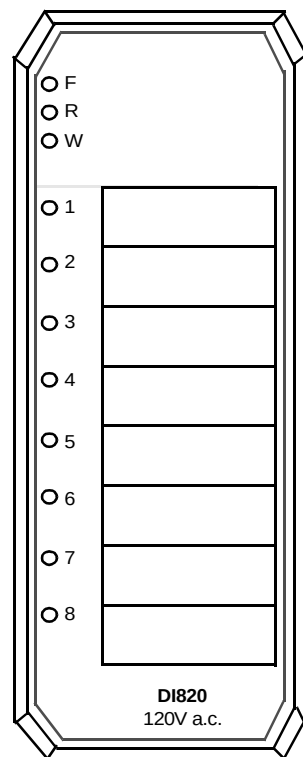
A.20.0.2 Description

The DI820 is an 8 channel 120 V a.c./d.c. digital input module for the S800 I/O. This module has 8 digital inputs. The a.c. input voltage range is 77 - 130 volt and the input current is 10 mA at 120 V a.c. The d.c. input range is 75 - 145 V and the input current is 2.8 mA at 110 V. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED, optical isolation barrier and an analog filter (6 ms).

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (8) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

Channel 1 can be used as voltage supervision input for channels 2 - 4, and channel 8 can be used as voltage supervision input for channels 5 - 7.



If the voltage connected to channel 1 or 8 disappears, the error inputs are activated and the Warning LED turns on. The error signal can be read from the ModuleBus. This supervision can be enabled/ disabled with a parameter. If the error inputs are disabled channel 1 and 8 can be used as normal input channels.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

Two different types of MTUs can be used, TU831 Extended MTU and TU811 Compact MTU both have two terminals per channel.

A.20.0.3 Technical Data*Table A-42 DI820 Digital Input Module Specifications*

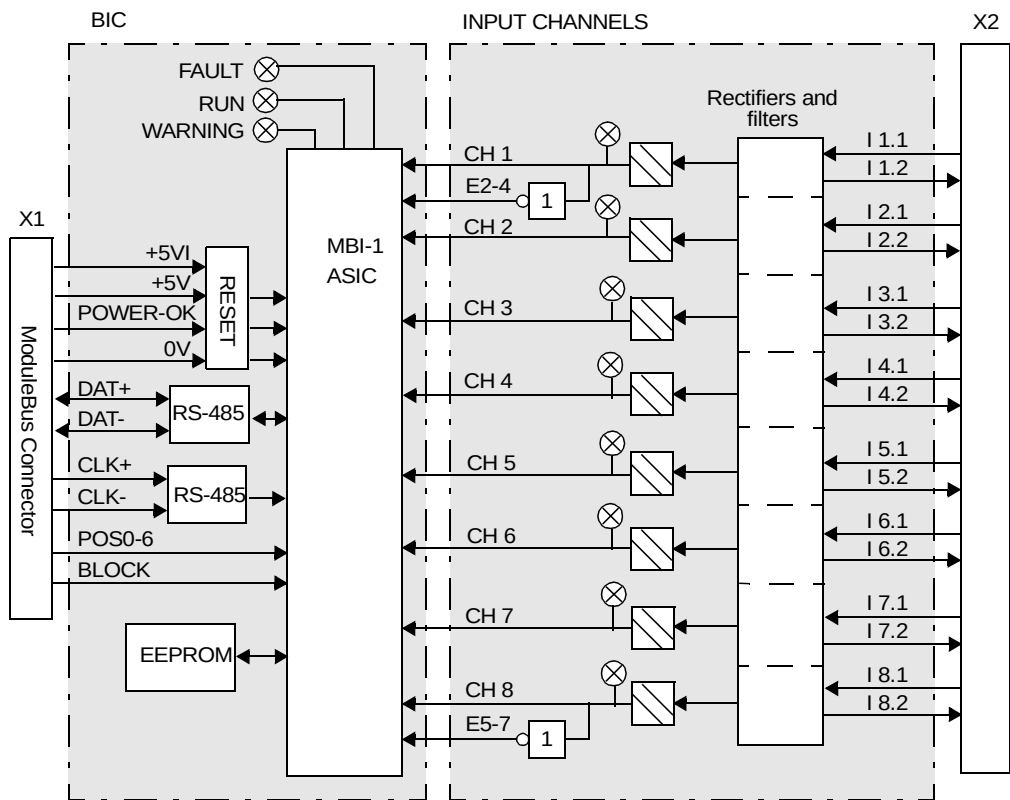
Feature	DI820 Digital Input Module
Number of channels	8
Rated voltage (process power supply range)	120 V a.c. (77 to 130 V a.c.) 110 V d.c. (75 to 145 V d.c.)
Input voltage range, "1"	77 to 130 V ±75 to 145 V d.c.
Input voltage range, "0"	0 to 30 V a.c. ±0 to 20 V d.c.
Nominal input channel current	10 mA ac @ 120 V a.c. 2.8 mA dc @ 110 V d.c.
Input frequency range a.c.	47...65 Hz
Impedance	12 kΩ (a.c.) 39 KΩ (d.c.)
Maximum Field Cable Length	200 meters (219 yd.) 100pF/m. for a.c. 600 meters (656 yd.) for d.c.
Filter times (digital, selectable)	2, 4, 8, 16 ms
Analog filter On/Off delay	5/18 ms
Process voltage supervision	2 channels, 1 and 8
Current consumption +5 V	50 mA
Power dissipation ⁽¹⁾	2.8 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾

Table A-42 DI820 Digital Input Module Specifications (Continued)

Feature	DI820 Digital Input Module
Isolation	Individually isolated channels (RIV=250 V)
Module termination units	TU811 or TU831
MTU keying code	AB
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.18 kg (0.4 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.20.0.4 Block Diagram DI820



A.20.0.5 Process Connections*Table A-43 DI820 Process Connections*

Process Connection	TU811 Terminal	TU831 Terminal
Ch 1.1 Input	B1	B1
Ch 1.2 Input	A1	A1
Ch 2.1 Input	C2	B2
Ch 2.2 Input	A2	A2
Ch 3.1 Input	B3	B3
Ch 3.2 Input	A3	A3
Ch 4.1 Input	C4	B4
Ch 4.2 Input	A4	A4
Ch 5.1 Input	B5	B5
Ch 5.2 Input	A5	A5
Ch 6.1 Input	C6	B6
Ch 6.2 Input	A6	A6
Ch 7.1 Input	B7	B7
Ch 7.2 Input	A7	A7
Ch 8.1 Input	C8	B8
Ch 8.2 Input	A8	A8

Figure A-56 shows the process connections for the Digital Input Module DI820 when installed on a TU831 Extended MTU.

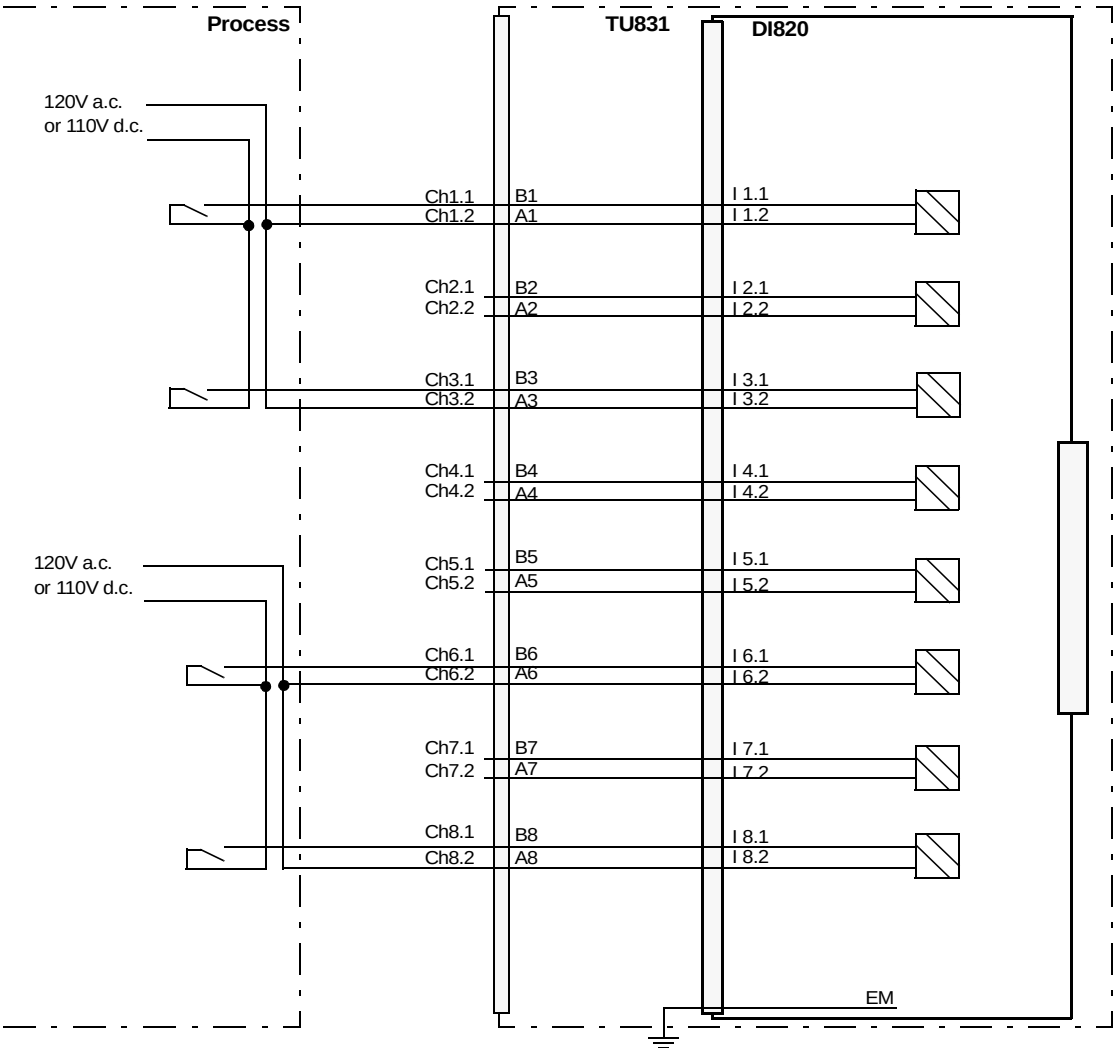


Figure A-56 DI820 with TU831 Extended MTU Process Connections

Figure A-57 shows the process connections for the DI820 when installed on a TU811 or TU813 Compact MTU.

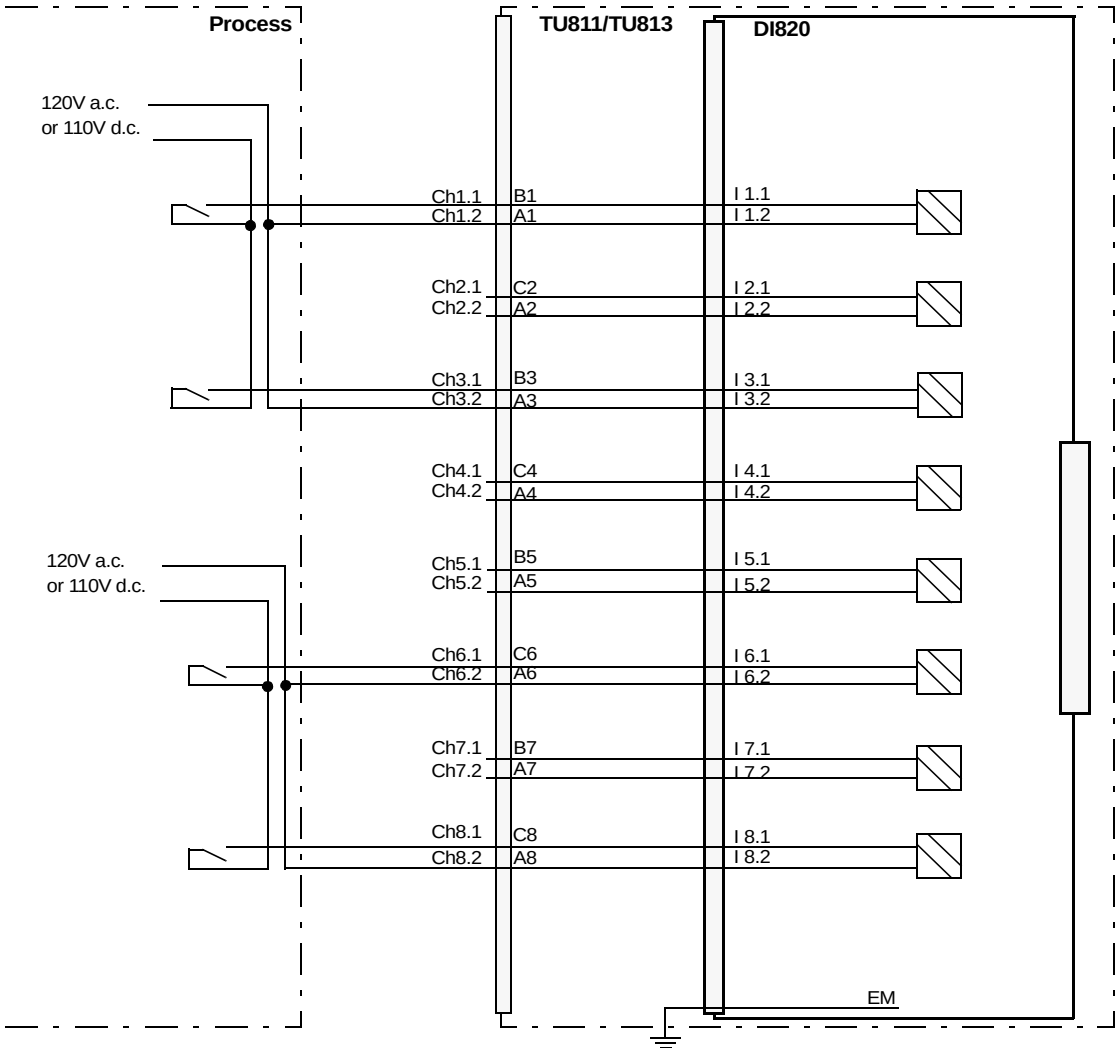


Figure A-57 DI820 with TU811 or TU813 Compact MTU Process Connections

A.21 DI821 Digital Input Module, 230 V a.c./d.c.

A.21.0.1 Features

- 8 channels for 230 V a.c./d.c. inputs
- Individually isolated points
- Voltage supervision of field input power
- Input status indicators
- Signal filtering
- EMC protection
- DIN rail mounting.
- Also in a G3 compliant version

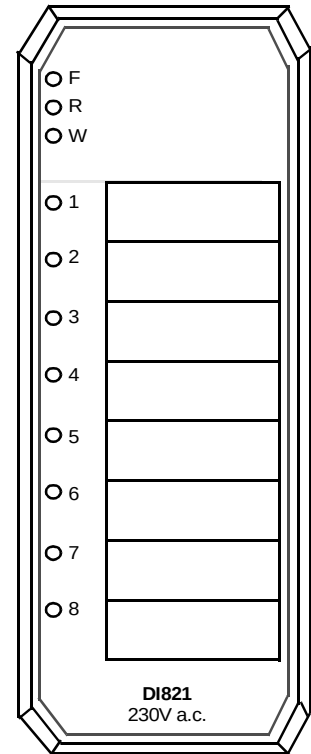
A.21.0.2 Description

The DI821 is an 8 channel 230 V a.c./d.c. digital input module for the S800 I/O. This module has 8 digital inputs. The ac input voltage range is 164 to 264 volt and the input current is 11 mA at 230 V a.c. The d.c. input voltage range is 175 to 275 volt and the input current is 1.6 mA at 220 V d.c. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED, optical isolation barrier and an analog filter (6 ms).

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (8) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

Channel 1 can be used as voltage supervision input for channels 2 - 4, and channel 8 can be used as voltage supervision input for channels 5 - 7.



If the voltage connected to channel 1 or 8 disappears, the error inputs are activated and the Warning LED turns on. The error signal can be read from the ModuleBus. This supervision can be enabled/disabled with the a parameter. If the error inputs are disabled channel 1 and 8 can be used as normal input channels.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input channels can be digitally filtered. The different filter times that can be achieved are 2, 4, 8 and 16 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than 3, 6, 12 and 24 ms will get through the filter.

Two different types of MTUs can be used, TU831 Extended MTU and TU811 Compact MTU both have two terminals per channel.

A.21.0.3 Technical Data*Table A-44 DI821 Digital Input Module Specifications*

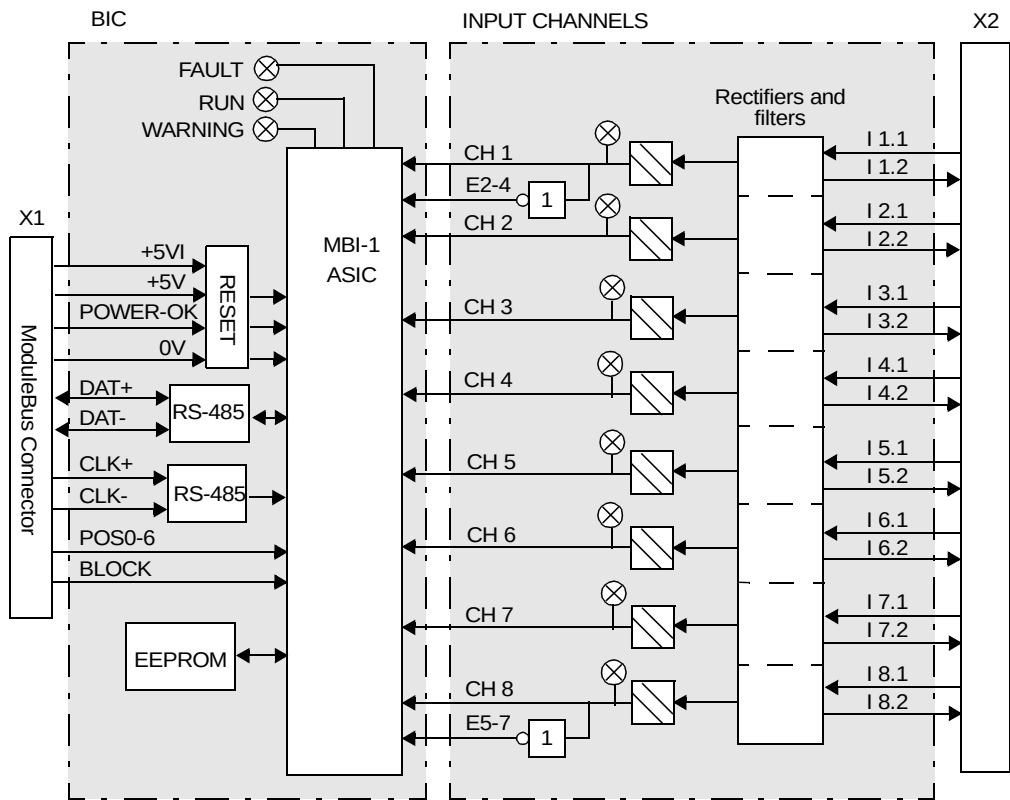
Feature	DI821 Digital Input Module
Number of channels	8
Rated voltage (process power supply range)	230 V a.c. (164 to 264 V a.c.) 220 V d.c. (175 to 275 V d.c.)
Input voltage range, "1"	164 to 264 V a.c. ±175 to 275 V d.c.
Input voltage range, "0"	0 to 50 V a.c. ±0 to 40 V d.c.
Nominal input channel current	11 mA @ 230 V a.c. 1.6mA @ 220 V d.c.
Input frequency range, a.c.	47...63 Hz
Impedance	21 kΩ (a.c.) 134 KΩ (d.c.)
Maximum field cable length	200 meters (219 yd.) 100pF/m for a.c. 600 meters (656 yd.) for d.c.
Filter times (digital, selectable)	2, 4, 8, 16 ms
Analog filter On/Off delay	5/28 ms
Process voltage supervision	2 channels, 1 and 8
Current consumption +5 V	50 mA
Power dissipation ⁽¹⁾	2.8 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾

Table A-44 DI821 Digital Input Module Specifications (Continued)

Feature	DI821 Digital Input Module
Isolation	Individually isolated channels (RIV=250 V)
Module termination units	TU811 or TU831
MTU keying code	AC
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.18 kg (0.4 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.21.0.4 Block Diagram DI821



A.21.0.5 Process Connections*Table A-45 DI821 Process Connections*

Process Connection	TU811 Terminal	TU831 Terminal
Ch 1.1 Input	B1	B1
Ch 1.2 Input	A1	A1
Ch 2.1 Input	C2	B2
Ch 2.2 Input	A2	A2
Ch 3.1 Input	B3	B3
Ch 3.2 Input	A3	A3
Ch 4.1 Input	C4	B4
Ch 4.2 Input	A4	A4
Ch 5.1 Input	B5	B5
Ch 5.2 Input	A5	A5
Ch 6.1 Input	C6	B6
Ch 6.2 Input	A6	A6
Ch 7.1 Input	B7	B7
Ch 7.2 Input	A7	A7
Ch 8.1 Input	C8	B8
Ch 8.2 Input	A8	A8

Figure A-58 shows the process connections for the Digital Input Module DI821 when installed on a TU831 Extended MTU.

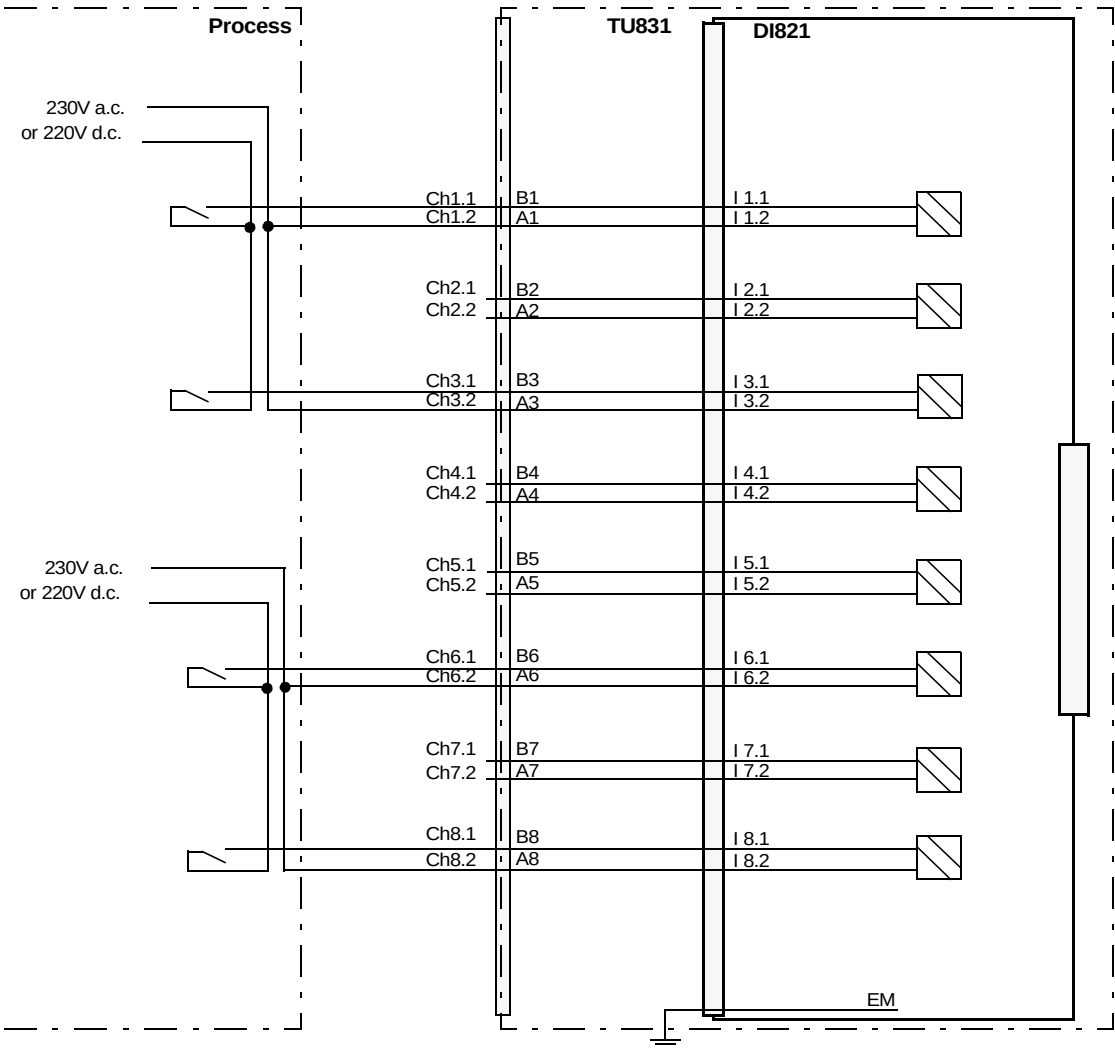


Figure A-58 DI821 with TU831 Extended MTU Process Connections

Figure A-59 shows the process connections for the DI821 when installed on a TU811 or TU813 Compact MTU.

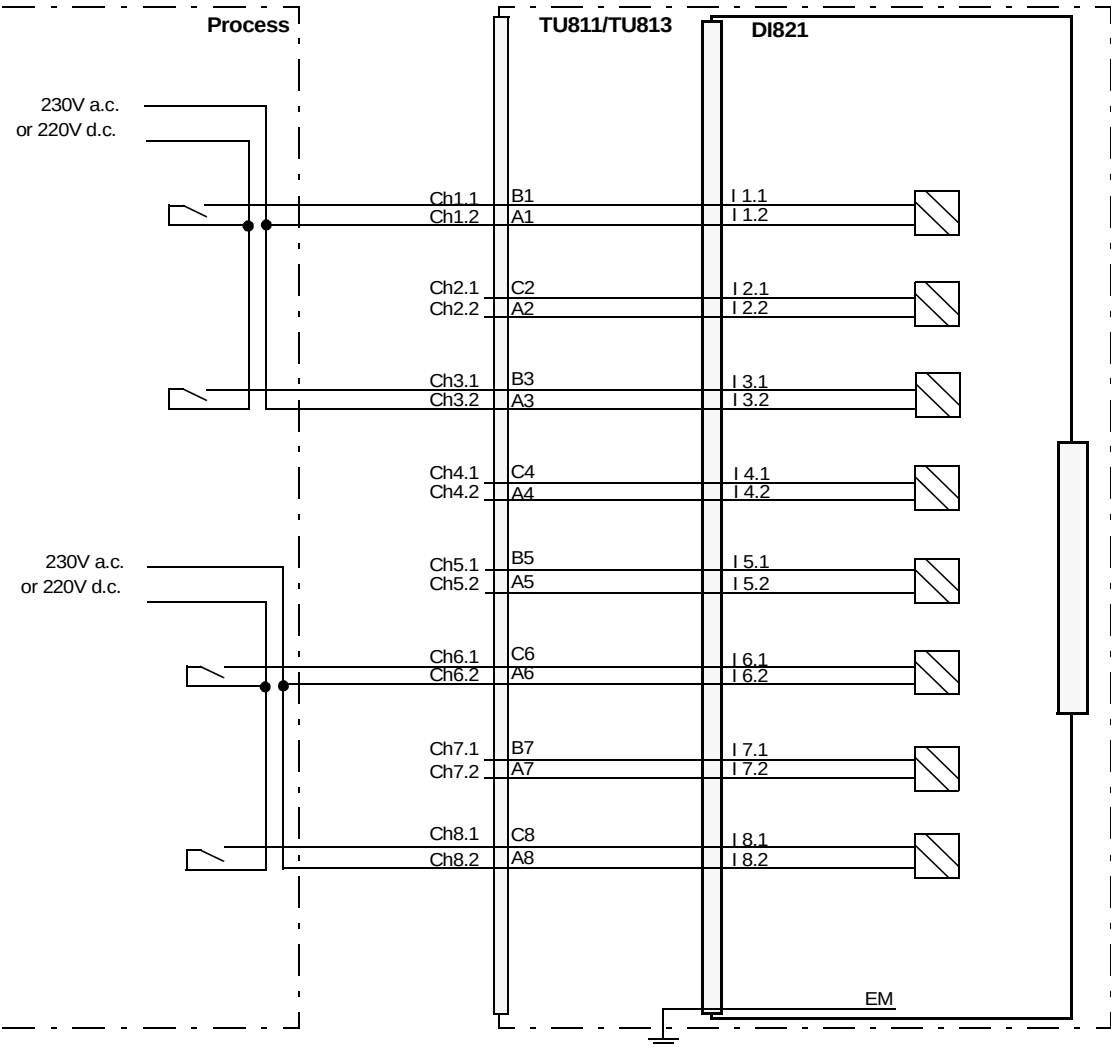


Figure A-59 DI821 with TU811 or TU813 Compact MTU Process Connections

A.22 DI825 Digital Input Module, 125 V d.c with SOE

A.22.0.1 Features

- 8 channels for 125 V d.c. inputs
- Individually isolated channels
- Input status indicators
- Sequence of event (SOE) functionality
- Signal filtering
- EMC protection
- DIN rail mounting.

A.22.0.2 Description

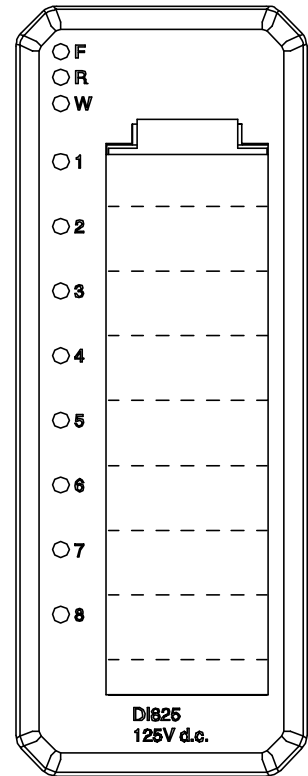
The DI825 is an 8 channel 125 V d.c. digital input module for the S800 I/O. The input range is 75 - 145 V and the input current is 3.9 mA at 125 V. The inputs are individually isolated.

Every input channel consists of current limiting components, EMC protection components, input state indication LED, optical isolation barrier.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (8) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

Channel 1 can be used as voltage supervision input for channels 2 - 4, and channel 8 can be used as voltage supervision input for channels 5 - 7.

If the voltage supervision is used and the voltage connected to channel 1 or 8 disappears, the channel error will be set for the channels and the Warning LED turns on. The error signal can be read from the ModuleBus. This supervision can be



enabled/ disabled with a parameter. If the supervision is disabled channel 1 and 8 can be used as normal input channels.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input channels can be digitally filtered. The filter times can be set between 0 to 100 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than will get through the filter.

Three different types of MTUs can be used; TU831 Extended MTU, TU811 or TU813 Compact MTU. All three has two terminals per channel.

A.22.0.3 Event Recording

The DI825 Input Module can be used for event recording (SOE), that is, changing signals at digital input channels can be announced together with a time stamp indicating when it occurred. Events are generated on both positive and negative going edges of the signals. The time stamp has a resolution of 0.4 millisecond, and is compensated for the filter time.

The module has intermediate storage for 32 events.

The SOE functionality can be switched on and off per channel.

For all channels with enabled SOE capability, a shutter filter is implemented that prevents intermediate storage for events from overflow. The shutter filter is closed as soon as the number of events generated within the shutter period (0-255 seconds) exceeds the shutter trigger number (0-255 changes). The shutter filter remains closed as long as the recovery time (0-65535 seconds) has not expired.

A.22.0.4 Simple Digital Input

If no event recording is used, the DI825 acts like a simple digital input device.

A.22.0.5 Technical Data*Table A-46 DI825 Digital Input Module Specifications*

Feature	DI825 Digital Input Module
Number of channels	8
Rated voltage	125 V d.c.
Input voltage range, "1"	71 to 156 V
Input voltage range, "0"	0 to 20 V
Nominal input channel current	3,9 mA @ 125 V
Input current "1"	≥ 1.8 mA
Input current "0"	≤ 1.0 mA
Nominal impedance	32 k Ω
Maximum Field Cable Length	600 meters (656 yd.)
Filter times (digital, selectable)	0 to 100 ms
Process voltage supervision	2 channels, 1 and 8
Shutter filter	
Shutter period	0 - 255 s
Shutter trigger number	0 - 255 changes
Recovery time	0 - 65535 s
Intermediate storage	32 events
Event recording resolution	0.4 ms
Error time stamp	-0.25 ms to 1 ms
Current consumption +5 V	Max 90 mA
Max power dissipation	4.4 W ⁽¹⁾
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾

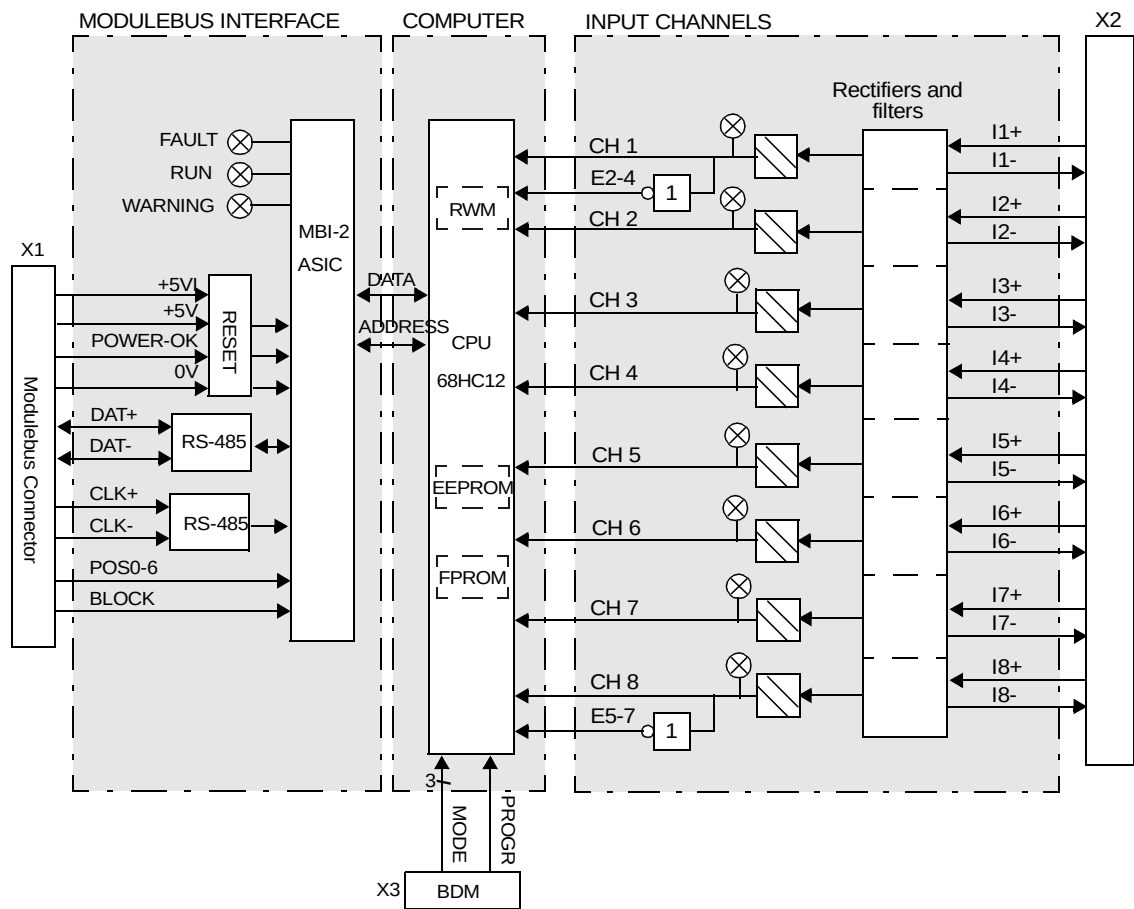
Table A-46 DI825 Digital Input Module Specifications (Continued)

Feature	DI825 Digital Input Module
Isolation	Individually isolated channels (RIV=250 V)
Dielectric test voltage	2300 V a.c. Ch - EM 1350 V a.c. Ch - Ch
Module termination units	TU811, TU813 or TU831
MTU keying code	AB
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.14 kg (0.31 lbs.)

(1) All inputs activated

(2) 40°C (104°F) applies to compact MTUs with I/O-modules mounted on vertical DIN rail.

A.22.0.6 Block Diagram DI825



A.22.0.7 Process Connections*Table A-47 DI825 Process Connections*

Process Connection	TU811 or TU813 Terminal	TU831 Terminal
Ch 1.1 Input	B1	B1
Ch 1.2 Input	A1	A1
Ch 2.1 Input	C2	B2
Ch 2.2 Input	A2	A2
Ch 3.1 Input	B3	B3
Ch 3.2 Input	A3	A3
Ch 4.1 Input	C4	B4
Ch 4.2 Input	A4	A4
Ch 5.1 Input	B5	B5
Ch 5.2 Input	A5	A5
Ch 6.1 Input	C6	B6
Ch 6.2 Input	A6	A6
Ch 7.1 Input	B7	B7
Ch 7.2 Input	A7	A7
Ch 8.1 Input	C8	B8
Ch 8.2 Input	A8	A8

Figure A-56 shows the process connections for the Digital Input Module DI825 when installed on a TU811 or TU813 Compact MTU.

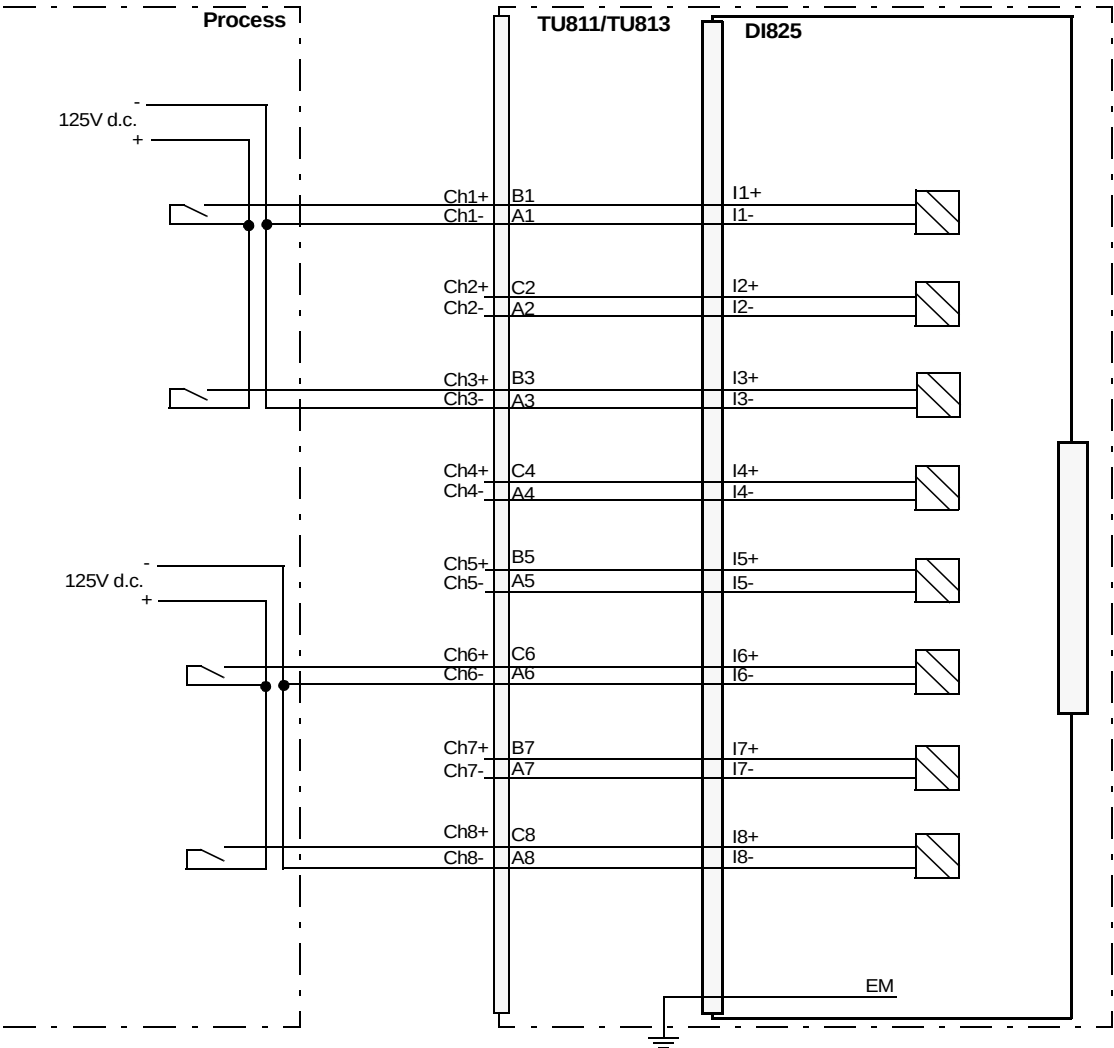


Figure A-60 DI825 with TU811 or TU813 Compact MTU Process Connections

Figure A-57 shows the process connections for the DI825 when installed on a TU831 Extended MTU.

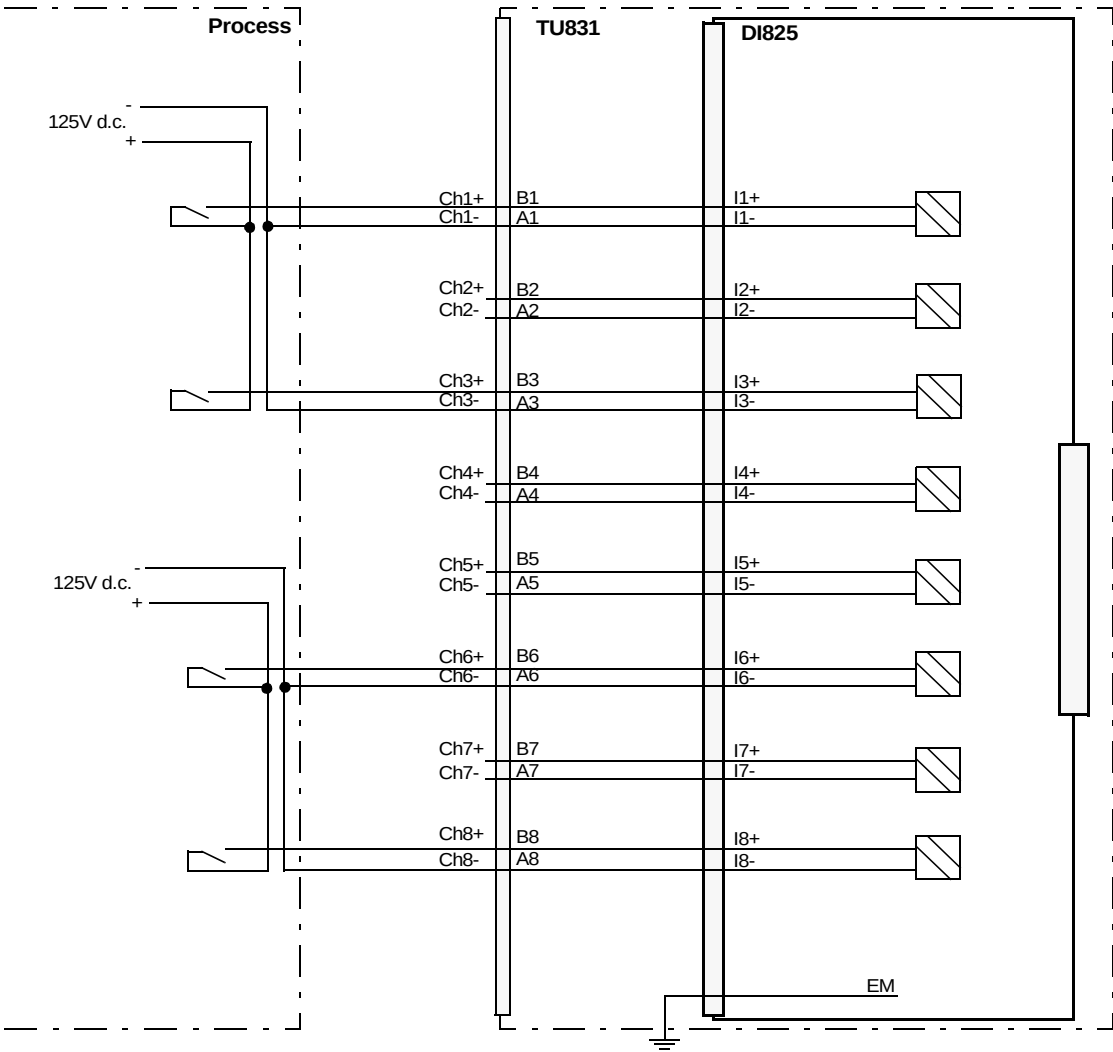


Figure A-61 DI825 with TU831 Extended MTU Process Connections

A.23 DI830 Digital Input Module, 24 V d.c. with SOE, Current Sinking

A.23.0.1 Features

- 16 channels for 24 V d.c. inputs with current sinking
- 2 isolated groups of 8 channels with voltage supervision
- Input status indicators
- Sequence of event (SOE) functionality
- Shutter filter
- EMC protection
- DIN rail mounting.

A.23.0.2 Description

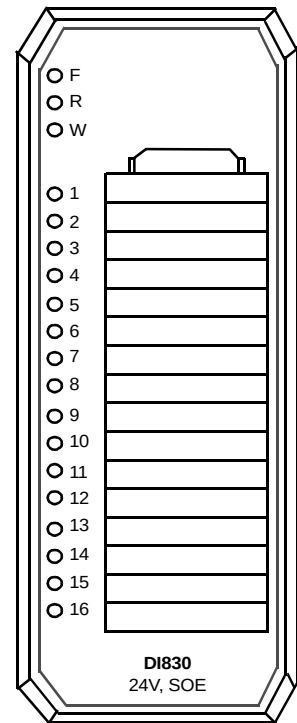
The DI830 is a 16 channel 24 V d.c. digital input module for the S800 I/O. The input voltage range is 18 to 30 V d.c. and the input current is 6 mA at 24 V d.c.

Each input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (16) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in the Init state, Error state or Not Configured state. In Not Configured state the FAULT LED is turned off after the first valid master frame to the module.

The module cyclically performs self-diagnostics. Module diagnostics include:

- Process power supply supervision (causes a module failure if detected)
- Event queue full



- Time synchronization missing

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input signals can be digitally filtered. The filter is selectable from 0 to 100 ms. This means that pulses shorter than the filter time will be filtered out and pulses longer than specified will get through the filter.

Five different types of MTUs can be used. The Extended MTU (for example TU830) enables three wire connection to the transducers without additional terminals. The Compact MTU (for example TU810 or TU 814) has terminals for process voltage supervision inputs, but requires external terminals for distribution of process power supply to the transducers. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.23.0.3 Event Recording

The DI830 Input Module can be used for event recording (SOE), that is, changing signals at digital input channels can be announced together with a time stamp indicating when it occurred. Events are generated on both positive and negative going edges of the signal. The time stamp has a resolution of 0.4 millisecond, and is compensated for the filter time.

The module has intermediate storage for 32 events.

The SOE functionality can be switched on and off per channel.

For all channels with enabled SOE capability, a shutter filter is implemented that prevents intermediate storage for events from overflow. The shutter filter is closed as soon as the number of events generated within the shutter period (0-255 seconds) exceeds the shutter trigger number (0-255 changes). The shutter filter remains closed as long as the recovery time (0-65535 seconds) has not expired.

A.23.0.4 Simple Digital Input

If no event recording is used, the DI830 acts like a simple digital input device.

A.23.0.5 Technical Data*Table A-48 DI830 Digital Input Module Specifications*

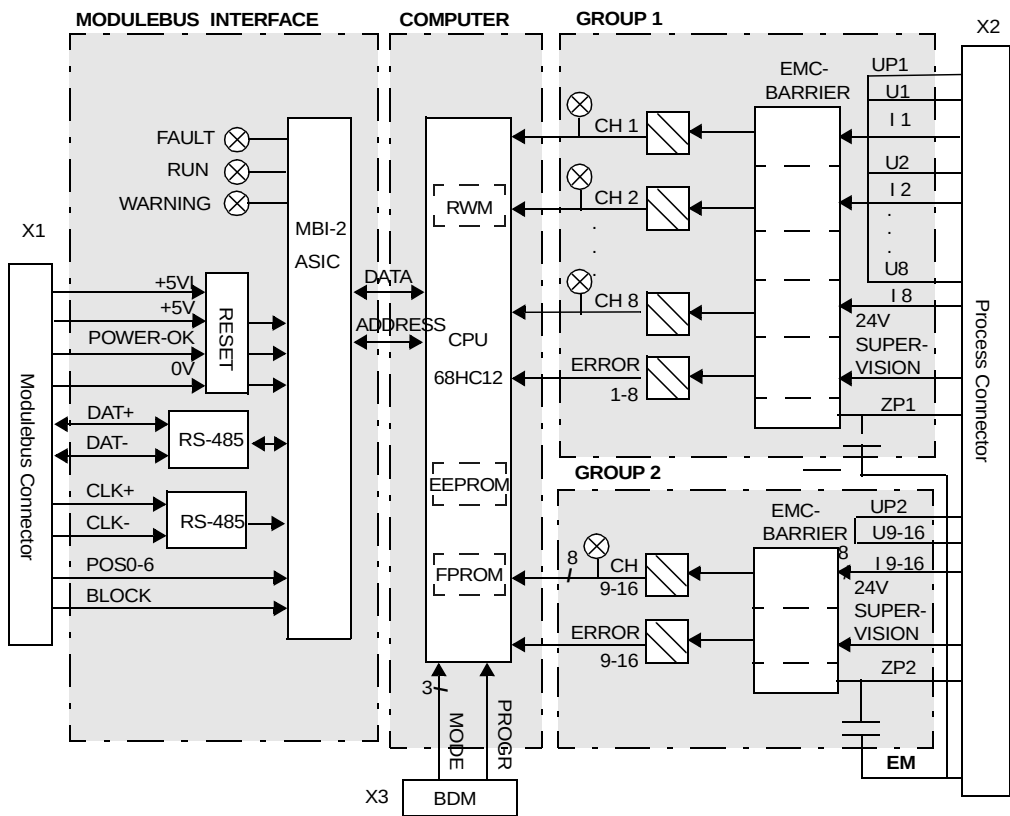
Feature	DI830 Digital Input Module
Number of channels	16 (2 x 8), current sinking
Rated voltage (Process power supply range)	24 V d.c. (18 to 30 V d.c.)
Input voltage range, "1"	13 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	7.4 mA @ 24 V d.c.
Input impedance	3.2 kΩ
Maximum field cable length	600 m (656 yd.)
Filter times (digital, selectable)	0 to 100 ms
Shutter filter Shutter period Shutter trigger Recovery time	0... 255 s 0... 255 changes 0... 65535 s
Event recording resolution	0.4 ms
Event recording accuracy	-0.3 ms to +0.7 ms
Process voltage supervision	2 channels (1 per group)
Current consumption +5 V	120 mA (max.) 100 mA (typ.)
Power dissipation ⁽¹⁾	2.3 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Yes, opto
Mounting termination units	TU810, TU812, TU814, TU830 or TU838

Table A-48 DI830 Digital Input Module Specifications (Continued)

Feature	DI830 Digital Input Module
MTU keying code	AA
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.22 kg (0.48 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volt.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.23.0.6 Block Diagram DI830



A.23.0.7 Process Connections*Table A-49 DI830 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	B1, B2	A1 (F1)
Ch1 Input	C1	3	C1	B1
Ch 2 Input	B1	16	C2	B2
Ch1/Ch2, L1-	A1	-	A1, A2	A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)
Ch 3 Input	C2	4	C3	B3
Ch 4 Input	B2	17	C4	B4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)
Ch 5 Input	C3	5	C5	B5
Ch 6 Input	B3	18	C6	B6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)
Ch 7 Input	C4	6	C7	B7
Ch 8 Input	B4	19	C8	B8
Ch 7/Ch8, L1-	A4	-	A7, A8	A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)
Ch 9 Input	C5	7	C9	B9

Table A-49 DI830 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
Ch 10 Input	B5	20	C10	B10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)
Ch 11 Input	C6	8	C11	B11
Ch 12 Input	B6	21	C12	B12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)
Ch 13 Input	C7	9	C13	B13
Ch 14 Input	B7	22	C14	B14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)
Ch 15 Input	C8	10	C15	B15
Ch 16 Input	B8	23	C16	B16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-62 shows the process connections for the Digital Input Module DI830 when installed on a TU830 Extended MTU.

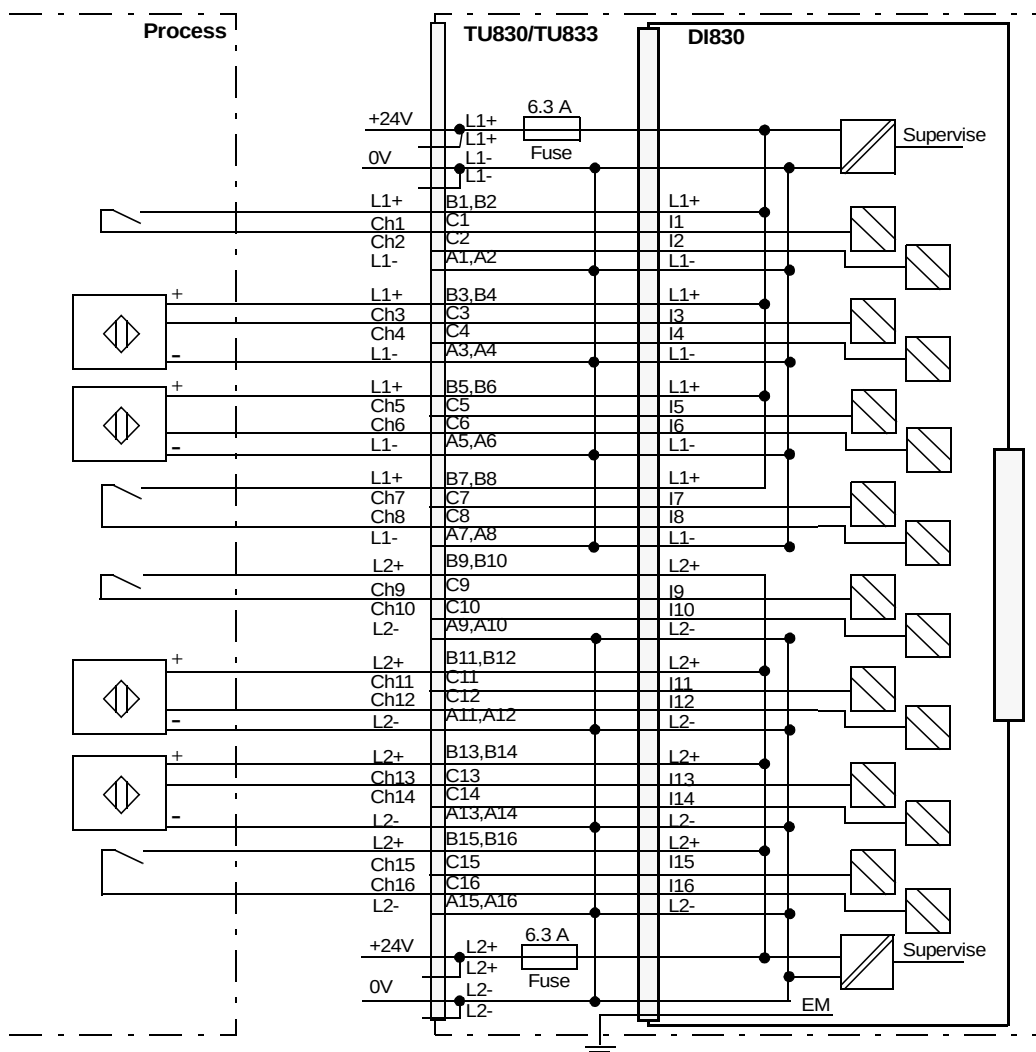


Figure A-62 DI830 with TU830 Extended MTU Process Connections

Figure A-63 shows the process connections for the Digital Input Module DI830 when installed on a TU838 Extended MTU.

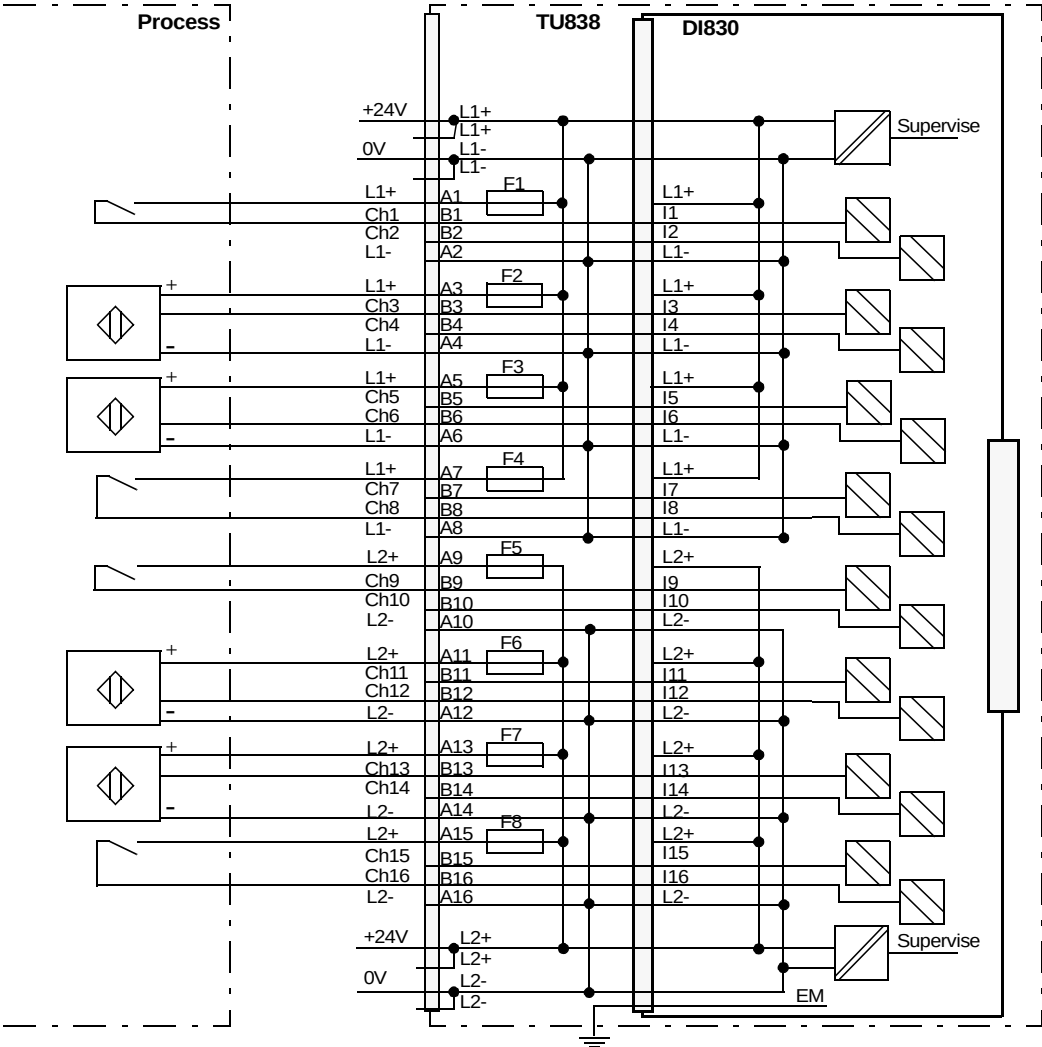


Figure A-63 DI830 with TU838 Extended MTU Process Connections

Figure A-64 shows the process connections for the DI830 when installed on a TU810 or TU814 Compact MTU.

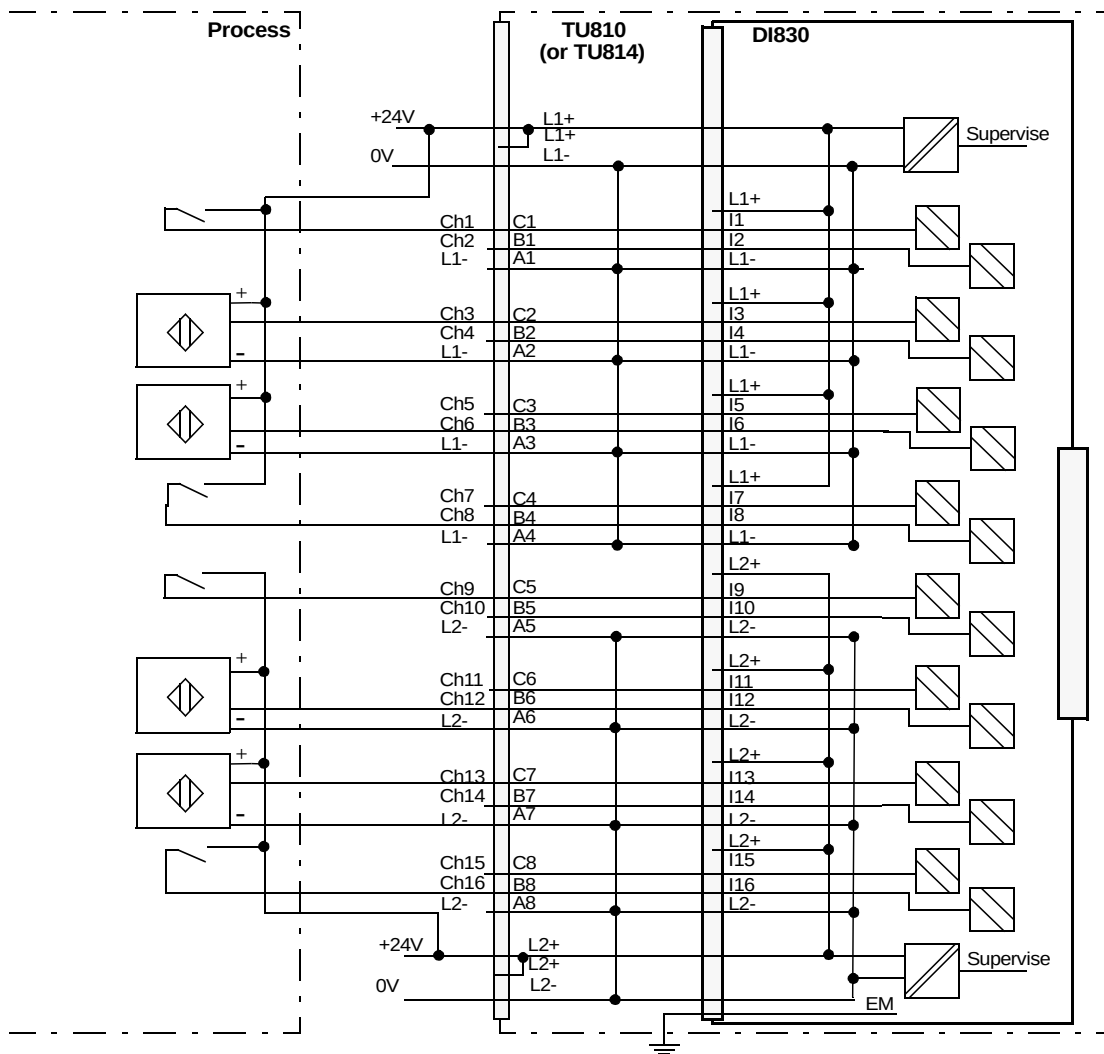


Figure A-64 DI830 with TU810 or TU814 Compact MTU Process Connections

Figure A-65 shows the process connections for the DI830 when installed on a TU812 Compact MTU.

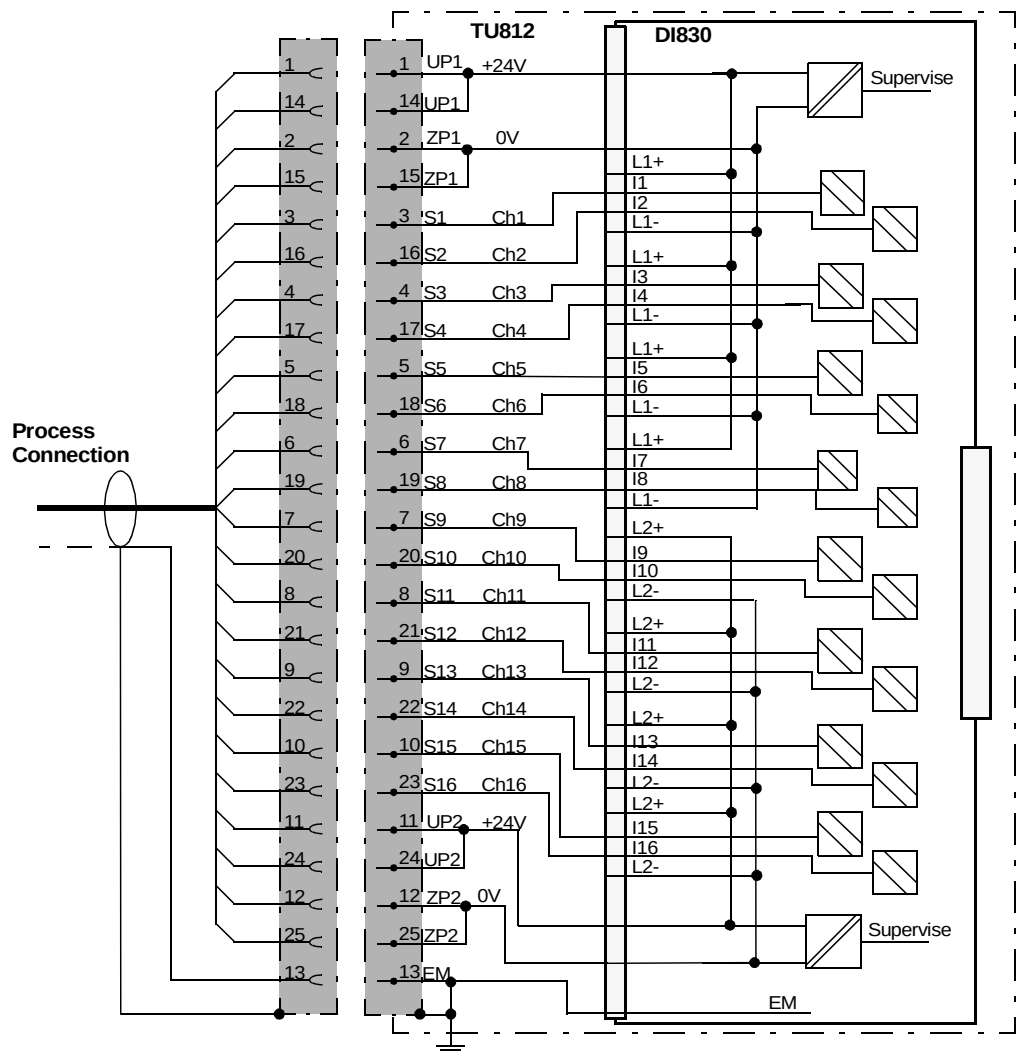


Figure A-65 DI830 with TU812 Compact MTU Process Connections

A.24 DI831 Digital Input Module, 48 V d.c. with SOE, Current Sinking

A.24.0.1 Features

- 16 channels for 48 V d.c. inputs with current sinking
- 2 isolated groups of 8 channels with voltage supervision
- Input status indicators
- Sequence of event (SOE) functionality
- Shutter filter
- EMC protection
- DIN rail mounting.

A.24.0.2 Description

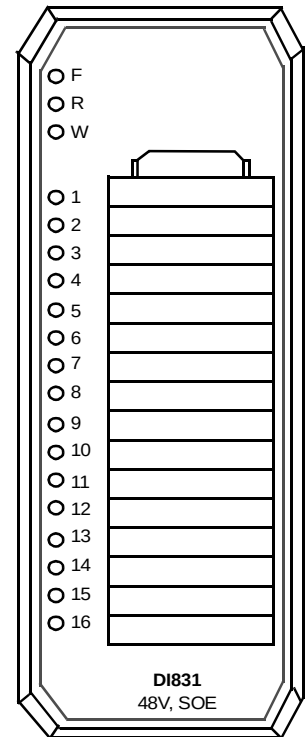
The DI831 is a 16 channel 48 V d.c. digital input module for the S800 I/O. The input voltage range is 36 to 60 V d.c. and the input current is 4 mA at 48 V d.c.).

Each input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (16) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in the Init state, Error state or Not Configured state. In Not Configured state the FAULT LED is turned off after the first valid master frame to the module.

The module cyclically performs self-diagnostics. Module diagnostics include:

- Process power supply supervision (causes a module failure if detected)
- Event queue full



- Time synchronization missing

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input signals can be digitally filtered. The filter is selectable from 0 to 100 ms. This means that pulses shorter than the filter time will be filtered out and pulses longer than specified will get through the filter.

Five different types of MTUs can be used. The Extended MTU (for example TU830) enables three wire connection to the transducers without additional terminals. The Compact MTU (for example TU810 or TU 814) has terminals for process voltage supervision inputs, but requires external terminals for distribution of process power supply to the transducers. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.24.0.3 Event Recording

The DI831 Input Module can be used for event recording (SOE), that is, changing signals at digital input channels can be announced together with a time stamp indicating when it occurred. Events are generated on both positive and negative going edges of the signals. The time stamp has a resolution of 0.4 millisecond, and is compensated for the filter time.

The module has intermediate storage for 32 events.

The SOE functionality can be switched on and off per channel.

For all channels with enabled SOE capability, a shutter filter is implemented that prevents intermediate storage for events from overflow. The shutter filter is closed as soon as the number of events generated within the shutter period (0-255 seconds) exceeds the shutter trigger number (0-255 changes). The shutter filter remains closed as long as the recovery time (0-65535 seconds) has not expired.

A.24.0.4 Simple Digital Input

If no event recording is used, the DI831 acts like a simple digital input device.

A.24.0.5 Technical Data*Table A-50 DI831 Digital Input Module Specifications*

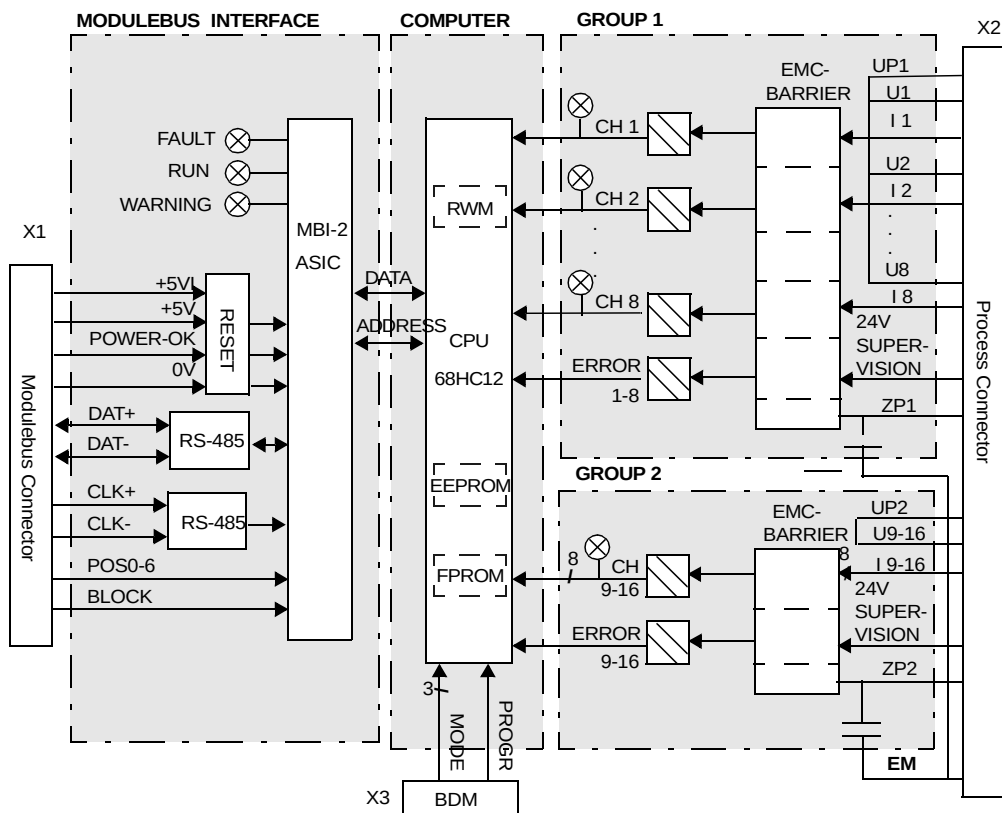
Feature	DI831 Digital Input Module
Number of channels	16 (2 x 8), current sinking
Rated voltage (Process power supply range)	48 V d.c. (36 to 60 V d.c.)
Input voltage range, "1"	+30 to +60 V.
Input voltage range, "0"	-60 to +10 V
Nominal input channel current	5 mA @ 48 V d.c.
Input impedance	9.6 k Ω
Maximum field cable length	600 meters, (656 yd.)
Bounce filter times (digital, selectable)	0 to 100 ms
Shutter filter Shutter period Shutter trigger Recovery time	0... 255 s 0... 255 changes 0... 65535 s
Event recording resolution	0.4 ms
Event recording accuracy	-0.3 ms to +0.7 ms
Process voltage supervision	2 channels (1 per group)
Current consumption +5 V	120 mA (max.) 100 mA (typ.)
Power dissipation ⁽¹⁾	3.2 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Yes, opto
Module termination units	TU810, TU812, TU814, TU830 TU838

Table A-50 DI831 Digital Input Module Specifications (Continued)

Feature	DI831 Digital Input Module
MTU keying code	BD
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.22 kg (0.48 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 48 Volt.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.24.0.6 Block Diagram DI831



A.24.0.7 Process Connections*Table A-51 DI831 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)
Ch1/Ch 2, L1+	-	-	B1, B2	A1 (F1)
Ch1 Input	C1	3	C1	B1
Ch 2 Input	B1	16	C2	B2
Ch1/Ch2, L1-	A1	-	A1, A2	A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)
Ch 3 Input	C2	4	C3	B3
Ch 4 Input	B2	17	C4	B4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)
Ch 5 Input	C3	5	C5	B5
Ch 6 Input	B3	18	C6	B6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)
Ch 7 Input	C4	6	C7	B7
Ch 8 Input	B4	19	C8	B8
Ch 7/Ch8, L1-	A4	-	A7, A8	A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)
Ch 9 Input	C5	7	C9	B9

Table A-51 DI831 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector (1)	TU830/TU833 Terminal	TU838 Terminal
Ch 10 Input	B5	20	C10	B10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)
Ch 11 Input	C6	8	C11	B11
Ch 12 Input	B6	21	C12	B12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)
Ch 13 Input	C7	9	C13	B13
Ch 14 Input	B7	22	C14	B14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)
Ch 15 Input	C8	10	C15	B15
Ch 16 Input	B8	23	C16	B16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-66 shows the process connections for the Digital Input Module DI831 when installed on a TU830 Extended MTU.

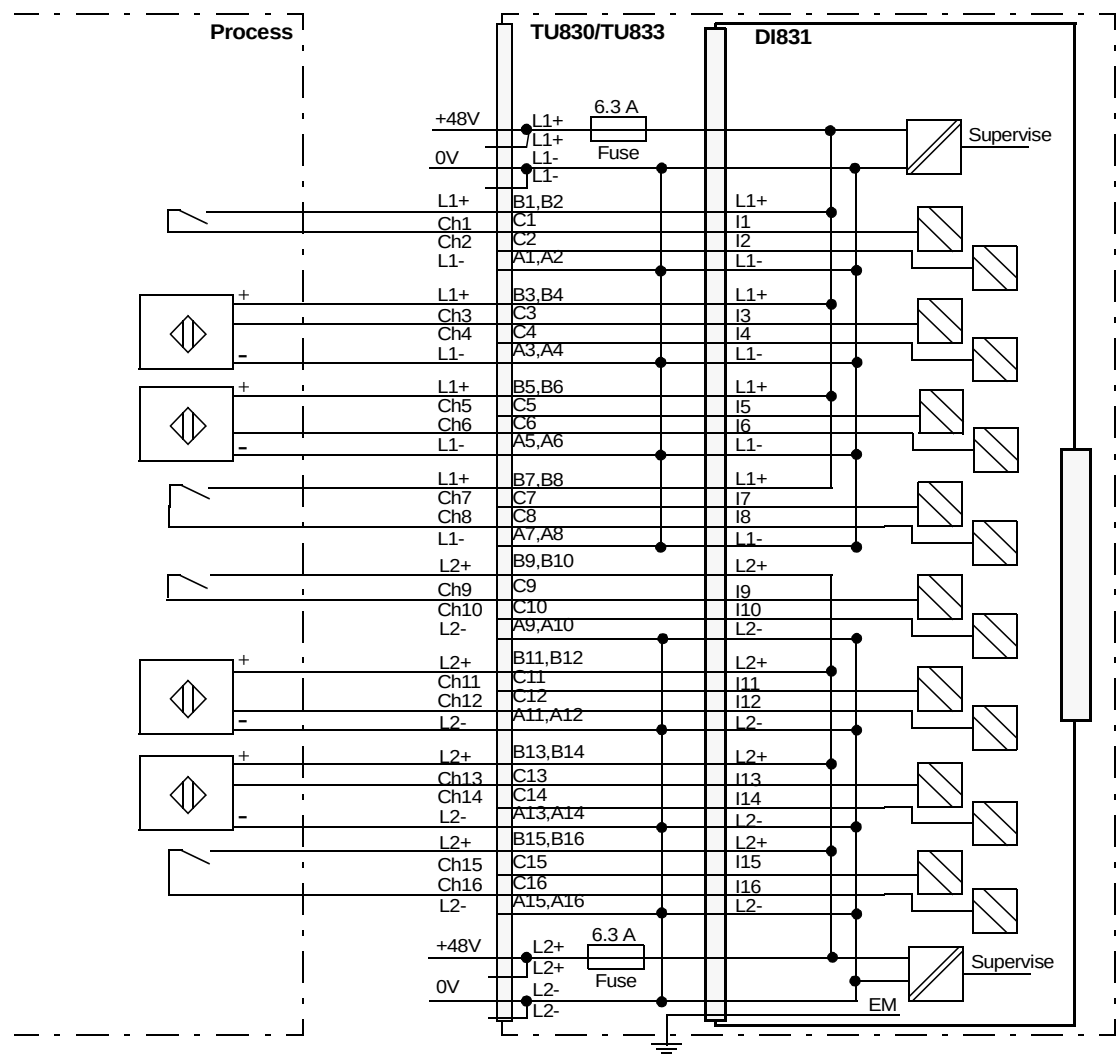


Figure A-66 DI831 with TU830 Extended MTU Process Connections

Figure A-67 shows the process connections for the Digital Input Module DI831 when installed on a TU838 Extended MTU.

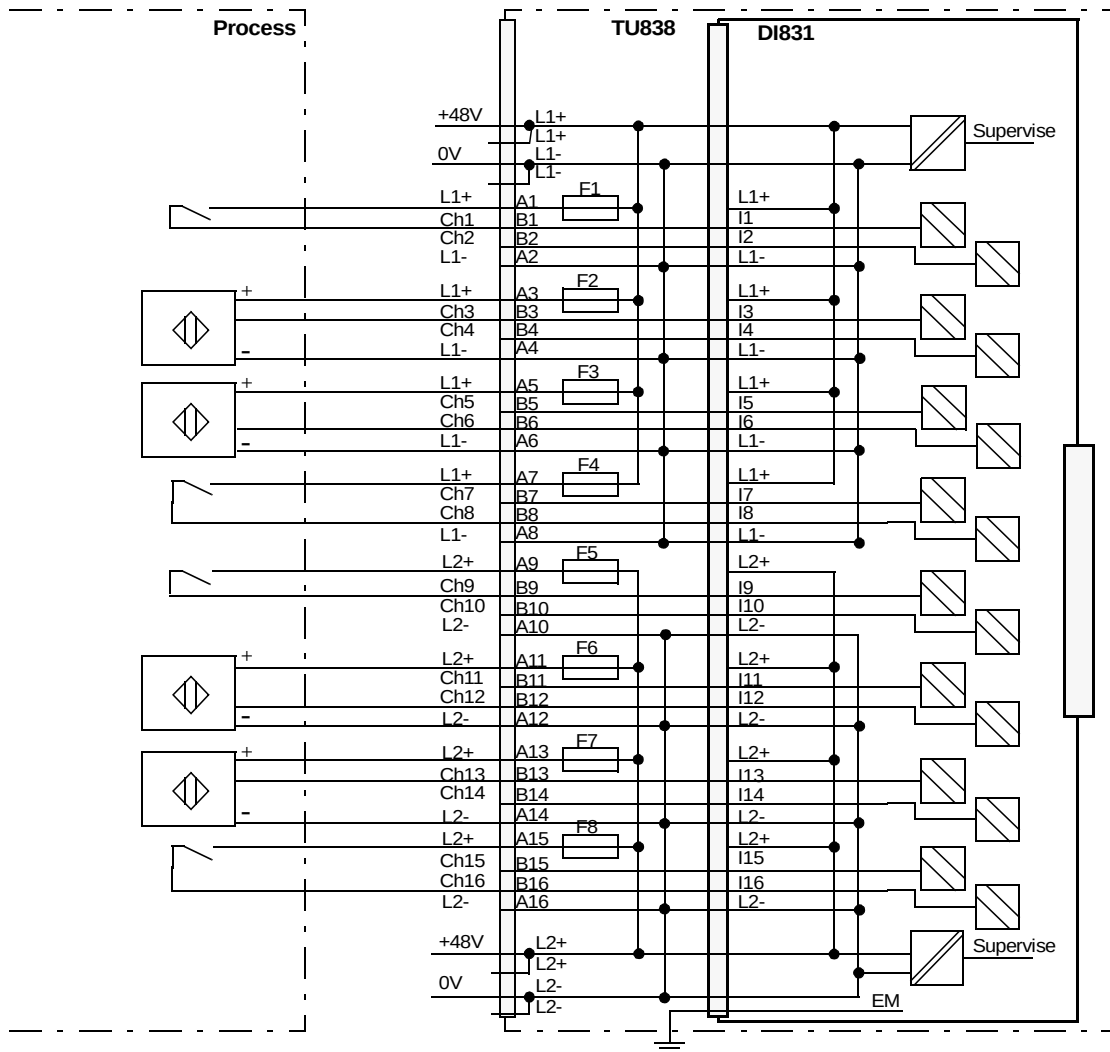


Figure A-67 DI831 with TU838 Extended MTU Process Connections

Figure A-68 shows the process connections for the DI831 when installed on a TU810 or TU814 Compact MTU.

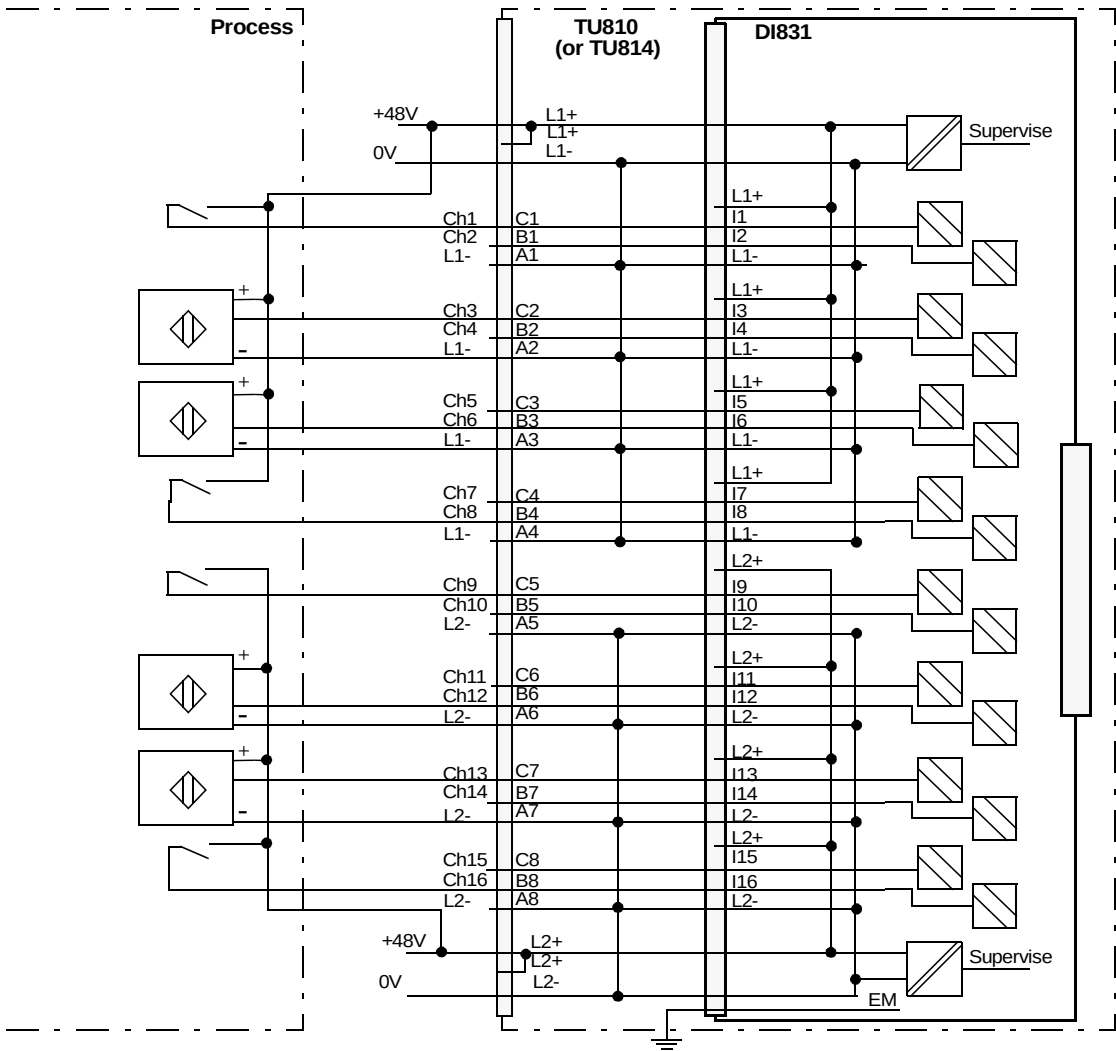


Figure A-68 DI831 with TU810 or TU814 Compact MTU Process Connections

Figure A-69 shows the process connections for the DI831 when installed on a TU812 Compact MTU.

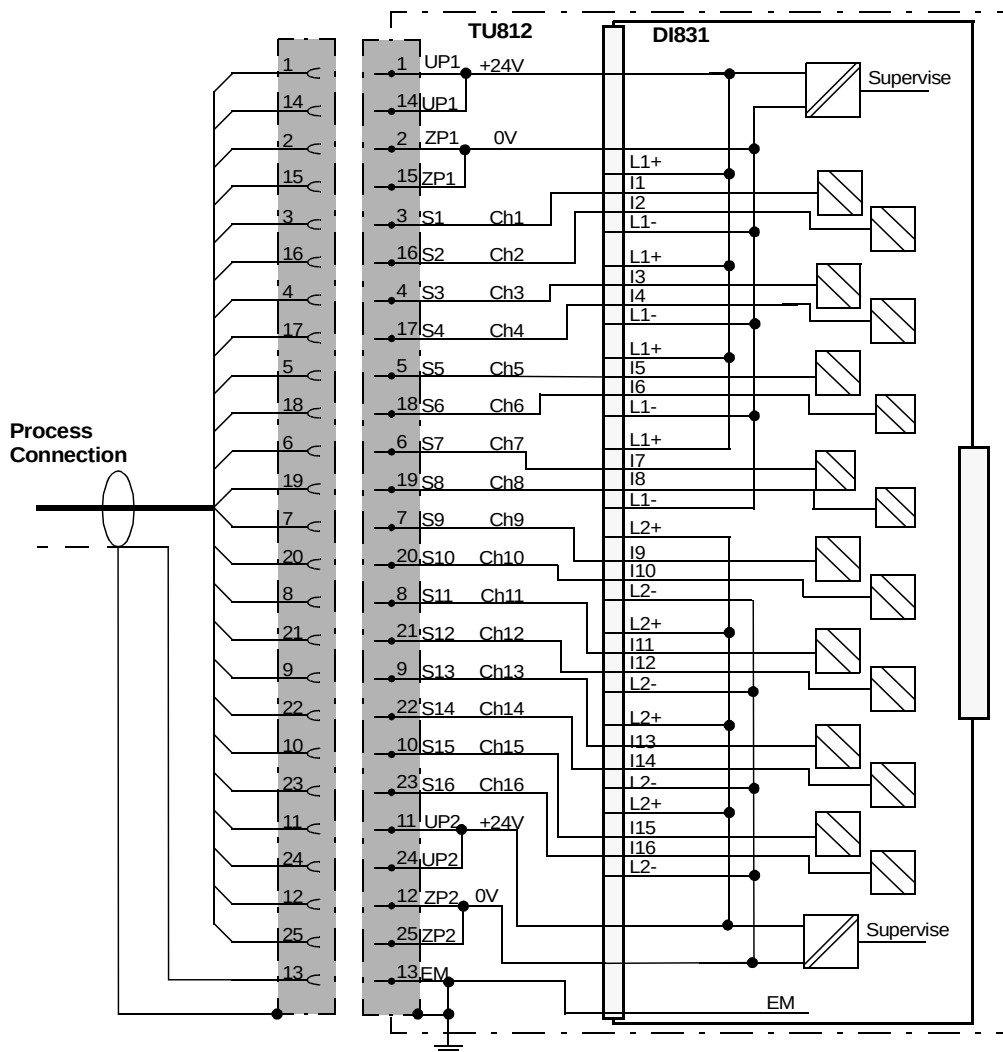


Figure A-69 DI831 with TU812 Compact MTU Process Connections

A.25 DI840 Digital Input Module

A.25.0.1 Features

- 16 channels for 24 V d.c. inputs with current sinking
- 1 group of 16 isolated from ground
- Input status indicators
- Advanced on-board diagnostics
- EMC protection
- Sequence of events
- DIN rail mounting
- Redundant or single applications
- Transducer power distribution

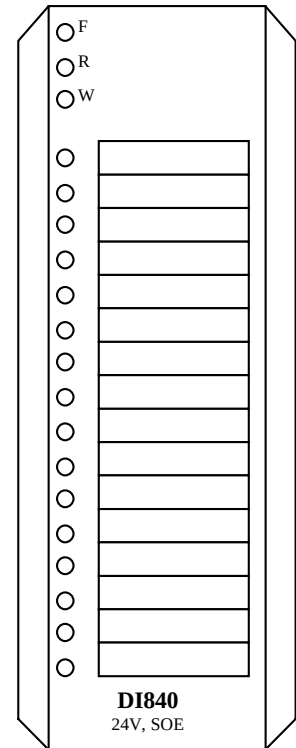
A.25.0.2 Description

The DI840 is a 16 channel 24 V d.c. digital input module for single or redundant applications. The input voltage range is 18 to 30 V d.c. and the input current is 7 mA at 24 V d.c.

Each input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (16) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in the Init state, Error state or Not Configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module.

The transducer power is supervised and current limited. One output per two input channels.



The Sequence of Event function (SOE) can collect events with a resolution of 1 ms. The event queue can contain up to 257 events. The function include a Shutter filter for repressing unwanted events.

The module cyclically performs self-diagnostics. Module diagnostics include:

- Process power supply supervision and transducer over current supervision are reported as External Channel Error. Error detection time is ≤ 500 ms.
- The internal channel circuitries are tested with test patterns. Error from those tests will be reported as Internal Channel Error. The error detection time is ≤ 100 ms.
- Error in the common parts of the test functions is reported as Module Error. Error detection time is ca 12 ms.

The SOE function can report the following status in the event message: Channel value, Queue full, Synchronization jitter, Uncertain time, Shutter filter active and Channel error.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input signals can be digitally filtered. The filter is selectable from 0 to 127 ms. This means that pulses shorter than the filter time will be filtered out and pulses longer than specified will get through the filter.

Five different types of MTUs can be used for single applications. The Extended MTU (for example TU830) enables three wire connection to the transducers without additional terminals. The Compact MTU (for example TU810 or TU 814) has terminals for process voltage supervision inputs, but requires external terminals for distribution of process power supply to the transducers. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant applications there are two types of MTUs, TU842 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

A.25.0.3 Technical Data*Table A-52 DI840 Digital Input Module Specifications*

Feature	DI840 Digital Input Module
Number of channels	16, current sinking
Rated voltage (Process power supply range)	24 V d.c. (19.2 to 30 V)
Input voltage range, "1"	11 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	7 mA @ 24 V d.c.
Input current, "1"	> 3 mA
Input current, "0"	< 1.5 mA
Input impedance	3.3 kΩ
Maximum field cable length	600 m (656 yd.)
Filter times (digital, selectable)	0 to 127 ms
Shutter filter Shutter period Shutter trigger Recovery time	2... 170 s 4 changes 0... 682 s
Event recording resolution	1 ms
Event recording accuracy	-0 ms / +1.3 ms
Transducer power, I max per channel pair	40 mA
Current consumption +5 V	100 mA
Current consumption +24 V (external)	15 mA + transducer power
Power dissipation ⁽¹⁾	2.7 W

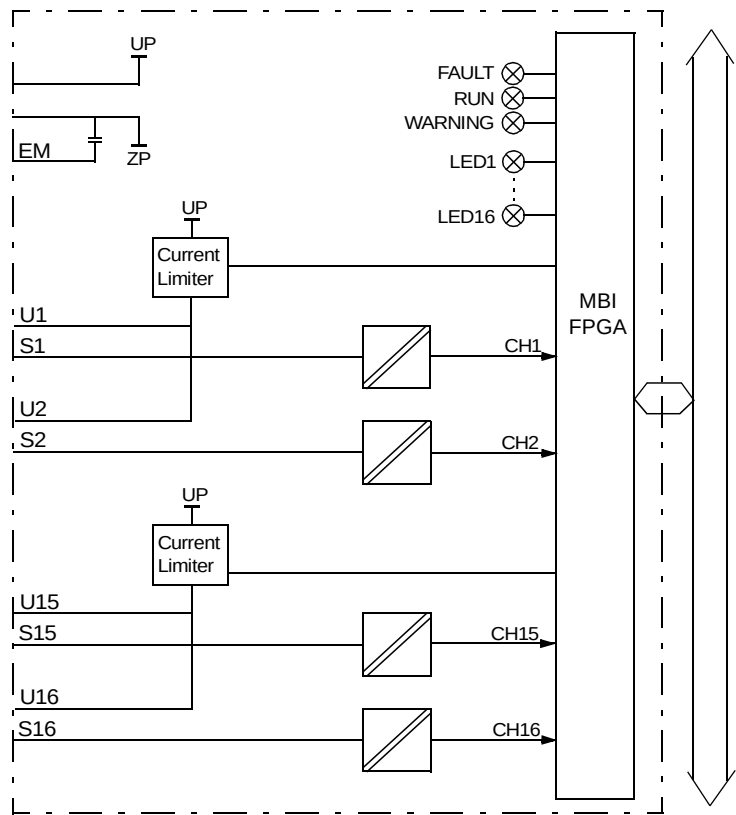
Table A-52 DI840 Digital Input Module Specifications (Continued)

Feature	DI840 Digital Input Module
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Yes, opto
Mounting termination units	TU810, TU812, TU814, TU830, TU838, TU842 or TU843
MTU keying code	CD
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.15 kg (0.33 lbs.)

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24 Volt.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.25.0.4 Block Diagram DI840



A.25.0.5 Process Connections*Table A-53 DI840 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/ TU833 Terminal	TU838 Terminal	TU842 TU843 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1-
Ch1/Ch 2, L1+	-	-	B1, B2	A1 (F1)	B1, B2
Ch1 Input	C1	3	C1	B1	C1
Ch 2 Input	B1	16	C2	B2	C2
Ch1/Ch2, L1-	A1	-	A1, A2	A2	A1, A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)	B3, B4
Ch 3 Input	C2	4	C3	B3	C3
Ch 4 Input	B2	17	C4	B4	C4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4	A3, A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)	B5, B6
Ch 5 Input	C3	5	C5	B5	C5
Ch 6 Input	B3	18	C6	B6	C6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6	A5, A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)	B7, B8
Ch 7 Input	C4	6	C7	B7	C7
Ch 8 Input	B4	19	C8	B8	C8
Ch 7/Ch8, L1-	A4	-	A7, A8	A8	A7, A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)	B9, B10
Ch 9 Input	C5	7	C9	B9	C9

Table A-53 DI840 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/ TU833 Terminal	TU838 Terminal	TU842 TU843 Terminal
Ch 10 Input	B5	20	C10	B10	C10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10	A9, A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)	B11, B12
Ch 11 Input	C6	8	C11	B11	C11
Ch 12 Input	B6	21	C12	B12	C12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12	A11, A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)	B13, B14
Ch 13 Input	C7	9	C13	B13	C13
Ch 14 Input	B7	22	C14	B14	C14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14	A13, A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)	B15, B16
Ch 15 Input	C8	10	C15	B15	C15
Ch 16 Input	B8	23	C16	B16	C16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2-

(1) Pin 13 connected to connector body for EM.

Figure A-70 shows the process connections for the Digital Input Module DI840 when installed on a TU830 Extended MTU.

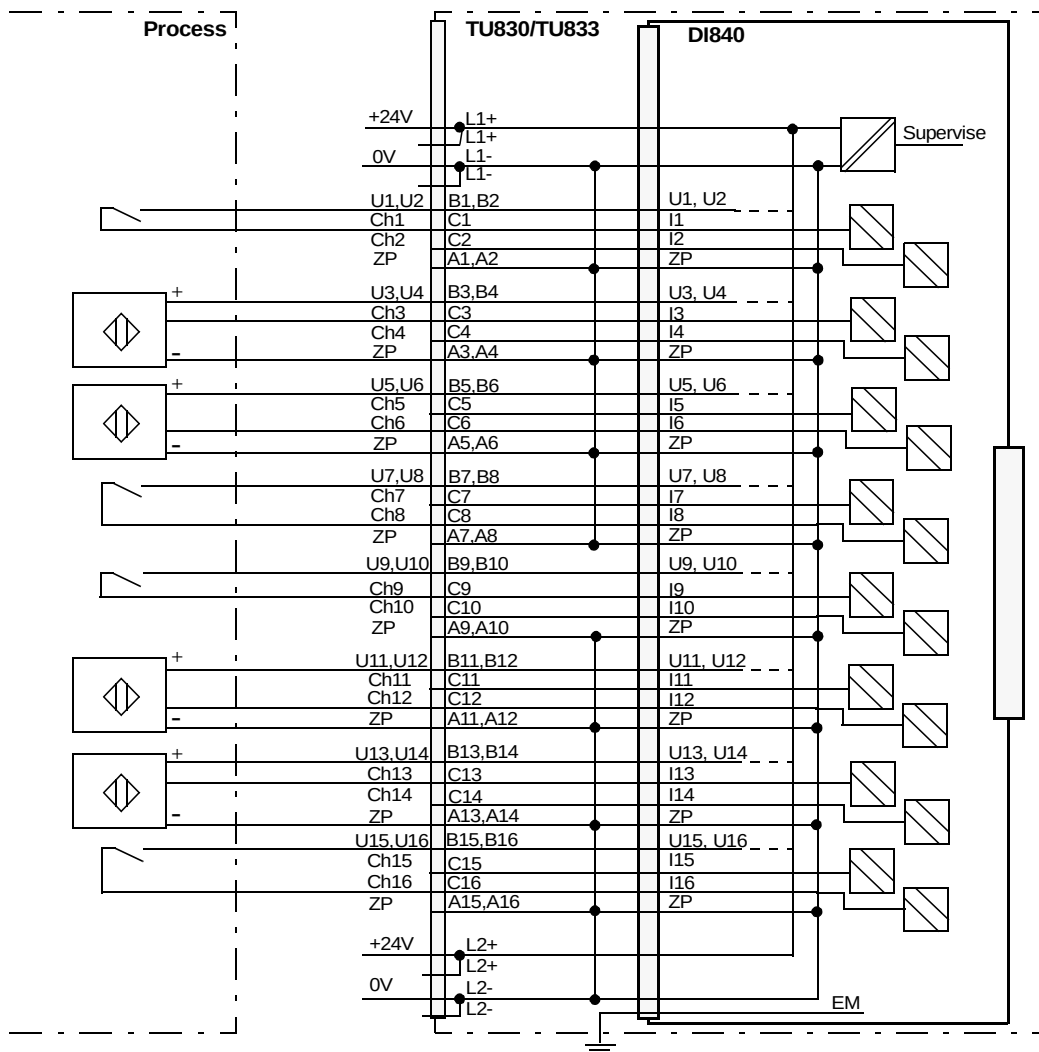


Figure A-70 DI840 with TU830 Extended MTU Process Connections

Figure A-71 shows the process connections for the Digital Input Module DI840 when installed on a TU838 Extended MTU.

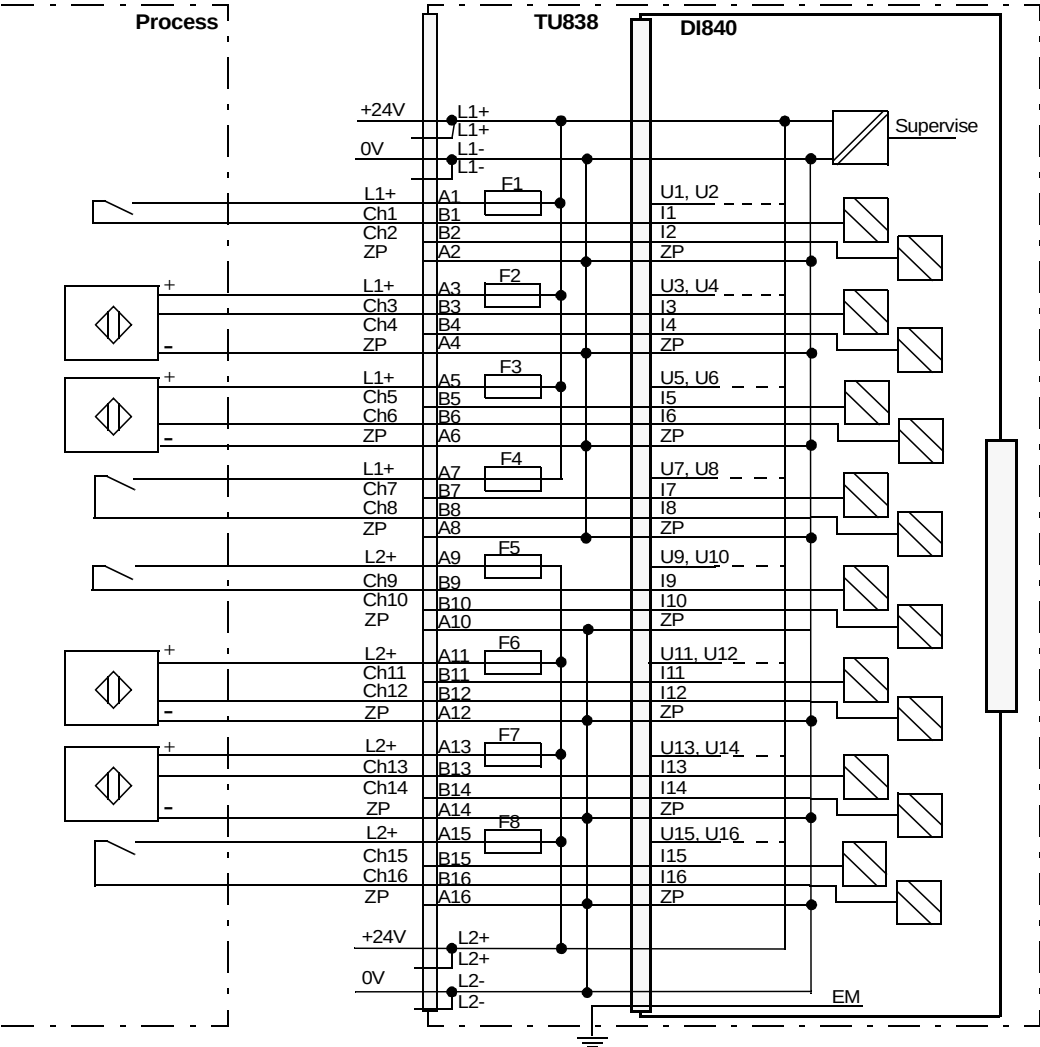


Figure A-71 DI840 with TU838 Extended MTU Process Connections

Figure A-72 shows the process connections for the Digital Input Module DI840 when installed on a TU810 or TU814 Compact MTU.

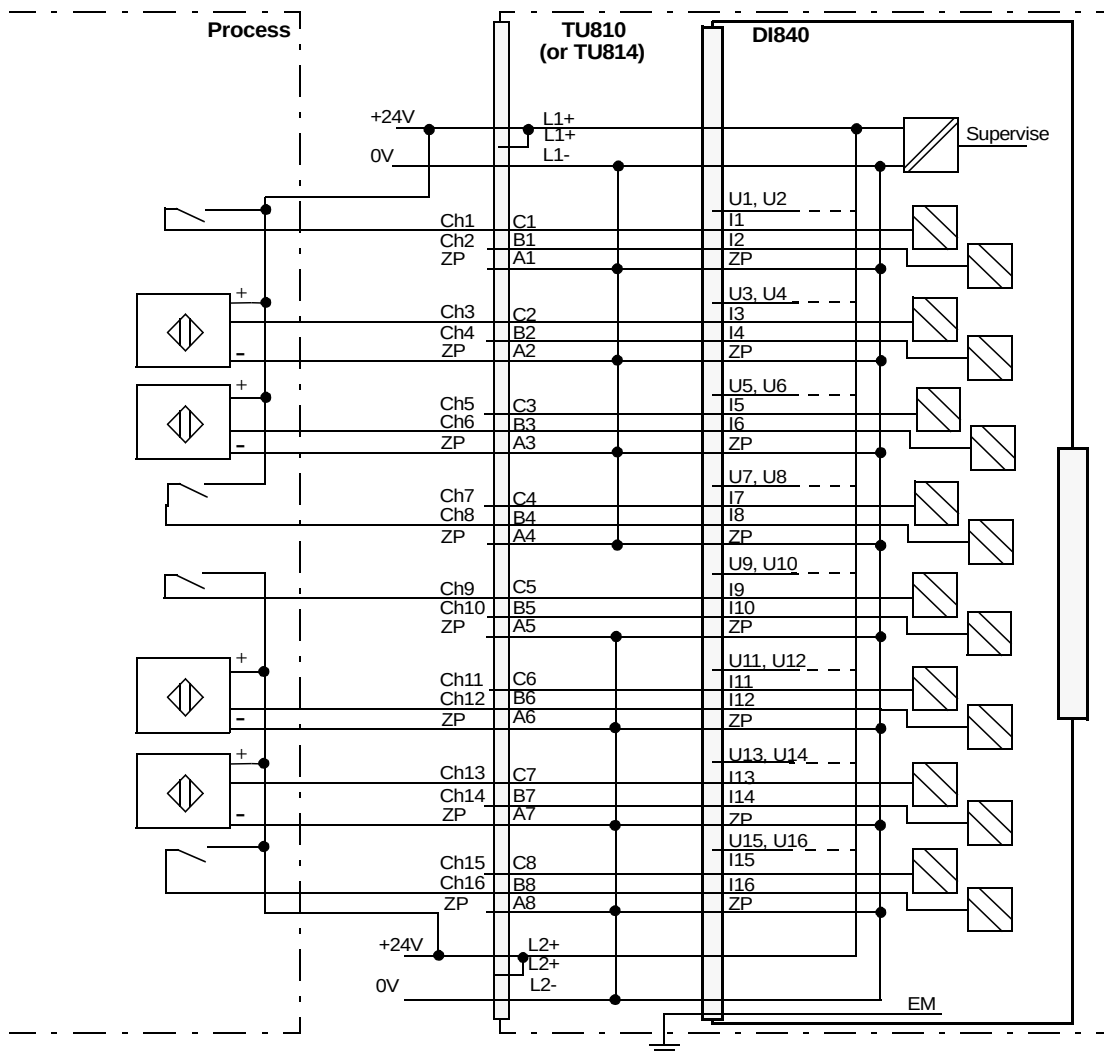


Figure A-72 DI840 with TU810 or TU814 Compact MTU Process Connections

Figure A-73 shows the process connections for the Digital Input Module DI840 when installed on a TU812 Compact MTU.

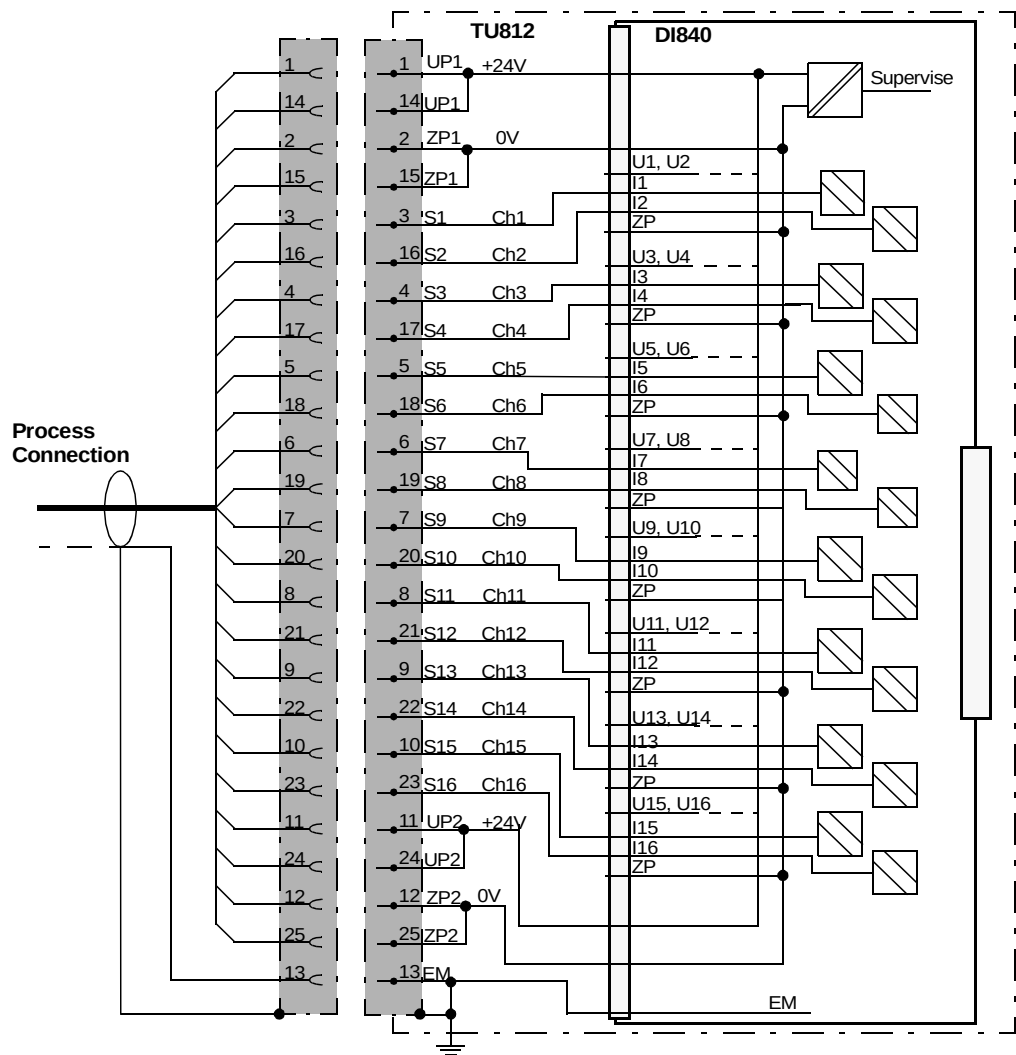


Figure A-73 DI840 with TU812 Compact MTU Process Connections

Figure A-74 shows the process connections for the Digital Input Module DI840 when installed on a TU842 or TU843 Redundant MTU.

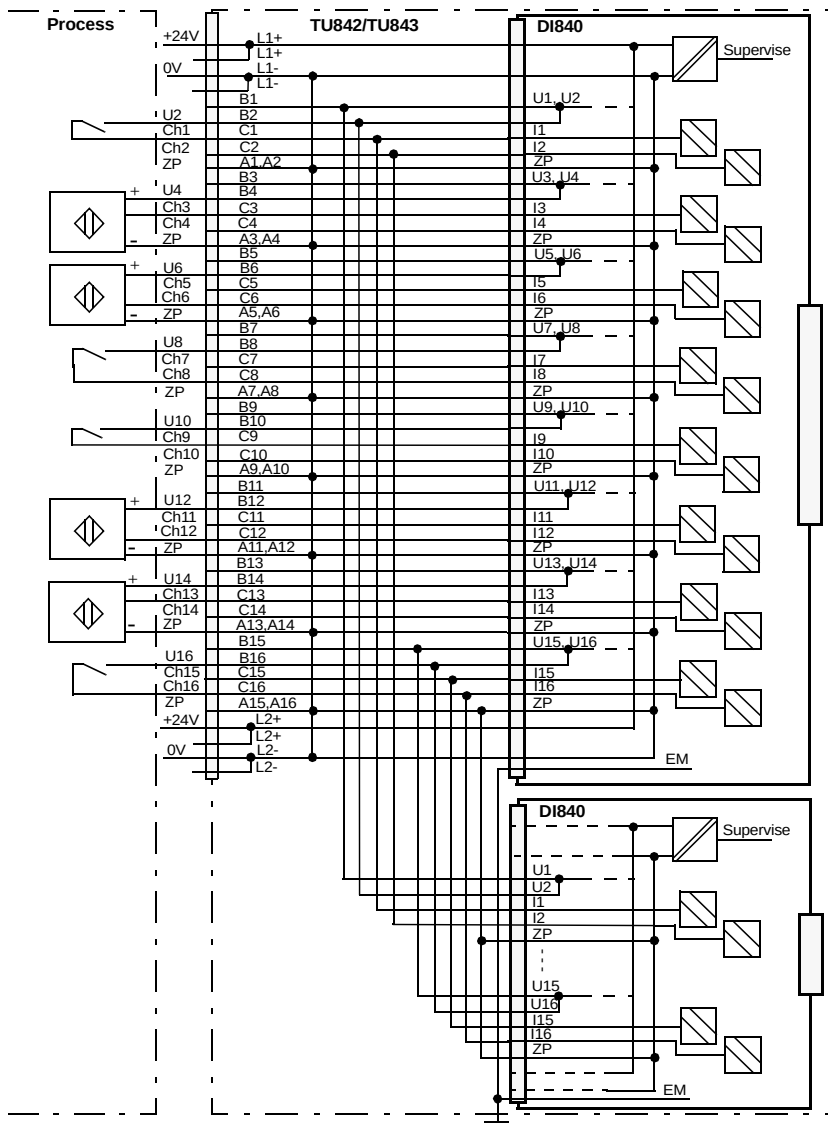
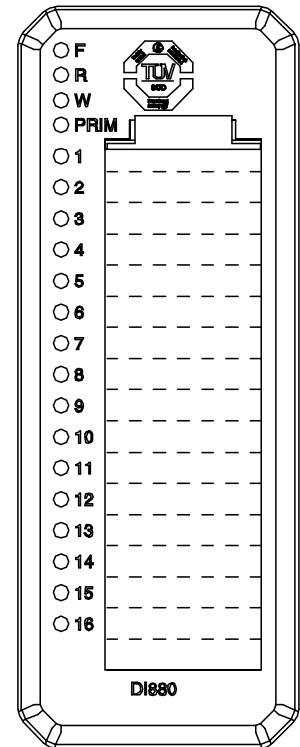


Figure A-74 DI840 with TU842 or TU843 Redundant MTU Process Connections

A.26 DI880 High Integrity Digital Input Module

A.26.0.1 Features

- 16 channels for 24 V d.c. inputs with current sinking.
- 1 group of 16 isolated from ground.
- Input status indicators.
- Advanced on-board diagnostics.
- EMC protection.
- Sequence of events.
- DIN rail mounting.
- Redundant or single configuration.
- Transducer power distribution.
- Certified for SIL3 according to EN 61508.
- Certified for AK6 according to DIN V 19250 / DIN V VDE 0801-AK6.
- Certified for Category 4 according to EN 954-1.



A.26.0.2 Description

The DI880 is a 16 channel 24 V d.c. digital input module for single or redundant configuration. The input voltage range is 18 to 30 V d.c. and the input current is 7 mA at 24 V d.c.

Each input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

There is one current limited transducer power output per input.

The Sequence of Event function (SOE) can collect events with a resolution of 1 ms. The event queue can contain up to 32 x 16 events. The function include a Shutter filter for suppression of unwanted events.

The SOE function can report the following status in the event message: Channel value, Queue full, Synchronization jitter, Uncertain time, Shutter filter active and Channel error.

The input signals can be digitally filtered. The filter is selectable from 0 to 127 ms. This means that pulses shorter than the filter time will be filtered out and pulses longer than specified will get through the filter.

Five different types of MTUs can be used for single applications. The Extended MTU (for example TU830) enables three wire connection to the transducers without additional terminals. The Compact MTU (for example TU810 or TU 814) has terminals for process voltage supervision inputs, but requires external terminals for distribution of process power supply to the transducers. The extended MTU, TU838, provide a fuse (3 A max.) per two channels for process power out. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant applications there are two types of MTUs, TU842 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

Self-diagnostic Functions

The module cyclically performs comprehensive self-diagnostic. Detected failures are grouped and reported as described below:

- Errors in External power supply will be reported as External error.
- Errors in circuits only affecting specific channels on the module (short circuits, open circuits, stuck-at faults) will be reported as Internal channel error.
- Errors in internal power supplies, Errors in micro controller, FPGA and Memory will be reported as Module Error.

Four LEDs indicate module status Fault (Red), Run (Green), Warning (Yellow) and Primary (Yellow):

- The RUN LED starts flashing when the module is ready to be configured and is steady lit when the module has reached operational state.
- The WARNING LED indicates external errors or internal channel errors.
- The FAULT LED indicates that there is Module errors present or that the module is in Init state.
- The PRIMARY LED indicates that the module is primary (in a redundant pair).

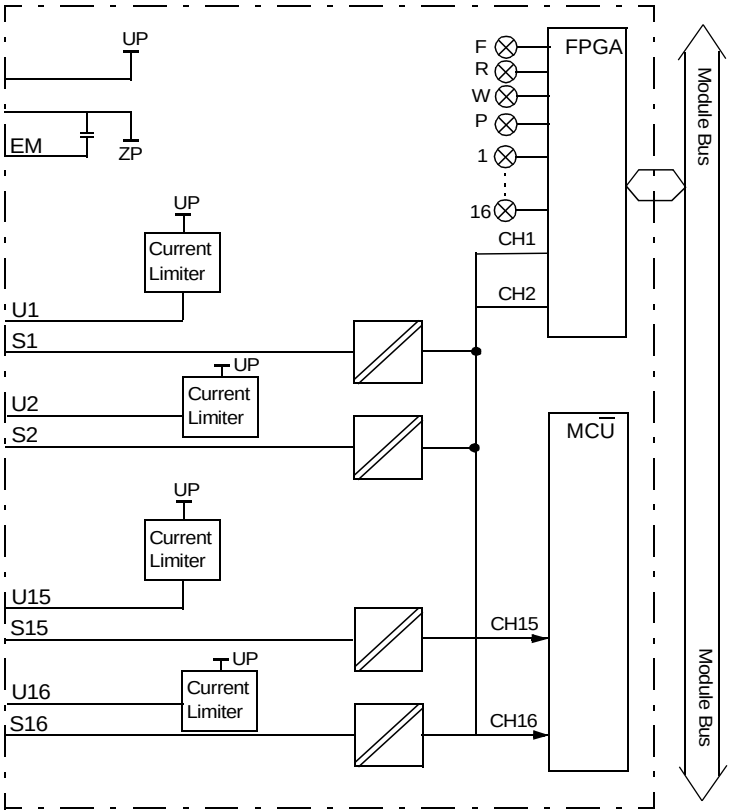
A.26.0.3 Technical Data*Table A-54 DI880 High Integrity Digital Input Module Specifications*

Feature	DI880 Digital Input Module
Number of channels	16, current sinking
Rated voltage (Process power supply range)	24 V d.c. (19.2 to 30 V)
Input voltage range, "1"	11 to 30 V
Input voltage range, "0"	-30 to +5 V
Nominal input channel current	7 mA @ 24 V d.c.
Input current, "1"	> 3 mA
Input current, "0"	< 1.5 mA
Input impedance	3.1 k Ω
Maximum field cable length	600 m (656 yd.)
Filter times (digital, selectable)	0 to 127 ms
Shutter filter: Shutter period Shutter trigger Recovery time	1 - 255 s (default 0, means deactivated filter) 1...255 changes (default 4) 0 - 65535 s (default 0, means deactivated filter)
Event recording resolution	1 ms
Transducer power (per input)	30 mA (max)
Current consumption +5 V	125 mA (max)
Current consumption +24 V (field supply)	15 mA + transducer power
Power dissipation	2.4 W

Table A-54 DI880 High Integrity Digital Input Module Specifications (Continued)

Feature	DI880 Digital Input Module
Maximum ambient temperature	55/40°C (131/104°F)
Isolation	Yes, opto
Mounting termination units	TU810, TU812, TU814, TU830, TU838, TU842, TU843
MTU keying code	FF
Event recording accuracy	-0 ms / +1.3 ms
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.15 kg (0.33 lbs.)

A.26.0.4 Block Diagram DI880



A.26.0.5 Process Connections*Table A-55 DI880 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/ TU833 Terminal	TU838 Terminal	TU842 TU843 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1-
Ch1/Ch 2, L1+	-	-	B1, B2	A1 (F1)	B1, B2
Ch1 Input	C1	3	C1	B1	C1
Ch 2 Input	B1	16	C2	B2	C2
Ch1/Ch2, L1-	A1	-	A1, A2	A2	A1, A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)	B3, B4
Ch 3 Input	C2	4	C3	B3	C3
Ch 4 Input	B2	17	C4	B4	C4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4	A3, A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)	B5, B6
Ch 5 Input	C3	5	C5	B5	C5
Ch 6 Input	B3	18	C6	B6	C6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6	A5, A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)	B7, B8
Ch 7 Input	C4	6	C7	B7	C7
Ch 8 Input	B4	19	C8	B8	C8
Ch 7/Ch8, L1-	A4	-	A7, A8	A8	A7, A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)	B9, B10
Ch 9 Input	C5	7	C9	B9	C9

Table A-55 DI880 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/ TU833 Terminal	TU838 Terminal	TU842 TU843 Terminal
Ch 10 Input	B5	20	C10	B10	C10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10	A9, A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)	B11, B12
Ch 11 Input	C6	8	C11	B11	C11
Ch 12 Input	B6	21	C12	B12	C12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12	A11, A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)	B13, B14
Ch 13 Input	C7	9	C13	B13	C13
Ch 14 Input	B7	22	C14	B14	C14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14	A13, A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)	B15, B16
Ch 15 Input	C8	10	C15	B15	C15
Ch 16 Input	B8	23	C16	B16	C16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)	L2-

(1) Pin 13 connected to connector body for EM.

Figure A-75 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU830 Extended MTU.

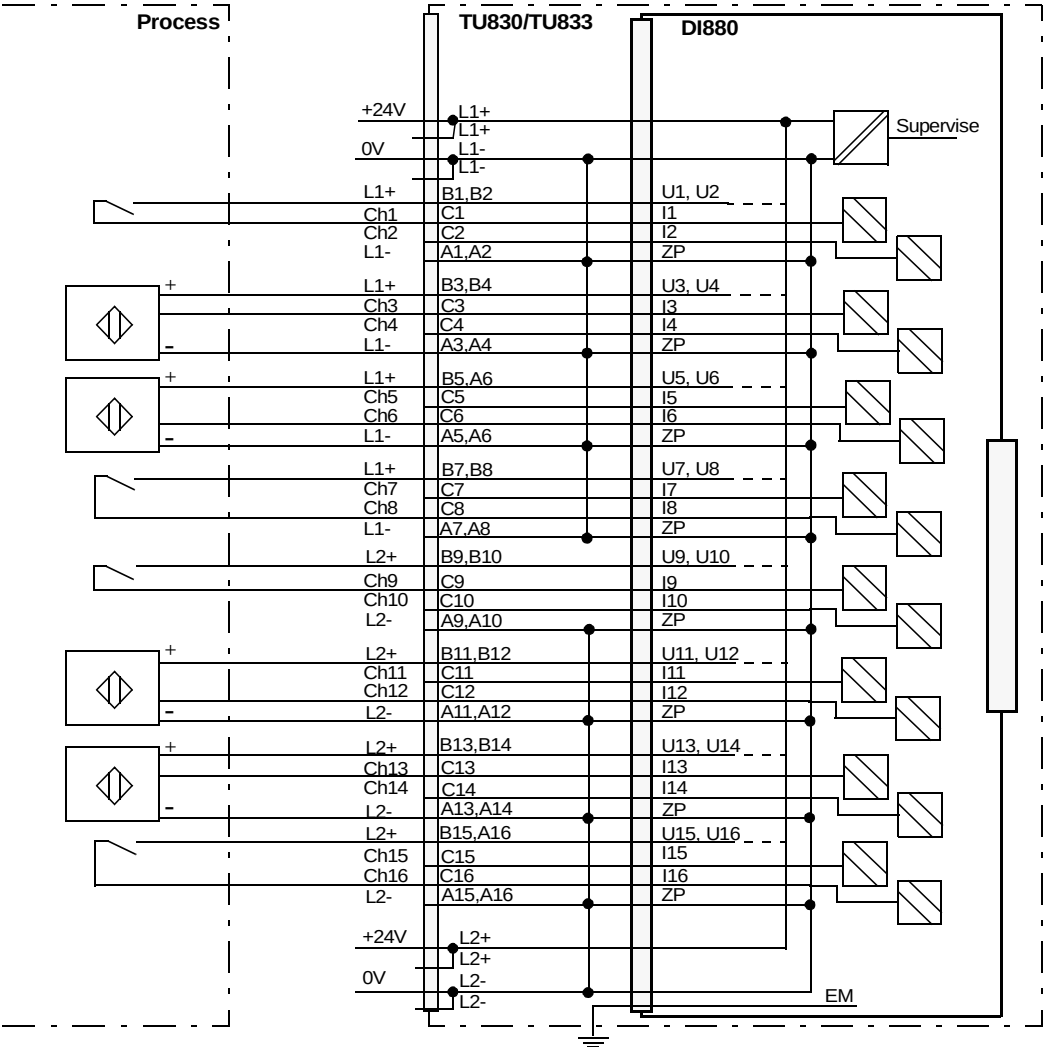


Figure A-75 DI880 with TU830 Extended MTU Process Connections

Figure A-76 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU838 Extended MTU.

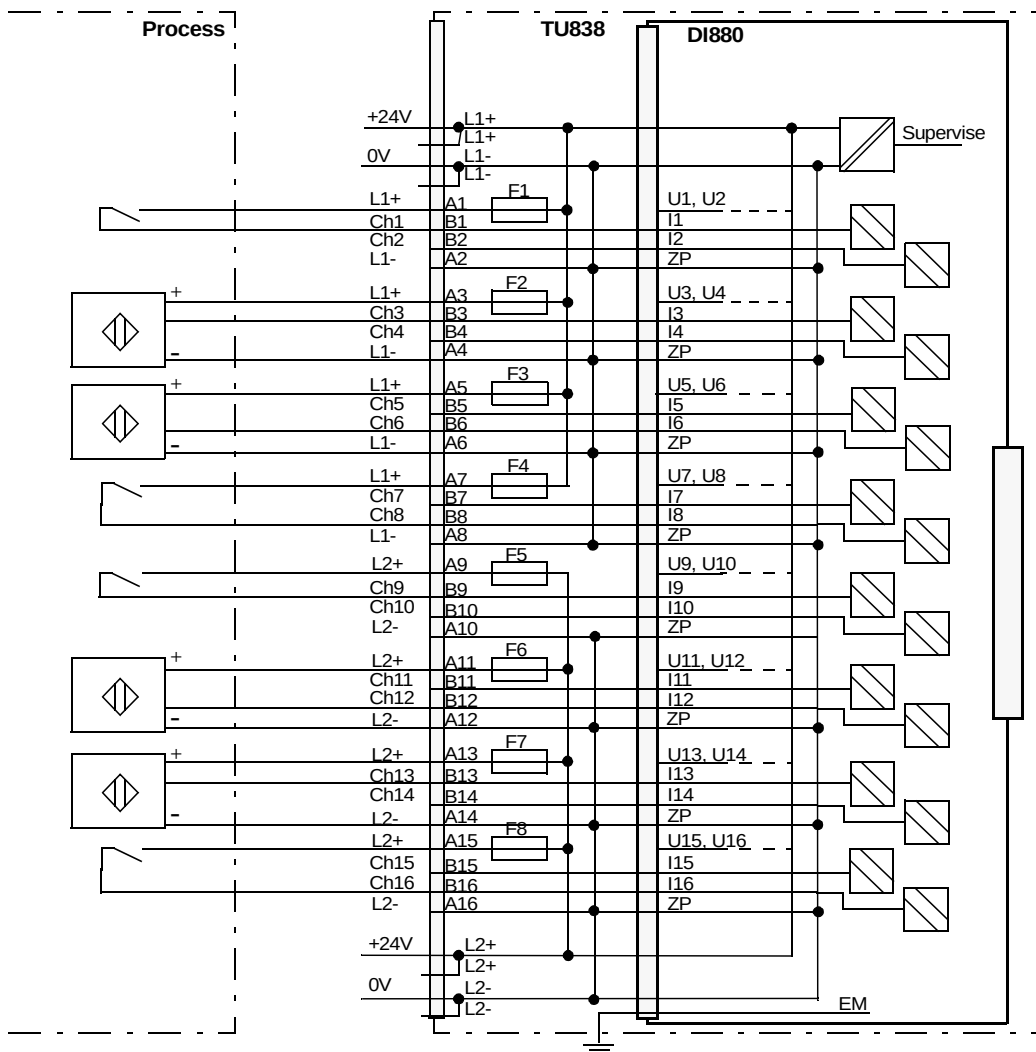


Figure A-76 DI880 with TU838 Extended MTU Process Connections

Figure A-77 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU810 or TU814 Compact MTU.

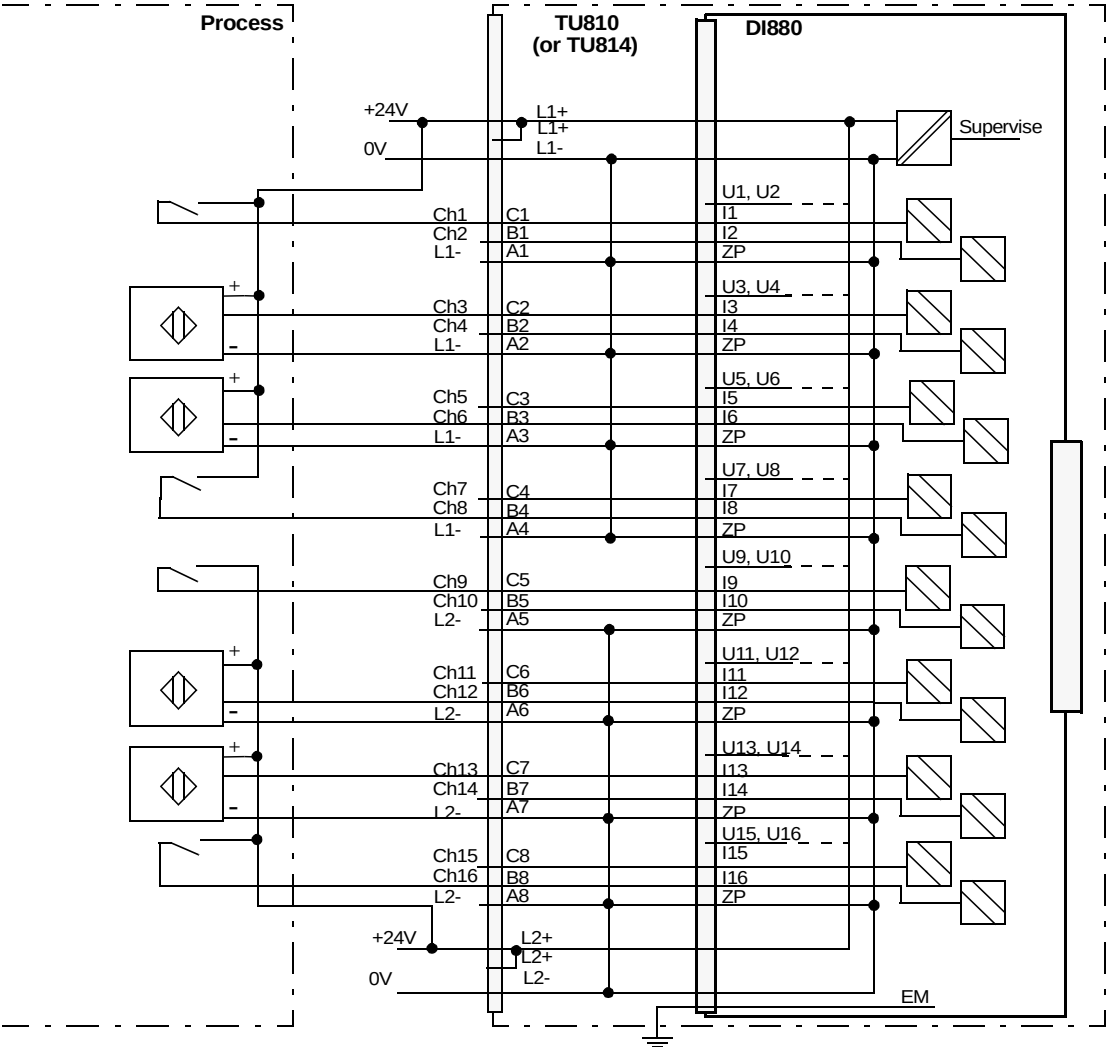


Figure A-77 DI880 with TU810 or TU814 Compact MTU Process Connections

Figure A-78 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU812 Compact MTU.

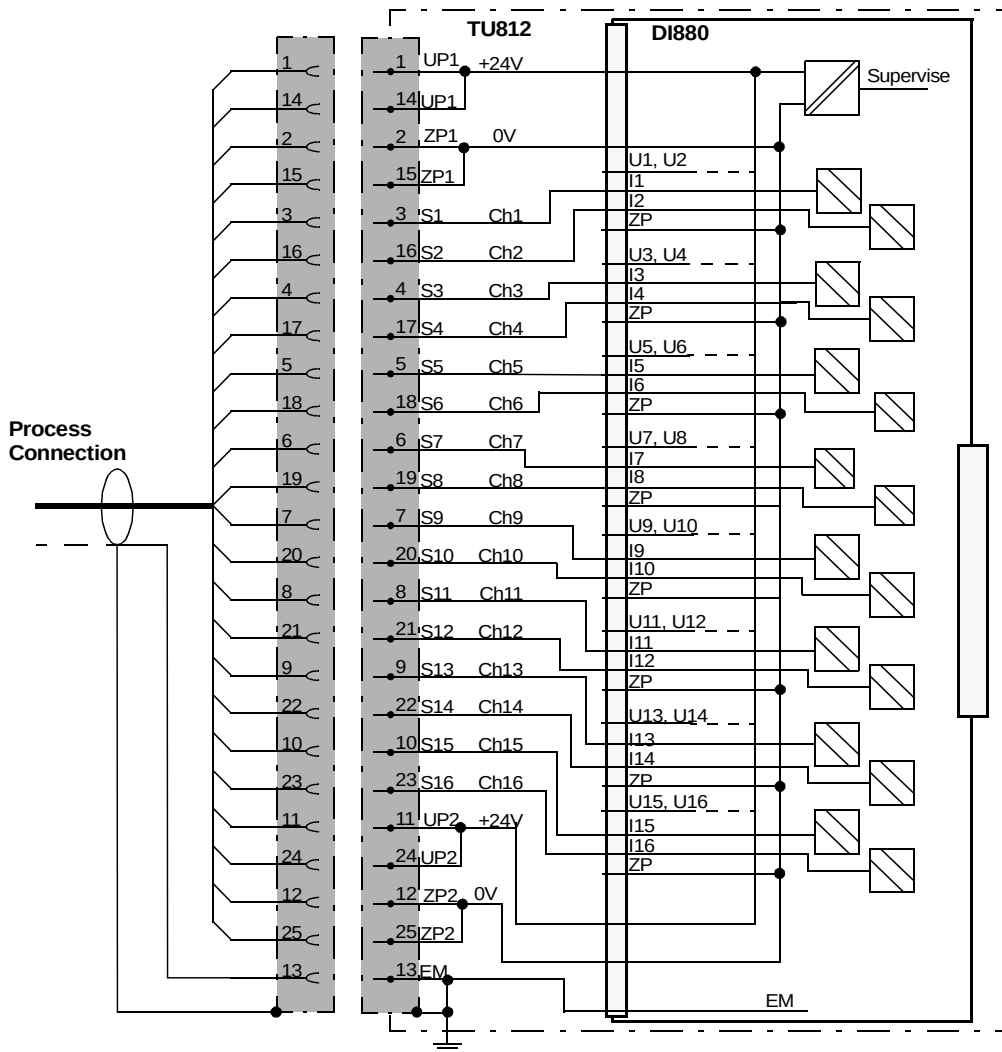


Figure A-78 DI880 with TU812 Compact MTU Process Connections

Figure A-79 shows the process connections for the High Integrity Digital Input Module DI880 when installed on a TU842 or TU843 Redundant MTU.

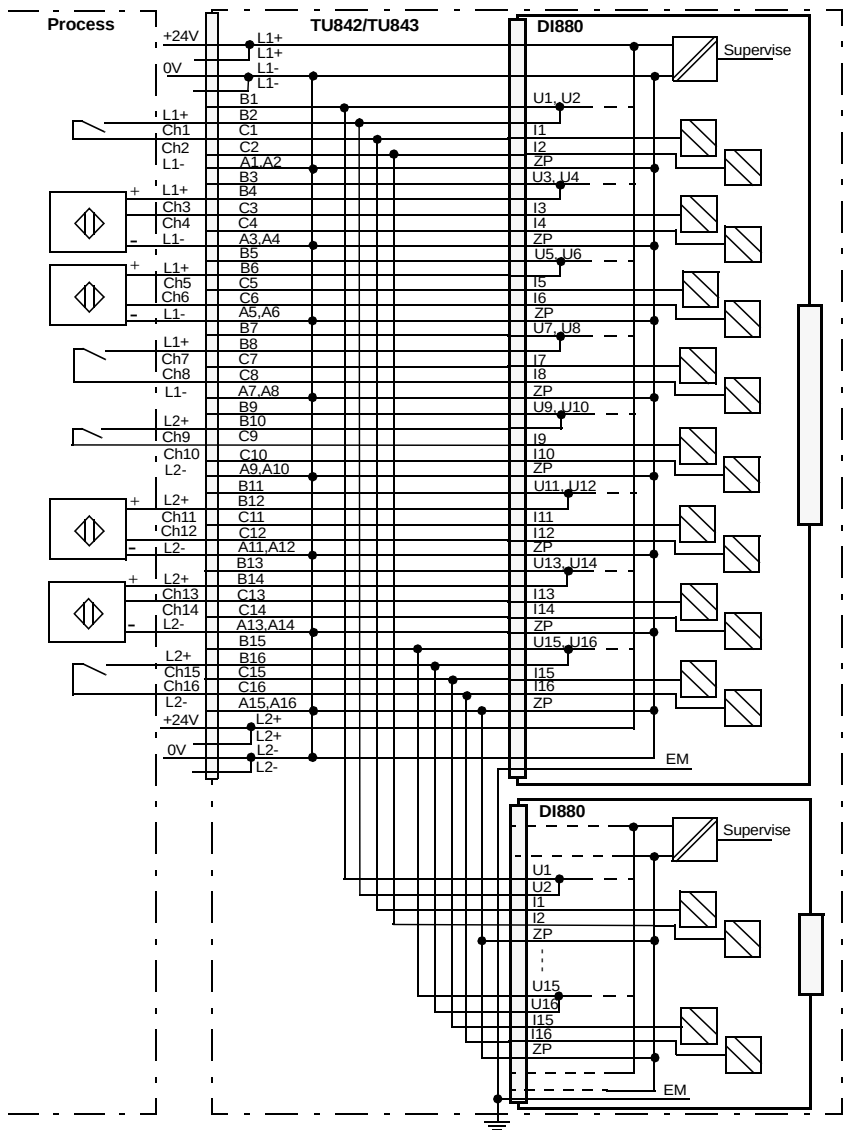
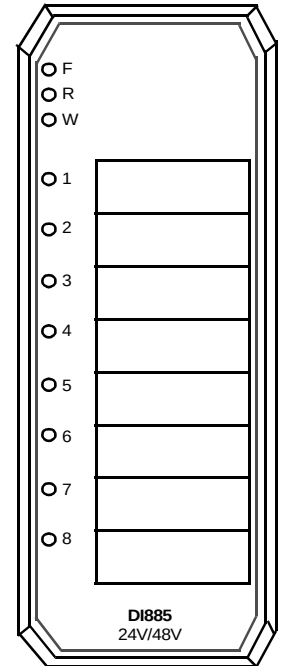


Figure A-79 DI880 with TU842 or TU843 Redundant MTU Process Connections

A.27 DI885 Digital Input Module, 24 V /48 V d.c. with SOE, Current Sinking

A.27.0.1 Features

- 8 channels for 24/48 V d.c. inputs with current sinking
- Input status indicators
- Sequence of event (SOE) functionality
- External 24 or 48 V d.c. sensor power supply
- Internal 48 V d.c. sensor power supply
- Short circuit protection to ground and 48 Volt
- Channel supervision
- Sensor power supply supervision
- Shutter filter
- EMC protection
- DIN rail mounting.



A.27.0.2 Description

The DI885 is a 8 channel 24/48 V digital input module for the S800 I/O. This module has 8 digital inputs. The input voltage range is 11.8 - 60 V d.c. and the input current is 1.6 mA at 24 V d.c., (3.2 mA at 48 V d.c.).

Every input channel consists of current limiting components, EMC protection components, input state indication LED and optical isolation barrier.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow). One LED (Yellow) per channel (8) indicate input state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is in the Init state, Error state or Not Configured state. In Not configured state the FAULT LED is turned off after the first valid access to the module.

The sensor power supply supervision gives an error signal if the voltage disappears, and the Warning LED turns on. The error signal can be read via the Modulebus.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The input signals of the input module DI885 can be filtered to suppress any electrical interference or contact bounce. The filter is selectable from 0 to 255 ms. This means that noise pulses shorter than the filter time will be filtered out and pulses longer than specified will get through the filter.

Four different types of MTUs can be used. The TU830 Extended MTU and the TU810 (or TU814) Compact MTU has terminals for process voltage inputs and three terminals per channel. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.27.0.3 Event Recording

The DI885 Input Module can be used for event recording (SOE), that is, changing signals at digital input channels can be announced together with a time stamp indicating when it occurred. The time stamp has a resolution of 1 millisecond, and is compensated for the filter time.

The module has intermediate storage for 32 events.

The SOE functionality can be switched on and off per channel.

For all channels with enabled SOE capability, a shutter filter is implemented that prevents intermediate storage for events from overflow. The shutter filter is closed as soon as the number of events generated within the shutter period (0-255 seconds) exceeds the shutter trigger number (0-255 changes). The shutter filter remains closed as long as the recovery time (0-65535 seconds) has not expired.

A.27.0.4 Simple Digital Input

If no event recording is used, the DI885 acts like a simple digital input device.

A.27.0.5 Channel Supervision

The DI885 is able to supervise the process channel regarding wire break of sensor cable, missing sensor and short circuit of sensor voltage to module ground.

The supervision can be switched on and off per device. The channel supervision is only possible when the contact is equipped with a parallel resistor of $47\text{ k}\Omega \pm 20\%$, and 48 V sensor power.

A.27.0.6 Sensor Power Supply and Supervision

The DI885 provides a 48 V d.c. sensor power supply per device.

The DC/DC - converter for 48 V d.c. supply can be powered from the internal 24 V d.c. provided by the ModuleBus or from an external source.

The power supply is short-circuit proof and galvanically insulated.

It is also possible to supply the sensors with an external 48 V d.c. power supply. In this case the internal voltage path is switched off.

A.27.0.7 Supported Sensor Types

The following sensor types are supported by the DI885.

Dry Contacts supervised: 48 V d.c./ 3,2 mA

The supervision is only possible for contacts with resistor connected in parallel. Supervision is always available within internal sensor power supply. Supervision in connection with external sensor power supply requires the same strict limits in the tolerances of the external supply voltage as for internal supply voltage (48 V d.c. $\pm 10\%$)

Dry Contacts not supervised with external Power Supply: $\geq 60\text{ V d.c.}$ / max. 4 mA

The maximum input voltage of 60 V DC must be kept strictly.

Electronic Inputs not supervised: 24 V d.c./ 1.6 mA

Only in combination with external power supply.

Open Collector Drivers (Current sourcing) not supervised: 24 V DC / 1.6 mA

Only in combination with external power supply.

A.27.0.8 Technical Data

Table A-56 DI885 Digital Input Module Specifications

Feature	DI885 Digital Input Module
Number of channels	8, current sinking
Power supply: Nominal voltage Operating voltage range	24 V d.c. 19.2 to 30 V d.c.
Process Power supply: (UP) Nominal voltage with internal supply Voltage range with external supply	48 V d.c.+/- 10% 18 V d.c. - 60 V d.c.
Input voltage range, "1"	>+ 11.2 V d.c.... <+ 60 V d.c.
Input voltage range, "0"	-30 V d.c. ... <+5 V d.c.
Nominal input channel current, "1"	0.8 mA... <4 mA
Nominal input channel current, "0"	<0.3 mA
Input impedance	15 kOhm
Maximum field cable length	600 meters, (656 yd.)
Bounce filter times (digital, selectable)	0 to 255 ms
Event recording resolution	1 ms
Event recording accuracy	-0.5 ms to +1.3 ms
Shutter filter Shutter period Shutter trigger Recovery time	0... 255 s 0.. 255 changes 0... 65535 s
Process voltage supervision	per device

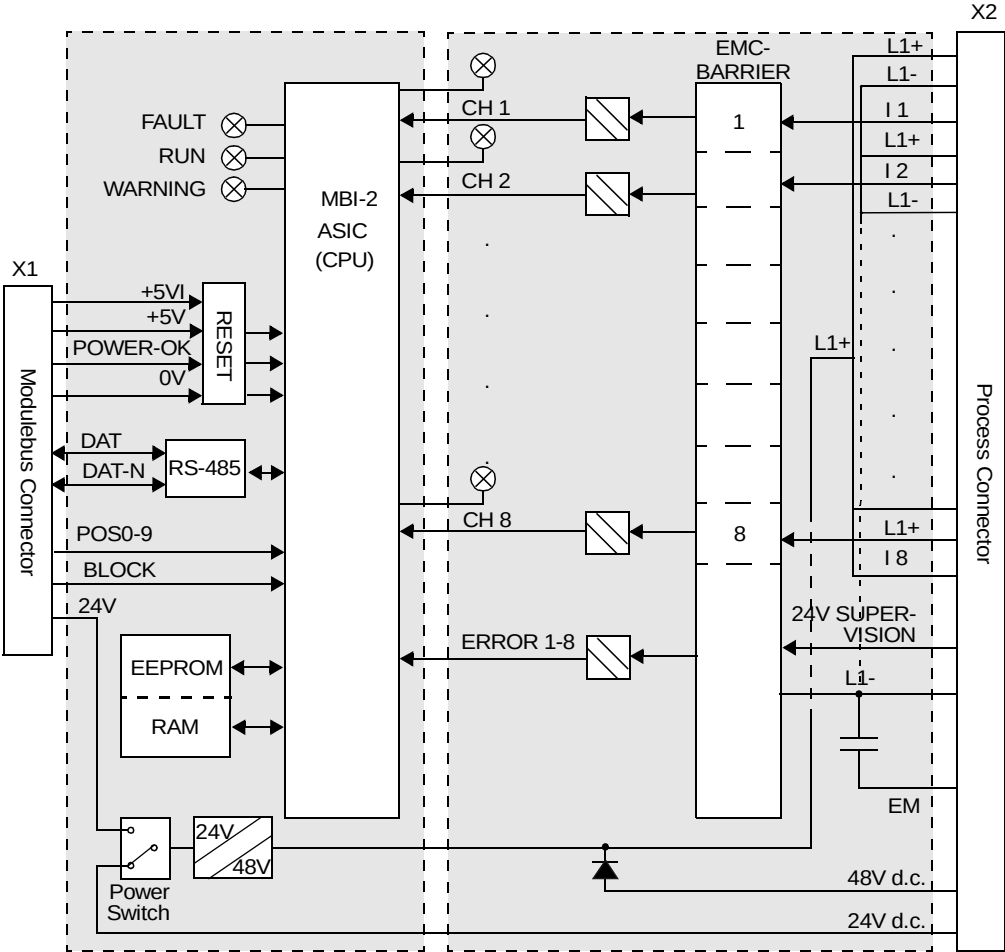
Table A-56 DI885 Digital Input Module Specifications (Continued)

Feature	DI885 Digital Input Module
Current consumption 5 V 24 V internal 24 V external 48 V external	160 mA 91 mA 91 mA 22 mA
Power dissipation ⁽¹⁾	3 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Isolation	Yes, opto
Module termination units	TU810, TU812, TU814 or TU830
MTU keying code	BF
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.22 kg (0.48 lbs.)

(1) Power dissipation is calculated with 70 percent of the channels activated at nominal voltage of 24/48 Volts.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.27.0.9 Block Diagram DI885



A.27.0.10 Process Connections*Table A-57 DI885 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
+24 V d.c. ext.	L1+ (2)	1, 14	L1+ (2)
0 V d.c.	L1-, L2-	2, 15	L1- (2), L2- (2)
Ch1 +48 V	B1	16	C2
Ch1 Input	C1	3	C1
Ch 2 +48 V	B2	17	C4
Ch 2 Input	C2	4	C3
Ch 3 +48 V	B3	18	C6
Ch 3 Input	C3	5	C5
Ch 4 +48 V	B4	19	C8
Ch 4 Input	C4	6	C7
Ch 5 +48 V	B5	20	C10
Ch 5 Input	C5	7	C9
Ch 6 +48 V	B6	21	C12
Ch 6 Input	C6	8	C11
Ch 7 +48 V	B7	22	C14
Ch 7 Input	C7	9	C13
Ch 8 +48 V	B8	23	C16
Ch8 Input	C8	10	C15
+48 V ext.	L2+ (2)	11, 24	L2+ (2)

(1) Pin 13 connected to connector body for EM.

Figure A-80 shows the process connections for the Digital Input Module DI885 when installed on a TU830 Extended MTU.

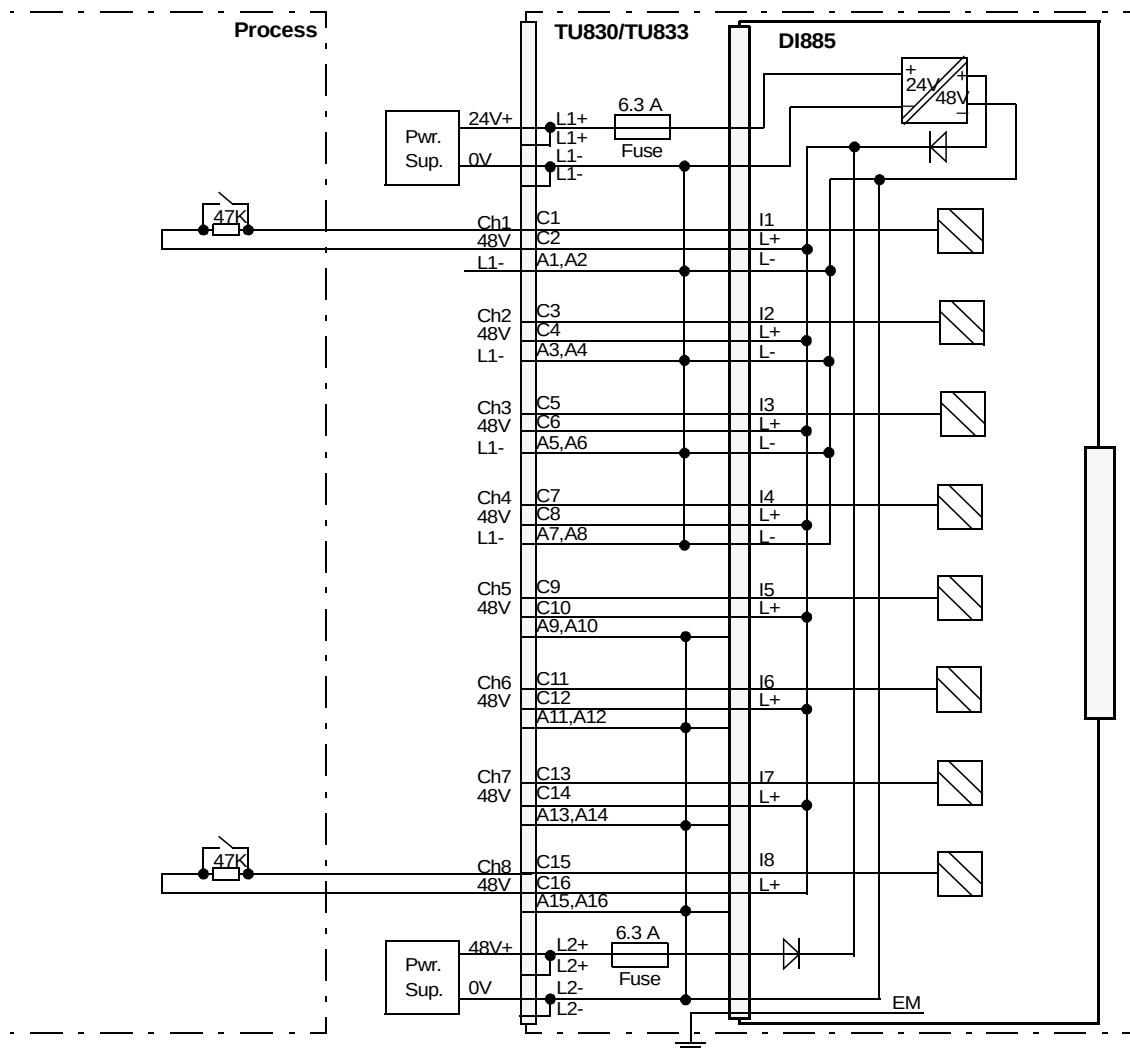


Figure A-80 DI885 with TU830 Extended MTU Process Connections

Figure A-81 shows the process connections for the DI885 when installed on a TU810 or TU814 Compact MTU.

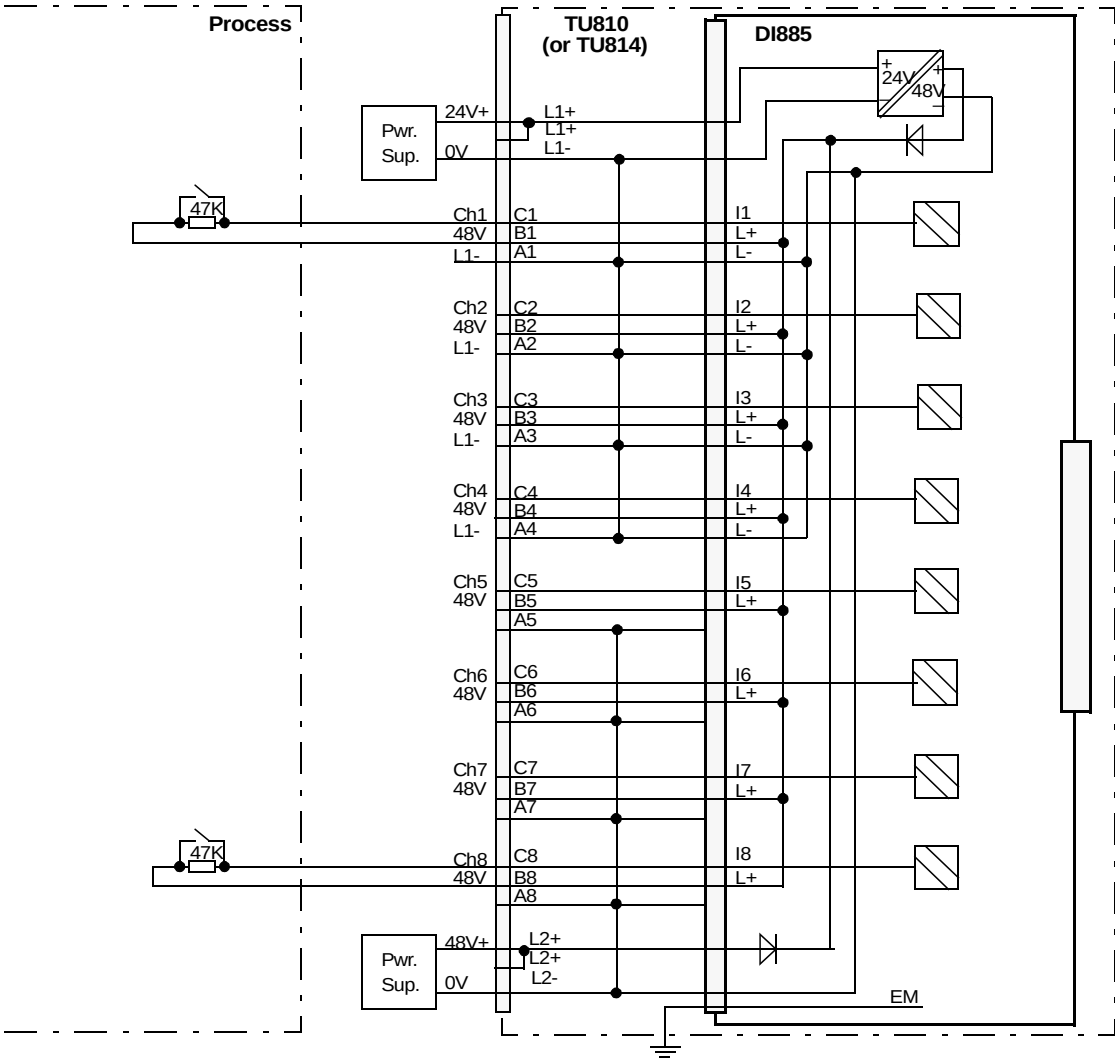


Figure A-81 DI885 with TU810 or TU814 Compact MTU Process Connections

Figure A-82 shows the connections for the DI885 when installed on a TU812.

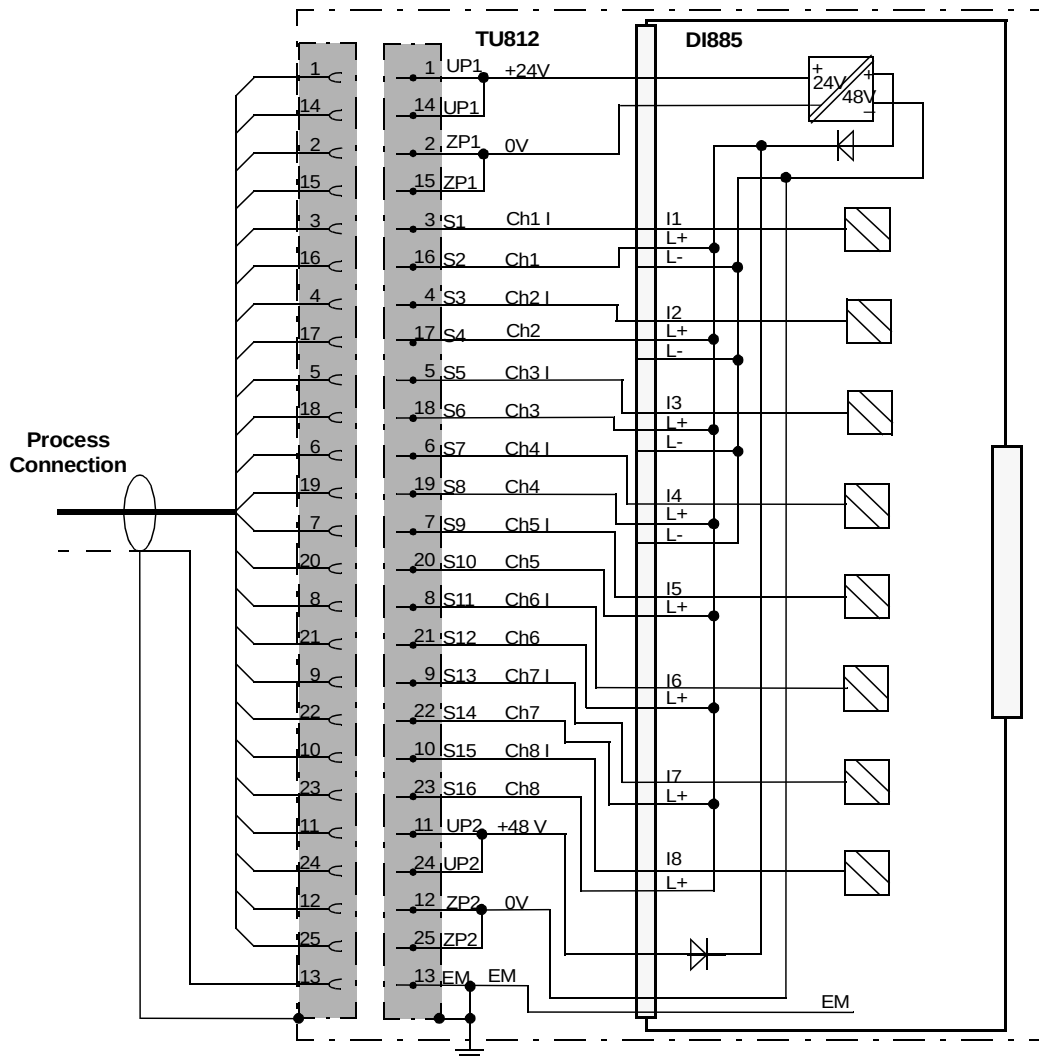


Figure A-82 DI885 with TU812 Compact MTU Process Connections

A.28 DO801 Digital Output Module 24 V, 0.5 A, Current Sourcing

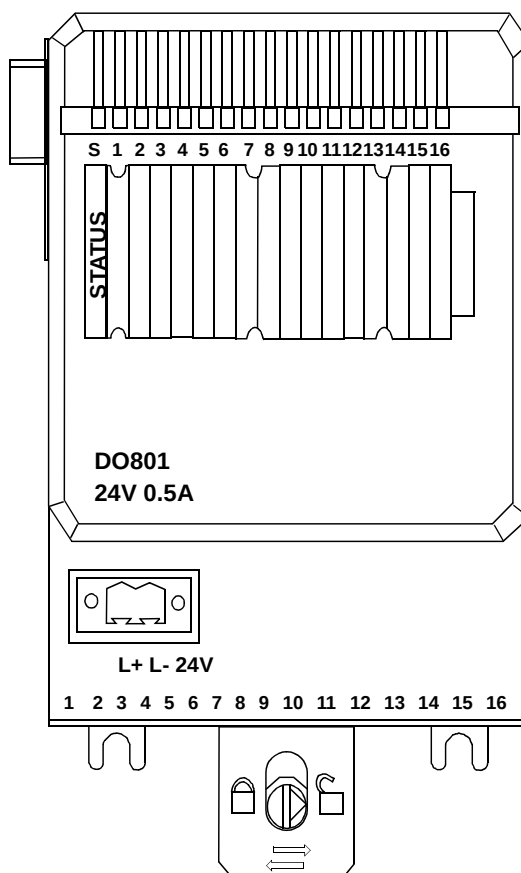
A.28.0.1 Features

- 16 channels for 24 V d.c. current sourcing outputs
- 1 isolated groups of 16 channels
- Output status indicators
- OSP sets outputs to predetermined state upon communication error
- Short-circuit protection to ground and 30 V
- Over-voltage and over-temperature protection
- EMC protection
- DIN rail mounting
- Process and power connection via detachable connectors

A.28.0.2 Description

The DO801 is a 16 channel 24 V digital output module for the S800 I/O. The output voltage range is 10 to 30 volt and the maximum continuous output current is 0.5 A. The outputs are protected against short circuits, over voltage and over temperature. The outputs are in one isolated group.

Each output channel consists of a short circuit and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier.



One STATUS LED indicate module status green/red. One LED (Yellow) per channel (16) indicate output state (On = 1 and Off = 0). The Status LED green indicates normal operation. The STATUS LED red indicates that the module is in Init state or Not Configured state. In Not Configured state the STATUS LED is turned off after the first valid access to the module.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct module address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the POWOK signal is active. The POWOK comes from the ModuleBus master after power is applied.

The outputs are current limited and protected against over temperature. If the outputs are overloaded the output current will be limited. This means that the power dissipation in the output stage will increase and the output will shutdown if the temperature in the output stage increases above 150 °C (302 °F). The output will switch on again automatically as the component temperature has decreased to about 140 °C (284 °F). If any output is shutdown due to overload the indication LED on that channel is not switched off. The output status of that channel can not be read from the module.

A.28.0.3 Technical Data*Table A-58 DO801 Digital Output Module Specifications*

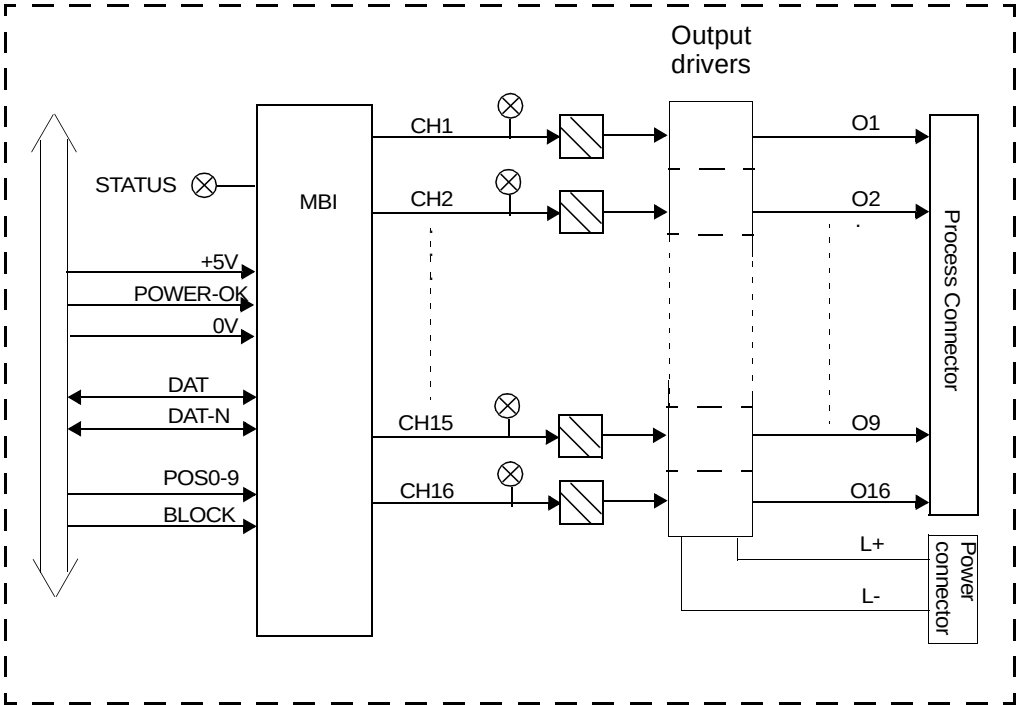
Feature	DO801 Digital Output Module
Number of channels	16 (1 x 16)
Type of output	Transistor current source, current limited
Voltage range	12 - 32 V d.c.
Load current, maximum	0.5 A
Short circuit current, maximum	2.4 A
Leakage current, maximum	<10 µa
Signal delay	<0.2 ms
Output impedance	<0.4 ohm
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption +5 V	80 mA
Power dissipation ⁽¹⁾	2.1 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Isolation	Groupwise isolated from ground (RIV=50 V)
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

Table A-58 DO801 Digital Output Module Specifications (Continued)

Feature	DO801 Digital Output Module
Acceptable wire sizes	Solid: 0.05-2.5mm ² , 30-12 AWG Stranded: 0.05-1.5mm ² , 30-12 AWG Recommended torque: 0.8 Nm Stripping length: 6-7.5 mm, 0.24-0.30 in
Width	86.1 mm (3.4")
Depth	58.5 mm (2.3")
Height	110 mm (4.33")
Weight	0.24 kg (0.53 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated.
(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.28.0.4 Block Diagram DO801



A.28.0.5 Process Connections*Table A-59 DO801 Process Connections*

Process Connection	Process Terminal
Ch 1 Output	1
Ch 2 Output	2
Ch 3 Output	3
Ch 4 Output	4
Ch 5 Output	5
Ch 6 Output	6
Ch 7 Output	7
Ch 8 Output	8
Ch 9 Output	9
Ch 10 Output	10
Ch 11 Output	11
Ch 12 Output	12
Ch 13 Output	13
Ch 14 Output	14
Ch 15 Output	15
Ch 16 Output	16

Figure A-83 shows the process connections for the DO801.

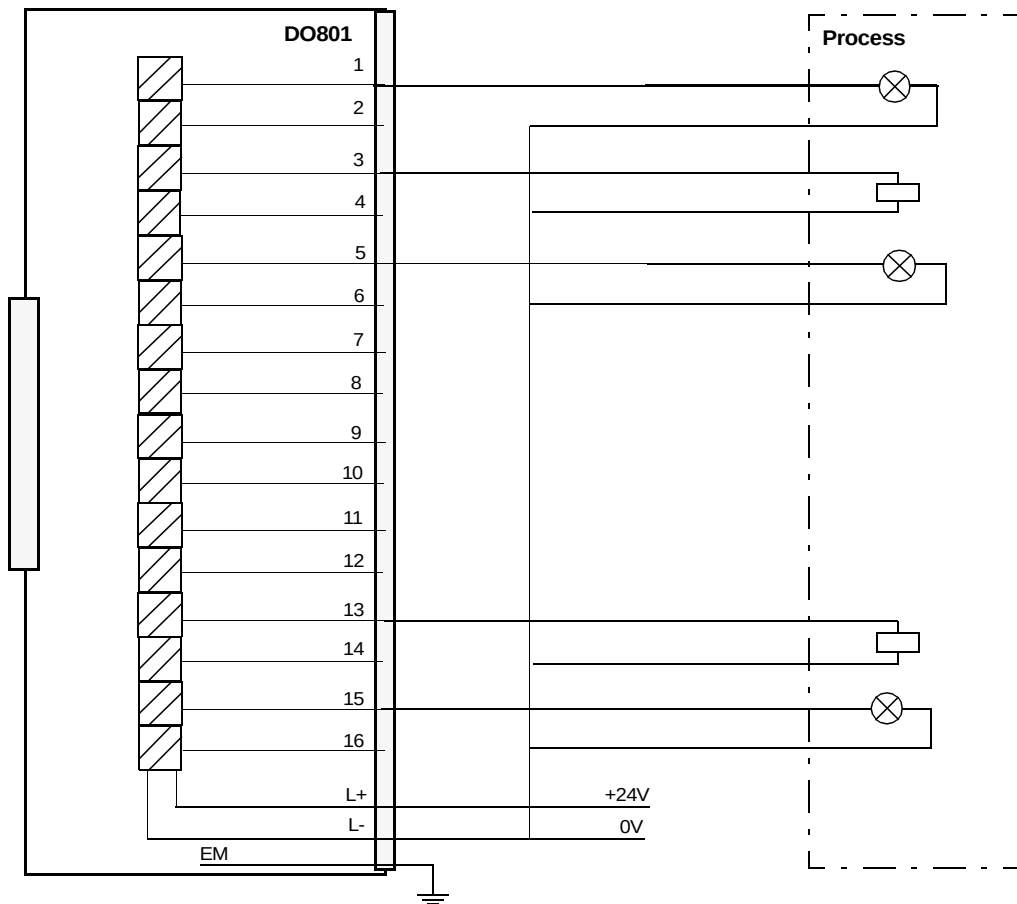


Figure A-83 DO801 Process Connections

A.29 DO802 Digital Output Module, 24-250 V, Relay Normally Open

A.29.0.1 Features

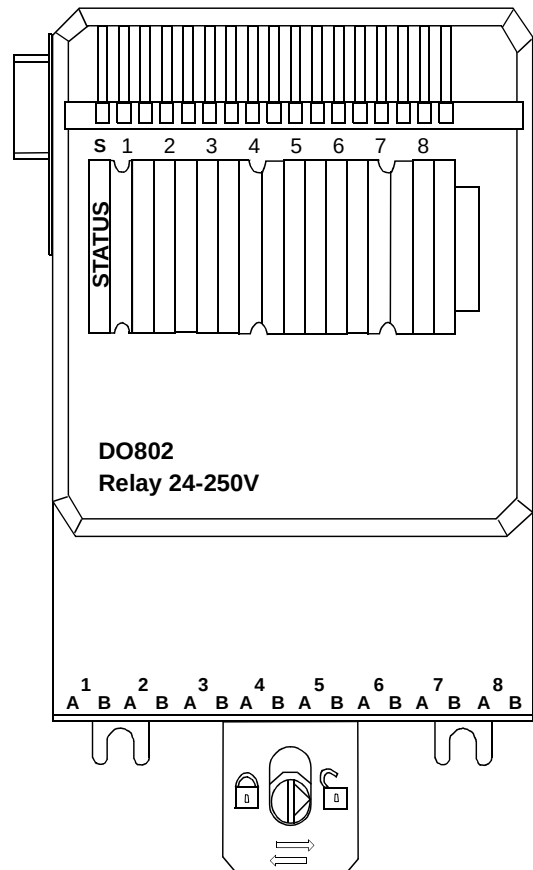
- 8 channels for 110 V d.c./250 V a.c. relay Normally Open (NO) outputs
- 8 isolated channels
- Output status indicators
- OSP sets outputs to predetermined state upon error detection
- EMC protection
- DIN rail mounting
- Process connection via detachable connectors

A.29.0.2 Description

The DO802 is an 8 channel 110 V d.c./250 V a.c. relay (NO) output module for the S800 I/O. The maximum voltage range is 250 volt and the maximum continuous output current is 2 A. All outputs are individually isolated.

Each output channel consists of optical isolation barrier, output state indication LED, relay driver, relay and EMC protection components.

One STATUS LED indicate module status green/red. One LED (Yellow) per channel (8) indicate output state (On = 1 and Off = 0). The Status LED green



indicates normal operation. The STATUS LED red indicates that the module is in Init state or Not Configured state. In Not Configured state the STATUS LED is turned off after the first valid access to the module.

The relay supply voltage supervision, derived from the 24 V distributed on the ModuleBus, gives a channel signal error and a module warning signal if the voltage disappears. The error signal and warning signal can be read via the ModuleBus. This supervision can be enabled/disabled with a parameter.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer which is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct node address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the POWOK signal is active.

A.29.0.3 Technical Data*Table A-60 DO802 Digital Output Module Specifications*

Feature	DO802 Digital Output Module
Number of channels	8
Type of output	Relay (NO)
Voltage range	24 - 110 V d.c./250 V a.c.
Load current, maximum	2 A
Load current, minimum	5 mA
Max break power	a.c. 500 VA d.c. 60W
Maximum field cable length (d.c., a.c.)	600 meters (656 yd.)
Pick-up time, maximum	10 ms
Release time, maximum	6 ms
Number of operations per hour, maximum	1000
Number of operations per lifetime: Mechanical Electrical at 30 V d.c. / 250 V a.c.	>20 x 10 ⁶ >0,16 x 10 ⁶ (2 A resistive)
Current consumption +5 V	70 mA
Current consumption +24 V	80 mA
Power dissipation ⁽¹⁾	2.2 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Power supervision	24/12 V Relay power converter monitor

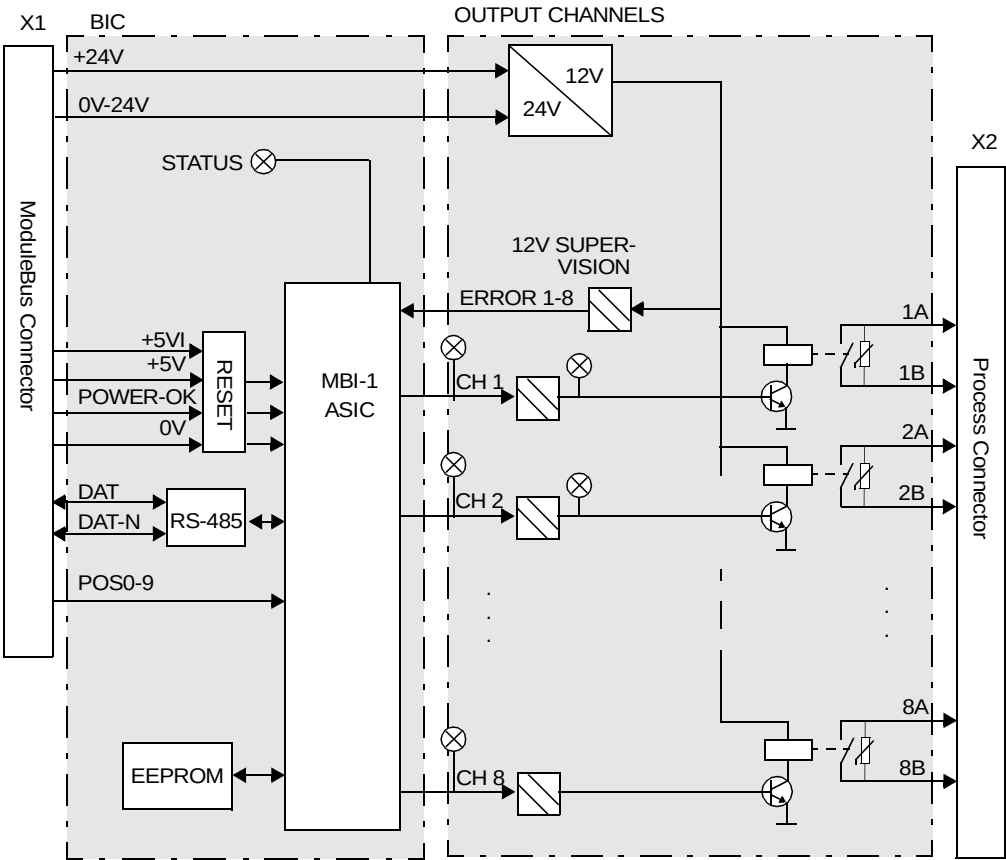
Table A-60 DO802 Digital Output Module Specifications (Continued)

Feature	DO802 Digital Output Module
Isolation	Individually isolated from ground (RIV=250 V)
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Acceptable wire sizes	Solid: 0.05-2.5mm ² , 30-12 AWG Stranded: 0.05-1.5mm ² , 30-12 AWG Recommended torque: 0.8 Nm Stripping length: 6-7.5 mm, 0.24-0.30 in
Width	86.1 mm (3.4")
Depth	58.5 mm (2.3")
Height	110 mm (4.33")
Weight	0.24 kg (0.53 lbs.)

(1) Power dissipation is calculated with 70 percent of the channels activated.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.29.0.4 Block Diagram DO802



A.29.0.5 Process Connections

Table A-61 DO802 Process Connections

Process Connection	Process Terminal
Ch1 Input	1A
	1B
Ch 2 Input	2A
	2B
Ch 3 Input	3A
	3B
Ch 4 Input	4A
	4B
Ch 5 Input	5A
	5B
Ch 6 Input	6A
	6B
Ch 7 Input	7A
	7B
Ch 8 Input	8A
	8B

Figure A-84 shows the process connections for the Digital Output Module DO802.

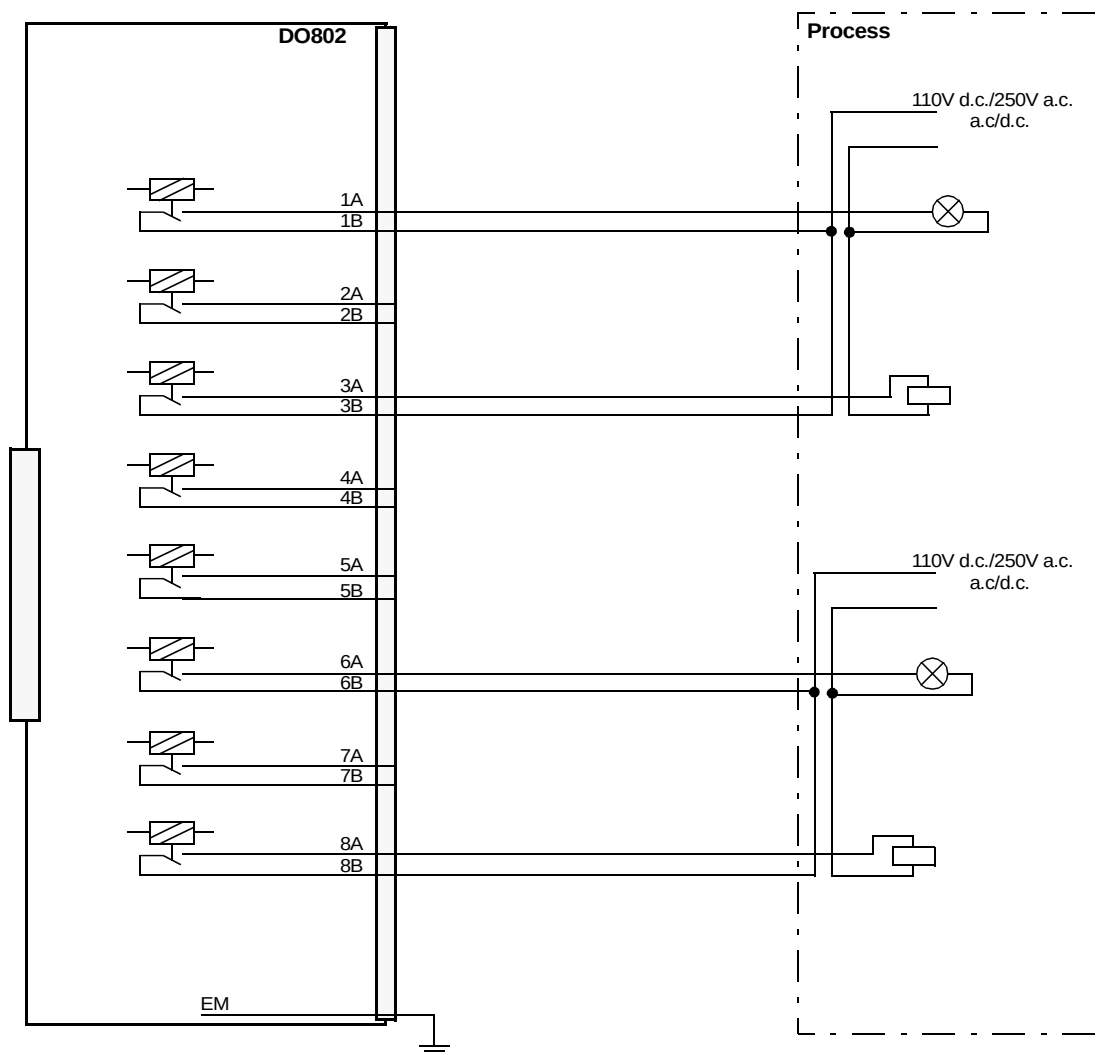


Figure A-84 DO802 Process Connections

A.30 DO810 Digital Output Module 24 V, 0.5 A Current Sourcing

A.30.0.1 Features

- 16 channels for 24 V d.c. current sourcing outputs
- 2 isolated groups of 8 channels with process voltage supervision
- Output status indicators
- OSP sets outputs to predetermined state upon error detection
- Short-circuit protection to ground and 30 V
- Over-voltage and over-temperature protection
- EMC protection
- DIN rail mounting.
- Also in a G3 compliant version.

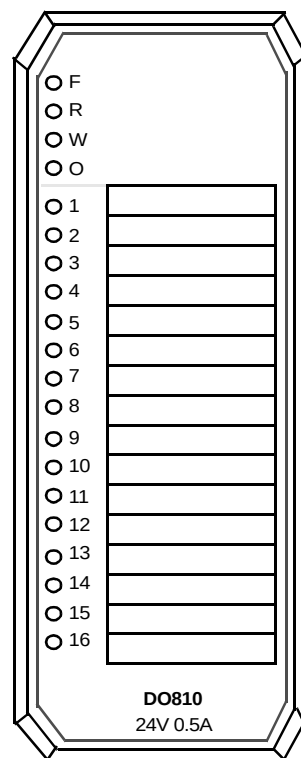
A.30.0.2 Description

The DO810 is a 16 channel 24 V digital output module for the S800 I/O. This module has 16 digital outputs. The output voltage range is 10 to 30 volt and the maximum continuous output current is 0.5 A.

The outputs are protected against short circuits, over voltage and over temperature. The outputs are divided into two individually isolated groups with eight output channels and one voltage supervision input in each group.

Each output channel consists of a short circuit and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier.

Four LEDs indicate module status Fault (Red), Run (Green), Warning (Yellow) and OSP (Yellow). One LED (Yellow) per channel (16) indicate output state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED



indicates if any error input is active. The FAULT LED indicates that the module is in Init state or Not Configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module. The OSP LED indicates that the module is in the OSP state and that the outputs are set to their OSP values.

The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct module address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The outputs are current limited and protected against over temperature. If the outputs are overloaded the output current will be limited. This means that the power dissipation in the output stage will increase and the output will shutdown if the temperature in the output stage increases above 150 °C (302 °F). The output will switch on again automatically as the component temperature has decreased to about 140 °C (284 °F). If any output is shutdown due to overload the indication LED on that channel is also switched off. The output status of that channel can not be read from the module.

Four different types of MTUs can be used. TU830 Extended MTU and TU810 (or TU814) Compact MTU have terminals for 24 V output power connections and two terminals per channels. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

A.30.0.3 Technical Data*Table A-62 DO810 Digital Output Module Specifications*

Feature	DO810 Digital Output Module
Number of channels	16 (2 x 8)
Type of output	Transistor current sourcing, current limited
Voltage range	12 - 32 V d.c.
Load current, maximum	0.5 A
Short circuit current, maximum	2.4 A
Leakage current, maximum	<10 µa
Output impedance	<0.4 ohm
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption +5 V	80 mA
Power dissipation ⁽¹⁾	2.1 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group)
Isolation	Groupwise isolated from ground (RIV=50 V)
Mounting termination units	TU810, TU812, TU814 or TU830
MTU keying code	AA
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529

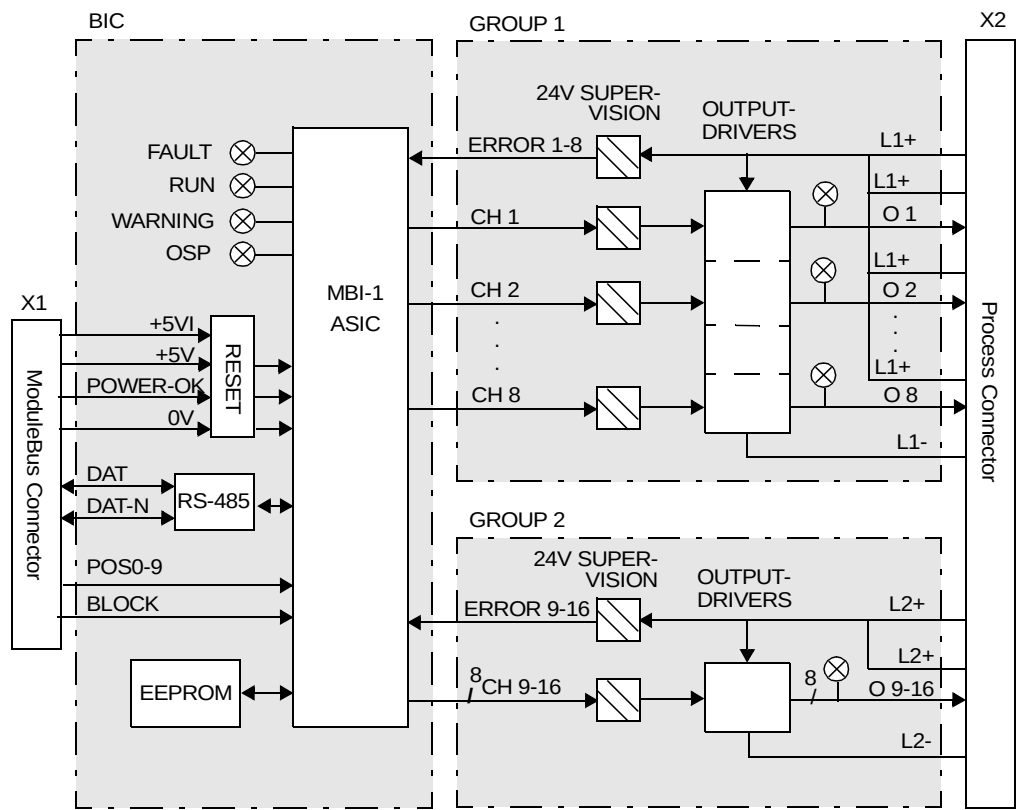
Table A-62 DO810 Digital Output Module Specifications (Continued)

Feature	DO810 Digital Output Module
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.18 kg (0.4 lbs.)

(1) Power dissipation is calculated with 70 percent of the channels activated.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.30.0.4 Block Diagram DO810



A.30.0.5 Process Connections*Table A-63 DO810 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)
Ch 1/Ch 2, L1+	-	-	B1, B2
Ch 1 Output	C1	3	C1
Ch 2 Output	B1	16	C2
Ch 1/Ch 2, L1-	A1	-	A1, A2
Ch 3/Ch 4, L1+	-	-	B3, B4
Ch 3 Output	C2	4	C3
Ch 4 Output	B2	17	C4
Ch 3/Ch 4, L1-	A2	-	A3, A4
Ch 5/Ch 6, L1+	-	-	B5, B6
Ch 5 Output	C3	5	C5
Ch 6 Output	B3	18	C6
Ch 5/Ch 6, L1-	A3	-	A5, A6
Ch 7/Ch 8, L1+	-	-	B7, B8
Ch 7 Output	C4	6	C7
Ch 8 Output	B4	19	C8
Ch 7/Ch 8, L1-	A4	-	A7, A8
Ch 9/Ch 10, L2+	-	-	B9, B10
Ch 9 Output	C5	7	C9

Table A-63 DO810 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal
Ch 10 Output	B5	20	C10
Ch 9/Ch 10, L2-	A5	-	A9, A10
Ch 11/Ch 12, L2+	-	-	B11, B12
Ch 11 Output	C6	8	C11
Ch 12 Output	B6	21	C12
Ch 11/Ch 12, L2-	A6	-	A11, A12
Ch 13/Ch 14, L2+	-	-	B13, B14
Ch 13 Output	C7	9	C13
Ch 14 Output	B7	22	C14
Ch 13/Ch 14, L2-	A7	-	A13, A14
Ch 15/ Ch16, L2+	-	-	B15, B16
Ch 15 Output	C8	10	C15
Ch 16 Output	B8	23	C16
Ch 15/Ch16, L2-	A8	-	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-85 shows the process connections for the Digital Output Module DO810 when installed on a TU830/TU833 Extended MTU.

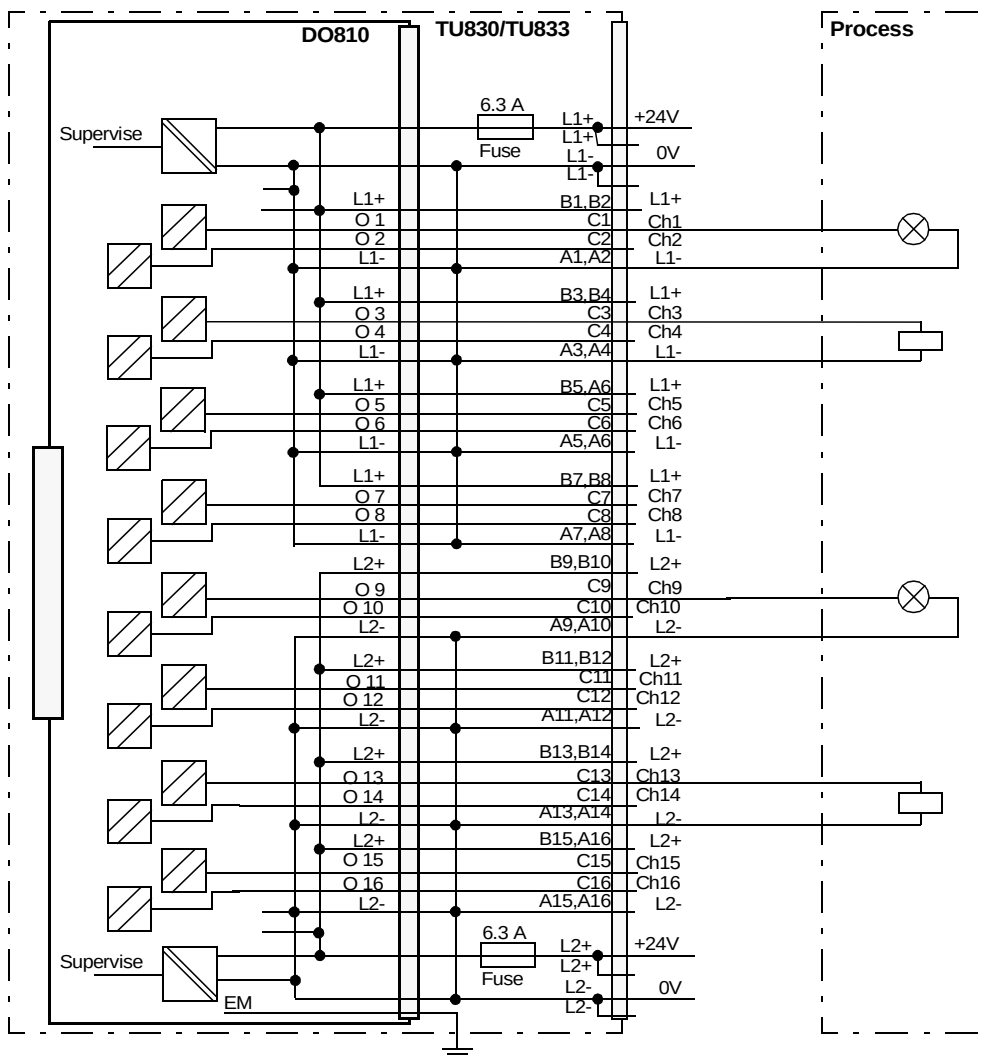


Figure A-85 DO810 with TU830/TU833 Extended MTU Process Connections

Figure A-86 shows the process connections for the DO810 when installed on a TU810 or TU814 Compact MTU.

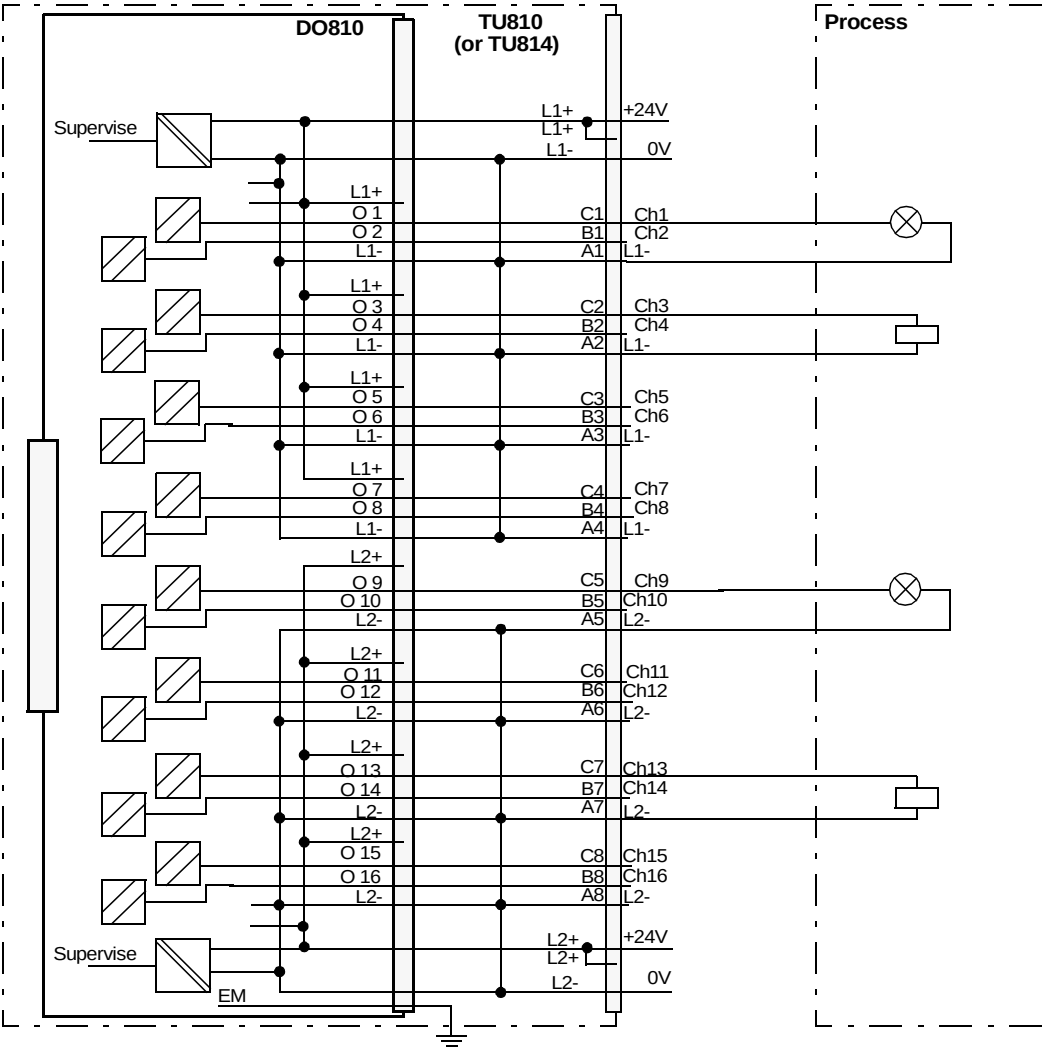


Figure A-86 DO810 with TU810 or TU814 Compact MTU Process Connections

Figure A-87 shows the process connections for the Digital Output Module DO810 when installed on a TU812 Compact MTU.

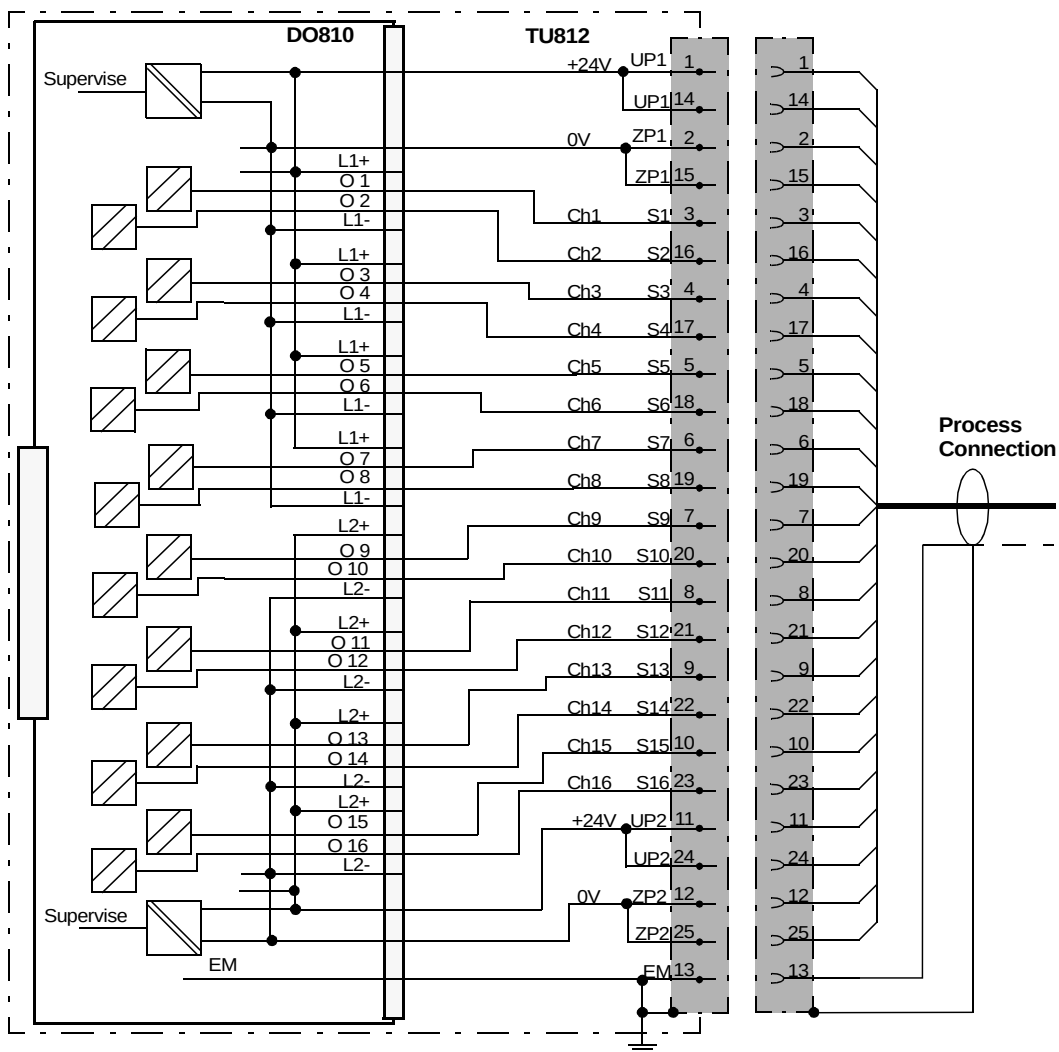


Figure A-87 DO810 with TU812 Compact MTU Process Connections

A.31 DO814 Digital Output Module 24 V, 0.5 A, Current Sinking

A.31.0.1 Features

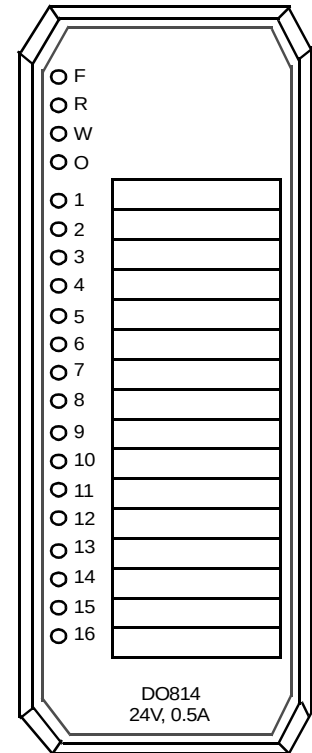
- 16 channels for 24 V d.c. current sinking outputs
- 2 isolated groups of 8 channels with process voltage supervision
- Output status indicators
- OSP sets outputs to predetermined state upon error detection
- Short-circuit protection to ground and 30 V
- Over-voltage and over-temperature protection
- EMC protection
- DIN rail mounting.

A.31.0.2 Description

The DO814 is a 16 channel 24 V digital output module with current sinking for the S800 I/O. The output voltage range is 10 to 30 volt and the maximum continuous current sinking is 0.5 A. The outputs are protected against short circuits and over temperature. The outputs are divided into two individually isolated groups with eight output channels and one voltage supervision input in each group.

Each output channel consists of a short circuit and over temperature protected low side switch, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier.

Four LEDs indicate module status Fault (Red), Run (Green), Warning (Yellow) and OSP (Yellow). One LED (Yellow) per channel (16) indicate output state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error input is active. The FAULT LED indicates that the module is



in Init state or Not Configured state. In Not configured state the FAULT LED is turned off after the first valid access to the module. The OSP LED indicates that the module is in the OSP state and that the outputs are set to their OSP values.

The process voltage supervision input give channel error signals if the voltage disappears. The error signal can be read via the ModuleBus.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct module address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK is inactive and POWOK signals is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The outputs are current limited and protected against over temperature. If the outputs are overloaded the output current sinking will be limited. This means that the power dissipation in the output stage will increase and the output will shutdown if the temperature in the output stage increases above 150 °C (302 °F). The output will switch on again automatically as the component temperature has decreased to about 140 °C (284 °F).

Five different types of MTUs can be used. The TU830 Extended MTU enables three wire connection to the devices without additional terminals. The TU810 (or TU814) Compact MTU has terminals for 24 V output power connection, but requires external terminals for distribution of 24 V power supply to the devices. The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process. TU838 provide a fuse (3 A max.) per two channels or process power output.

A.31.0.3 Technical Data*Table A-64 DO814 Digital Output Module Specifications*

Feature	DO814 Digital Output Module
Number of channels	16 (2 x 8) current sinking
Type of output	Transistor current sinking, current limited
Voltage range	12 - 32 V d.c.
Load current, maximum	0.5 A
Short circuit current, maximum	2.4 A
Leakage current, maximum	<10 µa
Output impedance	<0.4 ohm
Maximum field cable length	600 meters (656 yd.)
Current consumption +5 V	80 mA
Power dissipation ⁽¹⁾	2.1 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group)
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812, TU814, TU830 or TU838
MTU keying code	BE
Equipment class	Class I according to IEC 61140; (earth protected)

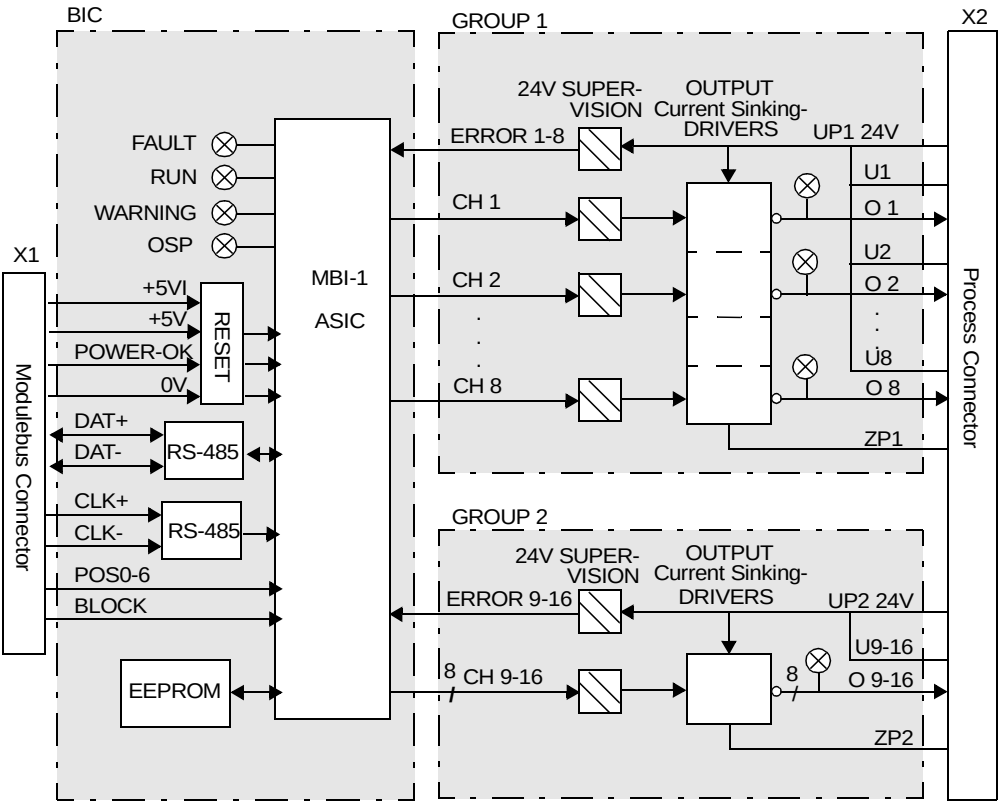
Table A-64 DO814 Digital Output Module Specifications (Continued)

Feature	DO814 Digital Output Module
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.18 kg (0.4 lbs.)

(1) Power dissipation is calculated with 70 percent of the channels activated.

(2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.31.0.4 Block Diagram DO814



A.31.0.5 Process Connections*Table A-65 DO814 Process Connection*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)
Ch 1/Ch 2, L1+	-	-	B1, B2	A1 (F1)
Ch 1 Output	C1	3	C1	B1
Ch 2 Output	B1	16	C2	B2
Ch 1/Ch 2, L1-	A1	-	A1, A2	A2
Ch 3/Ch 4, L1+	-	-	B3, B4	A3 (F2)
Ch 3 Output	C2	4	C3	B3
Ch 4 Output	B2	17	C4	B4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A4
Ch 5/Ch 6, L1+	-	-	B5, B6	A5 (F3)
Ch 5 Output	C3	5	C5	B5
Ch 6 Output	B3	18	C6	B6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A6
Ch 7/Ch 8, L1+	-	-	B7, B8	A7 (F4)
Ch 7 Output	C4	6	C7	B7
Ch 8 Output	B4	19	C8	B8
Ch 7/Ch 8, L1-	A4	-	A7, A8	A8
Ch 9/Ch 10, L2+	-	-	B9, B10	A9 (F5)
Ch 9 Output	C5	7	C9	B9

Table A-65 DO814 Process Connection (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal	TU838 Terminal
Ch 10 Output	B5	20	C10	B10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A10
Ch 11/Ch 12, L2+	-	-	B11, B12	A11 (F6)
Ch 11 Output	C6	8	C11	B11
Ch 12 Output	B6	21	C12	B12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A12
Ch 13/Ch 14, L2+	-	-	B13, B14	A13 (F7)
Ch 13 Output	C7	9	C13	B13
Ch 14 Output	B7	22	C14	B14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A14
Ch 15/ Ch16, L2+	-	-	B15, B16	A15 (F8)
Ch 15 Output	C8	10	C15	B15
Ch 16 Output	B8	23	C16	B16
Ch 15/Ch16, L2-	A8	-	A15, A16	A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-85 shows the process connections for the Digital Output Module DO814 when installed on a TU830/TU833 Extended MTU.

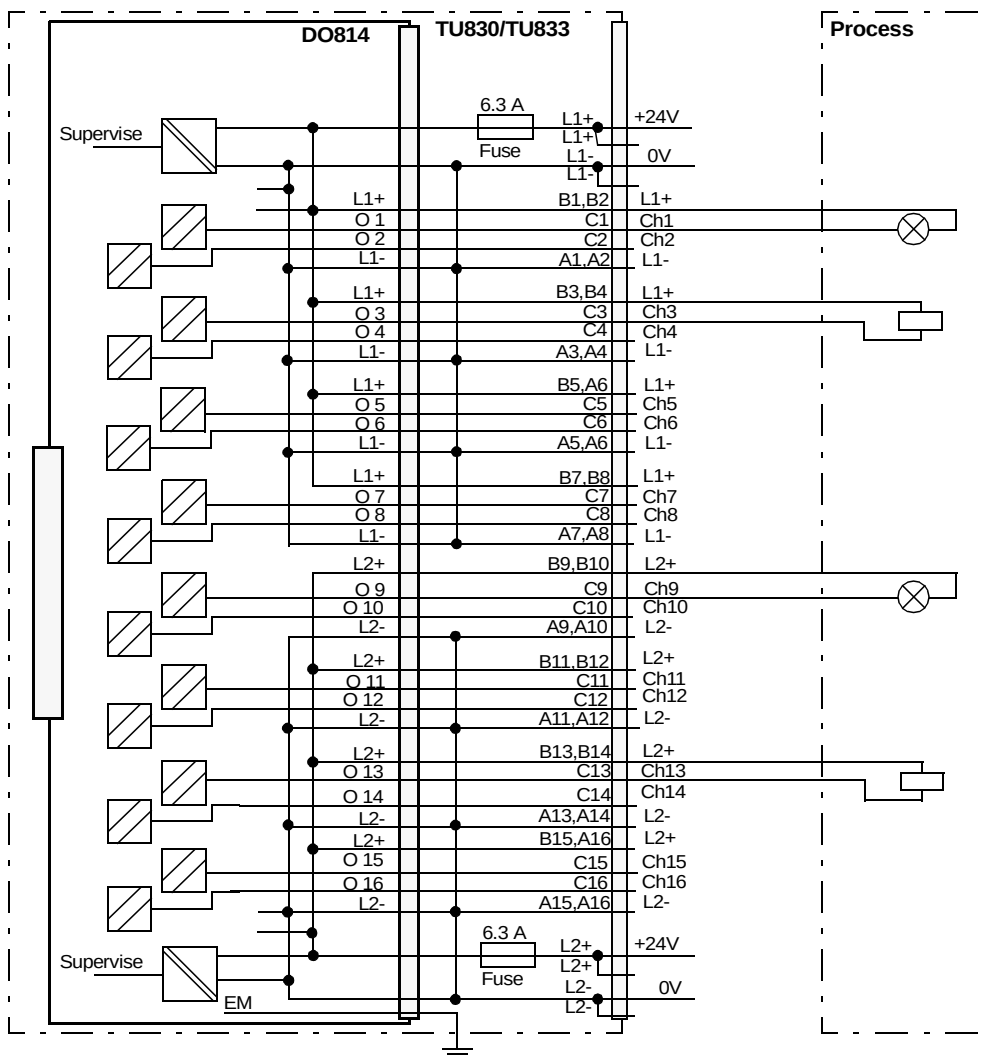


Figure A-88 DO814 with TU830/TU831 Extended MTU Process Connections

Figure A-89 shows the process connections for the Digital Output Module DO814 (current sinking) when installed on a TU838 Extended MTU.

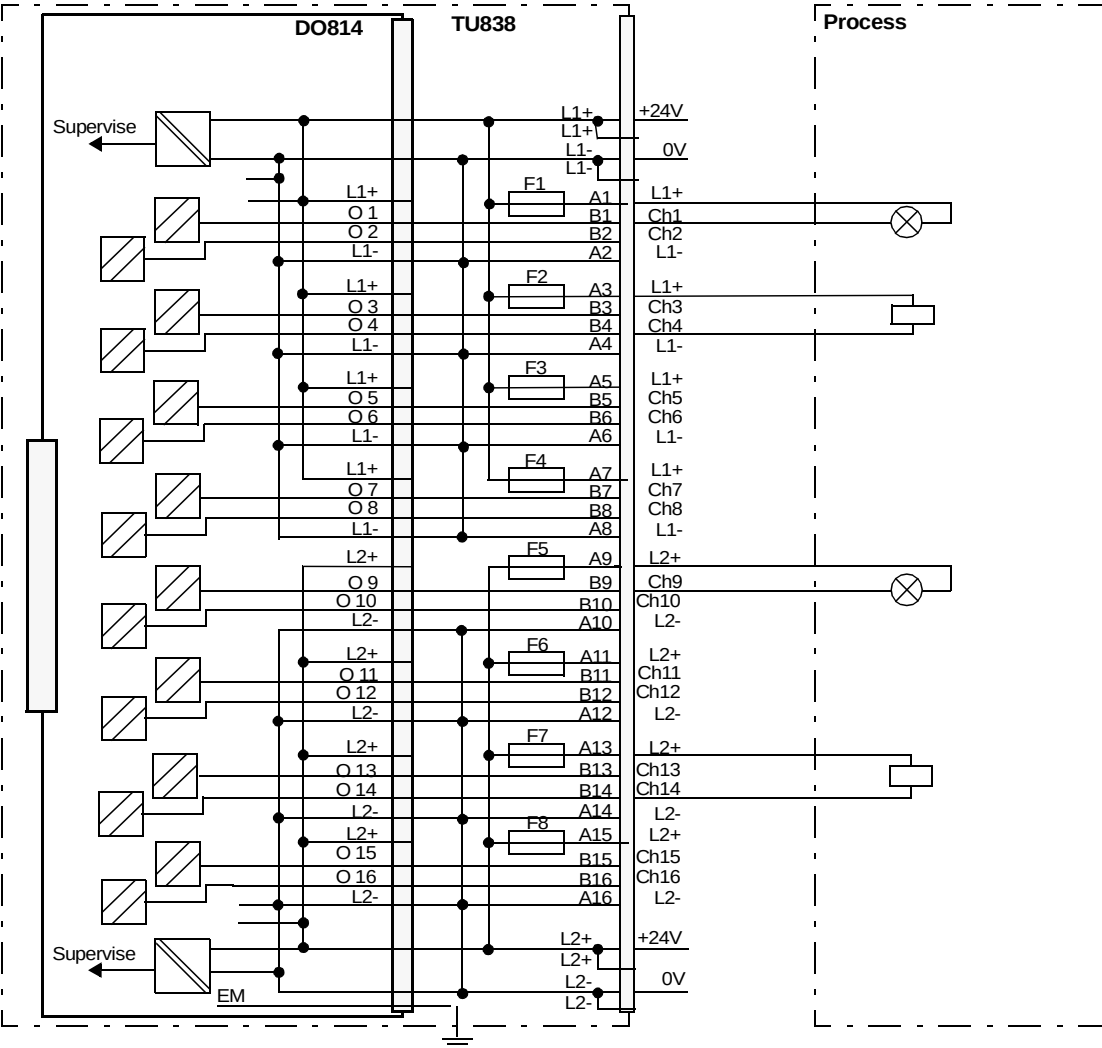


Figure A-89 DO814 with TU838 Extended MTU Process Connections

Figure A-90 shows the process connections for the DO814 when installed on a TU810 or TU814 Compact MTU.

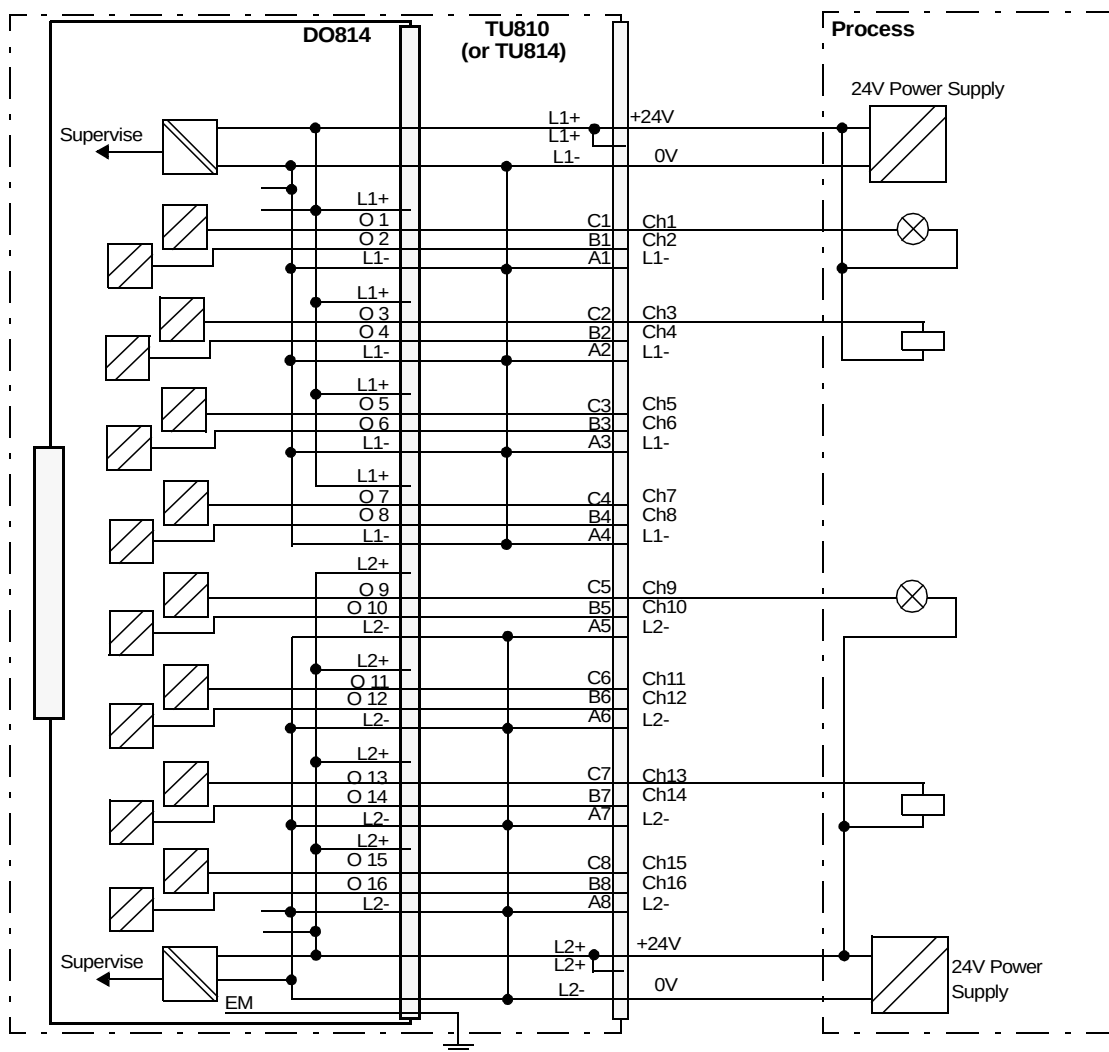


Figure A-90 DO814 with TU810 or TU814 Compact MTU Process Connections

Figure A-91 shows the process connections for the Digital Output Module DO814 when installed on a TU812 Compact MTU.

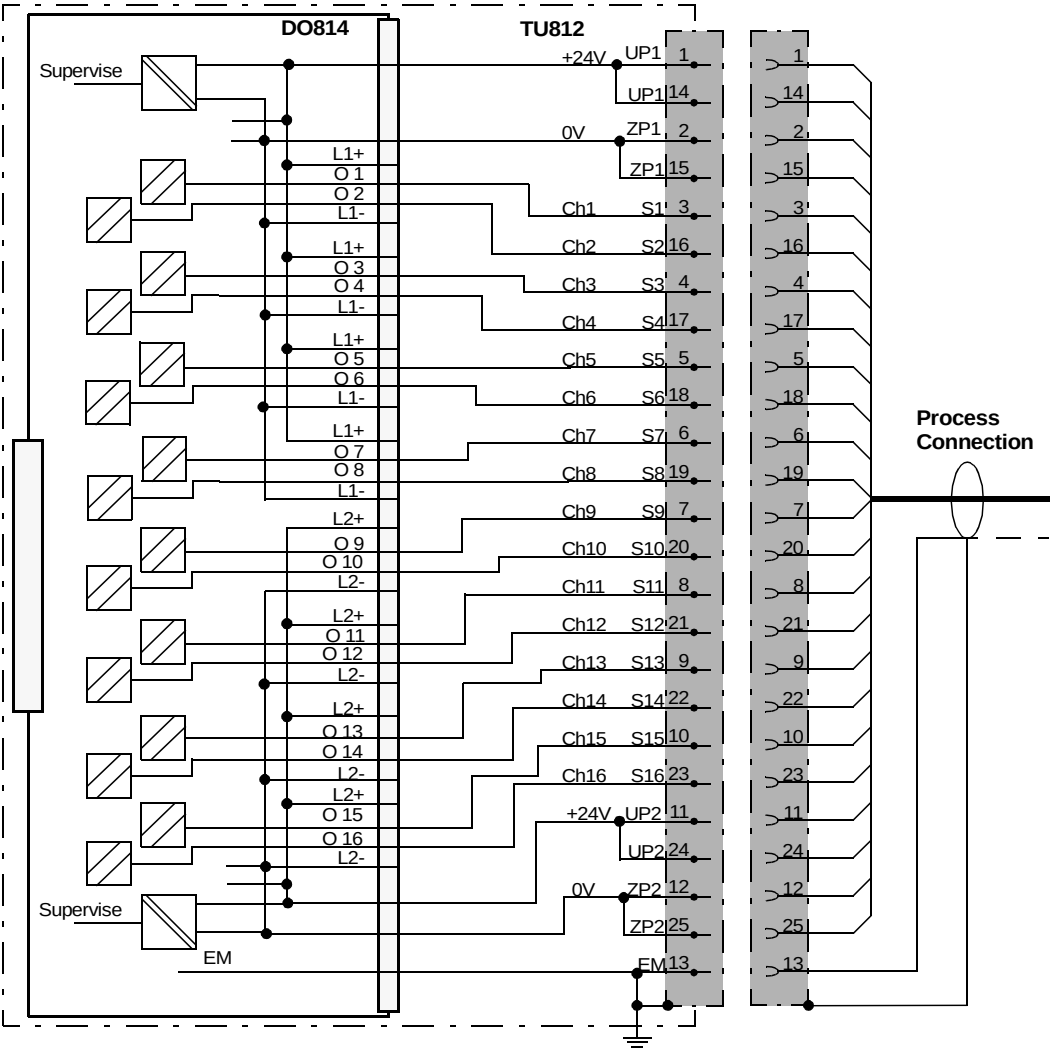
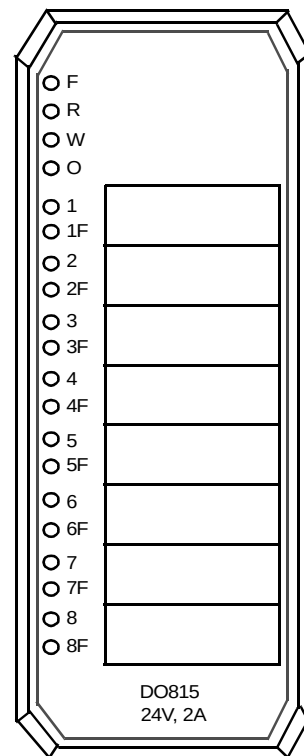


Figure A-91 DO814 with TU812 Compact MTU Process Connections

A.32 DO815 Digital Output Module 24 V, 2 A, Current Sourcing

A.32.0.1 Features

- 8 channels for 24 V d.c. current sourcing outputs
- 2 isolated groups of 4 channels with under voltage detection
- OSP sets outputs to predetermined state upon communication error
- Output status indicators and a channel wise error flag
- Short-circuit protection to ground and positive supply
- Over load protection
- Open load and short-circuit detection
- Two output fault operation modes: Automatic reset mode and Fault latching mode
- Inductive load driving capability
- Filament lamp load up to 10W
- EMC protection
- DIN rail mounting.
- Also in a G3 compliant version.



A.32.0.2 Description

The DO815 is a 8 channel 24 V digital output module for the S800 I/O. The output voltage range is 10 to 30 volt and the maximum continuous output current is 2 A @ 24 V. The outputs are protected against short circuits, and over load. The outputs are divided into two individually isolated groups with four output channels in each group.

Each output channel consists of a short circuit and over load protected high side driver with open load detection (on active signal), EMC protection components, inductive load suppression, output status indication LEDs and optical isolation barrier.

Four LEDs indicate module status; Fault (Red), Run (Green), Warning (Yellow) and OSP (Yellow). One LED (Yellow) per channel (8) indicate output state (On = 1 and Off = 0). The output fault diagnostic function, that is, short circuit, over load, under voltage and open load detection, activities a channel wise Error input and Fault LED (1F - 8F) (Red). The error signal can be read via the ModuleBus. The RUN LED indicates normal operation and the WARNING LED indicates if any Error input is active.

The FAULT LED indicates that the module is in Init state or Not Configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module. The OSP LED indicates that the module is in the OSP state and that the outputs are set to their OSP values.

The driver outputs provide a “free-wheel diode” to demagnetize inductive loads. No external demagnetization arrangement is required up to loads of 1J.

DO815 outputs are able to drive filament lamp loads up to 10W, but only in Automatic reset mode.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct module address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave OSP state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

DO815 provides two protection operation modes. Each channel can be configured to operate in one of the two modes.

1. Automatic reset mode (Default mode): The fault condition will disappear, then the fault disappears and the operation is resumed.
2. Fault latching mode (This mode is not applicable in all controllers): The output is switched off by any of the fault conditions. The fault latch remains in fault condition until reset by temporarily setting the automatic reset mode.

The output drivers are current limited and protected against over load. If an output has a short circuit to ground the output current will be limited and the driver will shutdown in order to minimize the power dissipation. In the automatic reset mode the output will switch on again automatically after a defined time interval. If the short circuit condition is still present, the output is turned off again, otherwise the normal operation is resumed. In the fault latching mode the output remains off until the fault condition is not valid and the reset of the fault latch is activated. If any output is shutdown due to fault condition the indication LED (Yellow) on that channel remains on if the channel is activated. The output status of the channel can be read from the module.

Four different types of MTUs can be used, TU830 Extended MTU and TU810, TU812 or TU814 Compact MTU have terminals for 24 V output power connection and terminals for the output channels. With use of TU812 the current per group is limited to 5 A.

A.32.0.3 Technical Data*Table A-66 DO815 Digital Output Module Specifications*

Feature	DO815 Digital Output Module
Number of channels	8 (2 x 4)
Type of output	High side driver, current limited
Process voltage (L+) Normal Range	24 V d.c. 10 - 32 V d.c.
On-state output voltage drop	Max. 0.5 V
Load current, maximum	2 A @ 24 V, 2,5 A @ 30 V
Total permissible current of outputs per group	Max. 6 A
Short circuit current	Max. 4 A
Open load detection current ⁽¹⁾	< 6 mA
Leakage current, maximum	Max. 500 µA
Output impedance	<0.25 ohm
Filament lamp load only in Automatic reset mode	Max. 10W
Inductive load switch off energy	Max. 1J
Output signal delay	Max. 0.2 ms
Switching frequency resistive load	Max. 200 Hz
Switching frequency inductive load	Max. 2.5 Hz
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption +5 V	120 mA, 150 mA max.

Table A-66 DO815 Digital Output Module Specifications (Continued)

Feature	DO815 Digital Output Module
Power dissipation ⁽²⁾	4 W @ 24 V
Maximum ambient temperature	55/40°C (131/104°F) ⁽³⁾
Output Set as Predetermined (OSP) timer	256 ⁽⁴⁾ , 512, 1024 ms
Isolation	Groupwise isolated from ground (RIV=50 V)
Module termination units	TU810, TU812 ⁽⁵⁾ , TU814 or TU830
MTU keying code	AA
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.2 kg (0.44 lbs.)

(1) On active signal

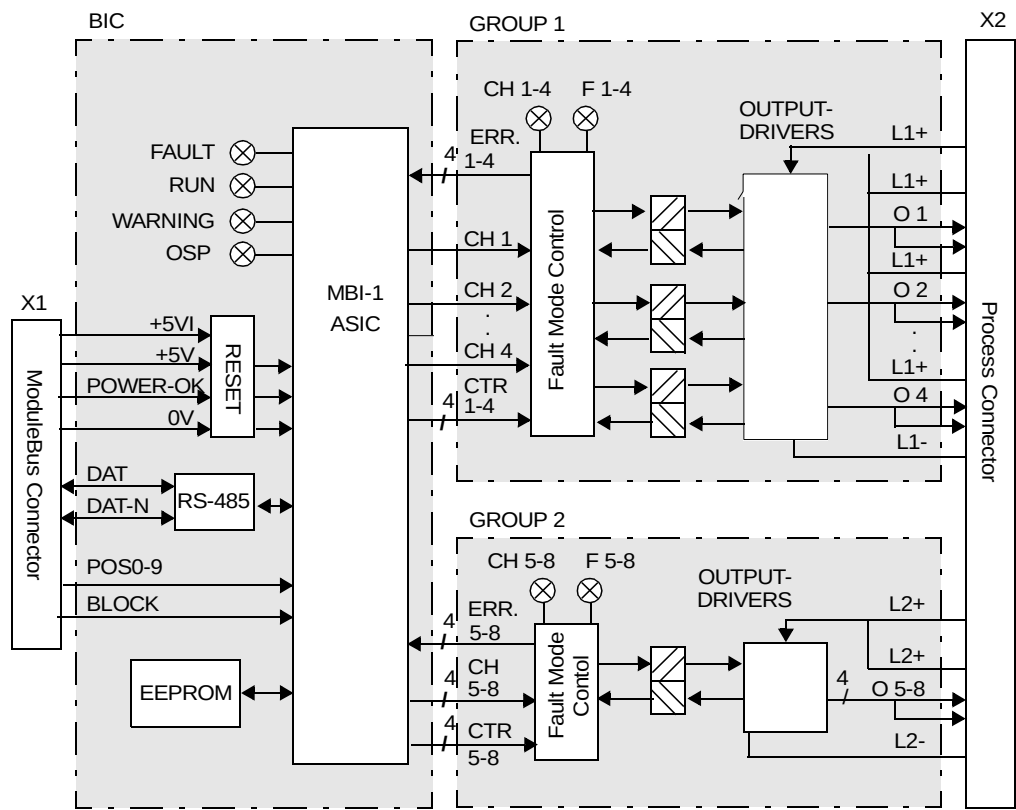
(2) Power dissipation is calculated with 70 percent of the channels activated.

(3) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

(4) 256 ms are used for Master. Set by the user for MOD.

(5) Current per group is limited to 5 A.

A.32.0.4 Block Diagram DO815



A.32.0.5 Process Connections*Table A-67 DO815 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 Terminal	TU830/TU833 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)
Ch 1/ L1+	-	-	B1, B2
Ch 1 Output	C1, B1	3, 16	C1, C2
Ch 1/L1-	A1	-	A1, A2
Ch 2/L1+	-	-	B3, B4
Ch 2 Output	C2, B2	4, 17	C3
Ch 2/, L1-	A2	-	A3, A4
Ch 3/ L1+	-	-	B5, B6
Ch 3Output	C3, B3	5, 18	C5
Ch 3/ L1-	A3	-	A5, A6
Ch 4/ L1+	-	-	B7, B8
Ch 4 Output	C4, B4	6, 19	C7
Ch 4/ L1-	A4	-	A7, A8
Ch 5/ L2+	-	-	B9, B10
Ch 5 Output	C5, B5	7, 20	C9
Ch 5/ L2-	A5	-	A9, A10
Ch 6/ L2+	-	-	B11, B12
Ch 6 Output	C6, B6	8, 21	C11
Ch 6/ L2-	A6	-	A11, A12

Table A-67 DO815 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 Terminal	TU830/TU833 Terminal
Ch 7/ L2+	-	-	B13, B14
Ch 7 Output	C7, B7	9, 22	C13
Ch 7/ L2-	A7	-	A13, A14
Ch 8/ L2+	-	-	B15, B16
Ch 8 Output	C8, B8	10, 23	C15
Ch 8/ L2-	A8	-	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)
0 V d.c.	L2-	12, 25	L2- (2)

Figure A-92 shows the process connections for the Digital Output Module DO815 when installed on a TU830/TU833 Extended MTU.

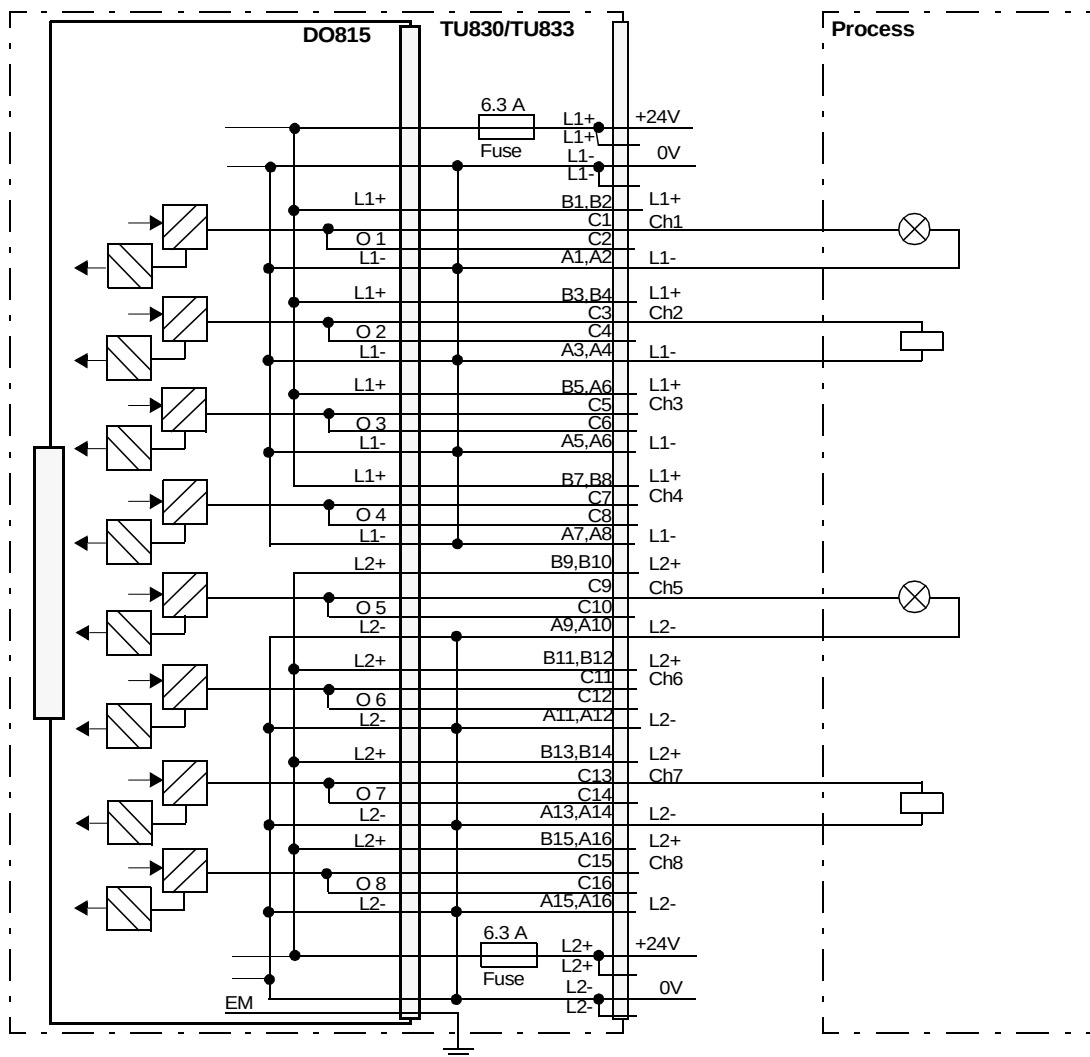


Figure A-92 DO815 with TU830/TU833 Extended MTU Process Connections

Figure A-93 shows the process connections for the Digital Output Module DO815 when installed on a TU812 Compact MTU.

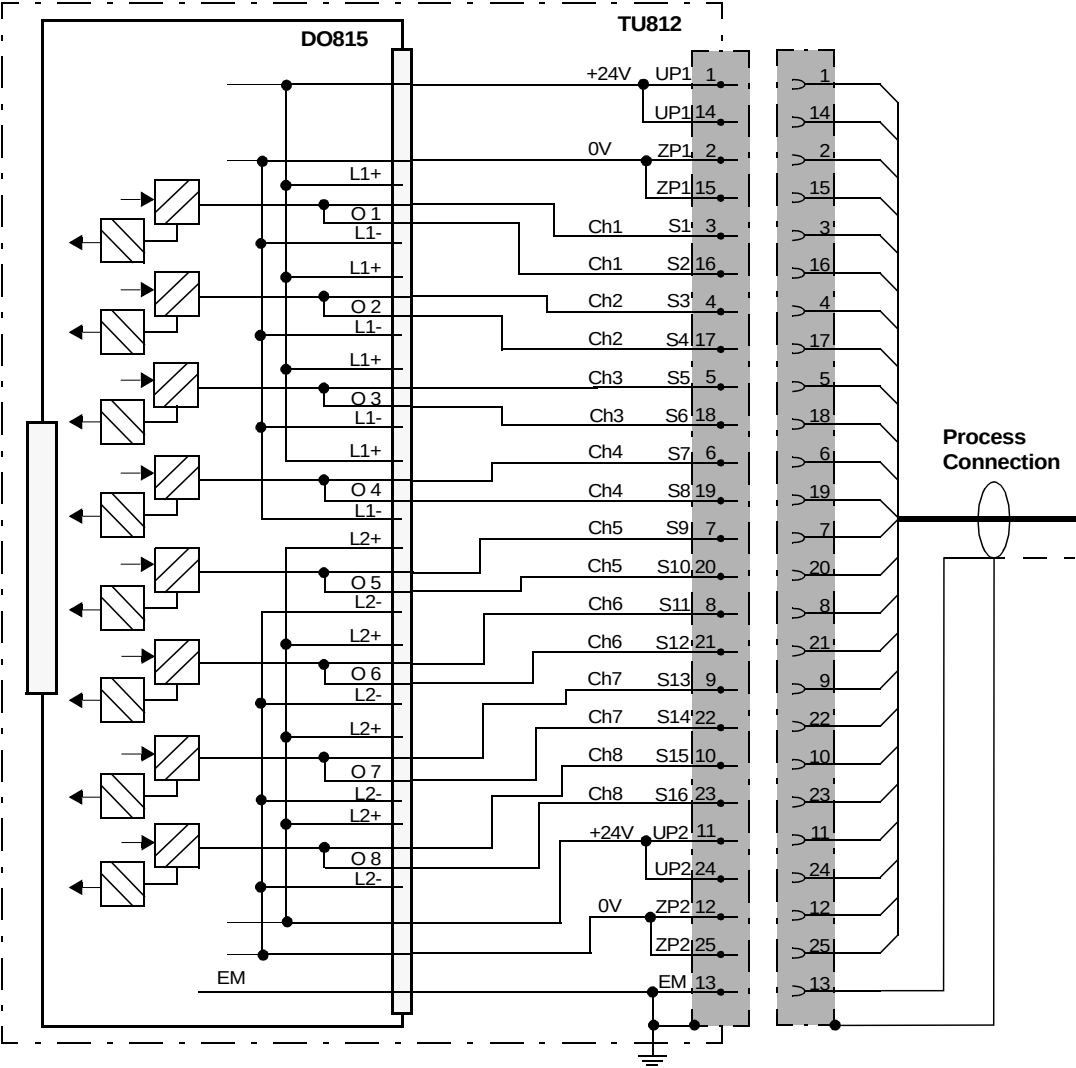


Figure A-93 DO815 with TU812 Compact MTU Process Connections

Figure A-94 shows the process connections for the DO815 when installed on a TU810 or TU814 Compact MTU.

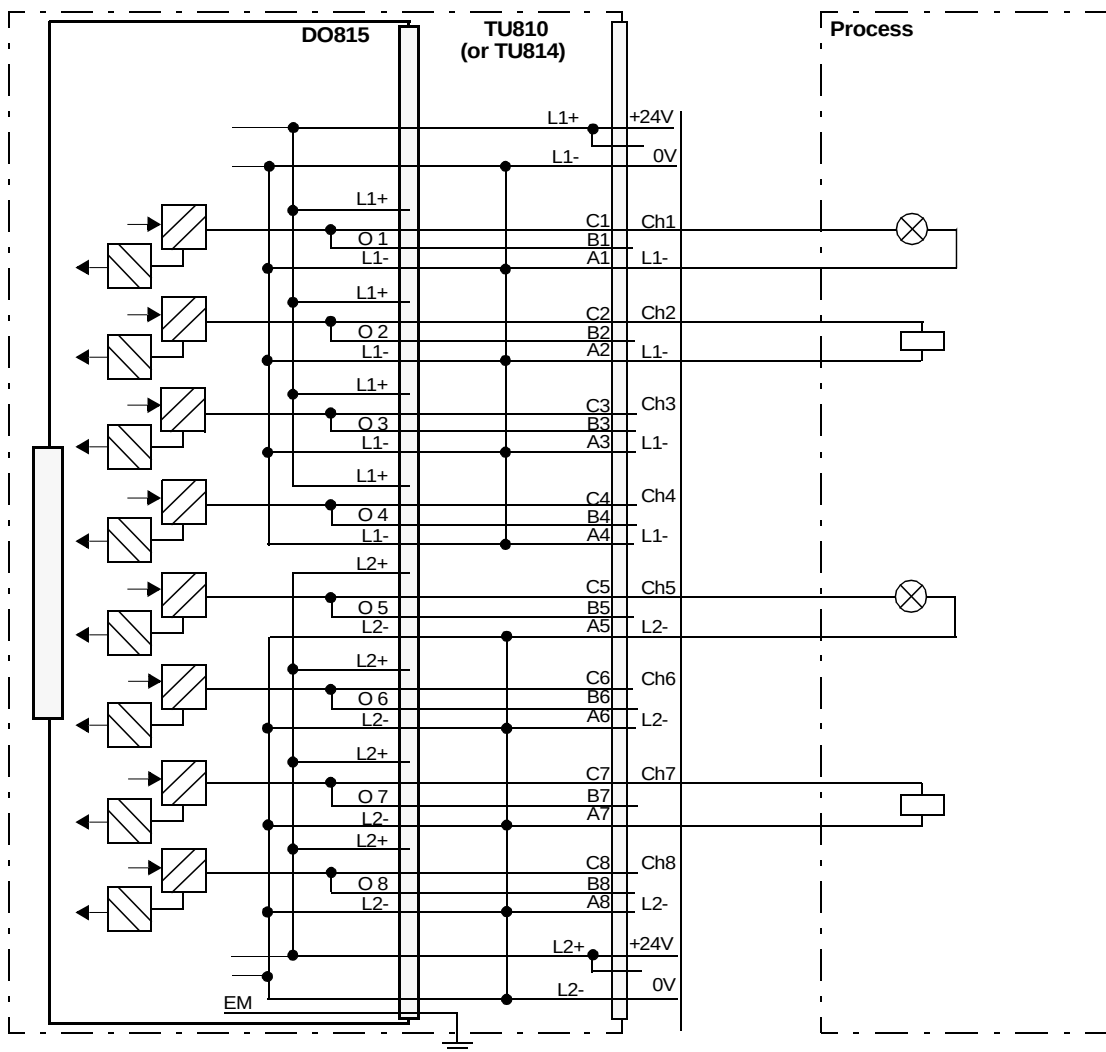


Figure A-94 DO815 with TU810 or TU814 Compact MTU Process Connections

A.33 DO820 Digital Output Module, Relay Normally Open

A.33.0.1 Features

- 8 channels for 230 V a.c./d.c. relay Normal Open (NO) outputs
- 8 isolated channels
- Output status indicators
- OSP sets outputs to predetermined state upon error detection
- EMC protection
- DIN rail mounting.
- Also in a G3 compliant version.

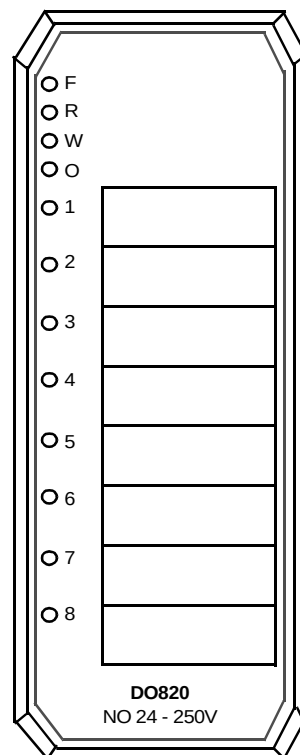
A.33.0.2 Description

The DO820 is an 8 channel 230 V a.c./d.c. relay (NO) output module for the S800 I/O. The maximum output voltage is 250 V a.c./d.c. and the maximum continuous output current is 3 A. All outputs are individually isolated.

Each output channel consists of optical isolation barrier, output state indication LED, relay driver, relay and EMC protection components.

Four LEDs indicate module status Fault (Red), Run (Green), Warning (Yellow) and OSP (Yellow). One LED (Yellow) per channel (8) indicate output state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error is active. The FAULT LED indicates that the module is in Init state or Not Configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module. The OSP LED indicates that the module is in the OSP state and that the outputs are set to their OSP values.

The relay supply voltage supervision, derived from the 24 V distributed on the ModuleBus, gives an error signal if the voltage disappears, and the Warning LED



turns on. The error signal can be read via the ModuleBus. This supervision can be enabled/disabled with a parameter.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer which is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct node address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Four different types of MTUs can be used. The TU831 Extended MTU and TU811 Compact MTU enables two wire connection to the devices without additional terminals. The extended MTUs, TU836, provides an individual fuse (3 A max.) per channel on the load outlet terminals. The extended MTUs, TU837, provides an individual fuse (3 A max.) per channel. Outputs can be individually isolated or grouped by bridging. Signal return terminals are provided in two groups of four terminals.

A.33.0.3 Technical Data*Table A-68 DO820 Digital Output Module Specifications*

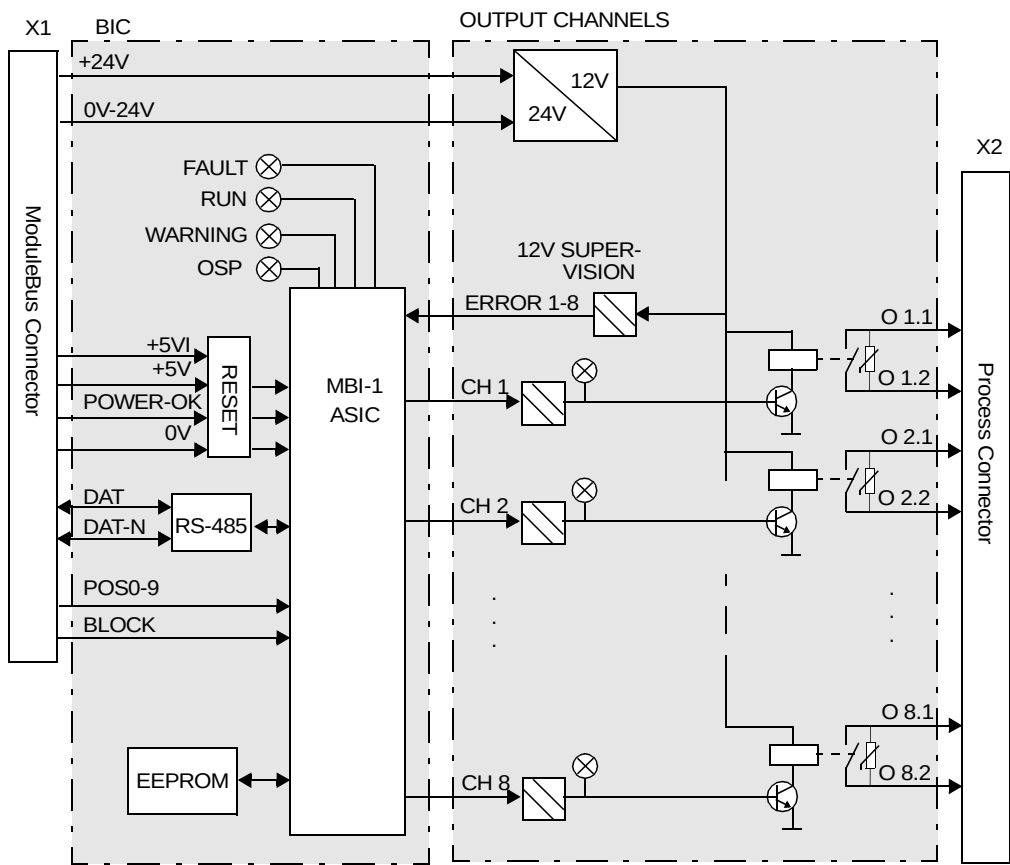
Feature	DO820 Digital Output Module
Number of channels	8
Type of output	Relay (NO)
Voltage range	5 - 250 V a.c./d.c.
Load current, maximum	3 A
Load current, minimum	5 mA
Max. make current	30 A, 200ms, L/R >10 ms
Max break power	a.c. 720 VA @ power factor > 0.4, d.c. 40 W L/R ≤ 40 ms
Maximum field cable length (d.c., a.c.)	600 meters (656 yd.)
Pick-up time, maximum	9 ms
Release time, maximum	5 ms
Number of operations per hour, maximum	2000
Number of operations per lifetime: Mechanical Electrical	>20 x 10 ⁶ >1 x 10 ⁶
Current consumption +5 V	60 mA
Current consumption +24 V	140 mA
Power dissipation ⁽¹⁾	2.9 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Output Set as Predetermined (OSP) timer	256 ⁽³⁾ , 512, 1024 ms

Table A-68 DO820 Digital Output Module Specifications (Continued)

Feature	DO820 Digital Output Module
Power supervision	24/12 V Relay power converter monitor
Isolation	Individually isolated from ground (RIV=250 V)
Module termination units	TU811, TU831, TU836 or TU837
MTU keying code	AD
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.23 kg (0.5 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.
- (3) 256 ms are used for Master. Set by the user for MOD.

A.33.0.4 Block Diagram DO820



A.33.0.5 Process Connections*Table A-69 DO820 Process Connections*

Process Connection	TU811 Terminal	TU831 Terminal	TU836 Terminal	TU837 Terminal
Ch 1.1 Output	B1	B1	11 (fused)	B1
Ch 1.2 Output	A1	A1	12	A1 (fused)
Ch 2.1 Output	C2	B2	21 (fused)	B2
Ch 2.2 Output	A2	A2	22	A2 (fused)
Ch 3.1 Output	B3	B3	31 (fused)	B3
Ch 3.2 Output	A3	A3	32	A3 (fused)
Ch 4.1 Output	C4	B4	41 (fused)	B4
Ch 4.2 Output	A4	A4	42	A4 (fused)
Ch 5.1 Output	B5	B5	51 (fused)	B5
Ch 5.2 Output	A5	A5	52	A5 (fused)
Ch 6.1 Output	C6	B6	61 (fused)	B6
Ch 6.2 Output	A6	A6	62	A6 (fused)
Ch 7.1 Output	B7	B7	71 (fused)	B7
Ch 7.2 Output	A7	A7	72	A7 (fused)
Ch 8.1 Output	C8	B8	81 (fused)	B8
Ch 8.2 Output	A8	A8	82	A8 (fused)
Process Power Source 1	-	-	L1, N1	N1, N1, 11, 12, 13, 14
Process Power Source 2	-	-	L2, N2	N2, N2, 25, 26, 27, 28

Figure A-95 shows the process connections for the Digital Output Module DO820 when installed on a TU831 Extended MTU.

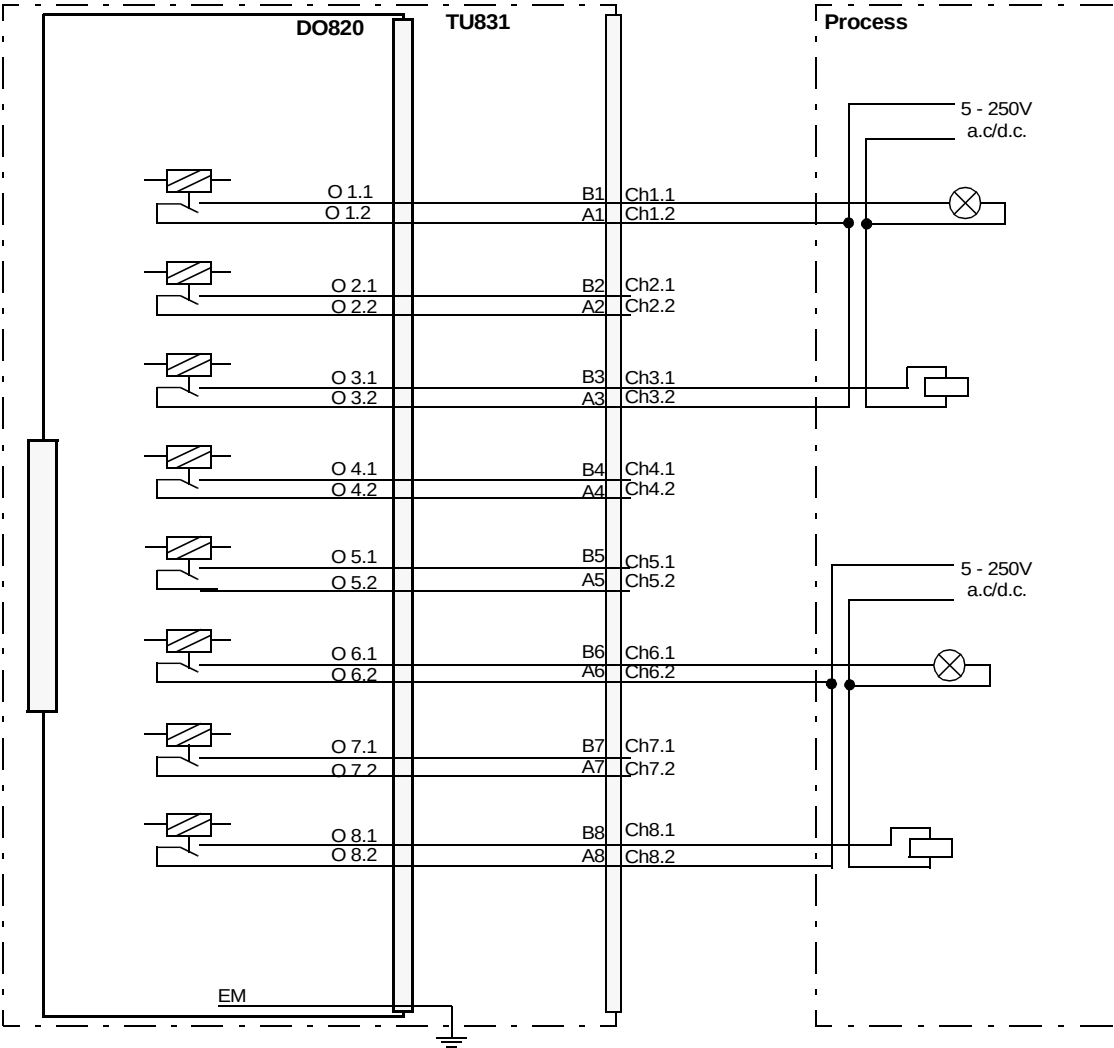


Figure A-95 DO820 with TU831 Extended MTU Process Connections

Figure A-96 shows the process connections for the DO820 when installed on a TU811 or TU813 Compact MTU.

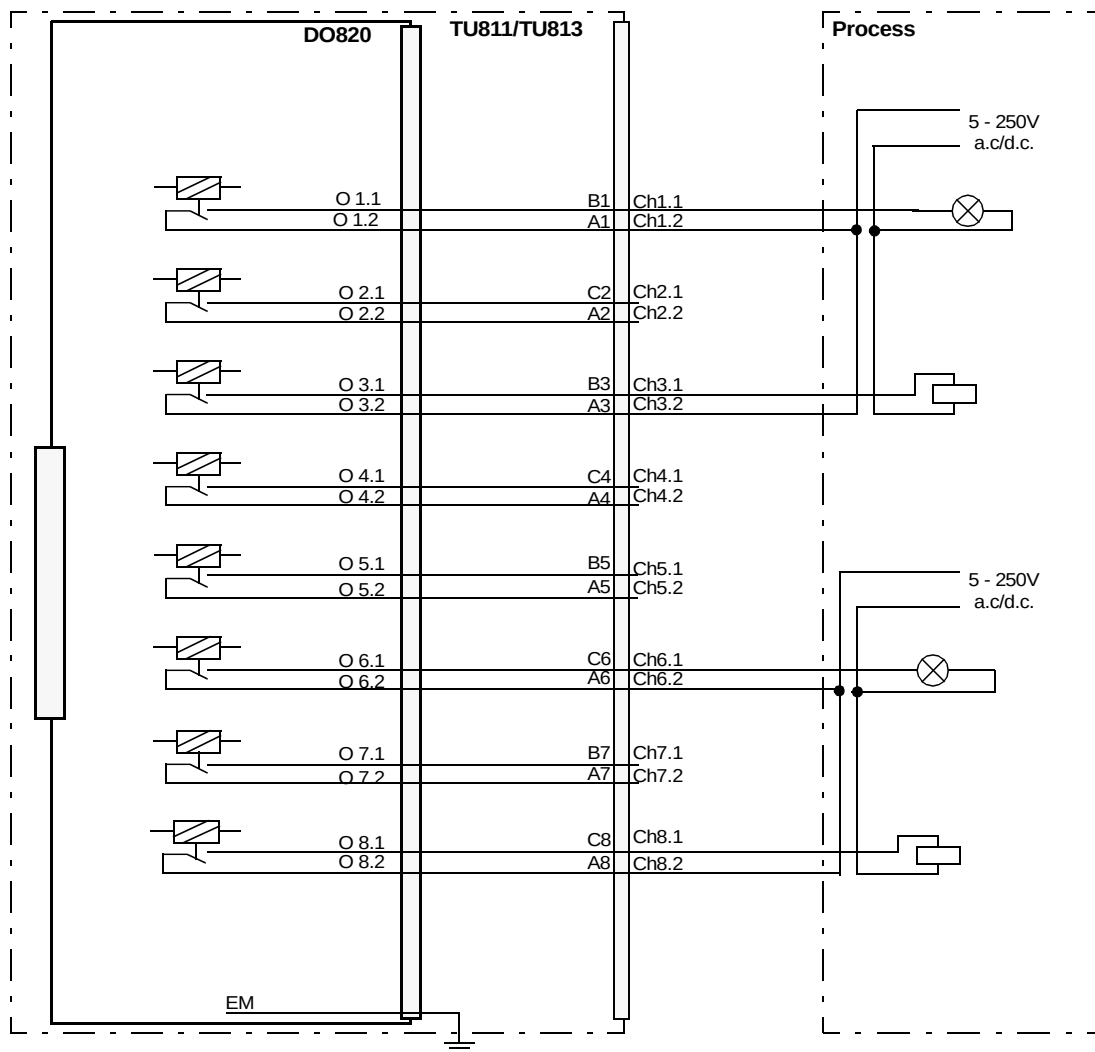


Figure A-96 DO820 with TU811 or TU813 Compact MTU Process Connections

Figure A-97 shows the process connections for the DO820 when installed on a TU836 Extended MTU.

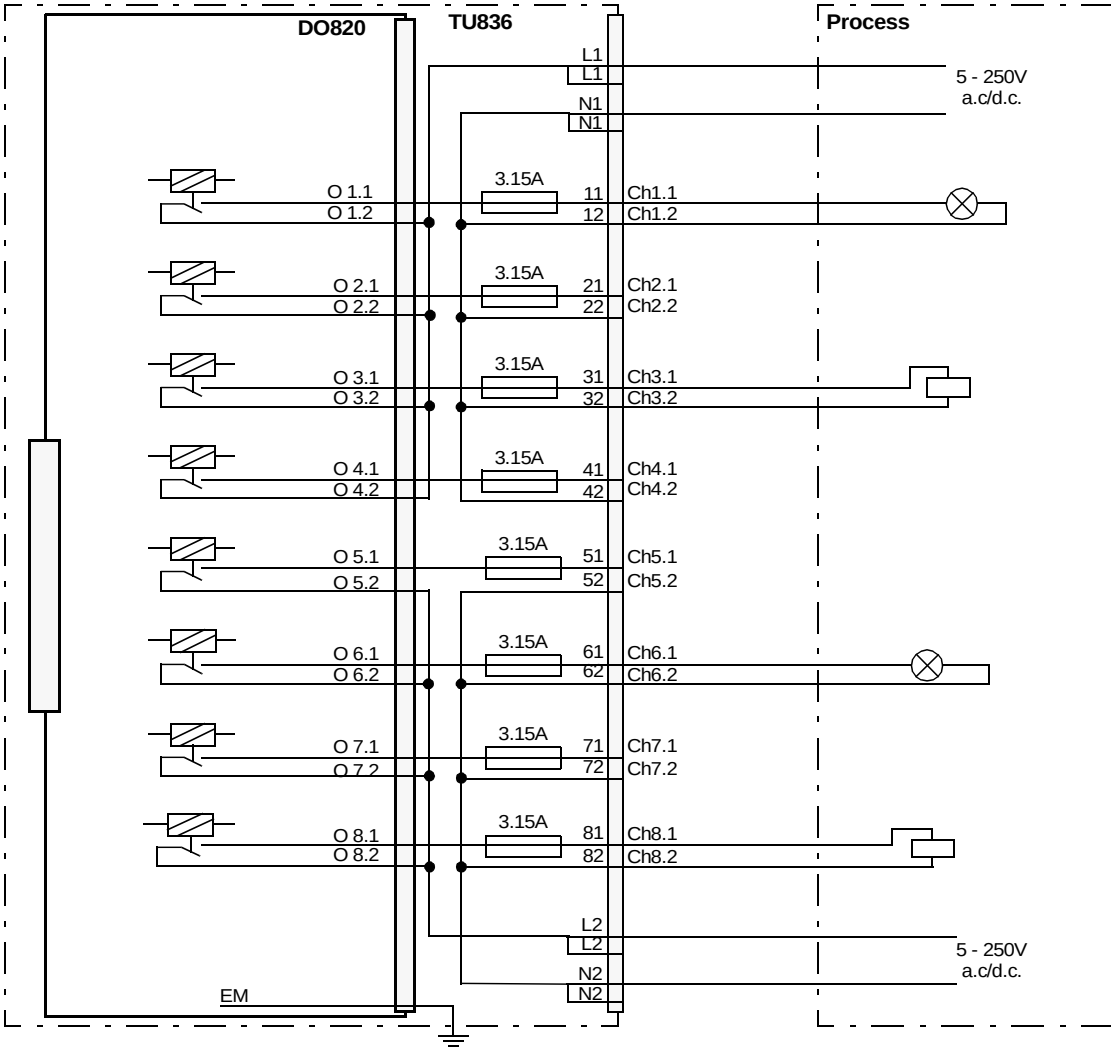


Figure A-97 DO820 with TU836 Extended MTU Process Connections

Figure A-98 shows the process connections for the DO820 when installed on a TU837 Extended MTU.

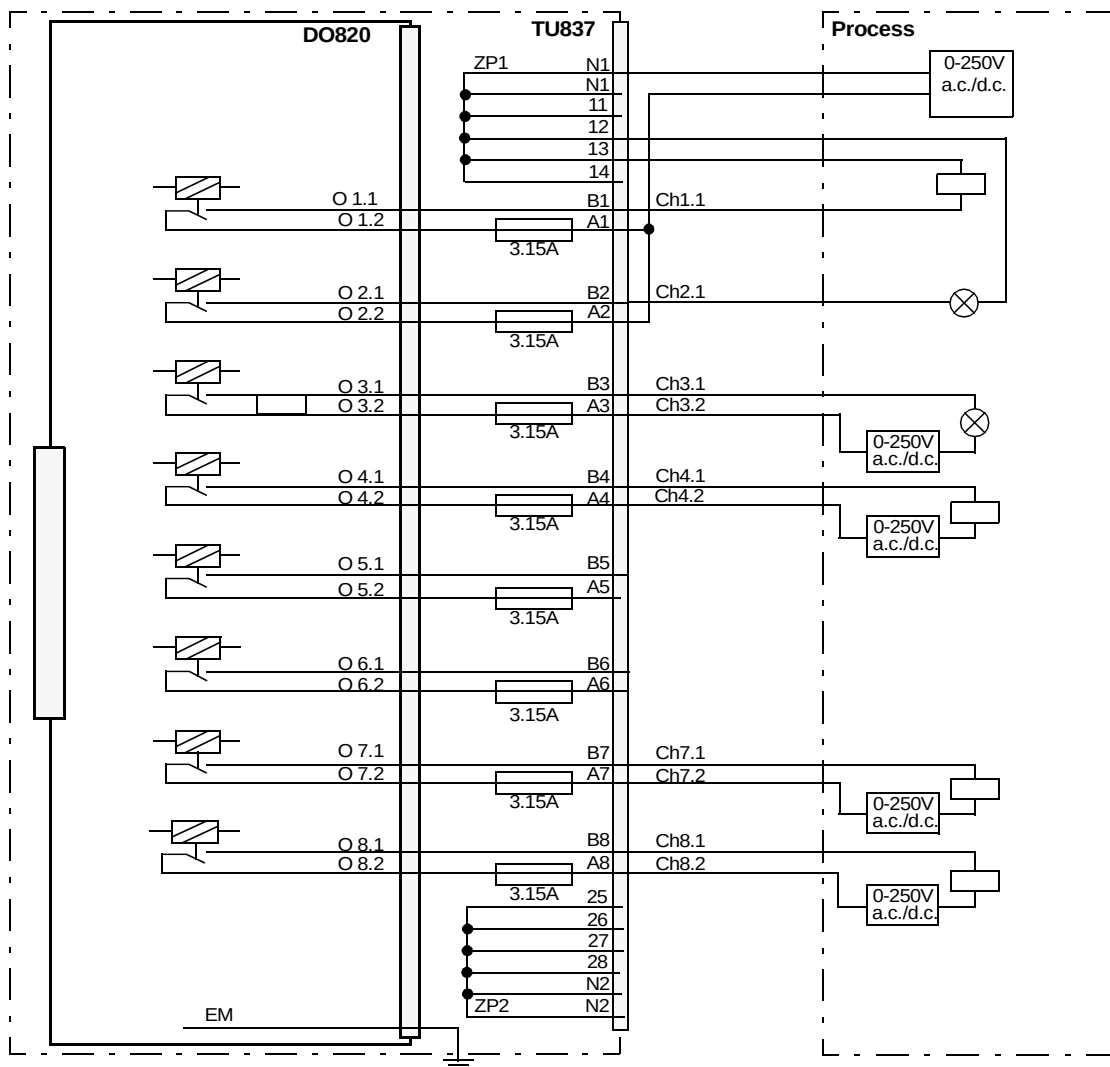


Figure A-98 DO820 with TU837 Extended MTU Process Connections

A.34 DO821 Digital Output Module, Relay Normally Closed

A.34.0.1 Features

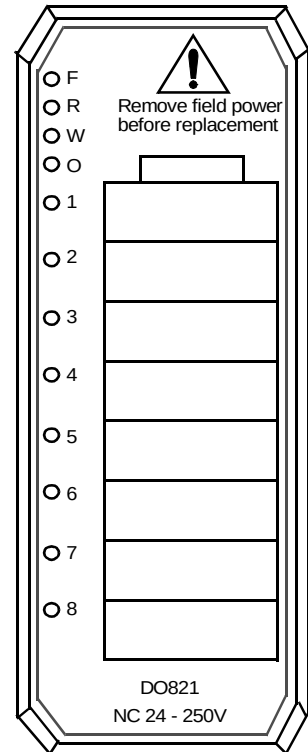
- 8 channels for 230 V a.c./d.c. relay Normal Closed (NC) outputs
- 8 isolated channels
- Output status indicators
- OSP sets outputs to predetermined state upon error detection
- EMC protection
- DIN rail mounting.

A.34.0.2 Description

The DO821 is an 8 channel 230 V a.c./d.c. relay (NC) output module for the S800 I/O. The maximum output voltage is 250 V a.c. and the maximum continuous output current is 3 A. All outputs are individually isolated.

Each output channel consists of optical isolation barrier, output state indication LED, relay driver, relay and EMC protection components.

Four LEDs indicate module status Fault (Red), Run (Green), Warning (Yellow) and OSP (Yellow). One LED (Yellow) per channel (8) indicate output state (On = 1 and Off = 0). The RUN LED indicates normal operation and the WARNING LED indicates if any error is active. The FAULT LED indicates that the module is in Init state or Not Configured state. In Not Configured state the FAULT LED is turned off after the first valid access to the module. The OSP LED indicates that the module is in the OSP state and that the outputs are set to their OSP values.



Caution

Since the module has normally closed relay contacts the field power must be removed before replacement.

The relay supply voltage supervision, derived from the 24 V distributed on the ModuleBus, gives an error signal if the voltage disappears, and the Warning LED turns on. The error signal can be read via the ModuleBus. This supervision can be enabled/disabled with a parameter.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer which is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct node address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Four different types of MTUs can be used. The TU831 Extended MTU and TU811 Compact MTU enables two wire connection to the devices without additional terminals. The extended MTU, TU836, provides an individual fuse (3 A max.) per channel on the load outlet terminals. The extended MTU, TU837 provides an individual fuse (3 A max.) per channel. Outputs can be individually isolated or grouped by bridging. Signal return terminals are provided in two groups of four terminals.

A.34.0.3 Technical Data*Table A-70 DO821 Digital Output Module Specifications*

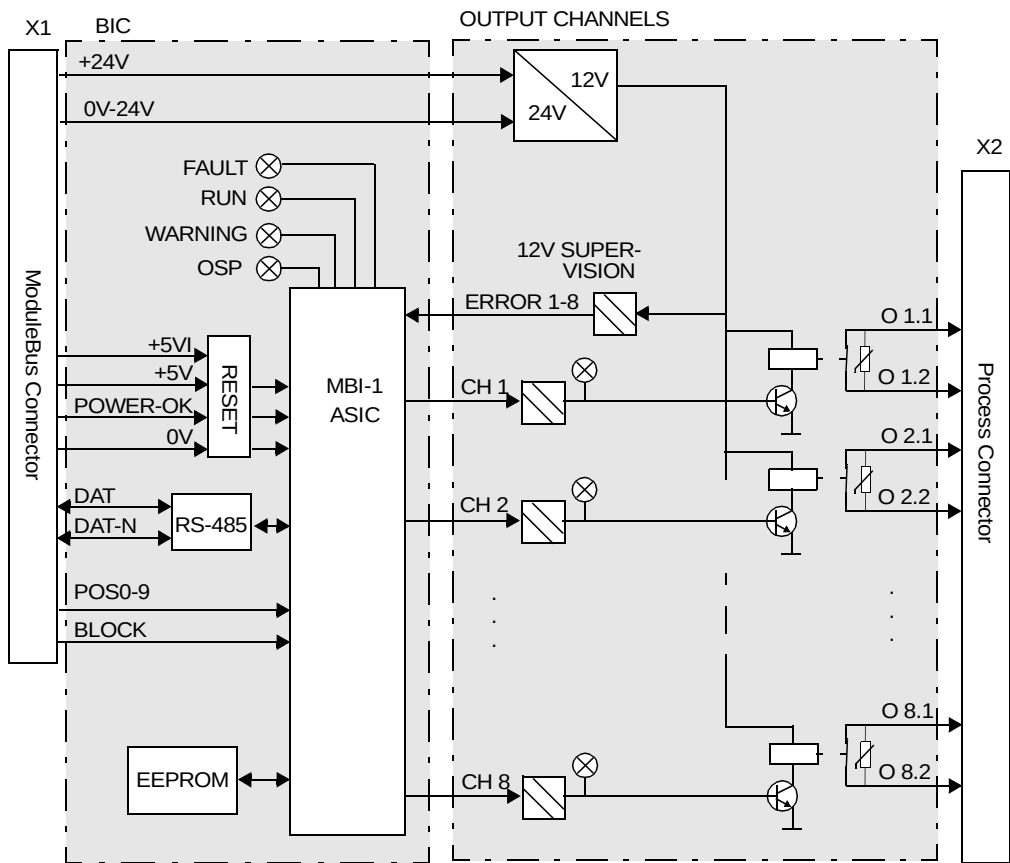
Feature	DO821 Digital Output Module
Number of channels	8
Type of output	Relay (NC)
Voltage range	5 - 250 V a.c./d.c.
Load current, maximum	3 A
Load current, minimum	5 mA
Max. make current	30 A, 200ms, L/R >10 ms
Max break power	a.c. 720 VA @ power factor > 0.4, d.c. 40 W L/R ≤ 40 ms
Maximum field cable length (d.c., a.c.)	600 meters (656 yd.)
Pick-up time, maximum	9 ms
Release time, maximum	5 ms
Number of operations per hour, maximum	2000
Number of operations per lifetime: Mechanical Electrical	>20 x 10 ⁶ >1 x 10 ⁶
Current consumption +5 V	60 mA
Current consumption +24 V	140 mA
Power dissipation ⁽¹⁾	2.9 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms

Table A-70 DO821 Digital Output Module Specifications (Continued)

Feature	DO821 Digital Output Module
Power supervision	24/12 V Relay power converter monitor
Isolation	Individually isolated from ground (RIV=250 V)
Module termination units	TU811, TU831, TU836 or TU837
MTU keying code	CA
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.23 kg (0.5 lbs.)

- (1) Power dissipation is calculated with 70 percent of the channels activated.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.34.0.4 Block Diagram DO821



A.34.0.5 Process Connections*Table A-71 DO821 Process Connections*

Process Connection	TU811 Terminal	TU831 Terminal	TU836 Terminal	TU837 Terminal
Ch 1.1 Output	B1	B1	11 (fused)	B1
Ch 1.2 Output	A1	A1	12	A1 (fused)
Ch 2.1 Output	C2	B2	21 (fused)	B2
Ch 2.2 Output	A2	A2	22	A2 (fused)
Ch 3.1 Output	B3	B3	31 (fused)	B3
Ch 3.2 Output	A3	A3	32	A3 (fused)
Ch 4.1 Output	C4	B4	41 (fused)	B4
Ch 4.2 Output	A4	A4	42	A4 (fused)
Ch 5.1 Output	B5	B5	51 (fused)	B5
Ch 5.2 Output	A5	A5	52	A5 (fused)
Ch 6.1 Output	C6	B6	61 (fused)	B6
Ch 6.2 Output	A6	A6	62	A6 (fused)
Ch 7.1 Output	B7	B7	71 (fused)	B7
Ch 7.2 Output	A7	A7	72	A7 (fused)
Ch 8.1 Output	C8	B8	81 (fused)	B8
Ch 8.2 Output	A8	A8	82	A8 (fused)
Process Power Source 1	-	-	L1, N1	N1, N1, 11, 12, 13, 14
Process Power Source 2	-	-	L2, N2	N2, N2, 25, 26, 27, 28

Figure A-99 shows the process connections for the Digital Output Module DO821 when installed on a TU831 Extended MTU.

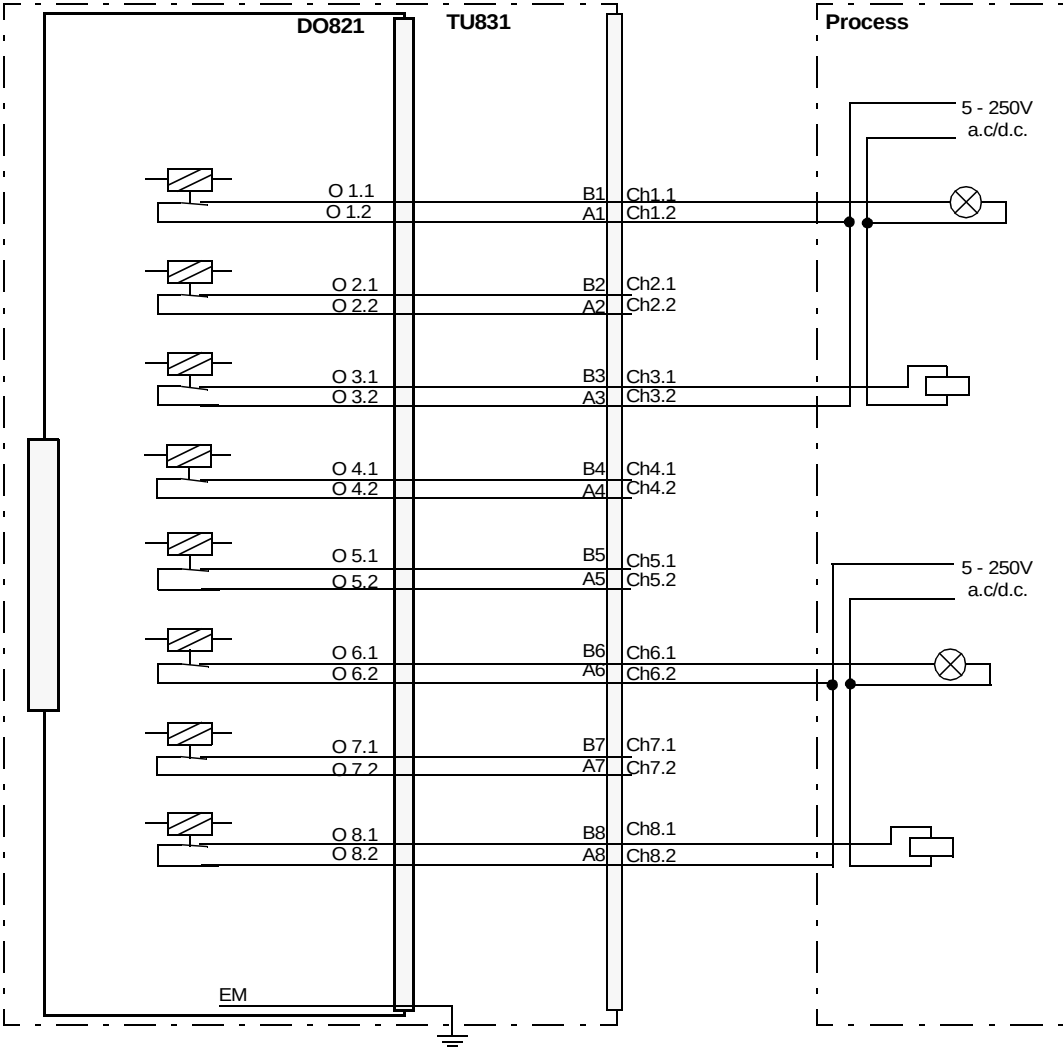


Figure A-99 DO821 with TU831 Extended MTU Process Connections

Figure A-100 shows the process connections for the DO821 when installed on a TU811 or TU813 Compact MTU.

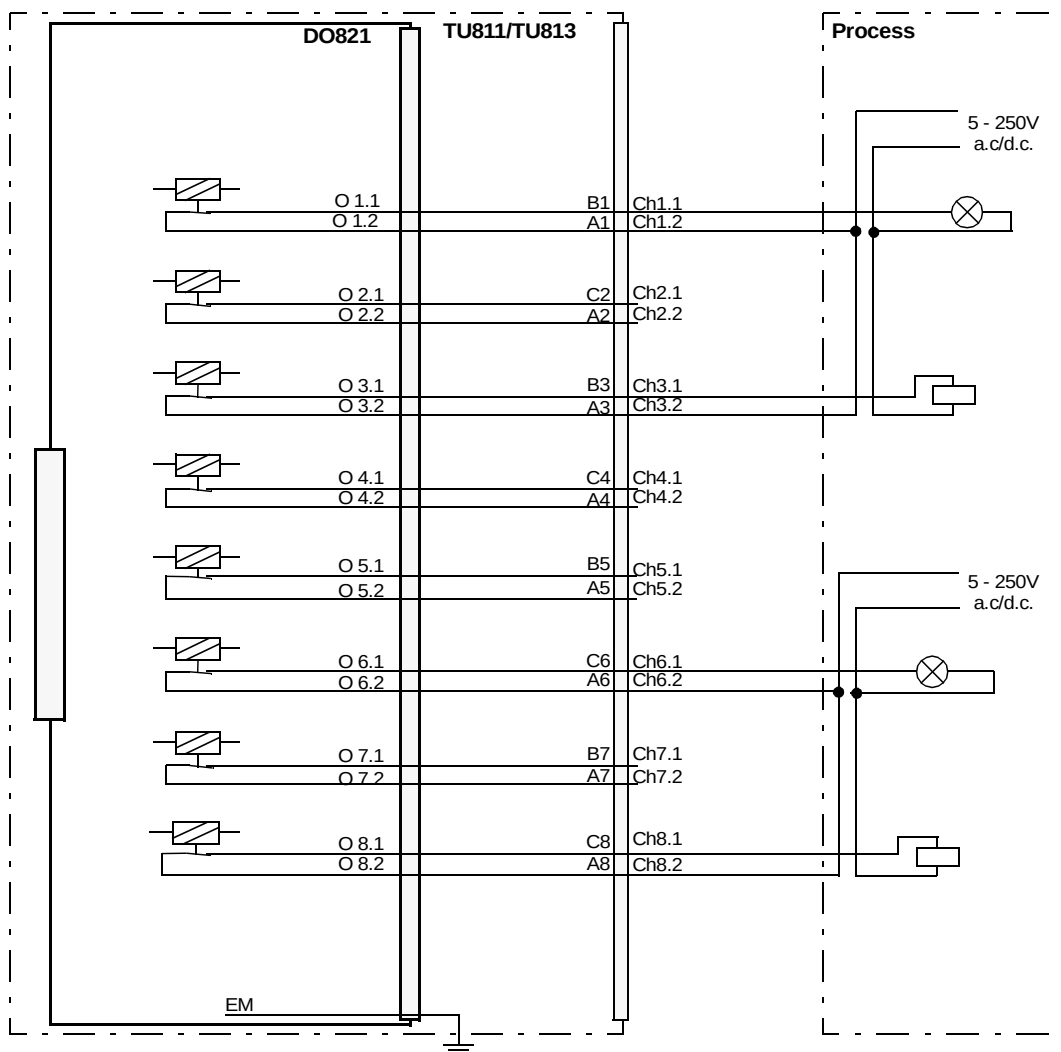


Figure A-100 DO821 with TU811 or TU813 Compact MTU Process Connections

Figure A-101 shows the process connections for the DO821 when installed on a TU836 Extended MTU.

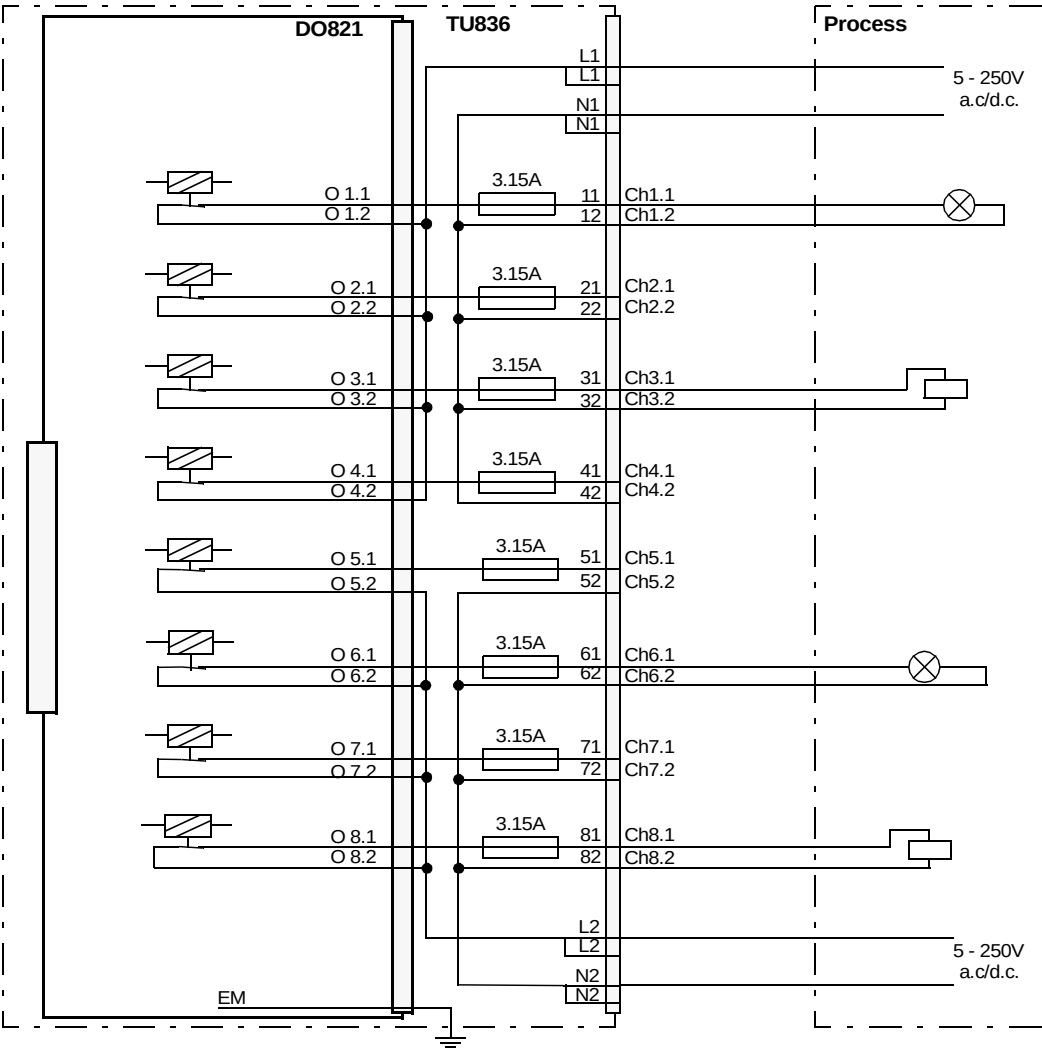


Figure A-101 DO821 with TU836 Extended MTU Process Connections

Figure A-102 shows the process connections for the DO821 when installed on a TU837 Extended MTU.

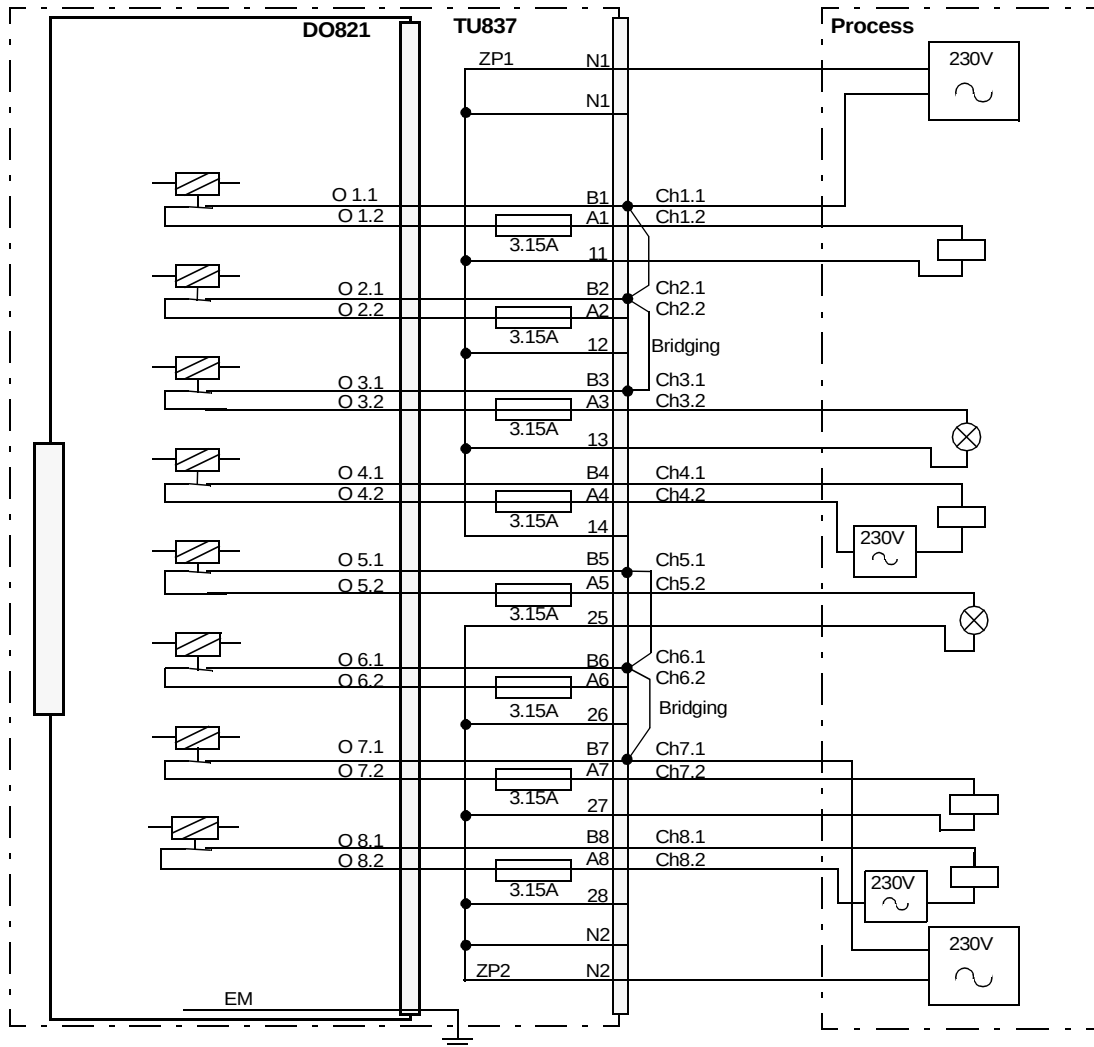


Figure A-102 DO821 with TU837 Extended MTU Process Connections

A.35 DO840 Digital Output Module

A.35.0.1 Features

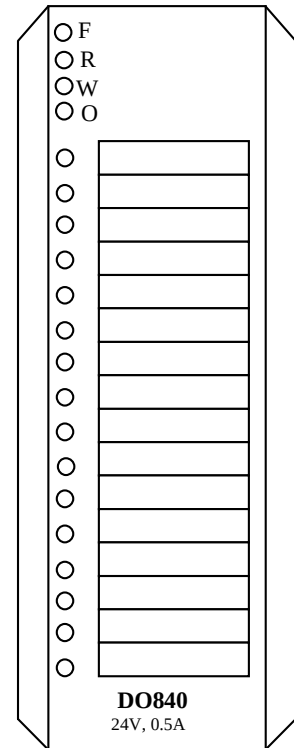
- 16 channels for 24 V d.c. current sourcing outputs
- 2 isolated groups of 8 channels with process voltage supervision
- Advanced on-board diagnostics
- Output status indicators
- OSP sets outputs to predetermined state upon error detection
- Redundant or single applications
- Current limited and over-temperature protection
- EMC protection
- DIN rail mounting.

A.35.0.2 Description

The DO840 is a 16 channel 24 V digital output module for single or redundant application. This module has 16 digital outputs. The maximum continuous output current per channel is 0.5 A. The outputs are current limited and protected against over temperature. The outputs are divided into two groups with eight output channels and one voltage supervision input in each group.

Each output channel consists of a current limited and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and optical isolation barrier.

Four LEDs indicate module status Fault (Red), Run (Green), Warning (Yellow) and OSP (Yellow). One LED (Yellow/Red) per channel (16) indicate output state (On = 1 = Yellow, Off = 0 and Error = Red). The RUN LED indicates normal operation and the WARNING LED indicates if there is error on active channels. The FAULT LED indicates that the module is in Init state or Not Configured state.



In Not Configured state the FAULT LED is turned off after the first valid access to the module. The OSP LED indicates that the module is in the OSP state and that the outputs are set to their OSP values.

External channel error is reported if process power is low and channel has over load. Internal channel error is reported if output driver or main power switch has failed. Module error is reported if internal power has failed or if internal communication link between the modules in redundant applications has failed.



The pulse tests inverts all outputs for the group for < 1ms in intervals of 100 ms. That will give a short pulse < 1ms on the output. The pulse tests can be enable/disable by parameter.

The outputs of the module will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is set by the controller and is used for ModuleBus supervision. The watchdog timer is re-triggered every time the correct module address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state and the active outputs (if any) are set to their OSP values which can be configured as a predefined value or to use the last good value sent.

The output values will be kept as long as the module stays in the OSP state. To change the outputs the module first has to leave this state. When reentering Operational State, the outputs are still kept with their OSP value until new valid values are written.

In redundant applications both modules must have the OSP-conditions fulfilled to go to OSP.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

The outputs can be set in two different modes for handling of over load, automatic reset or latch on fault mode.

The outputs are current limited and protected against over temperature. If the outputs are overloaded the output current will be limited. In automatic reset mode the power dissipation in the output stage will increase and the output will shutdown if the temperature in the output stage increases above 150 °C (302 °F). The output

will switch on again automatically as the component temperature has decreased to about 140 °C (284 °F). In Latch on Fault mode the outputs will switch off and stay so until the overload has disappeared and the fault is acknowledged. If any output is shutdown due to overload the indication LED on that channel is also switched to red.

Four different types of MTUs can be used for single applications. TU830 Extended MTU and TU810 (or TU814). The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant applications there are two types of MTUs, TU842 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

A.35.0.3 Technical Data*Table A-72 DO840 Digital Output Module Specifications*

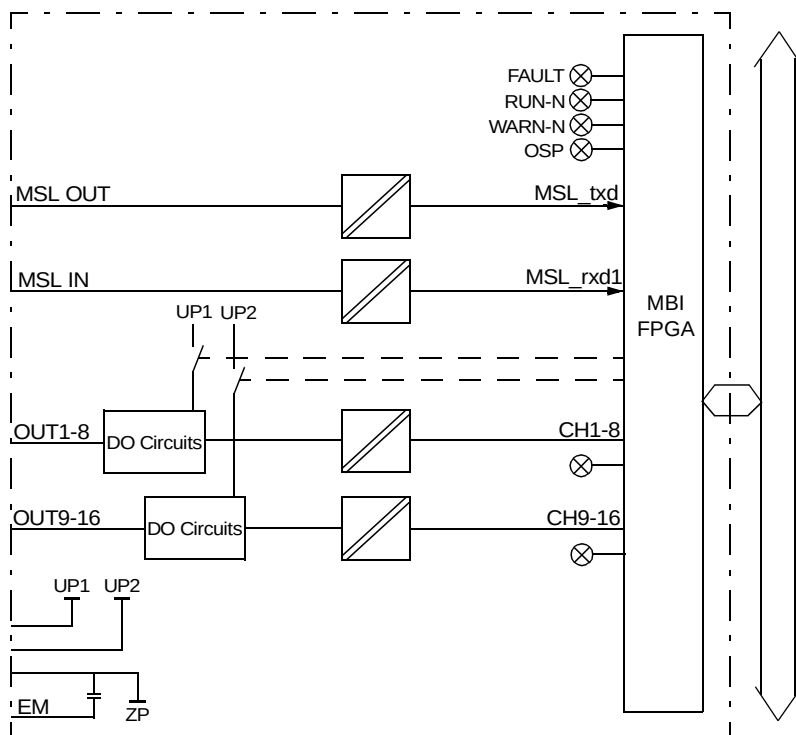
Feature	DO840 Digital Output Module
Number of channels	16 (2 x 8)
Type of output	Transistor current sourcing, current limited
Voltage range	19.2 - 32 V d.c.
Load current, maximum	0.5 A
Maximum continuous load current total per module	4A @ $\leq 40^{\circ}\text{C}$ 2A @ $\leq 55^{\circ}\text{C}$
Short circuit current, maximum	2.5 A
Leakage current, maximum	$<10\ \mu\text{A}$
On-state voltage drop	$\leq 0.3\ \text{V}$
Maximum Field Cable Length	600 meters (656 yd.)
Current consumption +5 V	130 mA
Current consumption external 24 V (no external load)	200 mA
Power dissipation ⁽¹⁾	4.3 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽²⁾
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group)
Isolation	Groupwise isolated from ground (RIV=50 V)
Mounting termination units	TU810, TU812, TU814, TU830, TU842 or TU843

Table A-72 DO840 Digital Output Module Specifications (Continued)

Feature	DO840 Digital Output Module
MTU keying code	CE
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.15 kg (0.33 lbs.)

- (1) Power dissipation is calculated with 24 V and 4 A total load.
- (2) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.35.0.4 Block Diagram DO840



A.35.0.5 Process Connections*Table A-73 DO840 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector⁽¹⁾	TU830/TU833 Terminal	TU842 TU843 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+
0 V d.c.	L1-	2, 15	L1- (2)	L1-
Ch 1/Ch 2, L1+	-	-	B1, B2	-
Ch 1 Output	C1	3	C1	C1
Ch 2 Output	B1	16	C2	C2
Ch 1/Ch 2, L1-	A1	-	A1, A2	A1, A2
Ch 3/Ch 4, L1+	-	-	B3, B4	-
Ch 3 Output	C2	4	C3	C3
Ch 4 Output	B2	17	C4	C4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A3, A3
Ch 5/Ch 6, L1+	-	-	B5, B6	-
Ch 5 Output	C3	5	C5	C5
Ch 6 Output	B3	18	C6	C6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A5, A6
Ch 7/Ch 8, L1+	-	-	B7, B8	-
Ch 7 Output	C4	6	C7	C7
Ch 8 Output	B4	19	C8	C8
Ch 7/Ch 8, L1-	A4	-	A7, A8	A7, A8
Ch 9/Ch 10, L2+	-	-	B9, B10	-
Ch 9 Output	C5	7	C9	C9

Table A-73 DO840 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal	TU842 TU843 Terminal
Ch 10 Output	B5	20	C10	C10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A9, A10
Ch 11/Ch 12, L2+	-	-	B11, B12	-
Ch 11 Output	C6	8	C11	C11
Ch 12 Output	B6	21	C12	C12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A11, A12
Ch 13/Ch 14, L2+	-	-	B13, B14	-
Ch 13 Output	C7	9	C13	C13
Ch 14 Output	B7	22	C14	C14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A13, A14
Ch 15/ Ch16, L2+	-	-	B15, B16	-
Ch 15 Output	C8	10	C15	C15
Ch 16 Output	B8	23	C16	C16
Ch 15/Ch16, L2-	A8	-	A15, A16	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+
0 V d.c.	L2-	12, 25	L2- (2)	L2-

(1) Pin 13 connected to connector body for EM.

Figure A-103 shows the process connections for the Digital Output Module DO840 when installed on a TU830/TU833 Extended MTU.

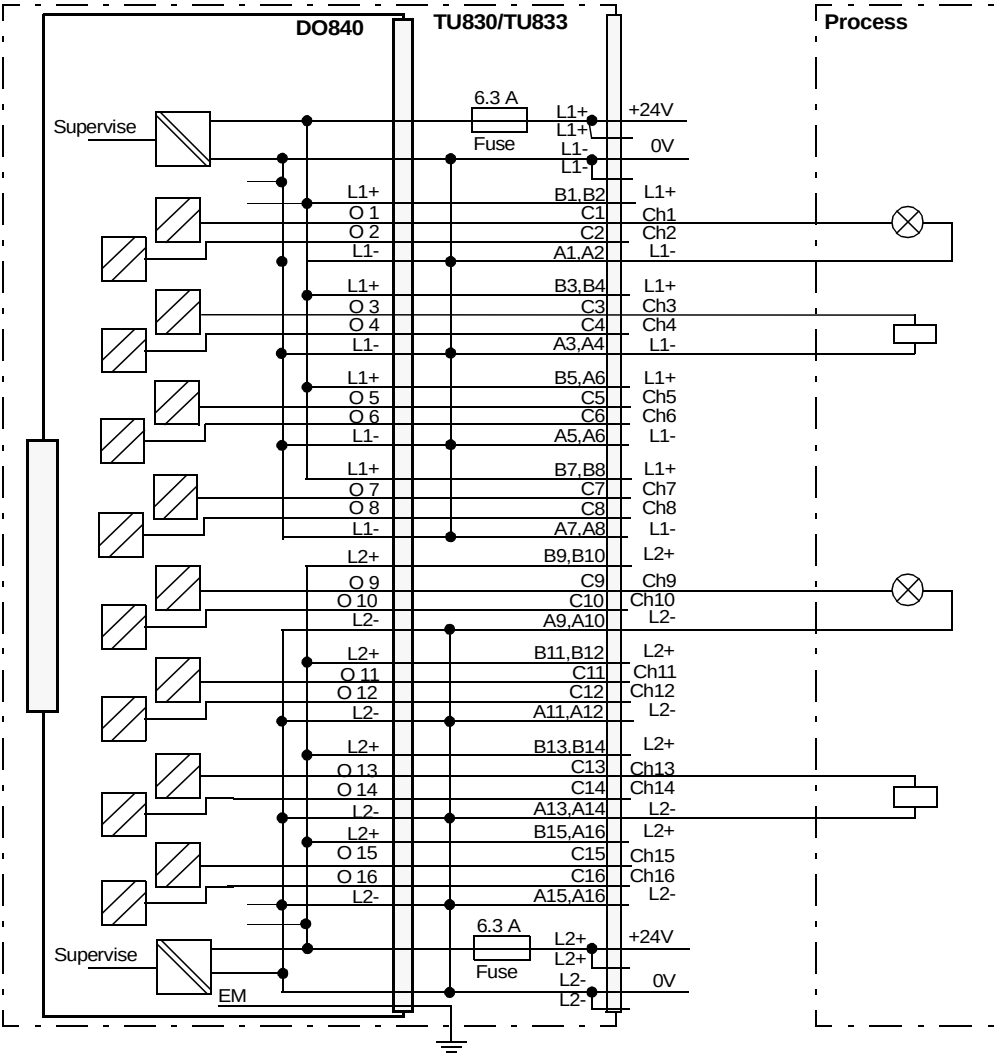


Figure A-103 DO840 with TU830/TU833 Extended MTU Process Connections

Figure A-104 shows the process connections for the Digital Output Module DO840 when installed on a TU810 or TU814 Compact MTU.

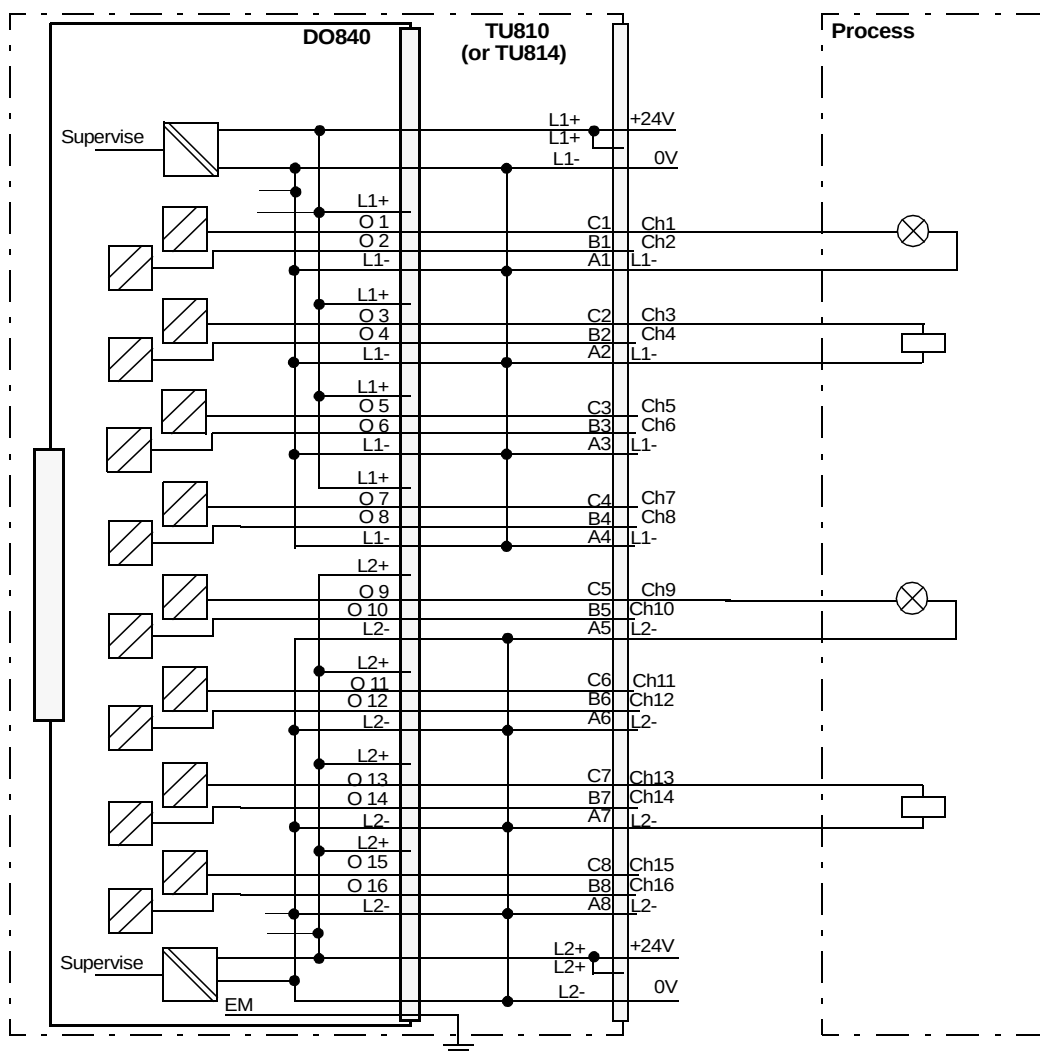


Figure A-104 DO840 with TU810 or TU814 Compact MTU Process Connections

Figure A-105 shows the process connections for the Digital Output Module DO840 when installed on a TU812 Compact MTU.

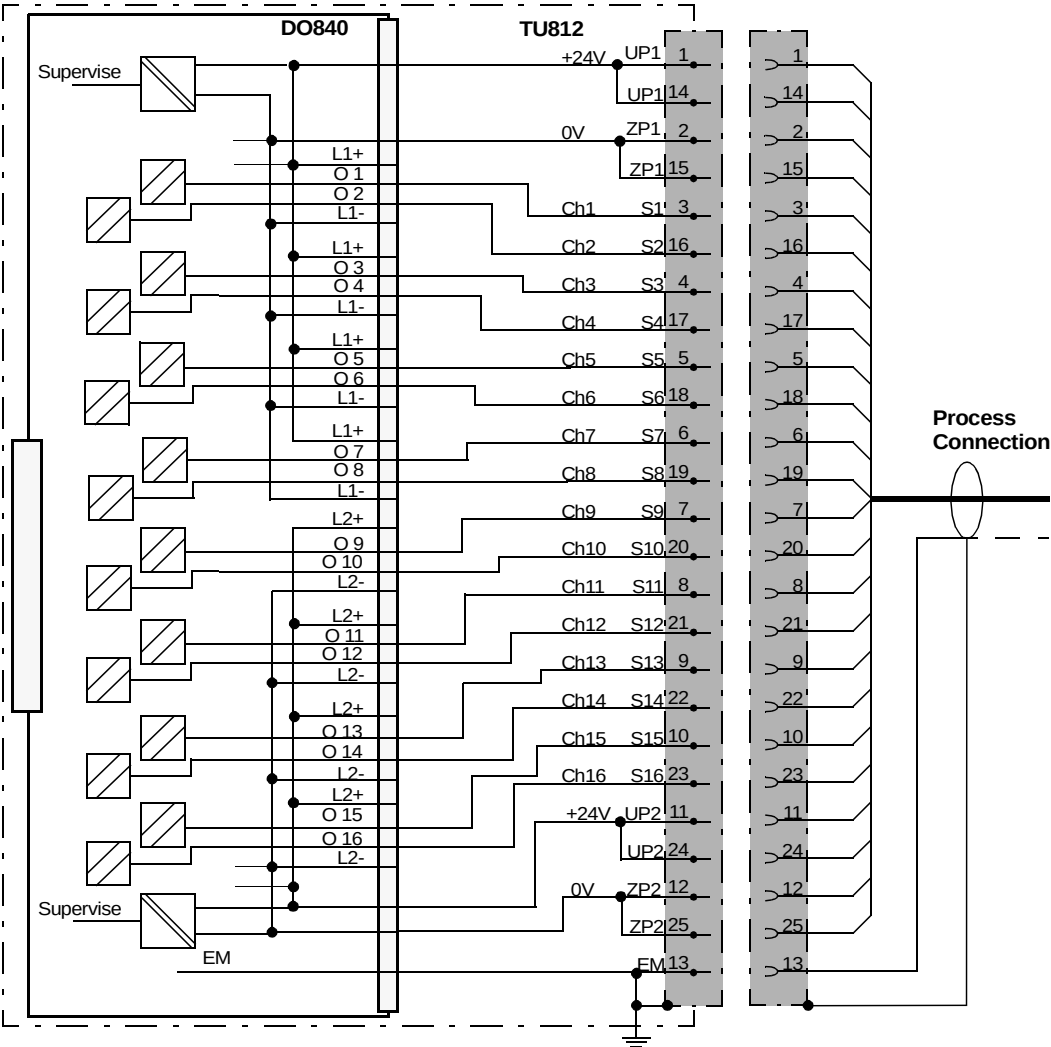


Figure A-105 DO840 with TU812 Compact MTU Process Connections

Figure A-106 shows the process connections for the Digital Output Module DO840 when installed on a TU842 or TU843 Redundant MTU.

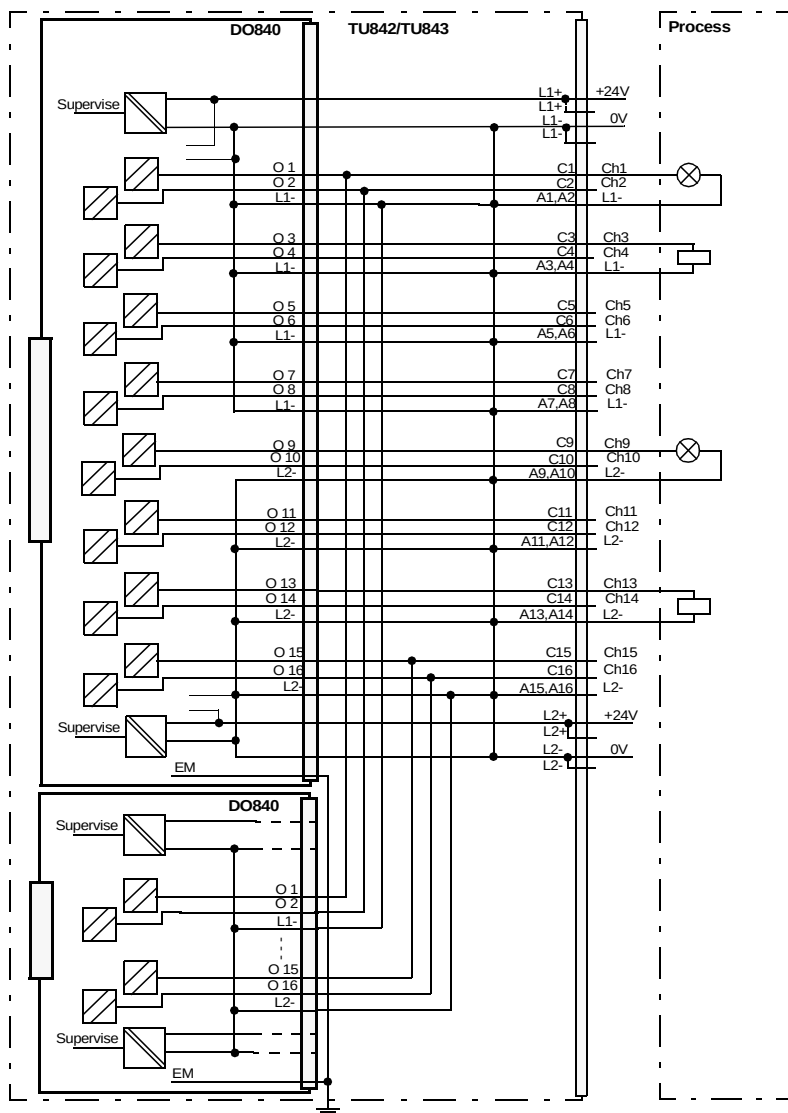
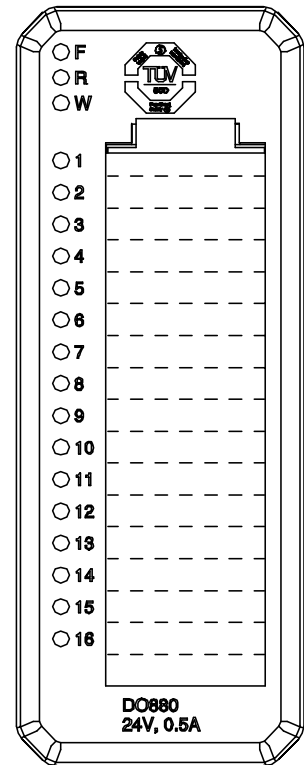


Figure A-106 DO840 with TU842 or TU843 Redundant MTU Process Connections

A.36 DO880 High Integrity Digital Output Module

A.36.0.1 Features

- 16 channels for 24 V d.c. current sourcing outputs in one isolated group.
- Process voltage supervision.
- Loop monitoring, supervision of short and open load with configurable limits (see table [Table A-74](#)).
- Diagnostic of output switches without pulsing on outputs.
- Advanced on-board diagnostics.
- Output status indicators (activated/error).
- Error detection.
- Redundant or single configuration.
- Current limitation at short and over-temperature protection of switches.
- Fault tolerance of 1 (as defined in EN 61508) for output drivers. For ND and CC systems, outputs can still be controlled with error on output drivers.
- EMC protection.
- DIN rail mounting.
- Certified for SIL3 according to EN 61508.
 - Normally Energized (NE) high demand and low demand
 - Normally De-energized (ND), low demand
 - Continuous Control (CC)
- Certified for AK6 according to DIN V 19250/DIN V VDE 0801-AK6.
- Certified for Category 4 according to EN954-1.



A.36.0.2 Description

The DO880 is a 16 channel 24 V digital output module for single or redundant application. The maximum continuous output current per channel is 0.5 A. The outputs are current limited and protected against over temperature.

Each output channel consists of a current limited and over temperature protected high side driver, EMC protection components, inductive load suppression, output state indication LED and an isolation barrier to the Modulebus.

The outputs can be set in two different modes for handling of over load, automatic reset when overload/short is removed or manual reset by operator (forcing output off and on).

The outputs are current protected and protected against over temperature. If load increases above 0,6A, the output will be switched off and an external channel error reported.

Four different types of MTUs can be used for single configuration. TU830 Extended MTU and TU810 (or TU814). The TU812 Compact MTU has a D-Sub 25 pin (male) connector for connection to the process.

For redundant configuration there are two types of MTUs, TU842 for mounting on a horizontal DIN rail and TU843 for mounting on a vertical DIN rail.

Self-diagnostic Functions

The module cyclically performs comprehensive self-diagnostic. Detected failures are grouped and reported as described below:

- Errors in External power supply and detected field loop fault will be reported as External error.
- Errors in circuits only affecting specific channels on the module (short circuits, open circuits, stuck-at faults) will be reported as Internal channel error.
- Errors in internal power supplies, Errors in micro controller, FPGA and Memory will be reported as Module Error.

Three LEDs indicate module status Fault (Red), Run (Green) and Warning (Yellow):

- The RUN LED starts flashing when the module is ready to be configured and is steady lit when the module has reached operational state.
- The WARNING LED indicates external errors or internal channel errors.
- The FAULT LED indicates that there is Module errors present or that the module is in Init state.

A.36.0.3 Technical Data*Table A-74 DO880 High Integrity Digital Output Module Specifications*

Feature	DO880 Digital Output Module
Number of channels	16
Type of output	Transistor current sourcing, current limited
Voltage range	19.2 - 32 V
Load current, maximum	0.5 A
Maximum continuous load current total per module	8A @ <40°C 4A @ <60°C
Short circuit current, maximum	See Figure A-107
Leakage current, maximum	<100 µA
Loop monitoring	Configurable for loop resistance from 50 Ω to 2 kΩ dependent of configuration and mode of operation
De-energized safe voltage at fault	<5 V
De-energized safe current at fault	<35 mA
On-state voltage drop	<0.8 V
Maximum field cable length	600 meters (656 yd.)
Current consumption +5 V	10 mA
Current consumption ModuleBus 24 V	55 mA (max)
Current consumption +24 V (field supply)	10 mA + channel output current
Power dissipation	5.6 W (0,5 A x 16 channels)
Maximum ambient temperature	55/40°C (131/104°F)

*Table A-74 DO880 High Integrity Digital Output Module Specifications
(Continued)*

Feature	DO880 Digital Output Module
Process voltage supervision	16 (1 per channel)
Isolation	Yes
Mounting termination units	TU810, TU812, TU814, TU830, TU842, TU843
MTU keying code	FE
Propagation delay Modulebus output	10 ms max
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.20 kg (0.44 lbs.)

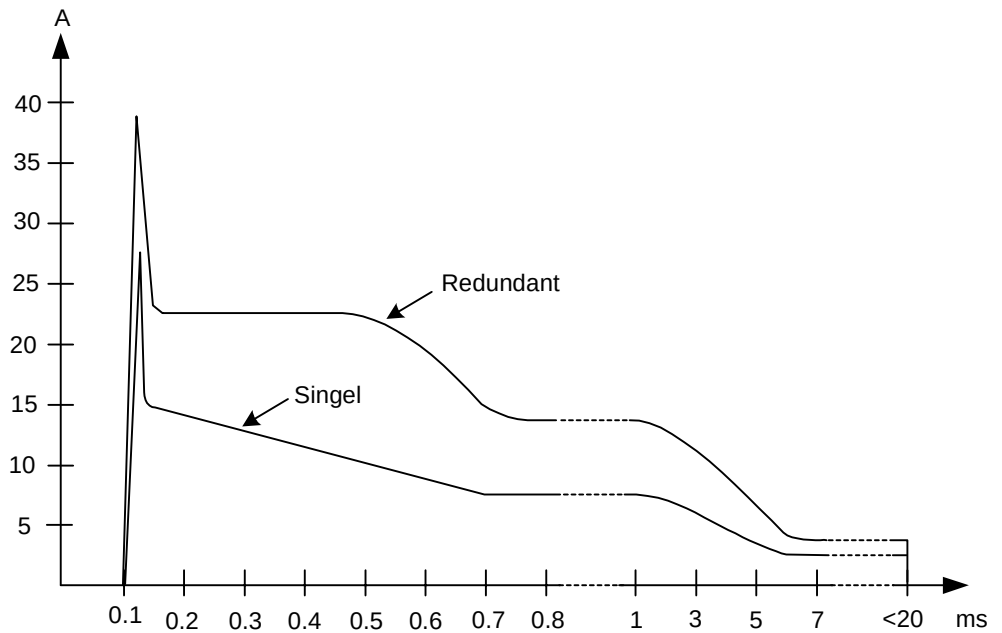


Figure A-107 Short circuit current, worst case

The short circuit current is dependent on the power supply and the cable resistance. A configuration with a power supply with very low internal resistance and a very low cable resistance represents the worst case.

A.36.0.5 Process Connections*Table A-75 DO880 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector⁽¹⁾	TU830/TU833 Terminal	TU842 TU843 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+
0 V d.c.	L1-	2, 15	L1- (2)	L1-
Ch 1/Ch 2, L1+	-	-	B1, B2	-
Ch 1 Output	C1	3	C1	C1
Ch 2 Output	B1	16	C2	C2
Ch 1/Ch 2, L1-	A1	-	A1, A2	A1, A2
Ch 3/Ch 4, L1+	-	-	B3, B4	-
Ch 3 Output	C2	4	C3	C3
Ch 4 Output	B2	17	C4	C4
Ch 3/Ch 4, L1-	A2	-	A3, A4	A3, A3
Ch 5/Ch 6, L1+	-	-	B5, B6	-
Ch 5 Output	C3	5	C5	C5
Ch 6 Output	B3	18	C6	C6
Ch 5/Ch 6, L1-	A3	-	A5, A6	A5, A6
Ch 7/Ch 8, L1+	-	-	B7, B8	-
Ch 7 Output	C4	6	C7	C7
Ch 8 Output	B4	19	C8	C8
Ch 7/Ch 8, L1-	A4	-	A7, A8	A7, A8
Ch 9/Ch 10, L2+	-	-	B9, B10	-
Ch 9 Output	C5	7	C9	C9

Table A-75 DO880 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 male Connector ⁽¹⁾	TU830/TU833 Terminal	TU842 TU843 Terminal
Ch 10 Output	B5	20	C10	C10
Ch 9/Ch 10, L2-	A5	-	A9, A10	A9, A10
Ch 11/Ch 12, L2+	-	-	B11, B12	-
Ch 11 Output	C6	8	C11	C11
Ch 12 Output	B6	21	C12	C12
Ch 11/Ch 12, L2-	A6	-	A11, A12	A11, A12
Ch 13/Ch 14, L2+	-	-	B13, B14	-
Ch 13 Output	C7	9	C13	C13
Ch 14 Output	B7	22	C14	C14
Ch 13/Ch 14, L2-	A7	-	A13, A14	A13, A14
Ch 15/ Ch16, L2+	-	-	B15, B16	-
Ch 15 Output	C8	10	C15	C15
Ch 16 Output	B8	23	C16	C16
Ch 15/Ch16, L2-	A8	-	A15, A16	A15, A16
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)	L2+
0 V d.c.	L2-	12, 25	L2- (2)	L2-

(1) Pin 13 connected to connector body for EM.

Figure A-108 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU830/TU833 Extended MTU.

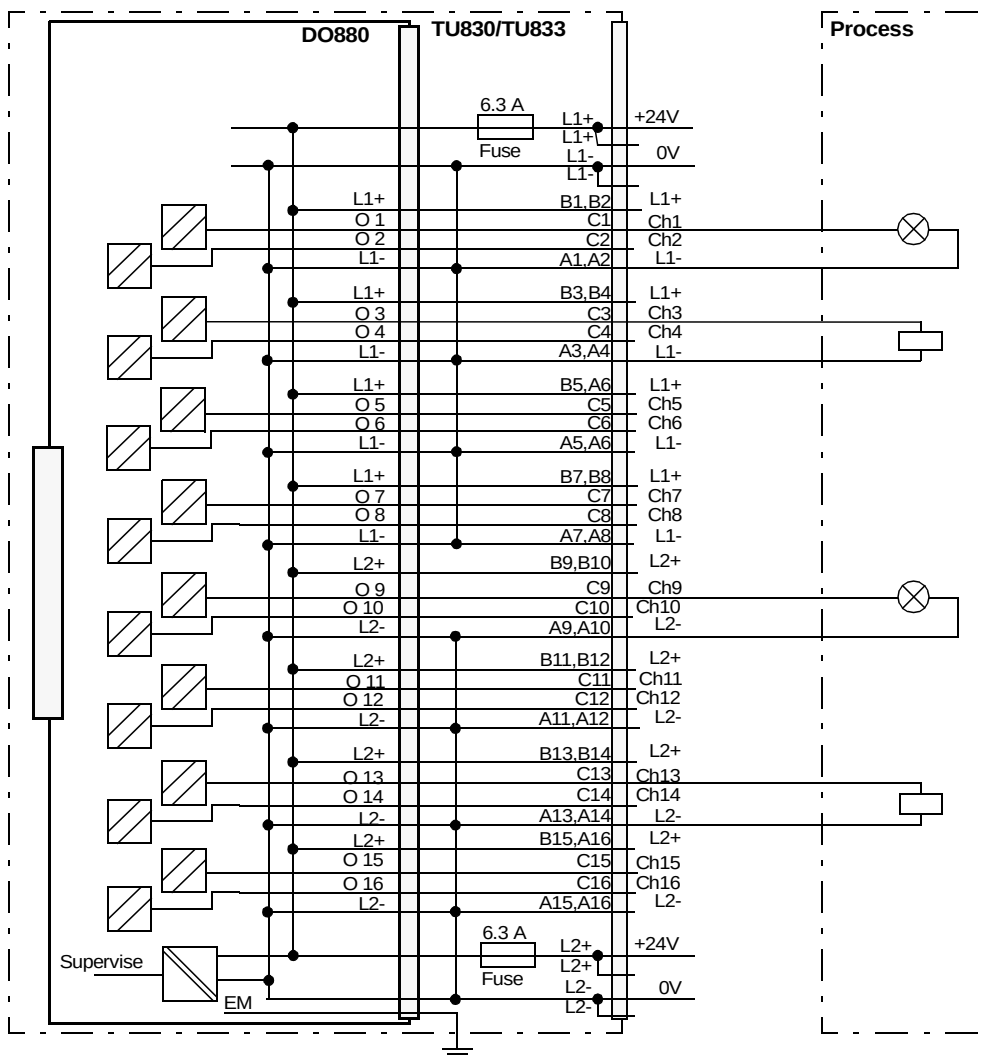


Figure A-108 DO880 with TU830/TU833 Extended MTU Process Connections

Figure A-109 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU810 or TU814 Compact MTU.

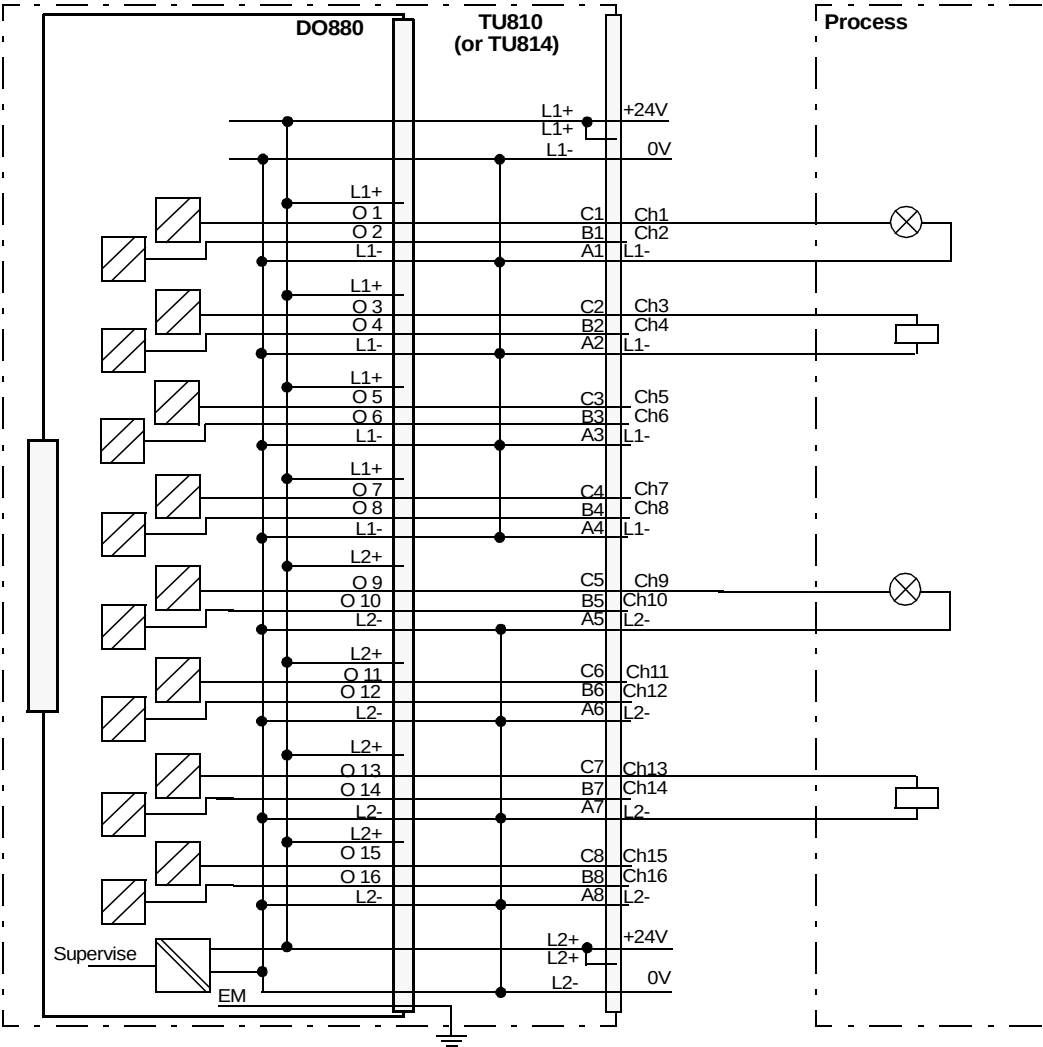


Figure A-109 DO880 with TU810 or TU814 Compact MTU Process Connections

Figure A-110 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU812 Compact MTU.

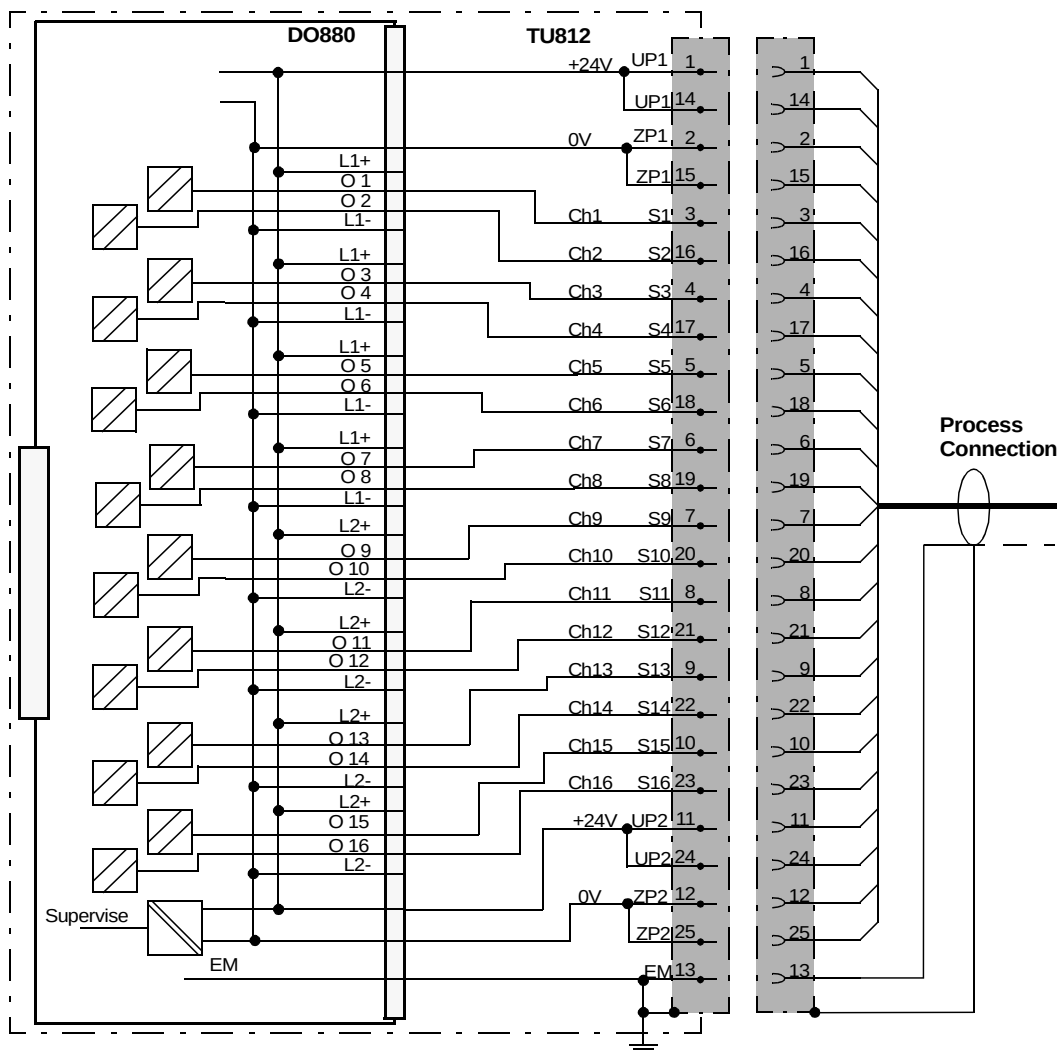


Figure A-110 DO880 with TU812 Compact MTU Process Connections

Figure A-111 shows the process connections for the High Integrity Digital Output Module DO880 when installed on a TU842 or TU843 Redundant MTU.

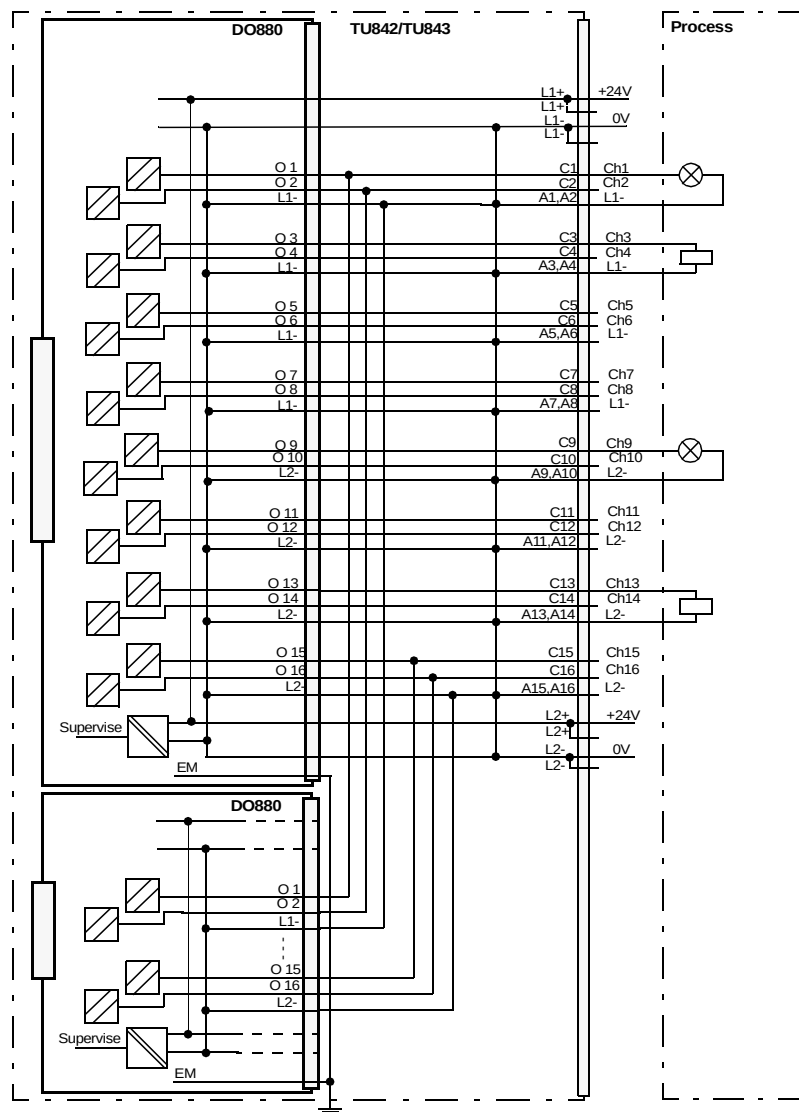


Figure A-111 DO880 with TU842 or TU843 Redundant MTU Process Connections

A.37 DP820 Incremental Pulse Counter Module

A.37.0.1 Features

- Two channels
- Interface for RS422, 5 V, 12 V, 24 V and 13 mA transducer signal levels
- Simultaneous pulse count and frequency measurement
- Pulse count (length/position) by accumulation in a bidirectional 29 bit counter
- Frequency (speed) measurement 0.25 Hz - 1.5 MHz
- EMC protection
- DIN rail mounting.

A.37.0.2 Description

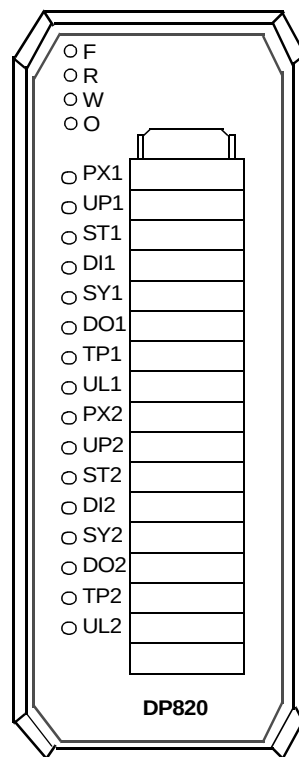
The DP820 module consists of two identical independent channels. Each channel can be used for independent pulse count (length/position) and frequency (speed) measurement.

A.37.0.3 Transducer Connection

Each channel has four inputs (A, B, ST and DI) and one output (DO). The input signals A and B are used as pulse inputs. The input signals ST and DI is used for synchronizing, sampling and gated count purposes.

The balanced inputs A, B and ST can be connected to pulse transducers with RS422, 5 V, 12 V, 24 V and 13 mA signal levels if an extended MTU is used (TU830). Adaption to different signal levels is made by using different terminals on the MTU (see section about process connection).

Only pulse transducers with RS422, 5 V and 13 mA signal levels can be used if an compact MTU is used (TU810, TU812 or TU814).



The unipolar input (DI) is intended for 24 V unipolar signal level.
The DO output is a current limited digital output, current sourcing type, 24 V d.c., 0.5 A.

All signals are individually isolated.

All inputs have overvoltage protection. A maximum voltage of 30 V can be connected without any damages.

Shielded twisted pair cables with characteristic impedance=100 (+/- 25%) ohm shall be used for connection of transducers with RS422/5 V /13 mA signals.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master after power is applied.

Input Filter

Each DP820 input has a configurable input filter (see Technical Data). Notice the following restrictions for selection of filters for inputs A or B:

The 1 μ s filter shall always be used when 12 V and 24 V inputs are used.

Unfiltered inputs can be used if RS422/+5 V /13 mA inputs are used, but cables between transducers and the DP820 module must then be separated from other cables to avoid that extra pulses occur due to EMI.

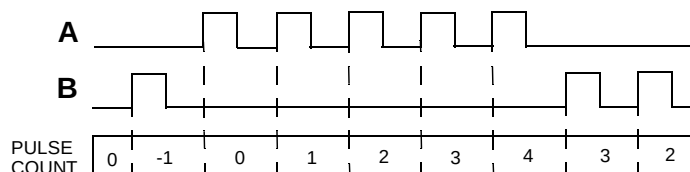
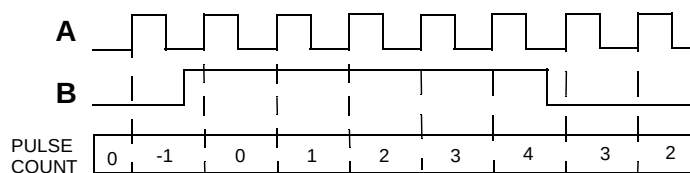
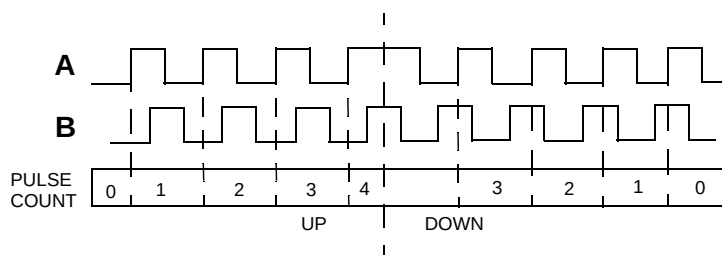
A.37.0.4 Pulse Encoding

The following different methods for pulse encoding are supported by DP820:

- Input A is used for counting up, input B is used for counting down, u/d.
- Input A is used for pulse counting, input B is used to determine count direction, c/d, B=0: down, B=1: up.
- Input A and B is used for a quadrature encoded signals. Multiplication factors x 1, x 2 and x 4 can be specified. Count direction is determined by A and B phase shift:

. 00 $\rightarrow$ 10 $\rightarrow$ 11 $\rightarrow$ 01 $\rightarrow$ 00 $\rightarrow$ 10 $\rightarrow$...

. 11 $\rightarrow$ 10 $\rightarrow$ 00 $\rightarrow$ 01 $\rightarrow$ 11 $\rightarrow$ 10 $\rightarrow$...

*Figure A-112 Up/Down Pulse Mode**Figure A-113 Count/Direction Mode**Figure A-114 Quadrature Mode, #1 (Count on Pos. Edge Input A)*

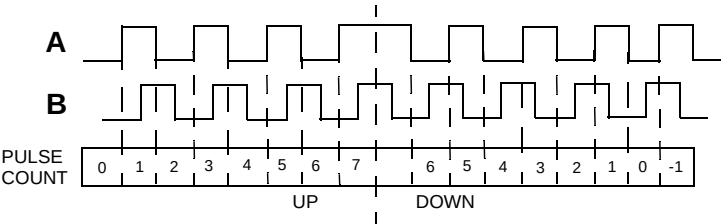


Figure A-115 Quadrature Mode, #2 (Count on Pos. Edge and Neg. Edge Input A)

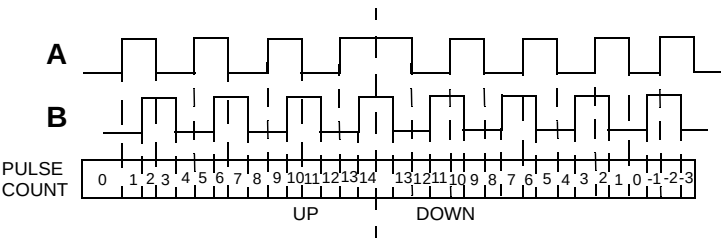


Figure A-116 Quadrature Mode, #4 (Count on Pos. Edge and Neg. Edge Input A and Input B)

A.37.0.5 Pulse Count (Length/Position) Measurement

Pulse count is done by pulse accumulation in a 29-bit (28bit + sign) bidirectional pulse counter. The pulse counter value is normally continuously loaded into the pulse register (see block diagram).

A pulse count sample condition can be specified by the user. When a sample condition is fulfilled is the value in the pulse register “frozen”. The value in the pulse register will remain “frozen” until a freeze disable command is received from the controller. The pulse accumulation in the pulse counter continues during the time when the pulse register is frozen.

The value of the pulse register (that is, actual pulse count value or “freezed” value) is read by the CPU, and transferred to the controller.

The pulse counter is synchronized (that is, set to zero) if a user selectable synchronization condition is fulfilled.

A comparator is used to compare the value of the pulse counter with the content of the compare register. The value of the compare register is specified by the user. A “coincidence” occur when a equal condition is detected by the comparator.

The coincidence function can be used to control the digital output signal (DO), as pulse count sample condition, as synchronization condition and as frequency sample condition (see below).

The pulse counter has overflow detection.

A.37.0.6 Gated Count Mode

In gated count mode the pulse counter only counts when the gate is active. The gate is controlled by the DI input. The gate can be controlled in two different ways:

The DI input is level sensitive, that is, the counter only counts when DI = high.

The DI input is edge sensitive, that is, the counter starts count on a positive edge on the DI input, stops on the next positive edge, continues on the next positive edge, and so forth.

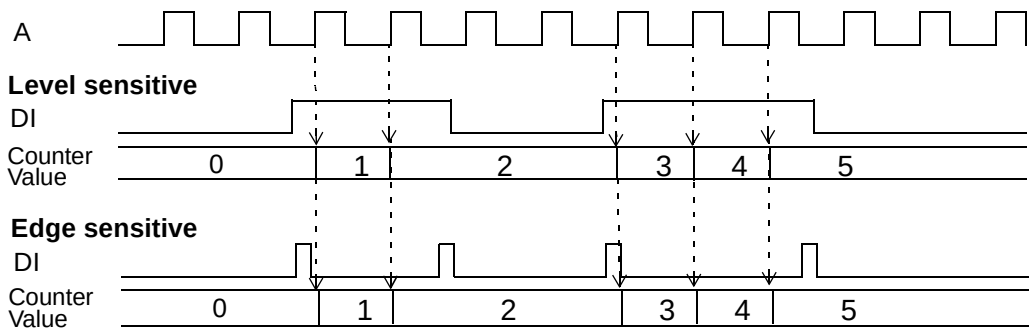


Figure A-117 Gated Count Mode in Two different Ways

Synchronization and sample conditions which uses the DI signal as part of the condition can not be used in gated count mode.

A.37.0.7 Frequency (speed) Measurement.

The frequency measurement function consists of two counters, that is, the SX and SR counters (see block diagram). The SX counter is used to count number of pulses (Sx) from the unknown input frequency. The SR counter is used to count the number of pulses (Sr) from a reference frequency source with frequency F_{REF} . The frequency value (Fx) is calculated as:

$$F_x = F_{REF} \times S_x / S_r$$

The SX counter is implemented by a 24 bit up/down counter (23 bit + sign). The SR counter is implemented by a 24 bit up-counter.

The SX and SR counters accumulates pulses during a measurement period. The measurement period can be determined in two different ways (user selectable):

By a measurement interval timer.

By the coincidence comparator function.

With the first method is a measurement interval for each channel defined by the user in increments of 1 ms from 1 to 2.700 ms. By changing the measurement interval the user can select a suitable filter time (integration time) with respect to the application's requirements.

With the second method is the measure interval controlled by the coincidence function, that is, a measurement interval is started when a coincidence is detected. Next coincidence terminates the measurement interval, and starts a new measurement interval.

At the end of each measurement period are the SX and SR registers is updated with the value of the SX and SR counters. The CPU reads the content in the SX and SR registers and calculates a frequency value.

It is possible to synchronize frequency measurements between the two channels, that is, the measurement period from one of the channels is then used by both channels.

A frequency sample condition can be specified by the user. When a sample condition is fulfilled is the value in the SX and SR registers "frozen". The value in

the SX and SR registers will remain “frozen” until a freeze disable command is received from the controller. The pulse accumulation in the SX and SR counters continues during the time when the SX and SR registers is frozen

The reference counter (SR) has a overflow detection function. The SR overflow will be activated if no incoming pulses has been detected during 4.3 s. When the CPU detects SR overflow, is the frequency value set to zero.

A.37.0.8 Digital Output

The digital output function can be configured in four different ways:

1. The digital output DO is activated when coincidence occur, and inactivated after a configurable pulse-length (1ms - 65535 ms).
2. The digital output DO is activated when DOVALUE =1, and inactivated after a configurable pulse-length (1ms - 65535 ms). The function is retriggable.
3. The digital output DO is activated when DOVALUE=1, and deactivated DOVALUE=0.
4. The digital output DO is activated when coincidence occur **and** the DOVALUE =1, and inactivated when DOVALUE=0.

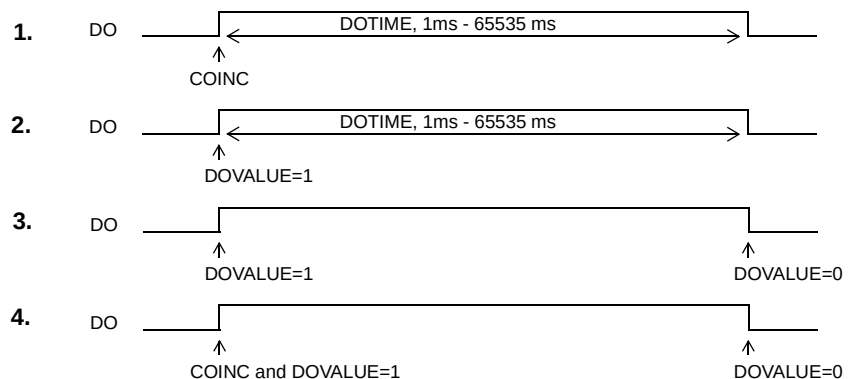


Figure A-118 Configuration of Digital Output Function

A.37.0.9 OSP Function

The digital outputs will be set to a predetermined value if the OSP-watchdog timer expires or if the SetOSPState command is received. The watchdog timer is re-triggered every time the correct module address has been decoded (or broadcast). If the watchdog timer expires or if the SetOSPState command is received, the module enters the OSP state.

The function in OSP state, and when reentering the operational state, will be different depending on how the DO function is configured (see Digital Output 1 - 4 above):

1. Function in OSP state: No more pulses will be activated as long as the module remains in OSP state. The DO pulse is always completed if the OSP-state is entered during an active DO pulse (this is, the pulse width is always in accordance with the DOTIME value).
Function when reentering operational state: The coincidence function has to be enabled before normal DO function will start.
2. Function in OSP state: Same as in 1. above. Function when reentering operational state: A new DO-pulse will be started as soon as a modulebus frame with DOVALUE=1 is received.
3. Function in OSP state: The digital outputs are set to their OSP values which can be configured as a predefined value or to use last good value sent.
Function when reentering operational state: The outputs keeps the OSP value until a modulebus frame with a new DOVALUE value is received.
4. Same as 3.

A.37.0.10 LED Indicators

For description about the LED-indicators with comments see [Table A-76](#)

Table A-76 Description of LED-Indicators

Name	Name	Color	Comments
PX1	PX2	Yellow	Activated on each pulse on A or B input (>0.5s flash)
UP1	UP2	Yellow	Activated when count direction = up
ST1	ST2	Yellow	Activated on each pulse on ST input (>0.5s flash)
DI1	DI2	Yellow	Activated on each pulse on DI input (>0.5s flash)
SY1	SY2	Yellow	Activated on PSX counter sync. (>0.5s flash)
DO1	DO2	Yellow	Activated when DO is activated (>0.5s flash)
TP1	TP2	Green	Transducer power OK

A.37.0.11 Technical Data*Table A-77 DP820 Incremental Pulse Counter Module Specifications*

Feature	DP820 Digital Pulse Counter
Number of channels	2
Power Supply voltage	24 V d.c. (12 to 32 V d.c.)
Max non-destructive voltage on inputs A, B, ST or DI	30 V d.c.
Maximum field cable length	200 m
Cable type Characteristic impedance	Shielded, twisted pair 100 (+/- 25%) ohm
Configurable input filters Input A and B Input ST Input DI	Unfiltered or 1 μ s 1 μ s or 1 ms 1 ms or 5 ms
Max input frequency / Min pulse width, input A and B	
RS422/+5 V /13 mA - range Filter = unfiltered Pulse encoding = u/d or c/d Pulse encoding = quadrature Filter = 1 μ s Pulse encoding = u/d or c/d Pulse encoding = quadrature	1.5 MHz / 333 ns 750 kHz / 667 ns 200 kHz / 2.5 μ s 100 kHz / 5 μ s
12 V - range (only TU830) Filter = unfiltered Filter = 1 μ s Pulse encoding = u/d or c/d Pulse encoding = quadrature	Not allowed 200 kHz / 2.5 μ s 100 kHz / 5 μ s

Table A-77 DP820 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP820 Digital Pulse Counter
24 V - range (only TU830) Filter = unfiltered Filter = 1 μ s Pulse encoding = u/d or c/d Pulse encoding = quadrature Max. input frequency/Min. pulse width, input ST All voltage ranges Filter = 1 μ s Filter = 1 ms	Not allowed 200 kHz / 2.5 μ s 100 kHz / 5 μ s 200 kHz / 2.5 μ s 1 kHz / 500 μ s
Max. input frequency/Min. pulse width, input DI Filter = 1 μ s Filter = 1 ms	1 kHz / 500 μ s 0.1 kHz / 5 μ s
Input impedance, A, B and ST -inputs RS422/+5 V /13 mA - range 12 V - range (only TU830) 24 V - range (only TU830)	100 Ω ⁽¹⁾ characteristic impedance 1 k Ω 2 k Ω
Input impedance, DI - input	2.5 k Ω

Table A-77 DP820 Incremental Pulse Counter Module Specifications (Continued)

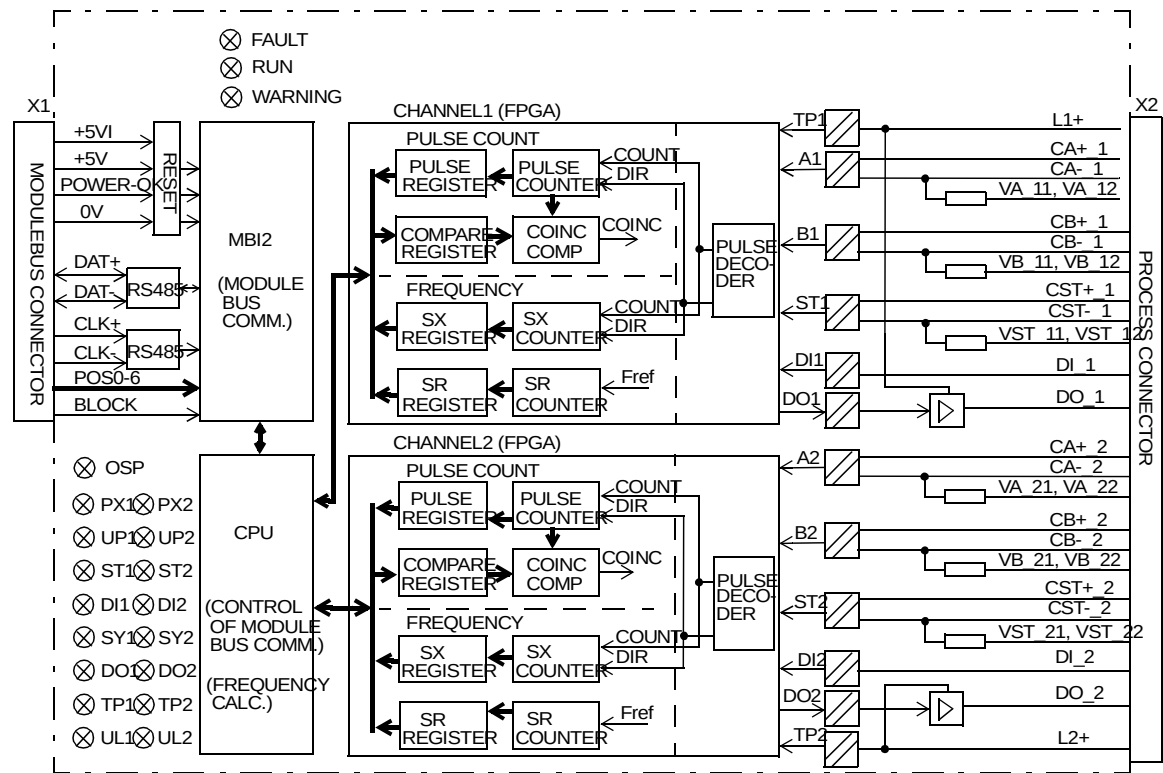
Feature	DP820 Digital Pulse Counter
Input signal voltage range Input A, B, ST RS422/+5 V /13 mA - range “1” “0” 12 V - range (external resistance) ⁽²⁾ “1” “0” 24 V - range (only TU830) ⁽³⁾ “1” “0” Input DI “1” “0”	2.5 V to 30 V -30 V to 1.0 V 8 V to 30 V -30 V to 2.0 V 15 V to 30 V -30 V to 5.0 V 15 V to 30 V -30 V to 5.0 V
Digital output, max. load current	0.5 A
Digital output, max. short circuit current	2.4 A
Digital output, max. leakage current	10 μ A
Digital output, max. output impedance	0.4 Ω
Max. frequency measurement error Relative error Absolute error (Temperature drift included)	[260/(MEASTIME _x in ms)] ppm [(260/(MEASTIME _x in ms)) +100] ppm
DP820 current consumption, +5 V	120 mA
Power dissipation	2.5 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽⁴⁾

Table A-77 DP820 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP820 Digital Pulse Counter
Output Set as Predetermined (OSP) timer	256, 512, 1024 ms
Process voltage supervision	2 channels (1 per group)
Isolation	Individually isolated channels
Mounting termination units	TU810, TU812, TU814, TU830 or TU833
MTU keying code	CB
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector
Height	119 mm (4.7")
Weight	0.15 kg (0.33 lbs.)

- (1) Load 20 mA at 5 V, 8 mA at 2.5 V
- (2) With TU830 external resistor 1.8 k Ω , see [Figure A-122](#).
With TU810, TU814 external resistor ca 920 Ω , see [Figure A-119](#).
- (3) With external resistor also TU810, TU814
External resistor 1.8 k Ω , see [Figure A-119](#).
- (4) 40°C (104°F) applies to compact MTUs with I/O-modules or S800L-modules mounted on vertical DIN rail.

A.37.0.12 Block Diagram DP820



A.37.0.13 Process Connections*Table A-78 DP820 Process Connections*

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/TU833 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)
0 V d.c. (ZP)	L1-	2, 15	L1- (2)
Ch1, CA+	C1	3	C1
Ch1, CA-	B1	16	C2
Ch1, VA_1	-	-	B1
Ch1, VA_2	-	-	B2
Ch1, Zp	A1	-	A1, A2
Ch1, CB+	C2	4	C3
Ch1, CB-	B2	17	C4
Ch1, VB_1	-	-	B3
Ch1, VB_2	-	-	B4
Ch1, Zp	A2	-	A3, A4
Ch1, CST+	C3	5	C5
Ch1, CST-	B3	18	C6
Ch1, VST_1	-	-	B5
Ch1, VST_2	-	-	B6
Ch1, Zp	A3	-	A5, A6
Ch1, DI	C4	6	C7
Ch1, DO	B4	19	C8
Ch1, L1+	-	-	B7

Table A-78 DP820 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/TU833 Terminal
Ch1, L1+	-	-	B8
Ch1, Zp	A4	-	A7, A8
Ch2, CA+	C5	7	C9
Ch2, CA-	B5	20	C10
Ch2, VA_1	-	-	B9
Ch2, VA_2	-	-	B10
Ch2, Zp	A5	-	A9, A10
Ch2, CB+	C6	8	C11
Ch2, CB-	B6	21	C12
Ch2, VB_1	-	-	B11
Ch2, VB_2	-	-	B12
Ch2, Zp	A6	-	A11, A12
Ch2, CST+	C7	9	C13
Ch2, CST-	B7	22	C14
Ch2, VST_1	-	-	B13
Ch2, VST_2	-	-	B14
Ch2, Zp	A7	-	A13, A14
Ch2, DI	C8	10	C15
Ch2, DO	B8	23	C16
Ch2, L2+	-	-	B15
Ch2, L2+	-	-	B16
Ch2, Zp	A8	-	A15, A16

Table A-78 DP820 Process Connections (Continued)

Process Connection	TU810 (or TU814) Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830/TU833 Terminal
+24 V d.c.	L2+ (2)	11, 24	L2+ (2)
0 V d.c. (ZP)	L2-	12, 25	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-119 shows the process connections for DP820 when installed on a TU810 or TU814 MTU.

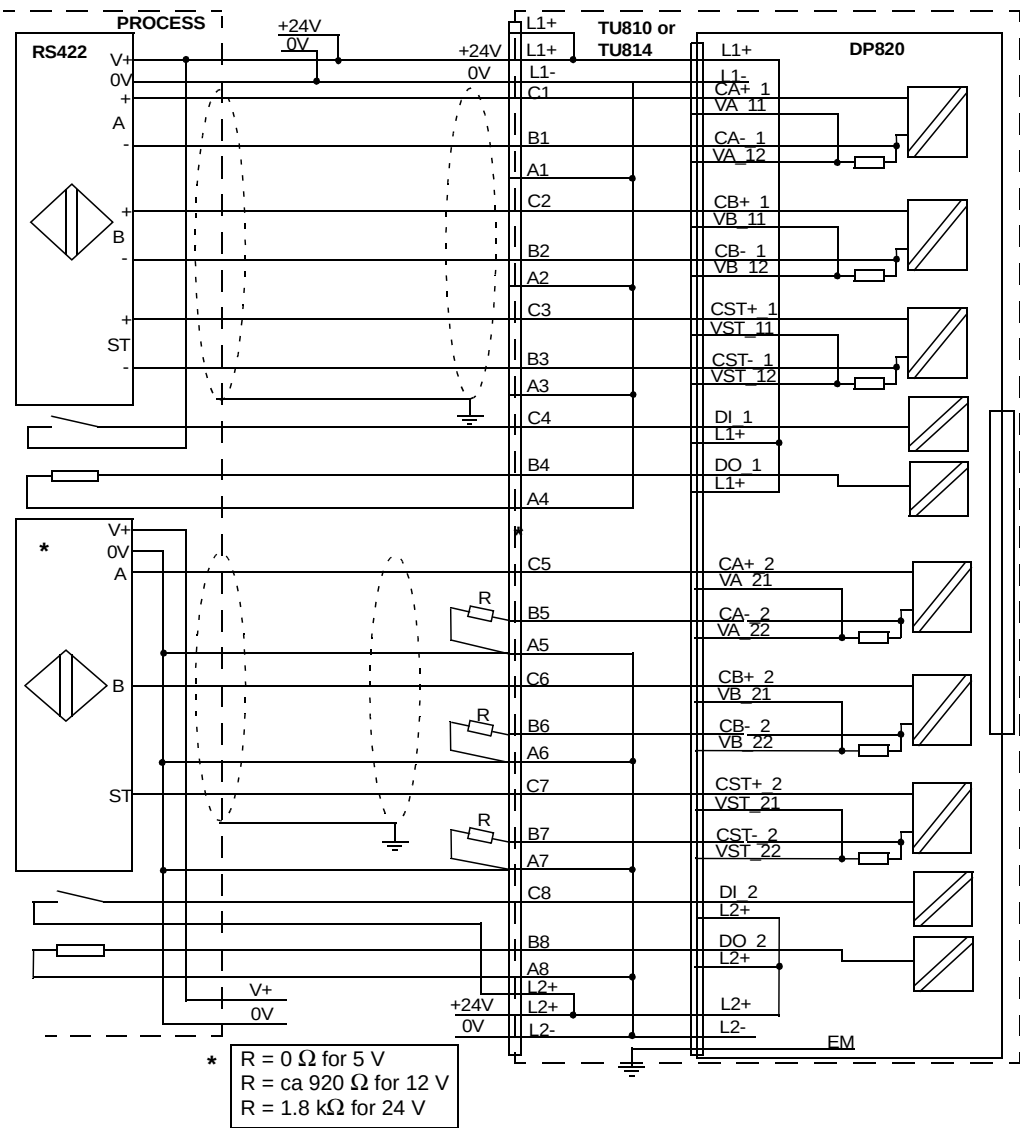


Figure A-119 DP820 with TU810 or TU814 MTU Process Connections

Figure A-120 shows the process connections for DP820 when installed on a TU812 MTU.

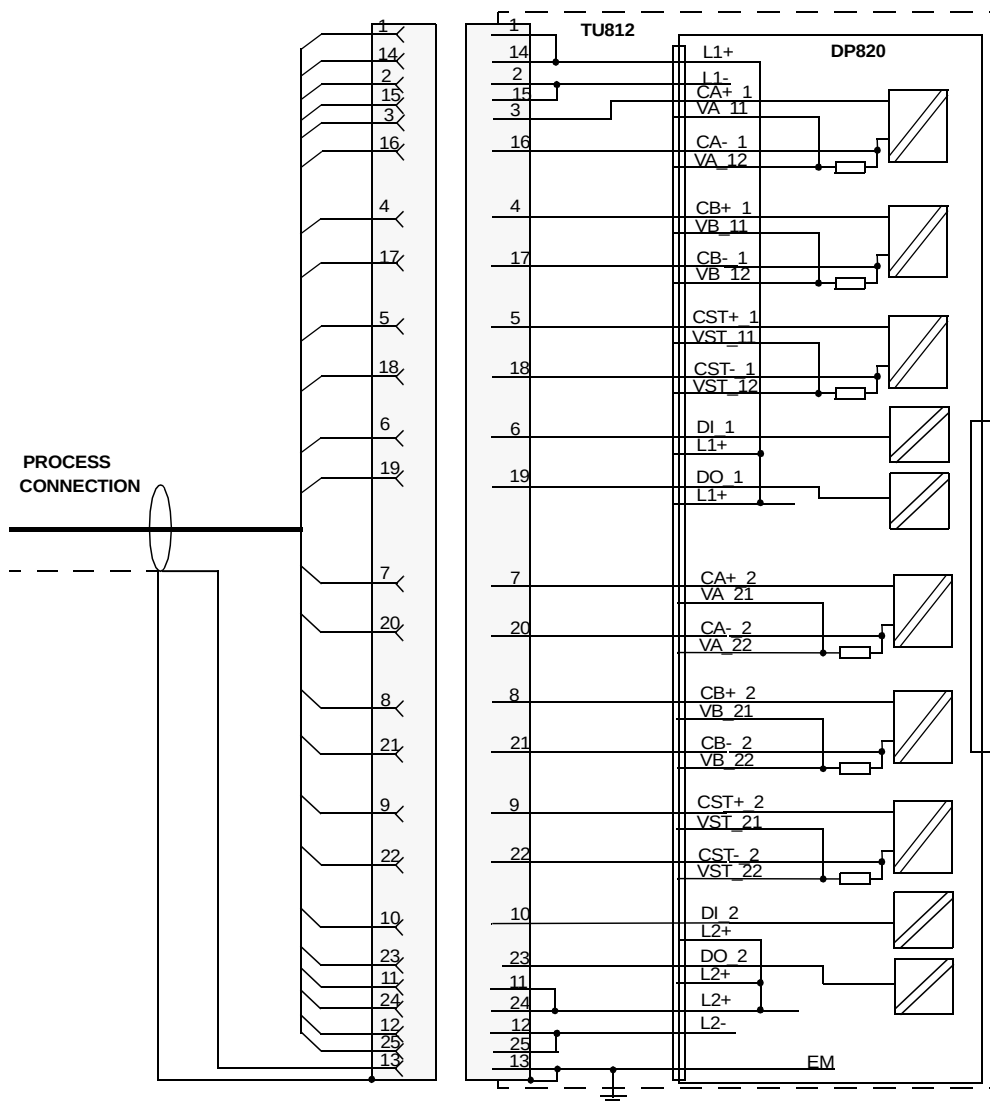


Figure A-120 DP820 with TU812 MTU Process Connections

Figure A-121 shows the process connections for DP820 when installed on a TU830 MTU, and with RS422 transducer connected to channel 1 and +5 V transducer to channel 2.

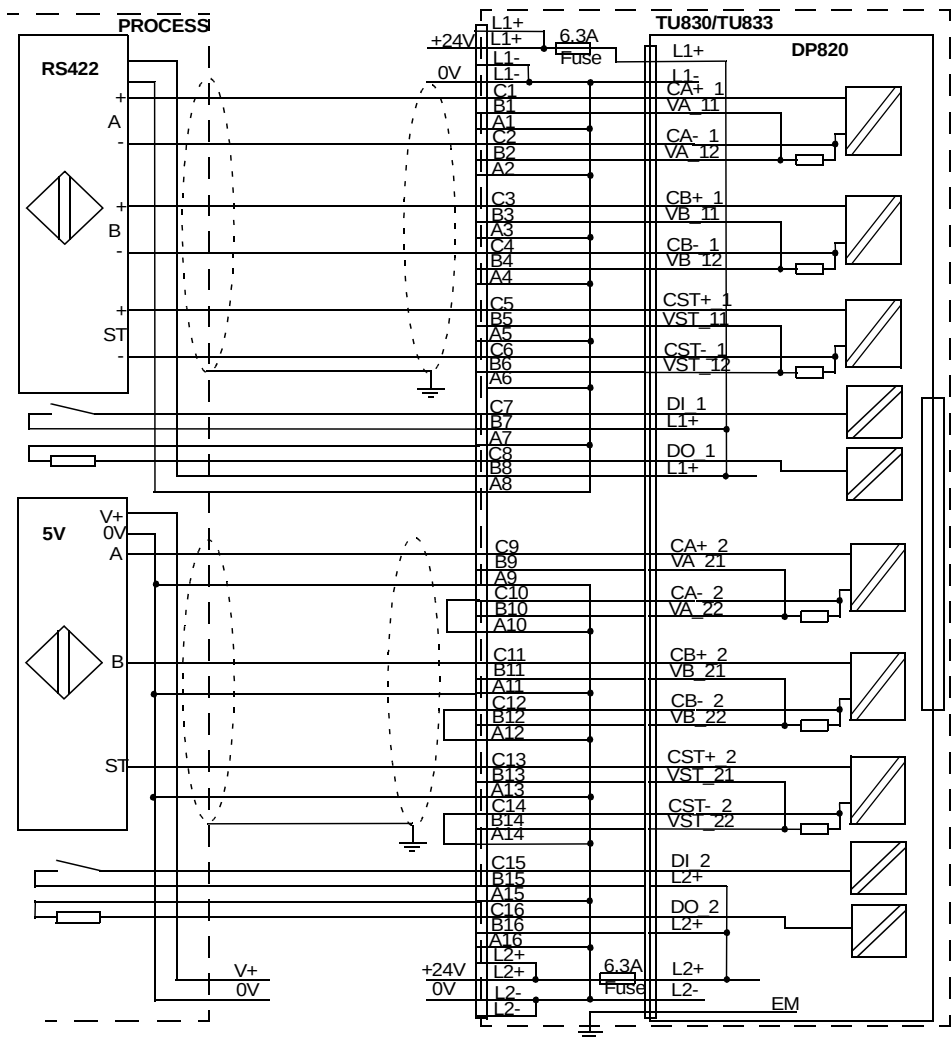
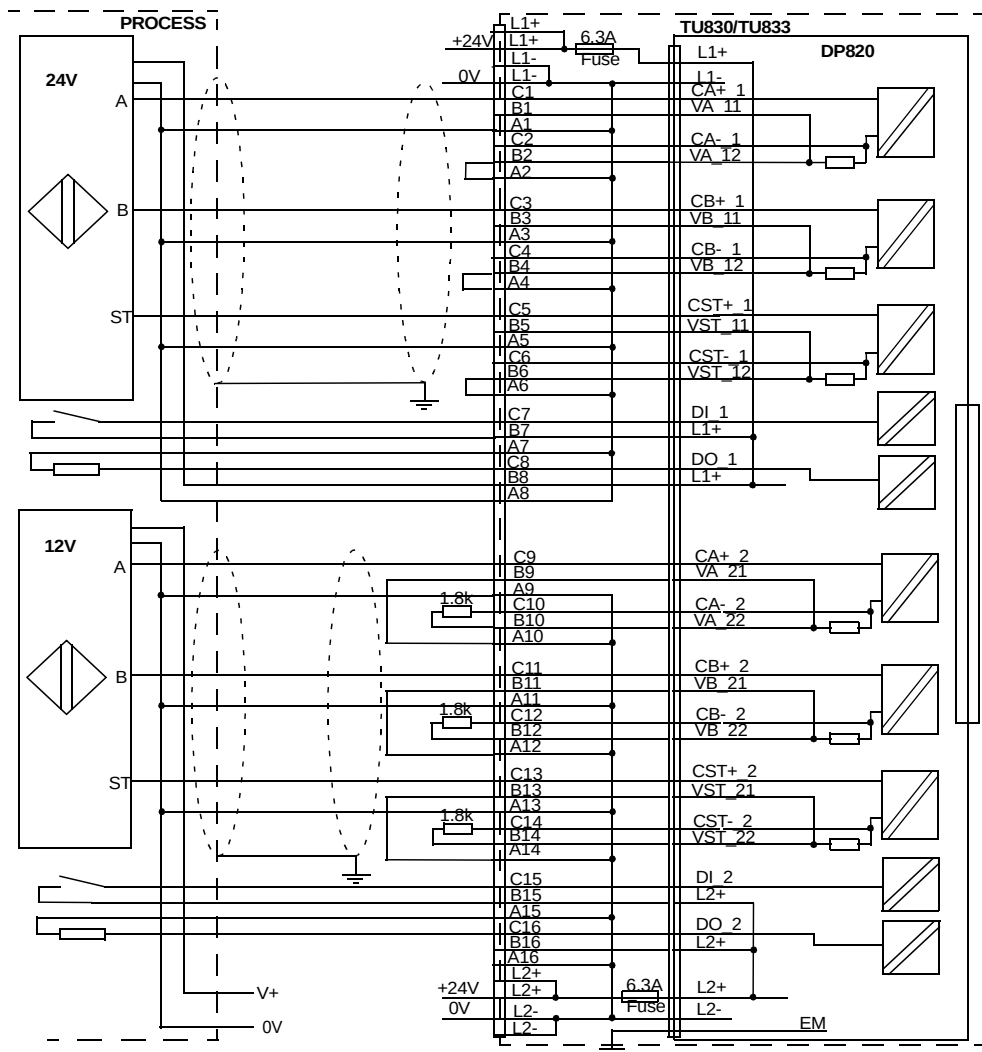


Figure A-121 DP820 with TU830 MTU Process Connections and with Transducer Connections

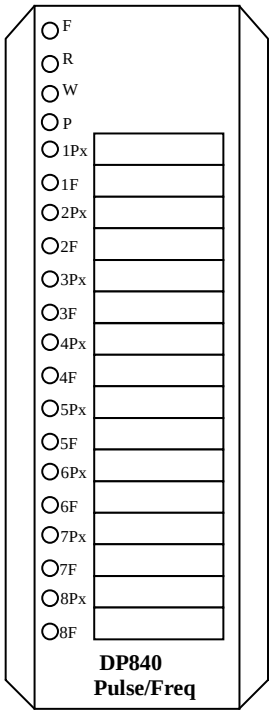
Figure A-122 shows the process connections for DP820 when installed on a TU830 MTU, and with +24 V transducer connected to channel 1 and +12 V transducer to channel 2.



A.38 DP840 Incremental Pulse Counter Module

A.38.0.1 Features

- 8 channels
- The modules can be used in both single and redundant applications.
- Interface for NAMUR, 12 V and 24 V transducer signal levels.
- Each channel can be configured for pulse count or frequency measurement.
- The inputs can also be read as DI signals.
- Pulse count by accumulation in a 16 bit counter.
- Frequency (speed) measurement 0.5 Hz - 20 kHz.
- Advanced on-board diagnostics.
- EMC protection
- DIN rail mounting.
- Also in a G3 compliant version.



A.38.0.2 Description

The DP840 module consists of 8 identical independent channels. Each channel can be used for pulse count or frequency (speed) measurement. The inputs can also be read as DI signals.

Each channel has a configurable input filter.

The module perform self-diagnostics cyclically. Module diagnostics include among other things:

- Transmitter power supply error, power supply error (process side), short circuit and open wire. These errors will be reported as External Channel Error.
- Counter supervision. This will be reported as Internal Channel Error.

- Error in data/address bus supervision will be reported as Module Error.
- Synchronization error will be reported as Module Warning.

The reset circuitry gives a reset signal when the module is inserted until the BLOCK signal is inactive and the POWOK signal is active. The BLOCK signal is deactivated when the module lock mechanism is in the locked position. The POWOK comes from the ModuleBus master or controller after power is applied.

Four LED indicate module status Fault (red), Run (green), Warning (yellow) and Primary (yellow). Two LED per channel indicate input state (Px yellow) and channel fault (F red). The Primary LED is on if the module is primary in a redundant pair. The Px LED is on if pulse (high signal) on the input and F LED is on if the channel is faulty.

A.38.0.3 Transducer Connection

Each channel has inputs for 12 V, 24 V and NAMUR input signals and a configurable transducer power output. The configurable transducer power is set on module (not channel wise) for all channels to either NAMUR, 12 V or 24V.

The module distribute the external transmitter supply to each channel. This adds a simple connection to distribute the supply to 2 or 3-wire transmitters. The transmitter power is supervised and current limited. The inputs can be supervised for short circuit and open wire. The supervision can be enabled/disabled per module (not channel wise).

The 2-wire transducers should be connected by shielded twisted pair cable.

The MTU have to be chosen with consideration to function and signal range, see [Table A-79](#). Type of sensor to be used is defined by parameters. The parameter set

the sensor power output for NAMUR sensors to 8.2 V, for 12 V sensors to 12 V and for 24 V sensors to 24 V.

Table A-79 Function and Signal Range with Different MTUs

MTU type	Redundant configuration			Single configuration		
	Namur sensors	12 V sensors	24 V sensors	Namur sensors	12 V sensors	24 V sensors
TU810/TU812/TU814				X		X
TU830				X	X	X
TU842/TU843		X	X			
TU844/TU845	X	X	X			

The parameter for internal and external shunt shall only be set to External when DP840 is used with TU844 or TU845.

A.38.0.4 Pulse Count Measurement

Pulse count is done by pulse accumulation in a 16 bit pulse counter. The pulse counter value is continuously loaded into the pulse register.

The value of the pulse register (that is, actual pulse count value) is read by the CPU, and transferred to the ModuleBus master.

A.38.0.5 Frequency (speed) Measurement.

The frequency measurement function consists of two counters, that is, the SX and SR counters. The SX counter is used to count number of pulses (Sx) from the unknown input frequency. The SR counter is used to count the number of pulses (Sr) from a reference frequency source with frequency F_{REF}. The frequency value (Fx) is calculated as:

$$F_x = F_{REF} \times S_x / S_r$$

The SX counter is implemented by a 12 bit up-counter. The SR counter is implemented by a 20 bit up-counter.

The SX and SR counters accumulates pulses during a measurement period.

The measurement interval for each channel defined by the user to 10 ms, 20 ms, 50 ms or 100 ms. By changing the measurement interval the user can select a suitable filter time (integration time) with respect to the application's requirements.

At the end of each measurement period the SX and SR registers is updated with the value of the SX and SR counters. The CPU reads the content in the SX and SR registers and calculates a frequency value.

The reference counter (SR) has a overflow detection function. The SR overflow will be activated if no incoming pulses has been detected during 3 s. When the CPU detects SR overflow, is the frequency value set to zero.

A.38.0.6 Redundant Applications

In a redundant application one module is set to primary and one to backup. The primary module synchronize the counter on the backup module every 10 seconds. After start-up it will take about 30 s before the backup has been synchronized.

A.38.0.7 Technical Data*Table A-80 DP840 Incremental Pulse Counter Module Specifications*

Feature	DP840 Digital Pulse Counter
Number of channels	8
Power Supply voltage	24 V d.c. (19.2 to 30 V d.c.)
Max non-destructive voltage on inputs	30 V d.c.
Maximum field cable length	200 m
Cable type	Twisted pair ⁽¹⁾
Frequency range	10 μ s input filter: 0.5 Hz - 20 kHz 100 μ s input filter ⁽²⁾ : 0.5 Hz - 5 kHz 800 μ s input filter ⁽²⁾ : 0.5 Hz - 625 Hz 6400 μ s input filter ⁽²⁾ : 0.5 Hz - 78 Hz
Min pulse width ("1" or "0")	10 μ s input filter: 10 μ s 100 μ s input filter: 100 μ s 800 μ s input filter: 800 μ s 6400 μ s input filter: 6400 μ s
Input thresholds, NAMUR	Open wire: $I_{IN} < 0.1$ mA Contact open: $0.1 \text{ mA} < I_{IN} < 1.6$ mA Contact closed: $1.6 \text{ mA} < I_{IN} < 6.0$ mA Short circuit: $I_{IN} > 6.0$ mA
Input thresholds, 12V / 24 V With external resistor for cable supervision	Open wire: $V_{IN} < 0.1$ V Contact open: $0.1 \text{ V} < V_{IN} < 1.6$ V Contact closed: $1.6 \text{ V} < V_{IN} < 6.0$ V Short circuit: $V_{IN} > 6.0$ V
Input threshold, 12 V No resistors for cable supervision	Contact open: $V_{IN} < 5.0$ V Contact closed: $V_{IN} > 5.0$ V
Input threshold, 24 V No resistors for cable supervision	Contact open: $V_{IN} < 8.3$ V Contact closed: $V_{IN} > 8.3$ V

Table A-80 DP840 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP840 Digital Pulse Counter
Maximum pulse frequency	20 kHz ⁽³⁾
Hysteresis	$(I_{ON} - I_{OFF}) / \text{Input threshold} > 20\%$ or $(V_{ON} - V_{OFF}) / \text{Input threshold} > 20\%$
Input impedance	NAMUR: 1 k Ω , +/-10% 12 V range: 2.8 k Ω , +/-10% 24 V range: 4.0 k Ω , +/-10%
Sensor supply voltage level (max. 20 mA/channel)	NAMUR: 8.2 V, +/-10% 12 V range: 12 V +/-10% 24 V range: $V_{L+} - (3.0 \pm 1.0) \text{ V}$
Sensor supply current limit	All ranges: <40 mA (single) <80 mA (redundant)
Max. measurement error, frequency measurement	Max relative error ⁽⁴⁾ : PRIT = 10 ms: 300 ppm PRIT = 20 ms: 150 ppm PRIT = 50 ms: 60 ppm PRIT = 100 ms: 30 ppm Max error in crystal oscillator: 120 ppm + 5 ppm/year Max absolute error = rel. error + oscillator error (PRIT = 10 ms, age < 16 year): 500 ppm (= 0.05%)
Min. sampling interval when used in pulse count mode	f_{MAX} - Maximum expected input frequency: $2^{16} \times (1/f_{MAX})$ $f_{MAX} = 20 \text{ kHz}$: 3.27 s
Synchronization accuracy	+/-1 pulse
DP840 current consumption, +5 V	115 mA

Table A-80 DP840 Incremental Pulse Counter Module Specifications (Continued)

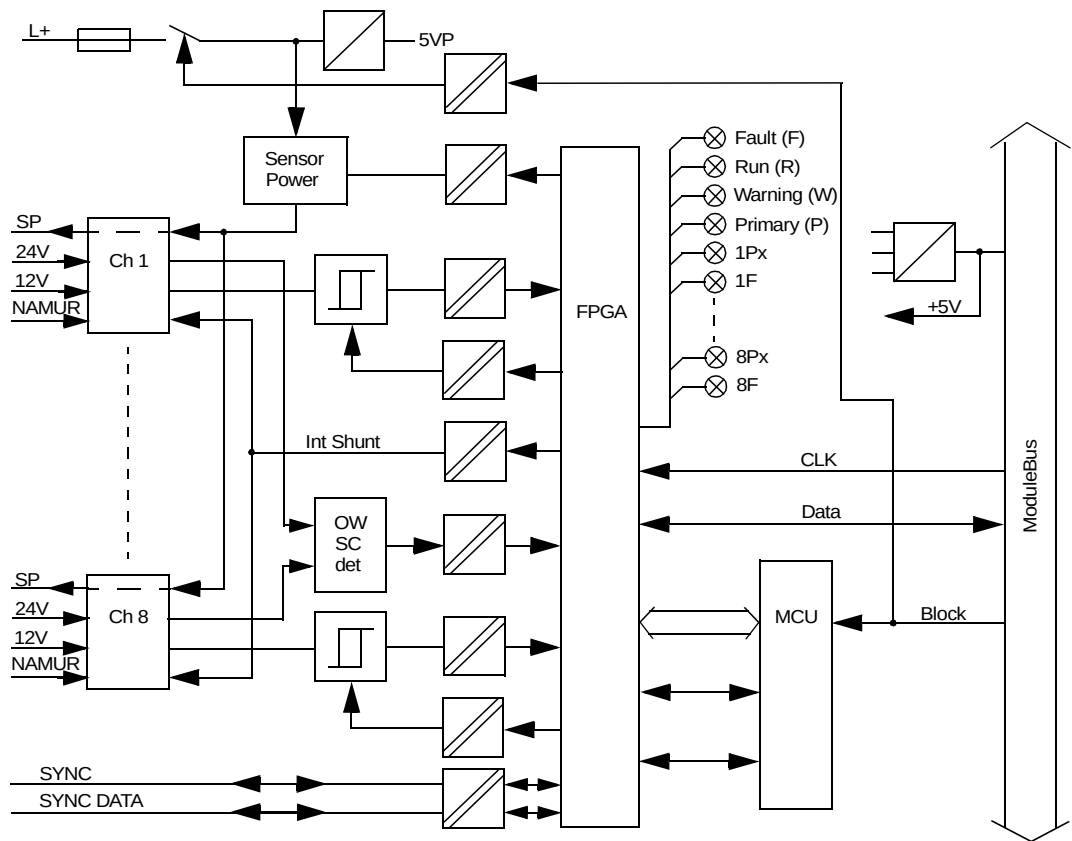
Feature	DP840 Digital Pulse Counter
External power supply consumption (Internal load + external load)	NAMUR = $56 + 0.5 \times \text{external load [mA]}$ 12 V = $89 + 0.7 \times \text{external load [mA]}$ 24 V = $97 + \text{external load [mA]}$
External power supply	24 V d.c. (19.2 to 30 V d.c.)
Power dissipation	4 W
Maximum ambient temperature	55/40°C (131/104°F) ⁽⁵⁾
Process voltage supervision	1 channel
Module termination units, single applications	TU810, TU812, TU814, TU830, TU833
Module termination units, redundant applications	TU842/TU843 or TU844/TU845
MTU keying code	CF
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	45 mm (1.77")
Depth	97 mm (3.8"), 106 mm (4.2") including connector

Table A-80 DP840 Incremental Pulse Counter Module Specifications (Continued)

Feature	DP840 Digital Pulse Counter
Height	119 mm (4.7")
Weight	0.15 kg (0.33 lbs)

- (1) Shielded cables for 2-wire transmitters
- (2) Symmetric input pulse (i.e. 50% duty cycle)
- (3) Input channel pulse supervision does not work with pulse frequency <2 Hz
- (4) Relative error - Max difference in frequency measurement between two channels on the same module connected to the same source.
- (5) 40°C (104°F) applies to compact MTUs with I/O-modules.

A.38.0.8 Block Diagram DP840



A.38.0.9 Process Connections*Table A-81 DP840 Process Connections*

Process Connection	TU810 or TU814 Terminal	TU812 D-Sub 25 Male Connector⁽¹⁾	TU830 or TU833 Terminal	TU842 or TU843 Terminal	TU844 or TU845 Terminal
+24 V d.c.	L1+ (2)	1, 14	L1+ (2)	L1+ (2)	L1+ (2)
0 V d.c.	L1-	2, 15	L1- (2)	L1- (2)	L1- (2)
I1, NAMUR	C1	3	C1	C1	B2
U1	-	-	B1	B1	B1
ZP	-	-	A1	A1	A1
I1, 24 V	B1	16	C2	C2	-
I1, 12 V	-	-	B2	B2	-
ZP	A1	-	A2	A2	A2
I2, NAMUR	C2	4	C3	C3	B4
U2	-	-	B3	B3	B3
ZP	-	-	A3	A3	A3
I2, 24 V	B2	17	C4	C4	-
I2, 12 V	-	-	B4	B4	-
ZP	A2	-	A4	A4	A4
I3, NAMUR	C3	5	C5	C5	B6
U3	-	-	B5	B5	B5
ZP	-	-	A5	A5	A5
I3, 24 V	B3	18	C6	C6	-
I3, 12 V	-	-	B6	B6	-
ZP	A3	-	A6	A6	A6

Table A-81 DP840 Process Connections (Continued)

Process Connection	TU810 or TU814 Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830 or TU833 Terminal	TU842 or TU843 Terminal	TU844 or TU845 Terminal
I4, NAMUR	C4	6	C7	C7	B8
U4	-	-	B7	B7	B7
ZP	-	-	A7	A7	A7
I4, 24 V	B4	19	C8	C8	-
I4, 12 V	-	-	B8	B8	-
ZP	A4	-	A8	A8	A8
I5, NAMUR	C5	7	C9	C9	B10
U5	-	-	B9	B9	B9
ZP	-	-	A9	A9	A9
I5, 24 V	B5	20	C10	C10	-
I5, 12 V	-	-	B10	B10	-
ZP	A5	-	A10	A10	A10
I6, NAMUR	C6	8	C11	C11	B12
U6	-	-	B11	B11	B11
ZP	-	-	A11	A11	A11
I6, 24 V	B6	21	C12	C12	-
I6, 12 V	-	-	B12	B12	-
ZP	A6	-	A12	A12	A12
I7, NAMUR	C7	9	C13	C13	B14
U7	-	-	B13	B13	B13
ZP	-	-	A13	A13	A13

Table A-81 DP840 Process Connections (Continued)

Process Connection	TU810 or TU814 Terminal	TU812 D-Sub 25 Male Connector ⁽¹⁾	TU830 or TU833 Terminal	TU842 or TU843 Terminal	TU844 or TU845 Terminal
I7, 24 V	B7	22	C14	C14	-
I7, 12 V	-	-	B14	B14	-
ZP	A7	-	A14	A14	A14
I8, NAMUR	C8	10	C15	C15	B16
U8	-	-	B15	B15	B15
ZP	-	-	A15	A15	A15
I8, 24 V	B8	23	C16	C16	-
I8, 12 V	-	-	B16	B16	-
ZP	A8	-	A16	A16	A16
	L2+ (2)	11, 24	L2+ (2)	L2+ (2)	L2+ (2)
	L2-	12, 25	L2- (2)	L2- (2)	L2- (2)

(1) Pin 13 connected to connector body for EM.

Figure A-123 shows the process connections for DP840 when installed on a TU810 or TU814 MTU.

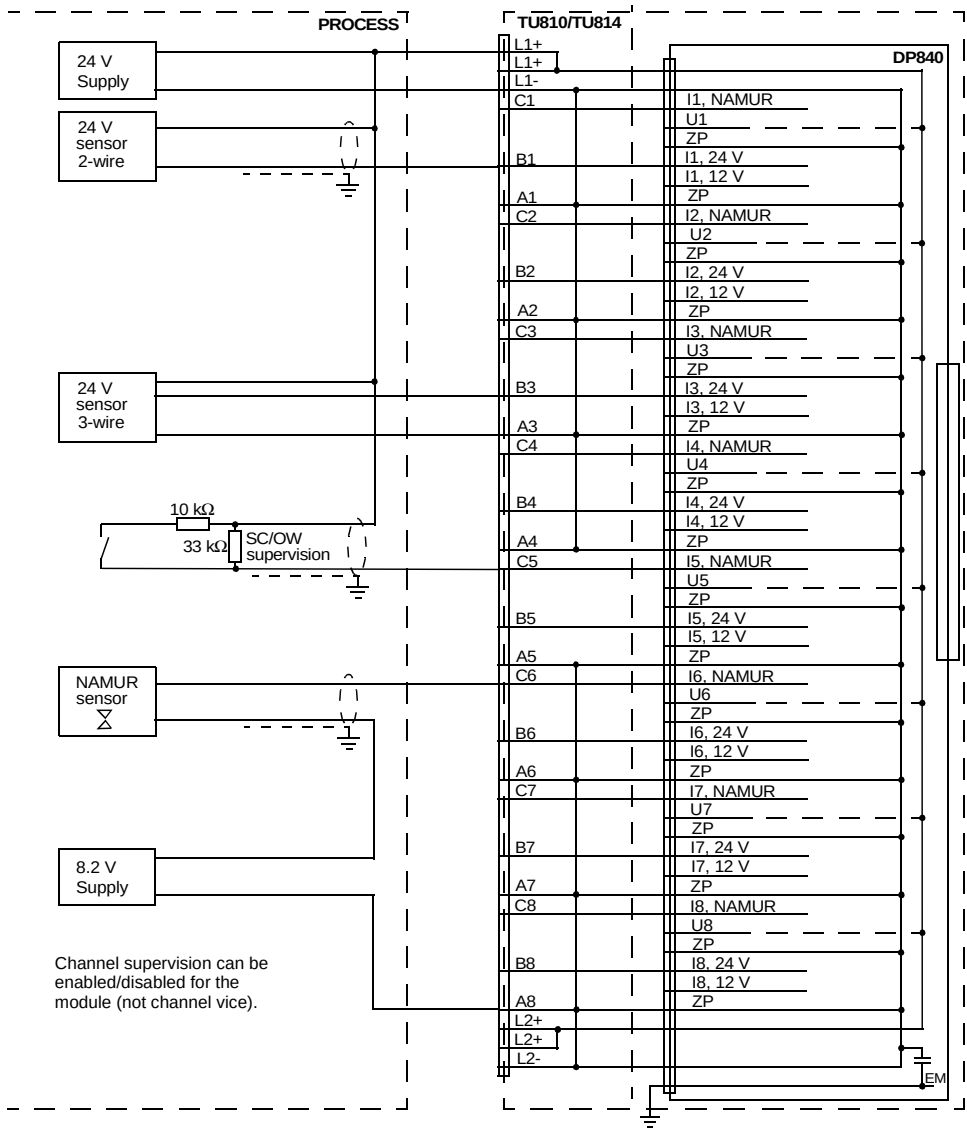


Figure A-123 DP840 with TU810 or TU814 MTU Process Connections

Figure A-124 shows the process connections for DP840 when installed on a TU812 MTU.

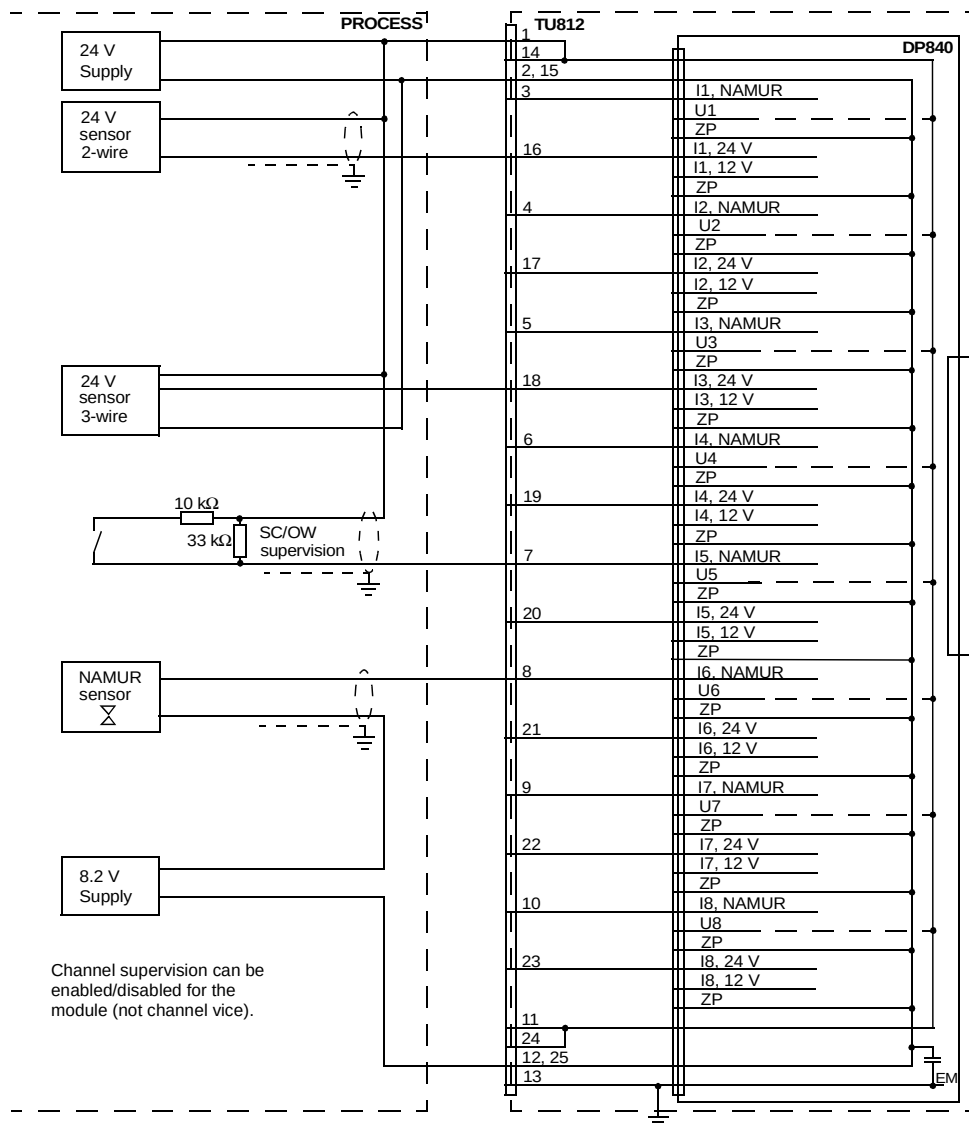


Figure A-124 DP840 with TU812 MTU Process Connections

Figure A-125 shows the process connections for DP840 when installed on a TU830 MTU.

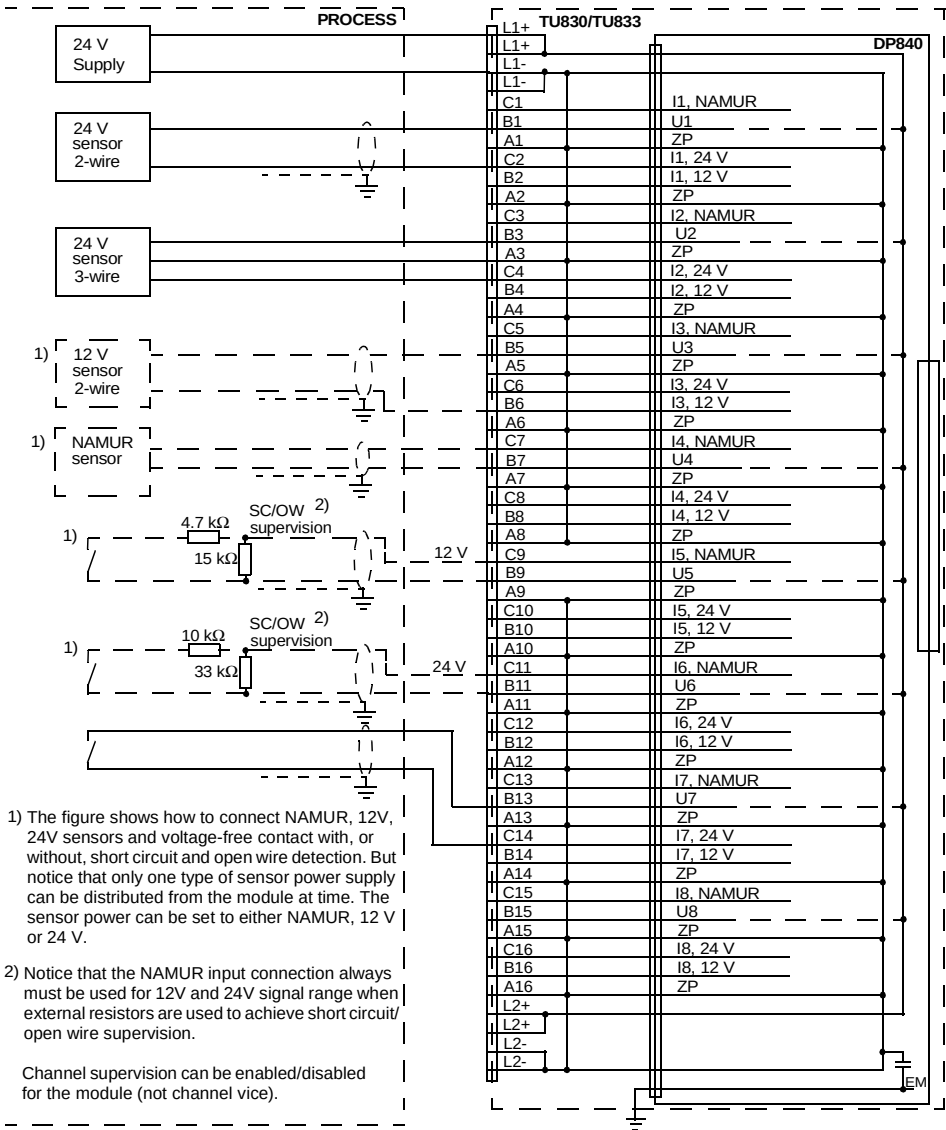


Figure A-125 DP840 with TU830 MTU Process Connections

Figure A-126 shows the process connections for DP840 when installed on a TU842 or TU843 MTU.

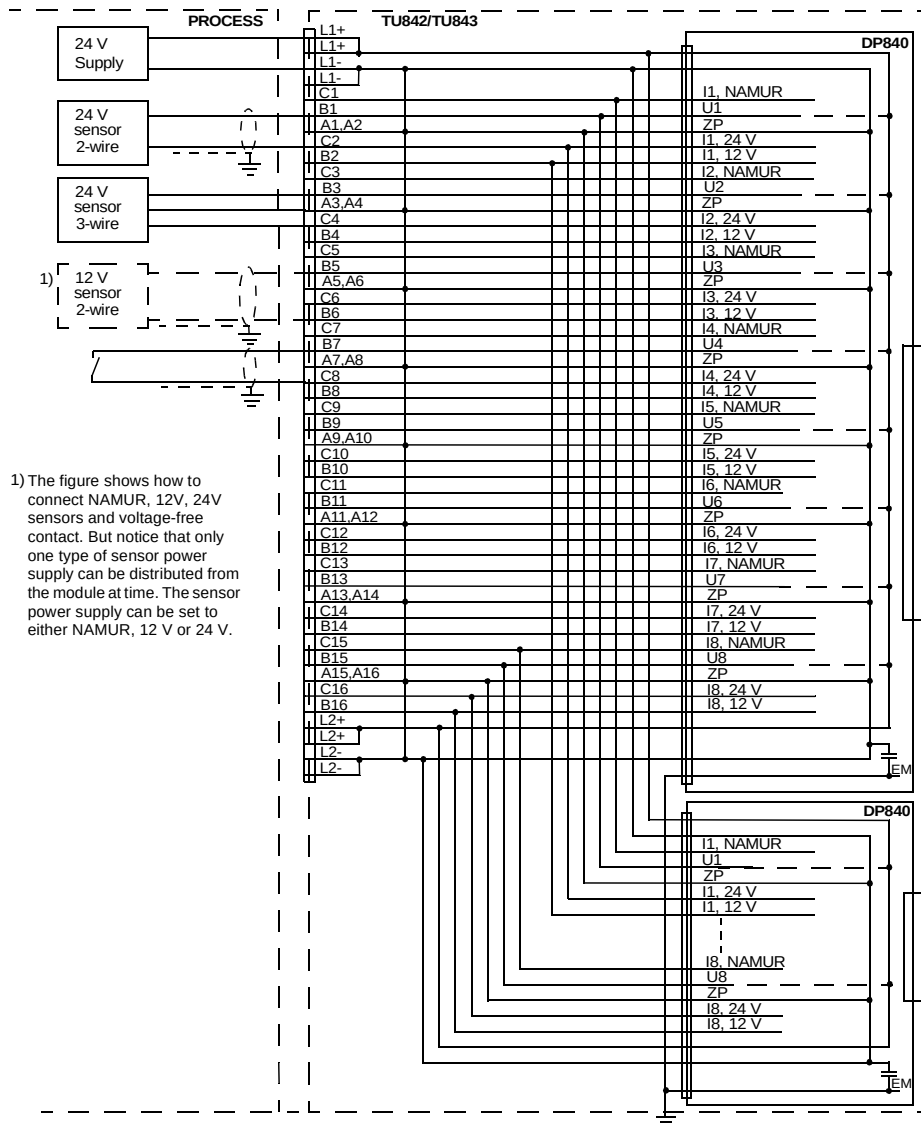


Figure A-126 DP840 with TU842 or TU843 MTU Process Connections

Figure A-127 shows the process connections for DP840 when installed on a TU844 or TU845 MTU.

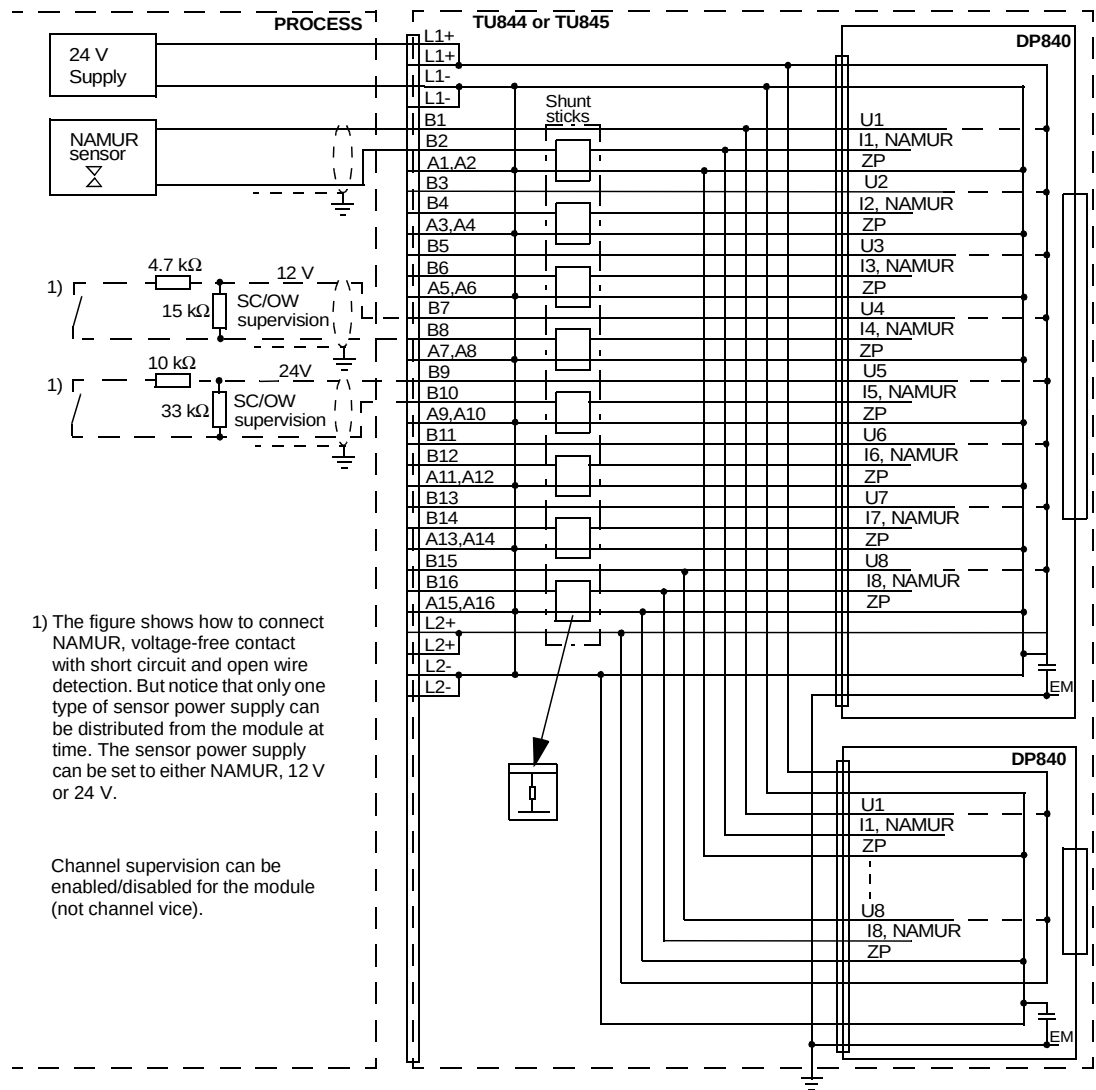
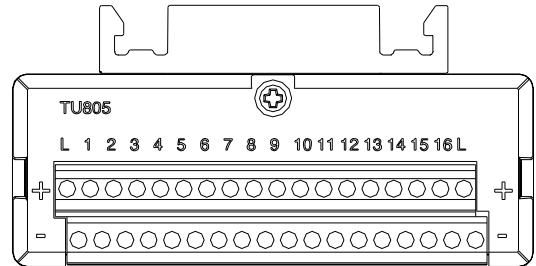


Figure A-127 DP840 with TU844 or TU845 MTU Process Connections

A.39 TU805 Terminal Unit

A.39.0.1 Features

- Enables 2- and 3-wire connections of process signals.
- Direct mounting on the I/O module.
- Requires no extra space.



A.39.0.2 Description

The TU805 is a 16 channel 50 V terminal unit for the S800L I/O modules DI801 and DO801. The Terminal Unit is a passive unit for distribution of external process power.

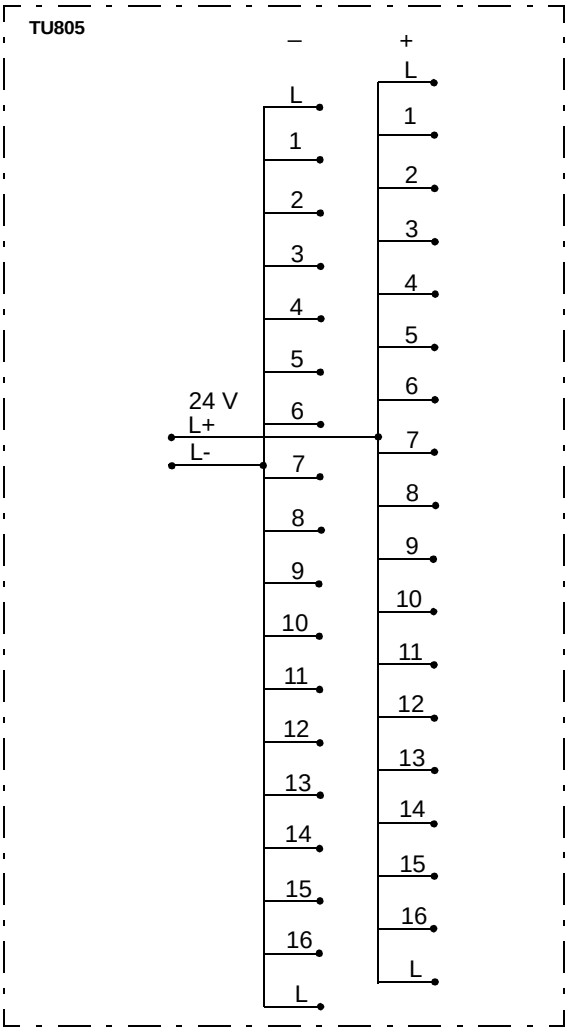
The module has 2 x 2 connections for external power and 2 x 16 connections for distribution.

A.39.0.3 Technical Data

Table A-82 TU805 Compact MTU Specifications

Item	Value
Process Connections	18 2 x 2 Process power terminals 2 x 16 Process power distribution terminals
Rated maximum continuous current per terminal	1 A
Acceptable Wire Sizes	Solid: 0.2 - 1.5 mm ² Stranded: 0.2 - 1.5 mm ² , 24- 16 AWG Recommended torque 0.3 Nm
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	85 mm (3.35")
Depth	39 mm (1.54") including connector, 30 mm (1.18") installed
Height	31,5 mm (1.24")
Weight	0.05 kg (0.11 lbs.)

A.39.0.4 Block Diagram TU805



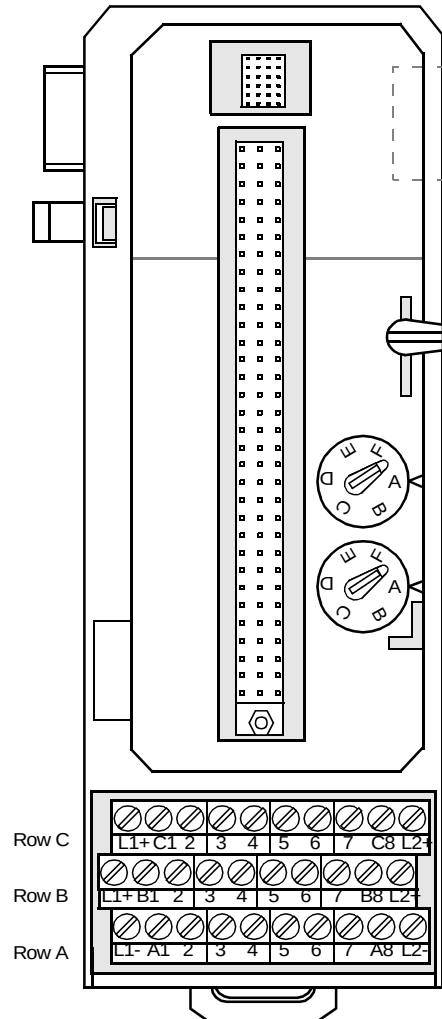
A.40 TU810 Compact MTU

A.40.0.1 Features

- 50 Volt applications - use with AI810, AI820, AI830, AI835, AI845, AO810, AO820, AO845, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO815, DO840, DO880, DP820 and DP840 I/O modules
- Compact installation of I/O modules using one-wire connections
- Up to 16 channels of field signals and process power connections
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.
- Also in a G3 compliant version.

A.40.0.2 Description

The TU810 is a 16 channel 50 V compact module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.



The TU810 MTU can have up to 16 I/O channels and two process voltage connections. The maximum rated voltage is 50 V and maximum rated current is 2A per channel. Two mechanical keys are used to configure the MTU for different types of I/O modules.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 8 I/O connections, one process voltage connection and 5 common L- connections.

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

A.40.0.3 Technical Data*Table A-83 TU810 Compact MTU Specifications*

Item	Value
Process Connections	30 up to 16 I/O channels 2 x 2 Process power terminals 5 x 2 Process power 0 V
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable Wire Sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical Keys (2)	36 different combinations
I/O Module Lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed

Table A-83 TU810 Compact MTU Specifications (Continued)

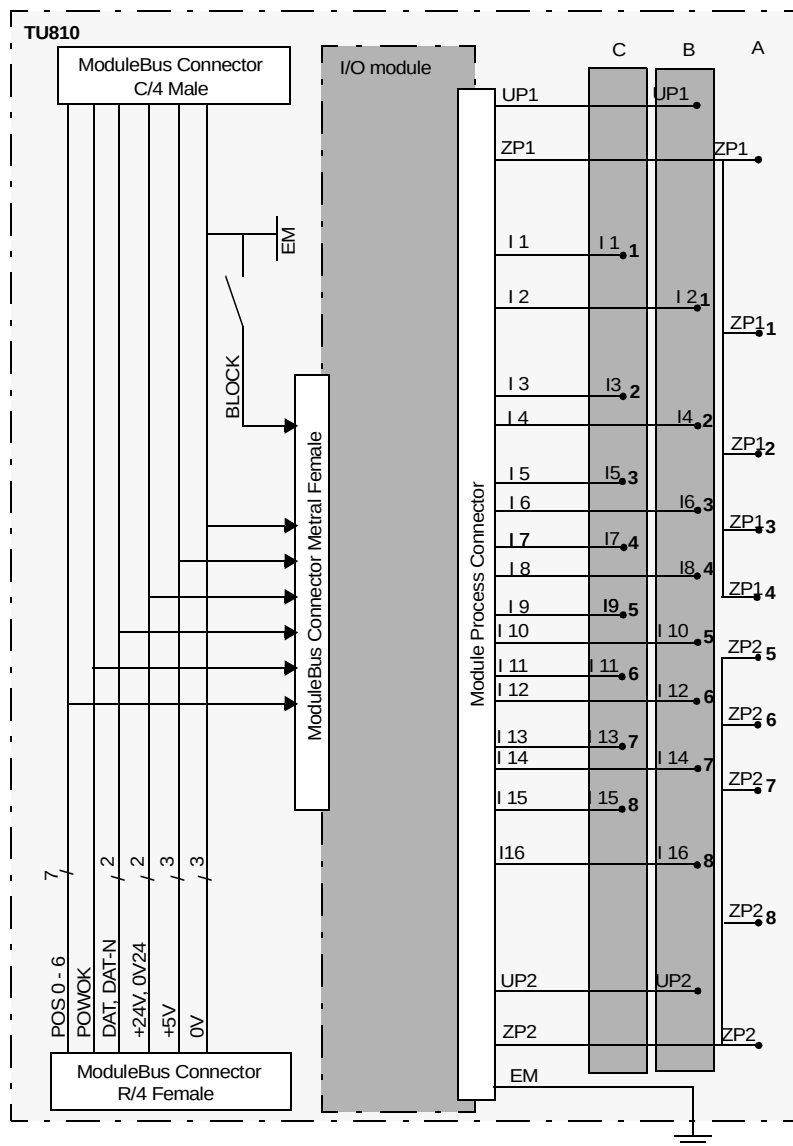
Item	Value
Depth	64 mm (2.52") including terminals
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)

A.40.0.4 Connections

Table A-84 TU810 Process Connection Screw Terminals (X1)

Position	Row A	Row B	Row C
1	L1-	L1+	L1+
2	A1 (L1-)	B1	C1
3	2 (L1-)	2	2
4	3 (L1-)	3	3
5	4 (L1-)	4	4
6	5 (L2-)	5	5
7	6 (L2-)	6	6
8	7 (L2-)	7	7
9	A8 (L2-)	B8	C8
10	L2-	L2+	L2+

A.40.0.5 Block Diagram TU810



A.41 TU811 Compact MTU

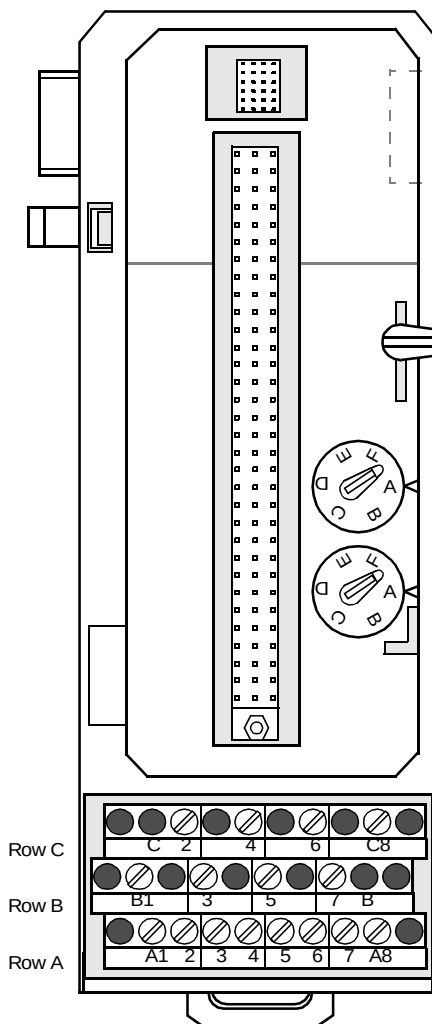
A.41.0.1 Features

- 250 Volt applications - use with DI820, DI821, DO820, and DO821 I/O modules
- Compact installation of I/O modules
- Up to 8 isolated channels of field signals
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.
- Also in a G3 compliant version.

A.41.0.2 Description

The TU811 is a 8 channel 250 V compact module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU811 MTU can have up to 8 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel. Two mechanical keys are used to configure the MTU for different types of I/O modules.



The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections.

The TU811 is primarily intended for modules with individually isolated channels.

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

A.41.0.3 Technical Data*Table A-85 TU811 Compact MTU Specifications*

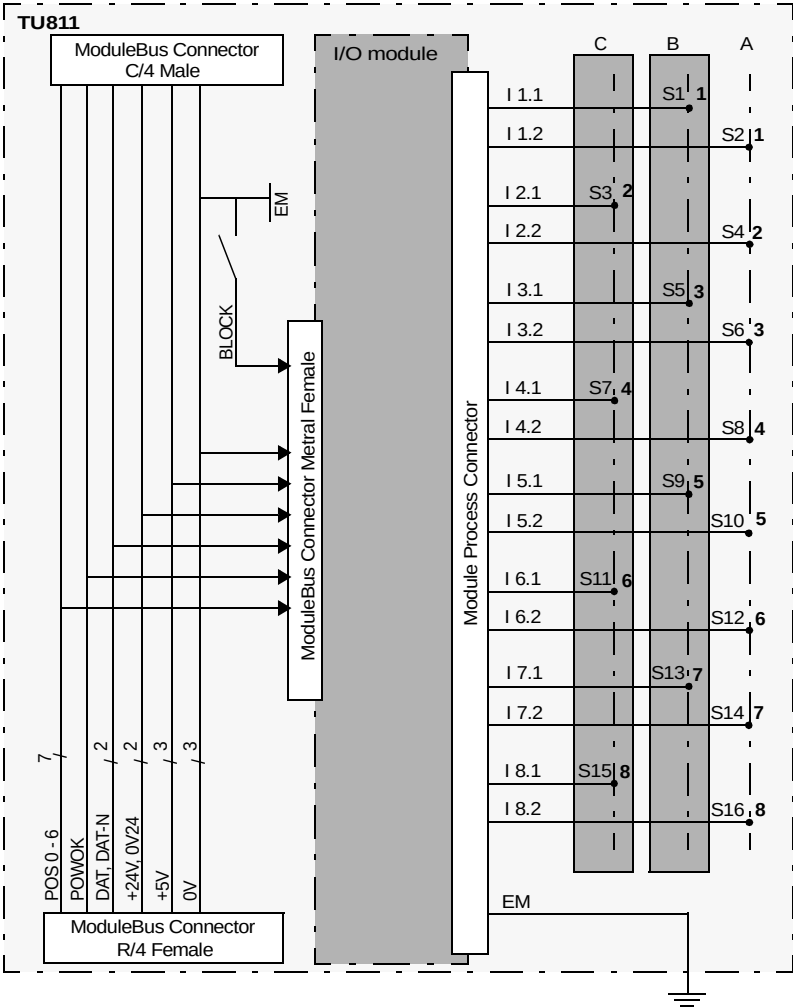
Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel)
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
G3 compliant version	According to ISA-S71.04. Marked with "Z" in the type designation.
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)

A.41.0.4 Connections*Table A-86 TU811 Process Connection Screw Terminals (X1)*

Position ⁽¹⁾	Row A	Row B	Row C
1	NC	NC	NC
2	A1	B1	NC
3	2	NC	C2
4	3	3	NC
5	4	NC	4
6	5	5	NC
7	6	NC	6
8	7	7	NC
9	A8	NC	C8
10	NC	NC	NC

(1) All positions marked NC are not mounted in the connector.

A.41.0.5 Block Diagram TU811



A.42 TU812 Compact MTU

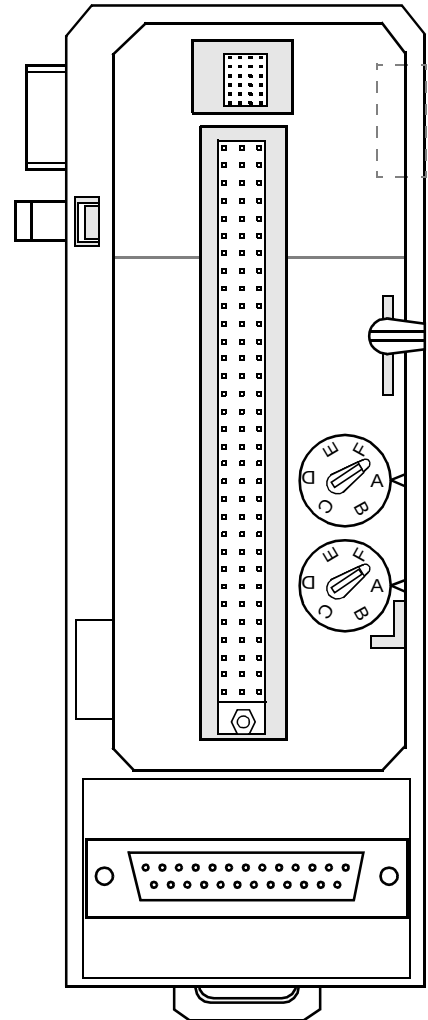
A.42.0.1 Features

- 50 Volt applications - use with AI810, AI820, AI830, AI835, AI845, AO810, AO820, AO845, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO840, DO880, DP820 and DP840 I/O modules
- Compact installation of I/O modules using D-sub connector.
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.

A.42.0.2 Description

The TU812 is a 50 V compact module termination unit (MTU) for the S800 I/O system with 16 signal connections. The MTU is a passive unit used for connection of the field wiring. It also contains a part of the ModuleBus.

The TU812 MTU can have up to 16 I/O signals. The maximum rated voltage is 50 V and maximum rated current is 2A per channel. The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.



Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal connector is a D-Sub 25 pin (male).

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

A.42.0.3 Technical Data*Table A-87 TU812 Compact MTU Specifications*

Item	Value
Process connections	25 pin (male) D-Sub connector up to 16 I/O signals
Rated maximum continuous current per I/O channel	2 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)
Rated max. continuous current per process voltage connection Up/Zp.	5 A

A.42.0.4 Connections

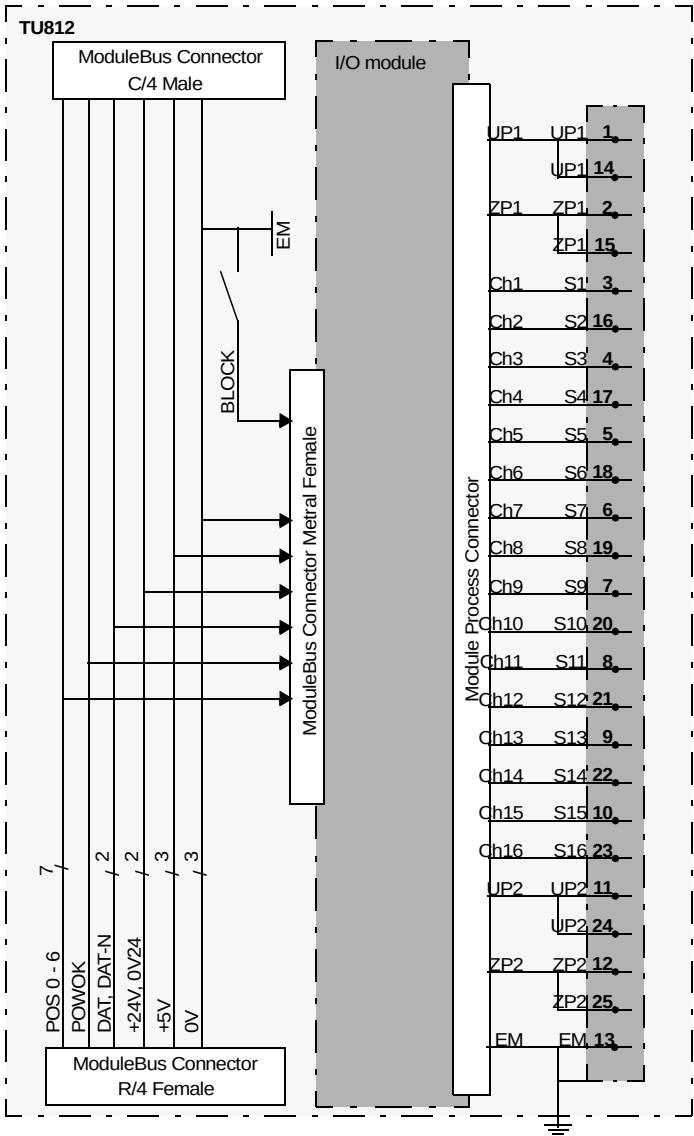
Table A-88 TU812 Process Connection D-Sub Connector (X1)

Position	Row A
1	UP1
2	ZP1
3	S1
4	S3
5	S5
6	S7
7	S9
8	S11
9	S13
10	S15
11	UP2
12	ZP2
13	EM
14	UP1
15	ZP1
16	S2
17	S4
18	S6
19	S8
20	S10
21	S12
22	S14

Table A-88 TU812 Process Connection D-Sub Connector (X1) (Continued)

Position	Row A
23	S16
24	UP2
25	ZP2

A.42.0.5 Block Diagram TU812



A.43 TU813 Compact MTU

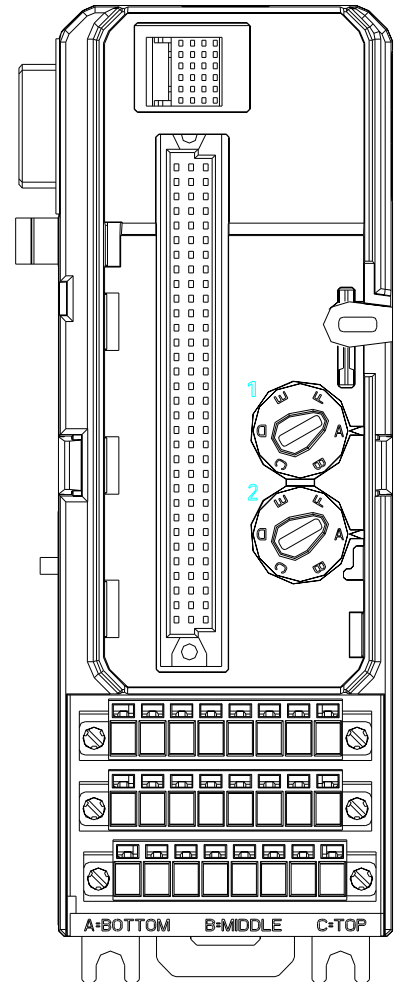
A.43.0.1 Features

- 250 Volt applications - use with DI820, DI821, DI825, DO820, DO821 and AI825 I/O modules
- Compact installation of I/O modules
- Up to 8 isolated channels of field signal connections with crimped snap-in connectors.
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.

A.43.0.2 Description

The TU813 is a 8 channel 250 V compact module termination unit (MTU) for the S800 I/O. The TU813 has three rows of crimp snap-in connectors for field signals and process power connections. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The maximum rated voltage is 250 V and maximum rated current is 3 A per channel. Two mechanical keys are used to configure the MTU for different types of I/O modules.



The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the I/O module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the I/O module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections.

The TU813 is primarily intended for modules with individually isolated channels.

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal.

Crimp terminals are provided for connection to field wiring and insertion into the 3 snap-on connectors. Once the contacts are correctly placed in the connectors, the cable can be easily inserted and removed without future wiring errors. This assembly function can be performed before the cables are delivered to the site.

Crimp snap in connectors are not included in TU813.



To provide protection of Hazardous Voltage all plugs must be connected.

A.43.0.3 Technical Data*Table A-89 TU813 Compact MTU Specifications*

Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel)
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes attached to crimped snap-in connectors (3) ⁽¹⁾	Stranded: 0.2 - 0.5 mm ² , 24 - 20 AWG 0.5 - 1.0 mm ² , 20 - 18 AWG 1.5 - 2.5 mm ² , 16 - 14 AWG
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Insulation test voltage Channel to EM Channel to Channel 24 V modulebus to EM	2300 V a.c. 1350 V a.c. 500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)

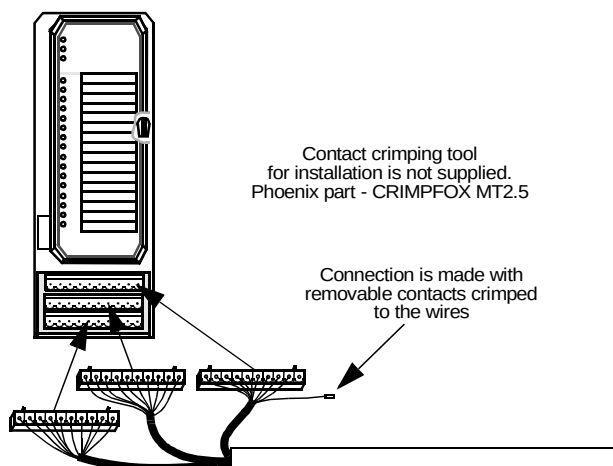
(1) Supplied by Phoenix Contact:

<i>Cable plug</i>	1808890	MSTBC 2.5/8/STZF-5.08
<i>Crimp snap in connector:</i>	1879531	MSTBC-MT 0.2 -0.5 or
	3190564	MSTBC-MT 0.5-1.0 or
	3190551	MSTBC-MT 1.5-2.5
<i>Crimping tool:</i>	1204038	CRIMPFOX MT 2.5
<i>Remove insulation tool:</i>	1204384	QUICK WIREFOX 6

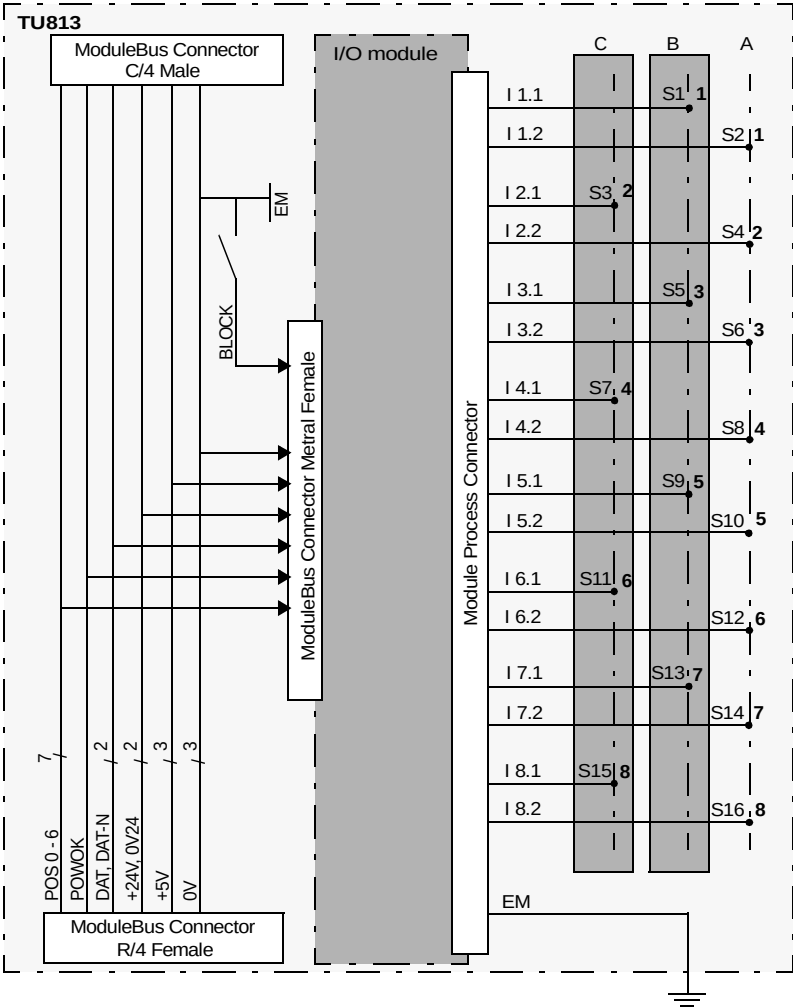
A.43.0.4 Connections*Table A-90 TU813 Process Connection Screw Terminals (X1)*

Position ⁽¹⁾	Row A	Row B	Row C
1	NC	NC	NC
2	A1	B1	NC
3	2	NC	C2
4	3	3	NC
5	4	NC	4
6	5	5	NC
7	6	NC	6
8	7	7	NC
9	A8	NC	C8
10	NC	NC	NC

(1) All positions marked NC are not mounted in the connector.



A.43.0.5 Block Diagram TU813



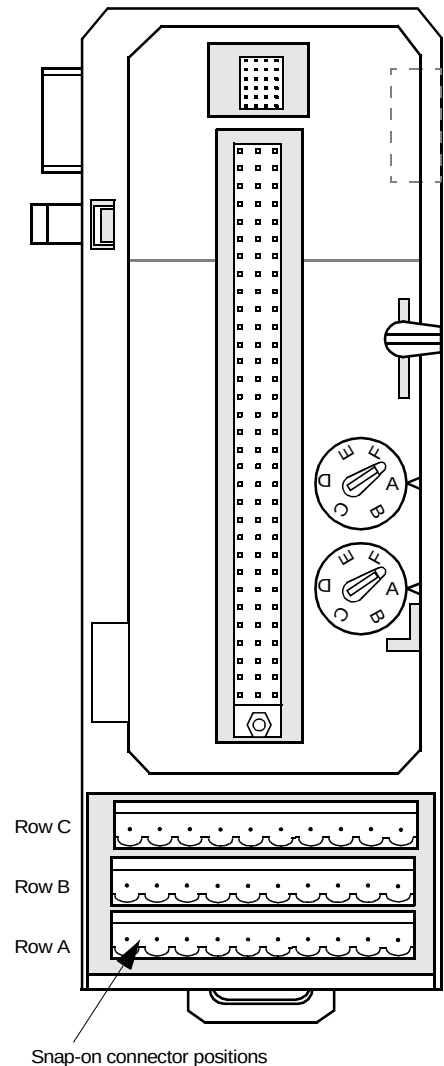
A.44 TU814 Compact MTU

A.44.0.1 Features

- 50 Volt applications - use with AI810, AI820, AI830, AI835, AI845, AO810, AO820, AO845, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO815, DO840, DO880, DP820 and DP840 I/O modules
- Compact installation of I/O modules using one-wire connections
- Up to 16 channels of field signals and process power connections with crimped snap-in connectors
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.

A.44.0.2 Description

The TU814 is a 16 channel 50 V compact module termination unit (MTU) for the S800 I/O. The TU814 has three rows of crimp snap-in connectors for field signals and process power connections. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.



The TU814 MTU can have up to 16 I/O channels and two process voltage connections. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel. Two mechanical keys are used to configure the MTU for different types of I/O modules.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 8 I/O connections, 2 process voltage connection and 5 common L- connections.

The top part of the MTU can be removed to replace the termination board even with an operational system. Such a need can be caused by a damaged terminal screw.

Crimp terminals are provided for connection to field wiring and insertion into the 3 snap-on connectors. Once the contacts are correctly placed in the connectors, the cable can be easily inserted and removed without future wiring errors. This assembly function can be performed before the cables are delivered to the site.

Cable plugs and crimp snap in connectors are not included in TU814.

A.44.0.3 Technical Data*Table A-91 TU814 Compact MTU Specifications*

Item	Value
Process connections	30 up to 16 I/O channels 2 x 2 process power terminals 2 x 5 process power 0 V
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution: Maximum 24V current distribution:	1.5 A 1.5 A
Acceptable wire sizes attached to crimped snap-in connectors (3) ⁽¹⁾	Stranded: 0.2 - 0.5 mm ² , 24 - 20 AWG 0.5 - 1.0 mm ² , 20 - 18 AWG 1.5 - 2.5 mm ² , 16 - 14 AWG
Mechanical keys (2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	64 mm (2.52") including connector, 58.5 mm (2.3") edge to edge installed
Depth	64 mm (2.52"), including terminals
Height	170 mm (6.7") including latch
Weight	0.17 kg (0.37 lbs.)

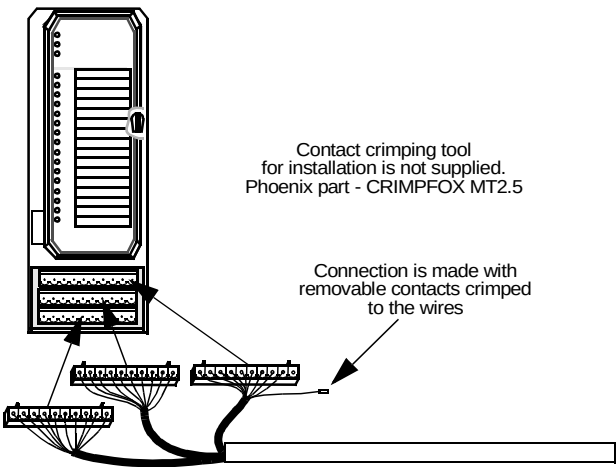
(1) Supplied by Phoenix Contact:

<i>Cable plug</i>	1808890	MSTBC 2.5/10-ST-5.08
<i>Crimp snap in connector:</i>	1879531	MSTBC-MT 0.2-0.5 or
	3190564	MSTBC-MT 0.5-1.0 or
	3190551	MSTBC-MT 1.5-2.5
<i>Crimping tool:</i>	1204038	CRIMPFOX MT 2.5
<i>Remove insulation tool:</i>	1204384	QUICK WIREFOX 6

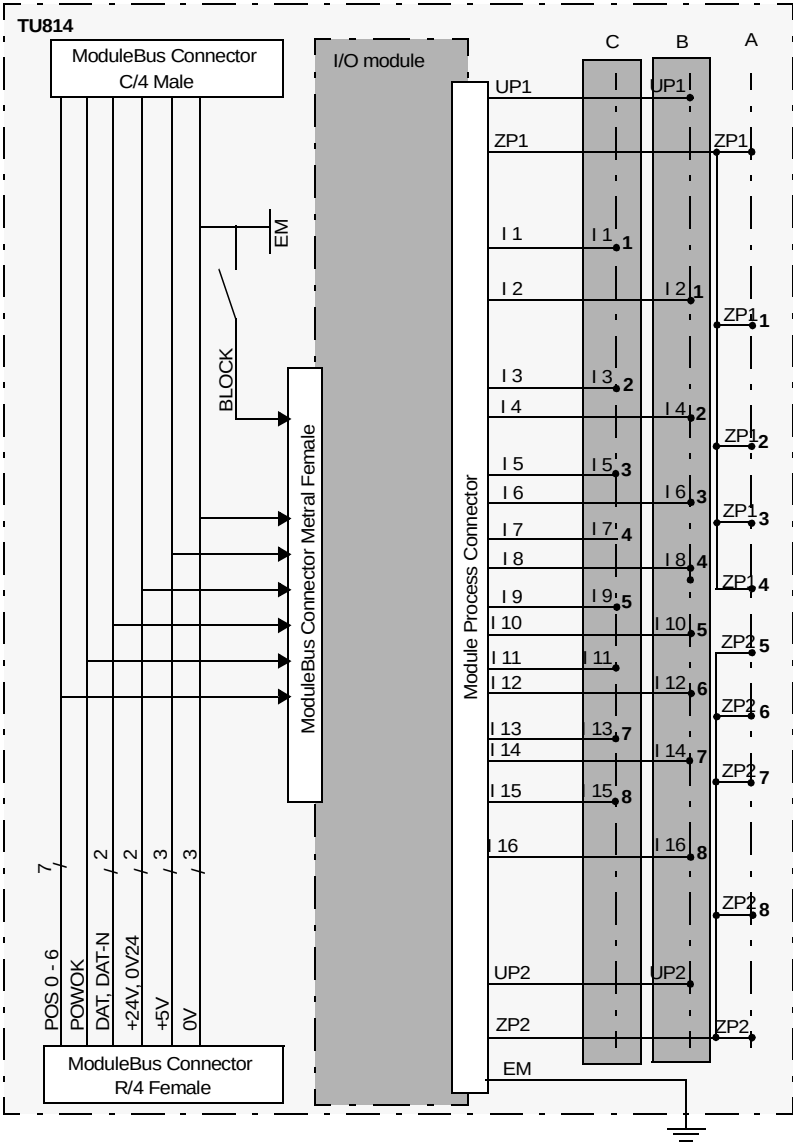
A.44.0.4 Connections

Table A-92 TU814 Process Connection Crimp Connector (X1)

Position	Row A	Row B	Row C
1	L1-	L1+	L1+
2	A1 (L1-)	B1	C1
3	2 (L1-)	2	2
4	3 (L1-)	3	3
5	4 (L1-)	4	4
6	5 (L2-)	5	5
7	6 (L2-)	6	6
8	7 (L2-)	7	7
9	A8 (L2-)	B8	C8
10	L2-	L2+	L2+



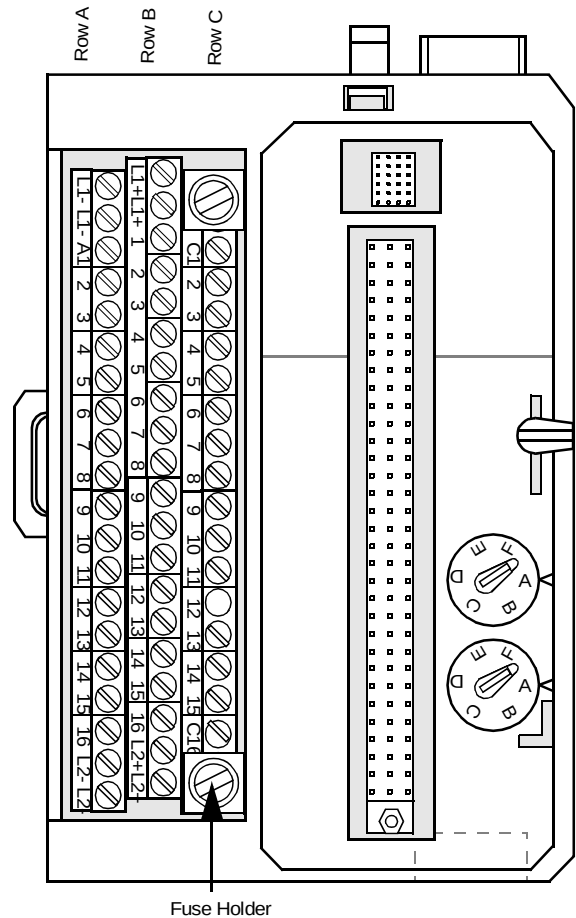
A.44.0.5 Block Diagram TU814



A.45 TU830 Extended MTU

A.45.0.1 Features

- 50 Volt applications - use with AI810, AI820, AI830, AI835, AI843, AI845, AO810, AO820, AO845, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO815, DO840, DO880, DP820 and DP840 I/O modules
- Complete installation of I/O modules using 3-wire connections, fuses and field power distribution
- Up to 16 channels of field signals and process power connections
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.



A.45.0.2 Description

The TU830 is a 16 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU830 MTU can have up to 16 I/O channels and two process voltage connections. Each channel has two I/O connections and one ZP connection. The process voltage can be connected to two individually isolated groups. Each group has a 6.3 A fuse. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel. It is recommended that the fuse rating be chosen to meet the applications needs.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 8 I/O channels, process voltage connection and a 6.3 A fuse (as delivered). Each I/O channel has two I/O connections and one ZP connection. For input modules, field power is provided by the B-row.

A.45.0.3 Technical Data*Table A-93 TU830 Extended MTU Specifications*

Item	Value
Process Connections	56 up to 16 I/O channels 4 Process terminals 6.3 A 10 x 2 Process power 0 V
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (2)	6.3 A (fast glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals

Table A-93 TU830 Extended MTU Specifications (Continued)

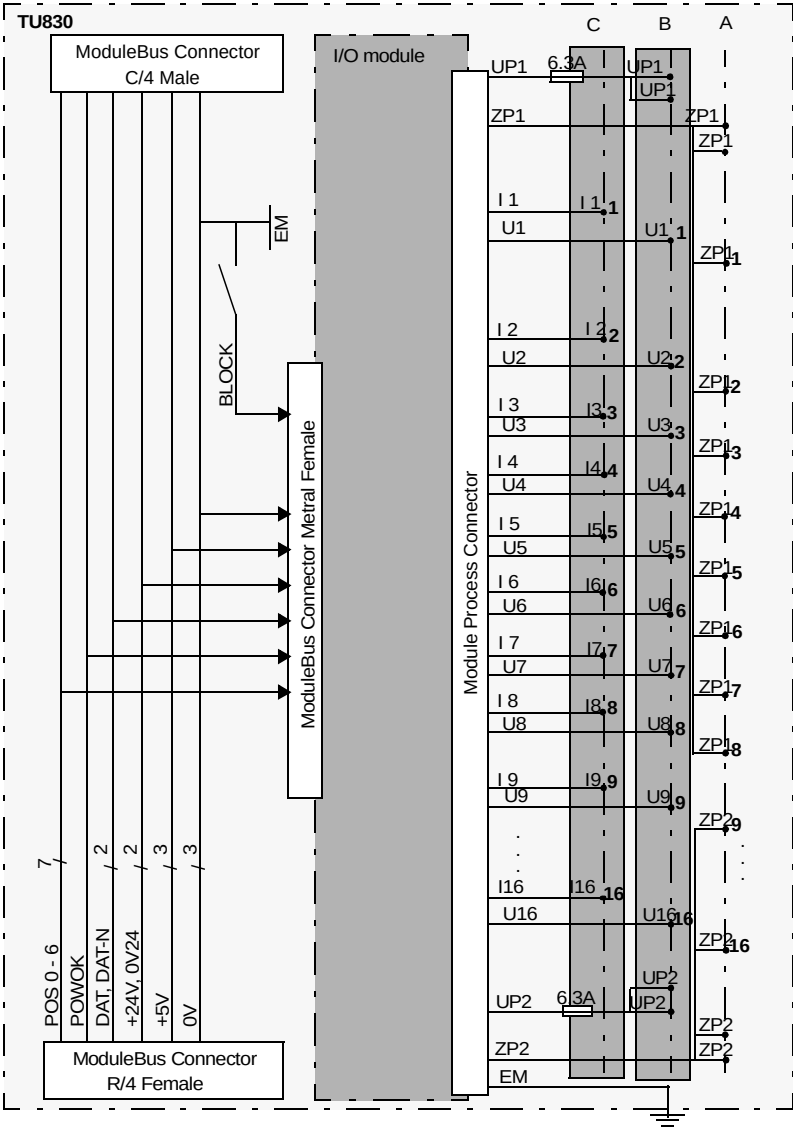
Item	Value
Height	110 mm (4.3")
Weight	0.28 kg (0.6 lbs.)

A.45.0.4 Connections*Table A-94 TU830 Process Connection Screw Terminals (X1)*

Position ⁽¹⁾	Row A	Row B	Row C
1	L1-	L1+	NC
2	L1-	L1+	NC
3	A1	B1	C1
4	2	2	2
5	3	3	3
6	4	4	4
7	5	5	5
8	6	6	6
9	7	7	7
10	8	8	8
11	9	9	9
12	10	10	10
13	11	11	11
14	12	12	12
15	13	13	13
16	14	14	14
17	15	15	15
18	A16	B16	C16
19	L2-	L2+	NC
20	L2-	L2+	NC

(1) All positions marked NC are not mounted in the connector.

A.45.0.5 Block Diagram TU830



A.46 TU831 Extended MTU

A.46.0.1 Features

- 250 Volt applications - use with DI820, DI821, DO820, and DO821 I/O modules
- Greater connection area for larger wires
- Up to 8 isolated channels of field signals
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.

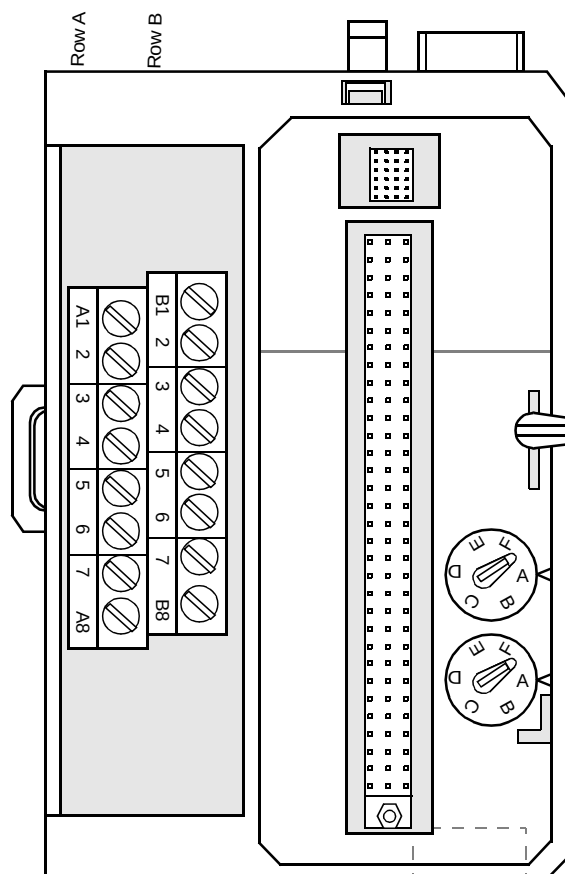
A.46.0.2 Description

The TU831 is a 8 channel 250 V extended module termination unit (MTU) for the S800 I/O.

The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU831 MTU can have up to 8 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.



The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections.

A.46.0.3 Technical Data*Table A-95 TU831 Compact MTU Specifications*

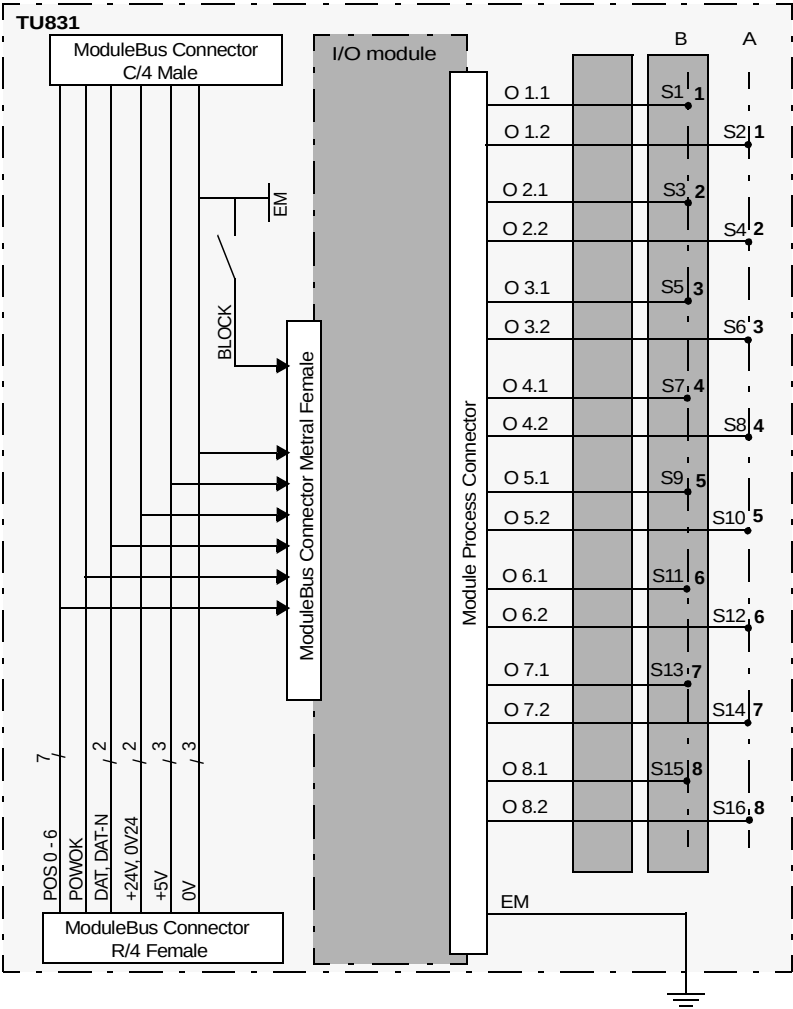
Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel)
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 6mm ² Stranded: 0.2 - 4 mm ² , 24 - 10 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.22 kg (0.48 lbs.)

A.46.0.4 Connections

Table A-96 TU831 Process Connection Screw Terminals (X1)

Position	Row A	Row B
1	A1	B1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	A8	B8

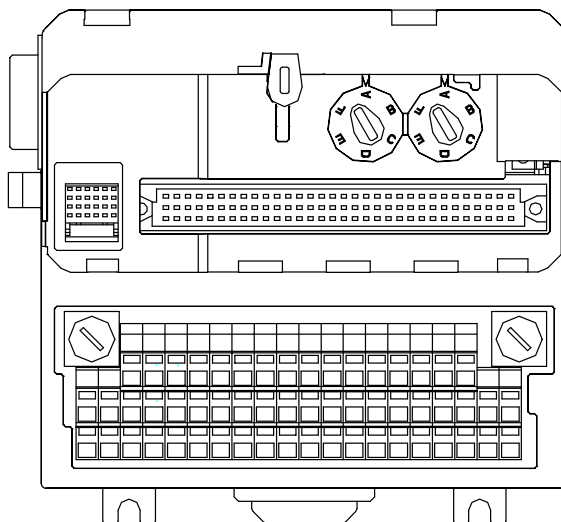
A.46.0.5 Block Diagram TU831



A.47 TU833 Extended MTU

A.47.0.1 Features

- 50 Volt applications - use with AI810, AI820, AI830, AI835, AI843, AI845, AO810, AO820, AO845, DI810, DI811, DI814, DI830, DI831, DI840, DI880, DI885, DO810, DO814, DO815, DO840, DO880, DP820 and DP840 I/O modules
- Complete installation of I/O modules using 3-wire connections, fuses and field power distribution.
- Up to 16 channels of field signals and process power connections.
- Connections to ModuleBus and I/O modules.
- Mechanical keying prevents insertion of the wrong I/O module.
- Latching device to DIN rail for grounding.
- DIN rail mounting.
- Spring-case terminal



A.47.0.2 Description

The TU833 is a 16 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU833 MTU can have up to 16 I/O channels and two process voltage connections. Each channel has two I/O connections and one ZP connection. The process voltage can be connected to two individually isolated groups. Each group has a 6.3 A fuse. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel. It is recommended that the fuse rating be chosen to meet the applications needs.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 8 I/O channels, process voltage connection and a 6.3 A fuse (as delivered). Each I/O channel has two I/O connections and one ZP connection. For input modules, field power is provided by the B-row.

The process connection terminals are of spring-case type. Only one wire per terminal is recommended.

A.47.0.3 Technical Data*Table A-97 TU833 Extended MTU Specifications*

Item	Value
Process Connections	56 up to 16 I/O channels 4 Process terminals 6.3 A 10 x 2 Process power 0 V
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (2)	6.3 A (fast glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 2.5 mm ² , 24 -12 AWG Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Only one wire per terminal
Mechanical keys (2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals

Table A-97 TU833 Extended MTU Specifications (Continued)

Item	Value
Height	105 mm (4.1")
Weight	0.28 kg (0.6 lbs.)

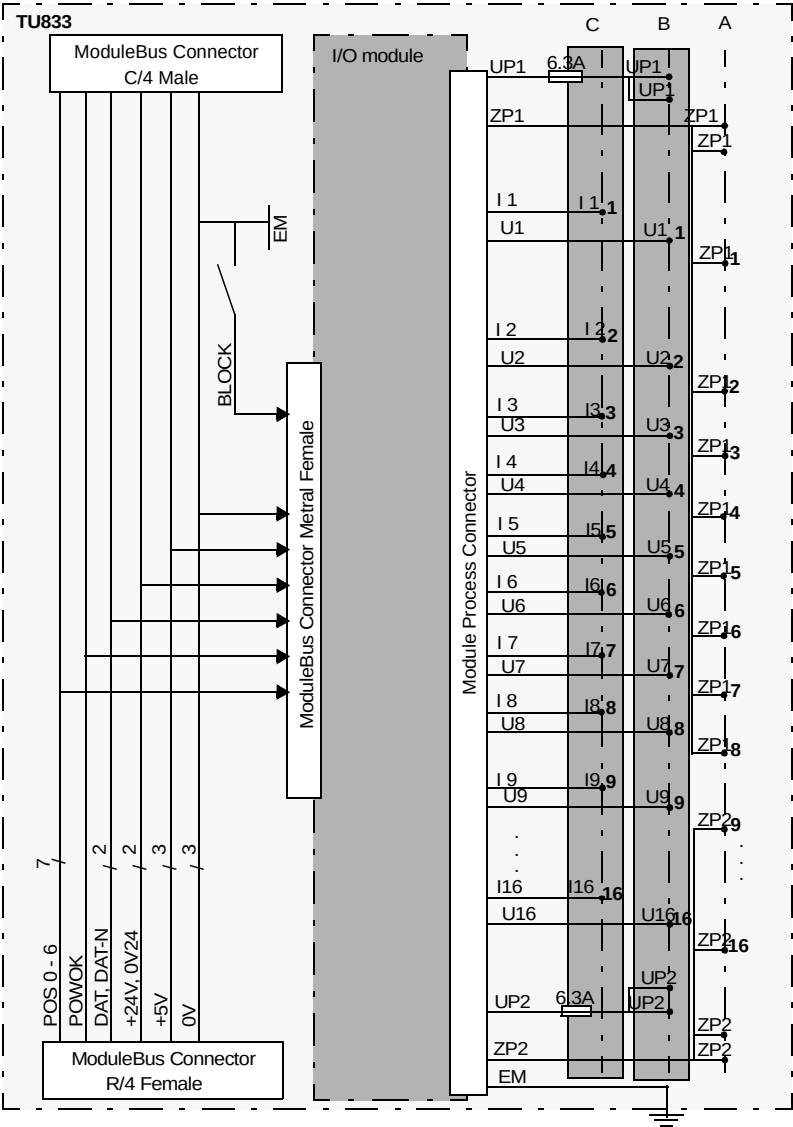
A.47.0.4 Connections

Table A-98 TU833 Process Connection Screw Terminals (X1)

Position ⁽¹⁾	Row A	Row B	Row C
1	L1-	L1+	NC
2	L1-	L1+	NC
3	A1	B1	C1
4	2	2	2
5	3	3	3
6	4	4	4
7	5	5	5
8	6	6	6
9	7	7	7
10	8	8	8
11	9	9	9
12	10	10	10
13	11	11	11
14	12	12	12
15	13	13	13
16	14	14	14
17	15	15	15
18	A16	B16	C16
19	L2-	L2+	NC
20	L2-	L2+	NC

(1) All positions marked NC are not mounted in the connector.

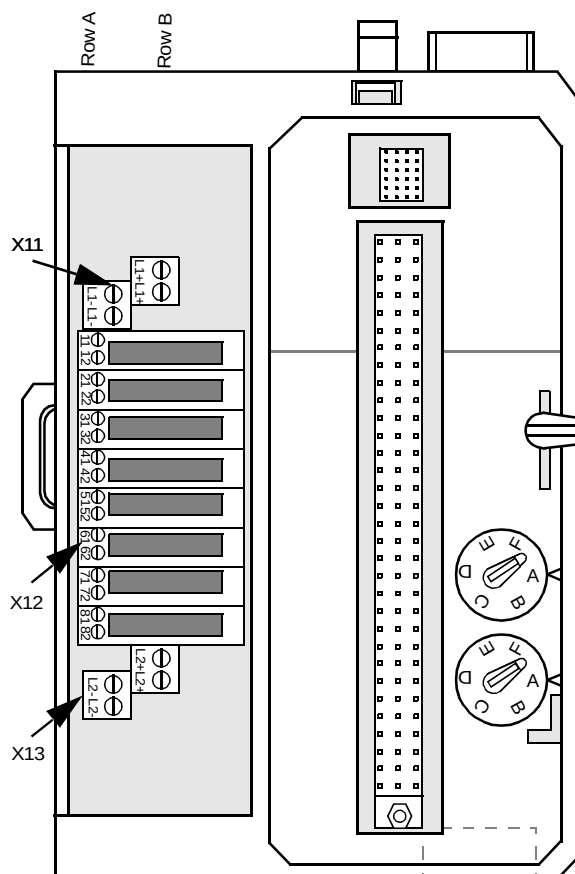
A.47.0.5 Block Diagram TU833



A.48 TU835 Extended MTU

A.48.0.1 Features

- 50 Volt applications - use with the AI810 and AI845 modules
- Up to 8 channels of field signals and process power connections
- Each channel has one fused transducer power terminal and one signal connection
- Process voltage can be connected to 2 individually isolated groups
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.



A.48.0.2 Description

The TU835 is a 8 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU835 MTU can have up to 8 I/O channels. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections: one fused transducer power terminal and one signal connection. Process voltage can be connected to two individually isolated groups.

A.48.0.3 Technical Data*Table A-99 TU835 Compact MTU Specifications*

Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel)
Rated maximum continuous current per I/O channel	2 A
ModuleBus: Maximum 5 current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (8)	100 mA (fast glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")

Table A-99 TU835 Compact MTU Specifications (Continued)

Item	Value
Weight	0.26 kg (0.57 lbs.)
Rated max. continuous current per process voltage connection Up/Zp.	8 A

A.48.0.4 Connections

Table A-100 TU835 Process Power Source Connections (X11, X13)

Position	Row A	Row B
X11 - 1	L1-	L1+
X11 - 2	L1-	L1+
X13 - 1	L2-	L2+
X13 - 2	L2-	L2+

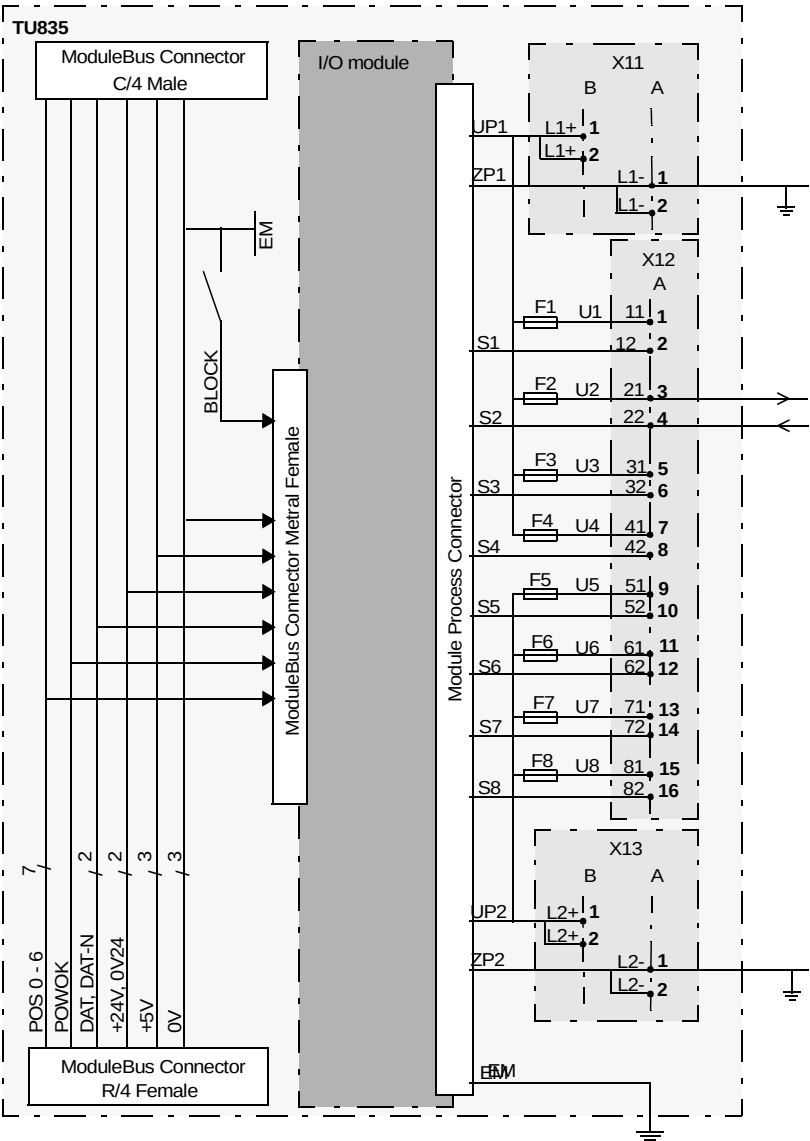
Table A-101 TU835 Process Connection Screw Terminals (X12)

Position	Row A
1	11 (F1, L1+ power)
2	12 (signal)
3	21 (F2, L1+ power)
4	22 (signal)
5	31 (F3, L1+ power)
6	32 (signal)
7	41 (F4, L1+ power)
8	42 (signal)

Table A-101 TU835 Process Connection Screw Terminals (X12) (Continued)

Position	Row A
9	51 (F5, L2+ power)
10	52 (signal)
11	61 (F6, L2+ power)
12	62 (signal)
13	71 (F7, L2+ power)
14	72 (signal)
15	81 (F8, L2+ power)
16	82 (signal)

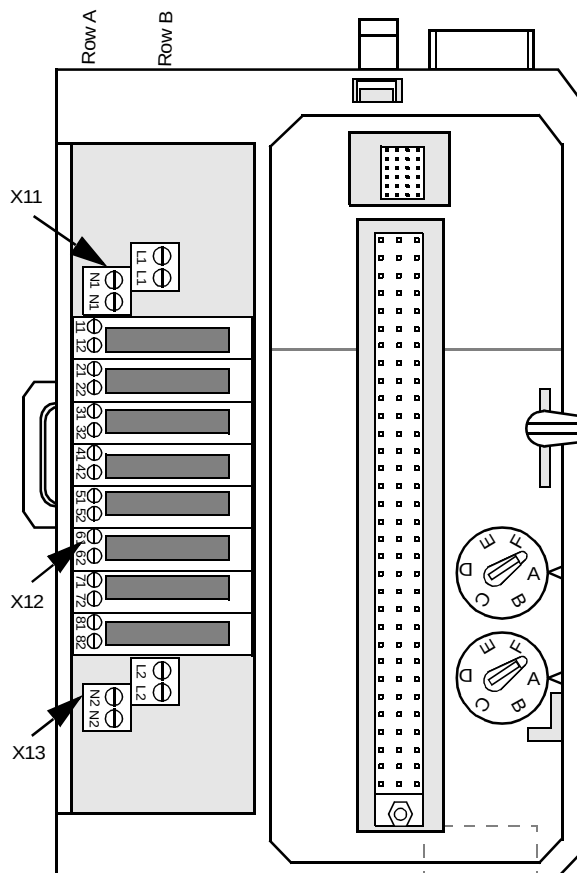
A.48.0.5 Block Diagram TU835



A.49 TU836 Extended MTU

A.49.0.1 Features

- 250 Volt applications - use with the DO820, and DO821 modules
- Two groups with 4 channels of field signals and process power connections
- Each channel has one fused load power terminal and one signal return connection
- Process voltage can be connected to 2 individually isolated groups
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.



A.49.0.2 Description

The TU836 is a 8 channel 250 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU836 MTU can have up to 8 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into 2 equal and individually isolated groups. Each group consists of 4 I/O connections and process voltage connection. Each channel has two connections: one fused load outlet terminal and one signal return connection.

A.49.0.3 Technical Data*Table A-102 TU836 Extended MTU Specifications*

Item	Value
Process connections	16 up to 8 I/O channels (2 terminals per channel)
Rated maximum continuous current per process voltage connection (L1, L2, N1, N2)	10 A
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Fuse (8)	3.15 A (fast glass tube, 5x20 mm)
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals

Table A-102 TU836 Extended MTU Specifications (Continued)

Item	Value
Height	110 mm (4.3")
Weight	0.26 kg (0.57 lbs.)

Connections*Table A-103 TU836 Process Power Source Connections (X11, X13)*

Position	Row A	Row B
X11 - 1	N1	L1
X11 - 2	N1	L1
X13 - 1	N2	L2
X13 - 2	N2	L2

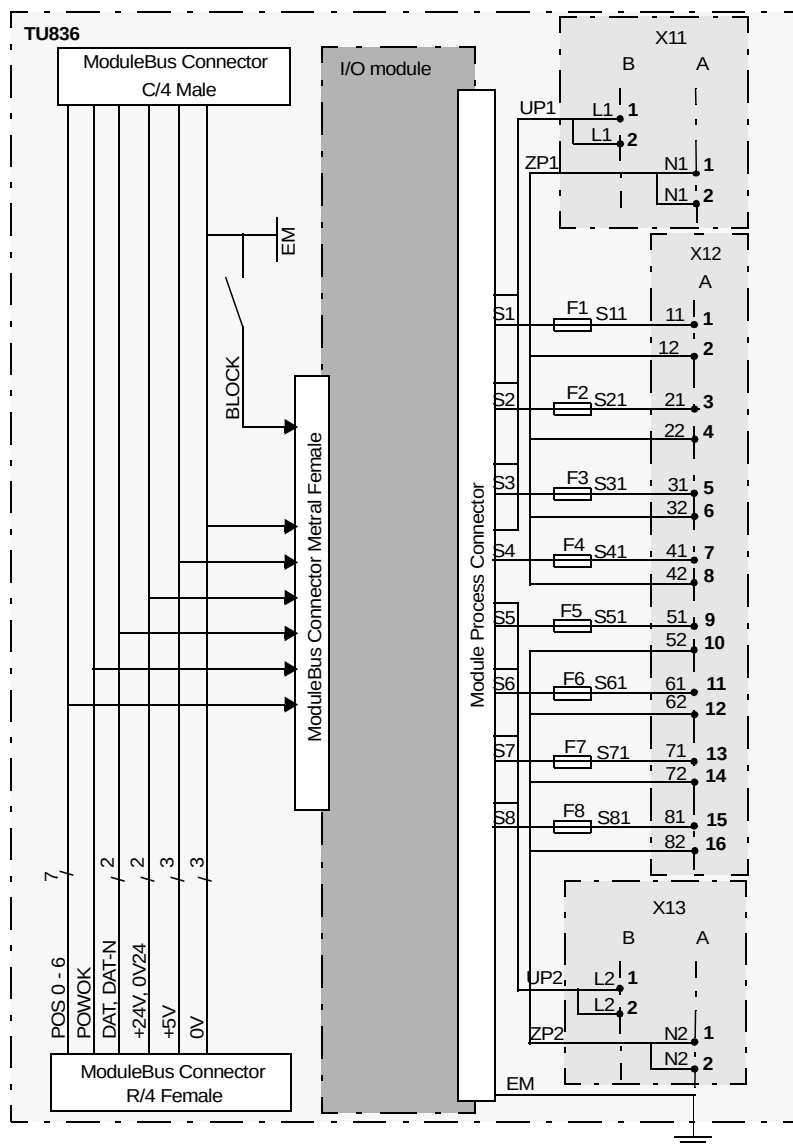
Table A-104 TU836 Process Connection Screw Terminals (X12)

Position	Row A
1	11 (F1, L1 power)
2	12 (signal return)
3	21 (F2, L1 power)
4	22 (signal return)
5	31 (F3, L1 power)
6	32 (signal return)
7	41 (F4, L1 power)
8	42 (signal return)

Table A-104 TU836 Process Connection Screw Terminals (X12) (Continued)

Position	Row A
9	51 (F5, L2 power)
10	52 (signal return)
11	61 (F6, L2 power)
12	62 (signal return)
13	71 (F7, L2 power)
14	72 (signal return)
15	81 (F8, L2 power)
16	82 (signal return)

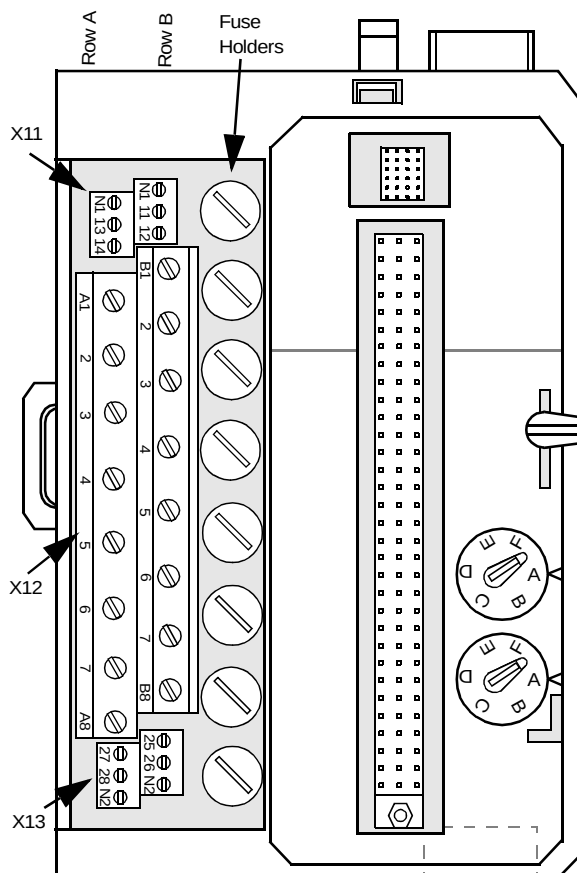
A.49.0.4 Block Diagram TU836



A.50 TU837 Extended MTU

A.50.0.1 Features

- 250 Volt applications - use with the DO820, and DO821 modules
- Up to 8 individually isolated channels of field signals and process power connections
- Each channel has two terminals and one is fused
- Allows a mix of isolated and grouped channels
- Process voltage return can be connected to 2 individually isolated groups
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting



A.50.0.2 Description

The TU837 is a 8 channel 250 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU837 MTU can have up to 8 I/O channels. The maximum rated voltage is 250 V and maximum rated current is 3 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals has 8 individually isolated I/O channels. Each channel has two connections, one is fused. There are 2 individually isolated groups for signal return connections.

A.50.0.3 Technical Data*Table A-105 TU837 Extended MTU Specifications*

Item	Value
Process connections	28 up to 8 I/O channels (2 terminals per channel) 2 x 6 power common terminals
Rated maximum continuous current per signal return connection (N1, N2)	10 A
Rated maximum continuous current per I/O channel	3 A
ModuleBus: Maximum 5 V current distribution: Maximum 24 V current distribution:	1.5 A 1.5 A
Fuse (8)	3.15 A (fast glass tube, 5x20 mm)
Acceptable wire sizes Signal connection Return connection	Solid: 0.2 - 6 mm Stranded: 0.2 - 4 mm ² , 24 - 10 AWG Solid: 0.2 - 4 mm Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	250 V
Dielectric test voltage	2000 V a.c.
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed

Table A-105 TU837 Extended MTU Specifications (Continued)

Item	Value
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.26 kg (0.57 lbs.)

A.50.0.4 Connections*Table A-106 TU837 Process Power Connection X11*

Terminal	Row A		Row B	
	Signal	Marking	Signal	Marking
1	ZP1	N1	ZP1	N1
2	ZP1	13	ZP1	11
3	ZP1	14	ZP1	12

Table A-107 TU 837 Process Power Connection X13

Terminal	Row A		Row B	
	Signal	Marking	Signal	Marking
1	ZP2	27	ZP2	25
2	ZP2	28	ZP2	26
3	ZP2	N2	ZP2	N2

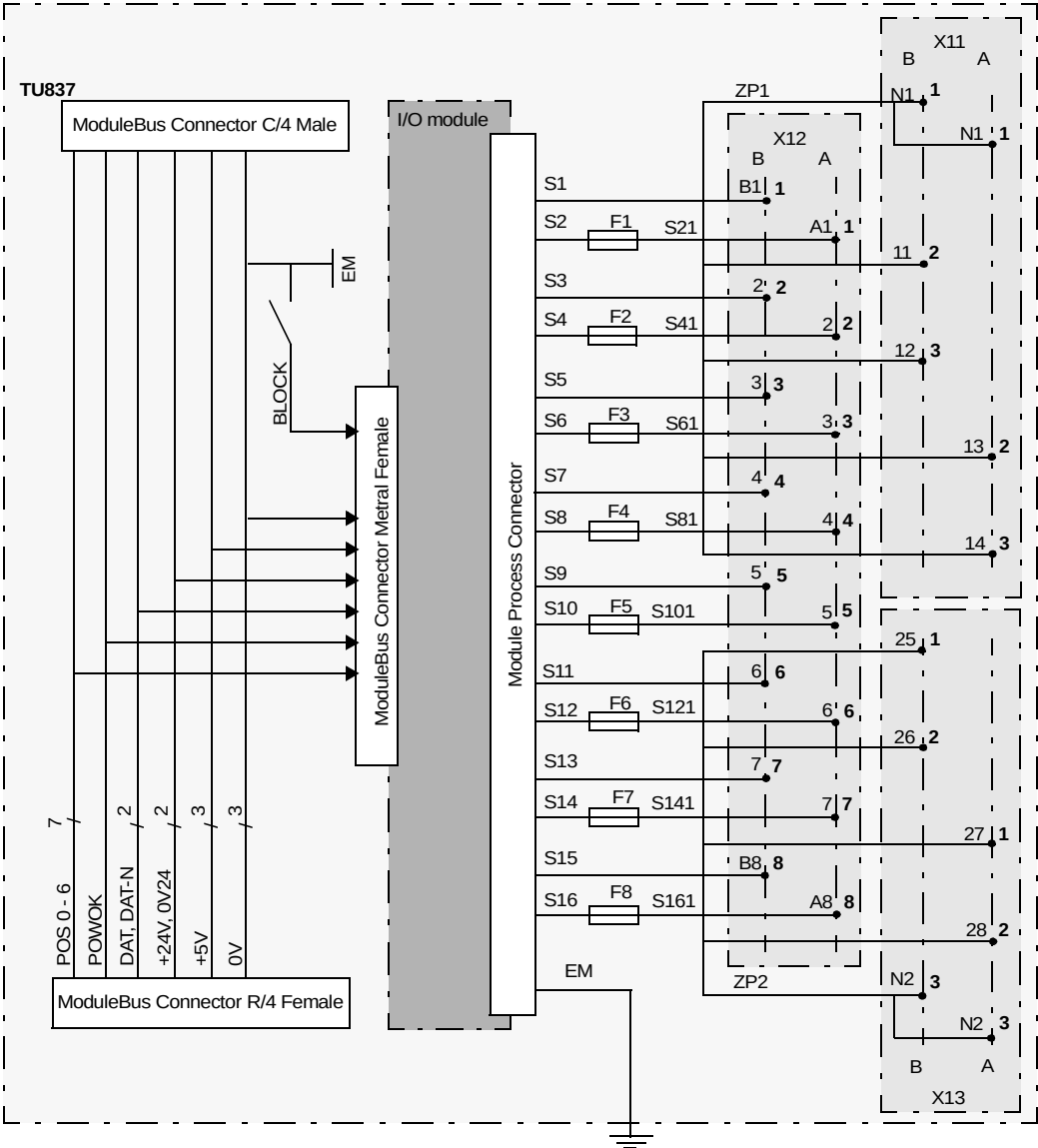
Table A-108 TU 837 Process Connection Terminals X12

Terminal	Row A		Row B	
	Signal	Marking	Signal	Marking
1	S21 (F1)	A1	S1	B1
2	S41 (F2)	2	S3	2
3	S61 (F3)	3	S5	3
4	S81 (F4)	4	S7	4
5	S101 (F5)	5	S9	5
6	S121 (F6)	6	S11	6

Table A-108 TU 837 Process Connection Terminals X12 (Continued)

Terminal	Row A		Row B	
	Signal	Marking	Signal	Marking
7	S141 (F7)	7	S13	7
8	S161 (F8)	A8	S15	B8

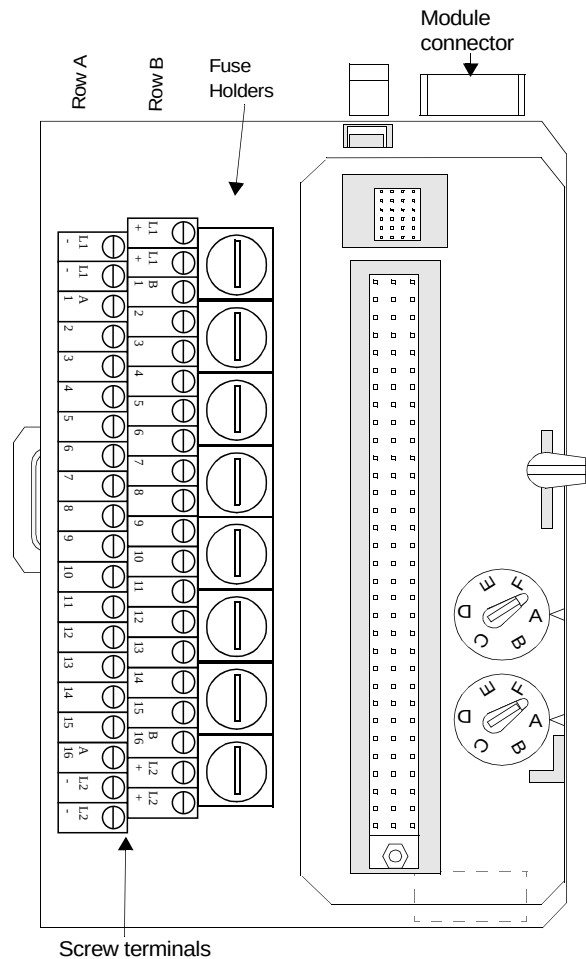
A.50.0.5 Block Diagram TU837



A.51 TU838 Extended MTU

A.51.0.1 Features

- 50 Volt applications - use with the AI810, AI845, DI810, DI811, DI814, DI830, DI831, DI840 and DI880 modules
- Complete installation of I/O modules using 3-wire connections, fuses and field power distribution
- Up to 16 channels of field signals and 8 process power connections
- Two channels share one fused transducer power terminal
- Process voltage can be connected to 2 individually isolated groups, if the I/O module supports it
- Connections to ModuleBus and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.



A.51.0.2 Description

The TU838 is a 16 channel 50 V extended module termination unit (MTU) for the S800 I/O. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU838 MTU can have up to 16 I/O channels. The maximum rated voltage is 50 V and maximum rated current is 3 A per channel.

The MTU distributes the ModuleBus to the I/O module and to the next MTU. It also generates the correct address to the I/O module by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Two mechanical keys are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

The process signal terminals are divided into two equal and individually isolated groups. Each group consists of 8 I/O channels, 4 fused transducer power outlets, 4 return connections and process voltage connection. Process voltage can be connected to two individually isolated groups, only valid if the I/O module supports that.

A.51.0.3 Technical Data*Table A-109 TU838 Extended MTU Specifications*

Item	Value
Process connections	40 up to 16 I/O channels 8 fused field power distributions 4 process power 12 process power (0 V)
Rated maximum continuous current per process voltage connection	10 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Rated max. continuous current per channel	3 A
Fuse (8)	Only on delivery: 100 mA (fast glass tube, 5x20 mm) Otherwise: Max. 3,5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2)	36 different combinations
I/O Module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.

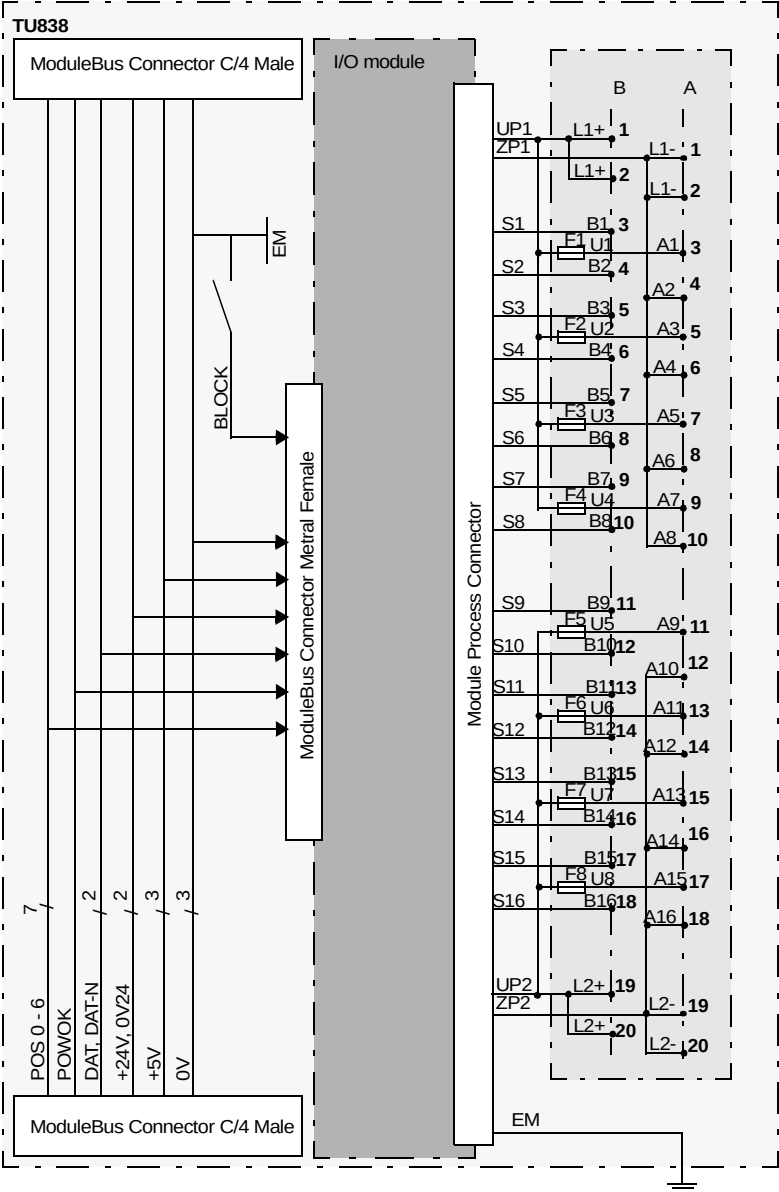
Table A-109 TU838 Extended MTU Specifications (Continued)

Item	Value
Width	126 mm (5") including connector, 120.5 mm (4.74") edge to edge installed
Depth	64 mm (2.52") including terminals
Height	110 mm (4.3")
Weight	0.26 kg (0.57 lbs.)

A.51.0.4 Connections*Table A-110 TU838 Process Connection Screw Terminals (X1)*

Row A	Row B
L1- (L1- power)	L1+ (L1+ power)
L1- (L1- power)	L1+ (L1+ power)
A1 (F1, L1+)	B1 (signal)
A2 (L1-)	B2 (signal)
A3 (F2, L1+)	B3 (signal)
A4 (L1-)	B4 (signal)
A5 (F3, L1+)	B5 (signal)
A6 (L1-)	B6 (signal)
A7 (F4, L1+)	B7 (signal)
A8 (L1-)	B8 (signal)
A9 (F5, L2+)	B9 (signal)
A10 (L2-)	B10 (signal)
A11 (F6, L2+)	B11 (signal)
A12 (L2-)	B12 (signal)
A13 (F7, L2+)	B13 (signal)
A14 (L2-)	B14 (signal)
A15 (F8, L2+)	B15 (signal)
A16 (L2-)	B15 (signal)
L2- (L2- power)	L2+ (L2+ power)
L2- (L2- power)	L2+ (L2+ power)

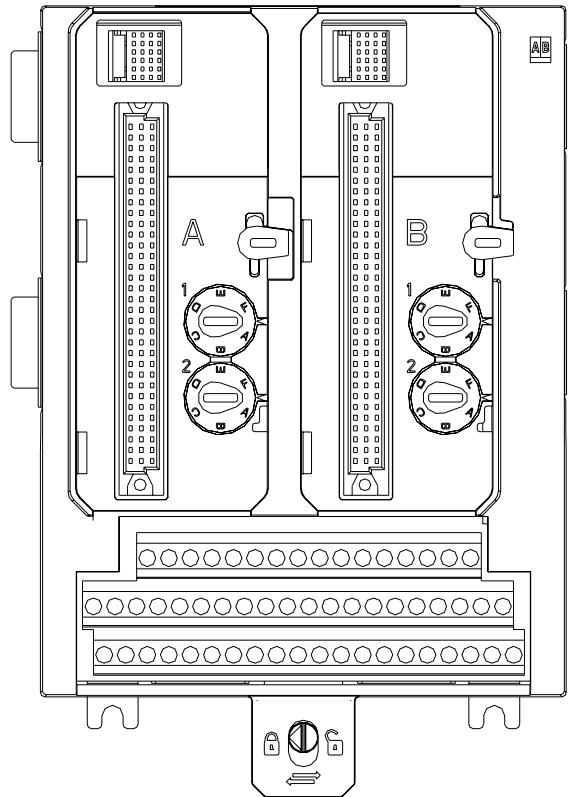
A.51.0.5 Block Diagram TU838



A.52 TU842 Redundant Horizontal MTU

A.52.0.1 Features

- 50 Volt applications - use with AI843, AO845, DI840, DI880, DO840, DO880 and DP840 I/O modules
- Complete installation of I/O modules using 3-wire connections and field power distribution
- Up to 16 channels of field signals and process power connections
- Connections to two ModuleBuses and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.



A.52.0.2 Description

The TU842 is a 16 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a horizontal DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU842 MTU can have up to 16 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. The maximum rated voltage is 50 V and maximum rated current is 3 A per channel.

The MTU distributes the two ModuleBuses to each I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each I/O module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations.

The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Each I/O channel has two I/O connections and one ZP connection. For input modules, field power is provided by the B-row.

A.52.0.3 Technical Data*Table A-111 TU842 Redundant Horizontal MTU Specifications*

Item	Value
Process Connections	56 up to 16 I/O channels 4 Process terminals 20 Process power 0 V
Rated maximum continuous current per I/O channel	3 A
Rated maximum continuous current per process voltage connection (L+)	10 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals

Table A-111 TU842 Redundant Horizontal MTU Specifications (Continued)

Item	Value
Height	186.5 mm (7.34") including locking device
Weight	0.6 kg (1.3 lbs.)

A.52.0.4 Connections

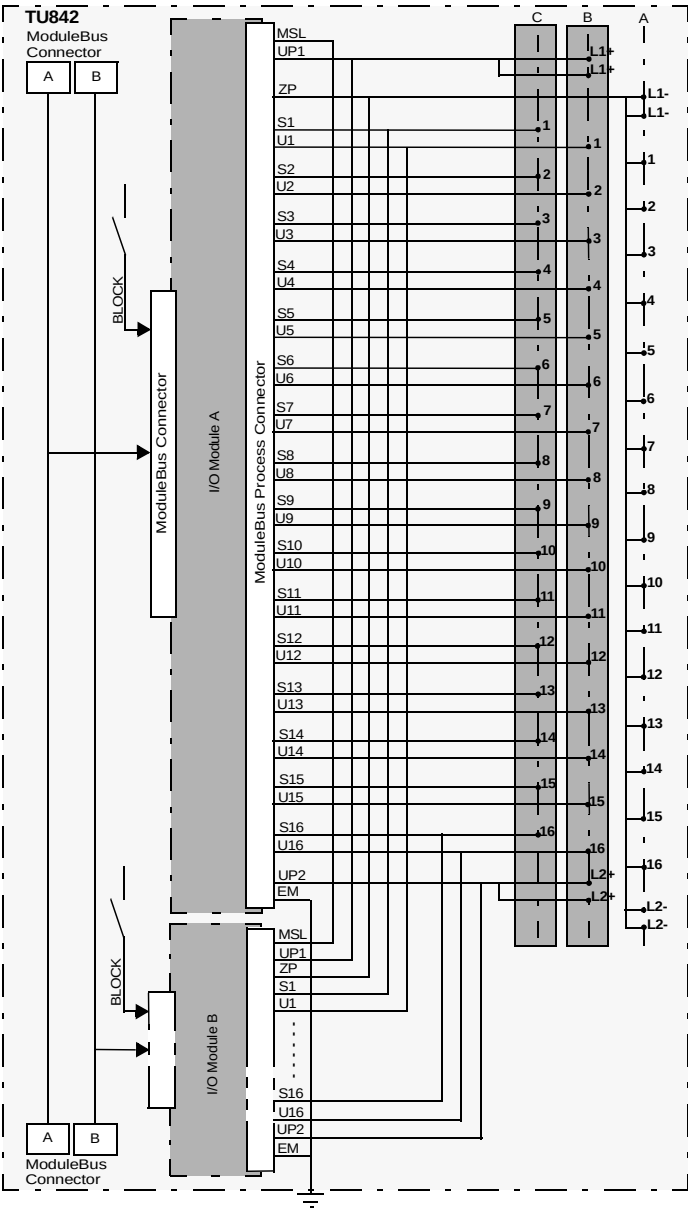
Table A-112 TU842 Process Connection Screw Terminals (X1)

Position	Row A	Row B	Row C
1	L1-	L1+	
2	L1-	L1+	
3	A1	B1	C1
4	2	2	2
5	3	3	3
6	4	4	4
7	5	5	5
8	6	6	6
9	7	7	7
10	8	8	8
11	9	9	9
12	10	10	10
13	11	11	11
14	12	12	12
15	13	13	13
16	14	14	14

Table A-112 TU842 Process Connection Screw Terminals (X1) (Continued)

Position	Row A	Row B	Row C
17	15	15	15
18	A16	B16	C16
19	L2-	L2+	
20	L2-	L2+	

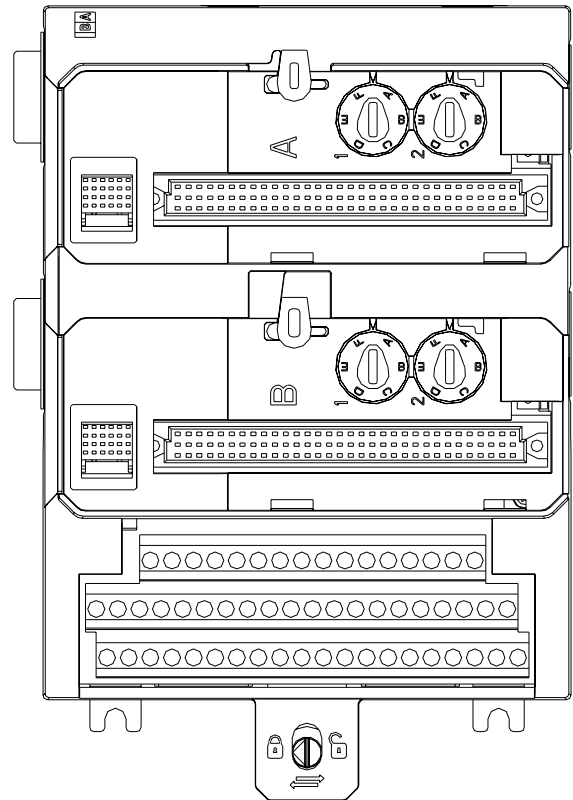
A.52.0.5 Block Diagram TU842



A.53 TU843 Redundant Vertical MTU

A.53.0.1 Features

- 50 Volt applications - use with AI843, AO845, DI840, DI880, DO840, DO880 and DP840 I/O modules
- Complete installation of I/O modules using 3-wire connections and field power distribution
- Up to 16 channels of field signals and process power connections
- Connections to two ModuleBuses and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.



A.53.0.2 Description

The TU843 is a 16 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a vertical DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU843 MTU can have up to 16 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. The maximum rated voltage is 50 V and maximum rated current is 3 A per channel.

The MTU distributes the two ModuleBuses, one to each the I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations.

The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

Each I/O channel has two I/O connections and one ZP connection. For input modules, field power is provided by the B-row.

A.53.0.3 Technical Data*Table A-113 TU843 Redundant Vertical MTU Specifications*

Item	Value
Process Connections	56 up to 16 I/O channels 4 Process terminals 20 Process power 0 V
Rated maximum continuous current per I/O channel	3 A
Rated maximum continuous current per process voltage connection (L+)	10 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals

Table A-113 TU843 Redundant Vertical MTU Specifications (Continued)

Item	Value
Height	186.5 mm (7.34") including locking device
Weight	0.6 kg (1.3 lbs.)

A.53.0.4 Connections

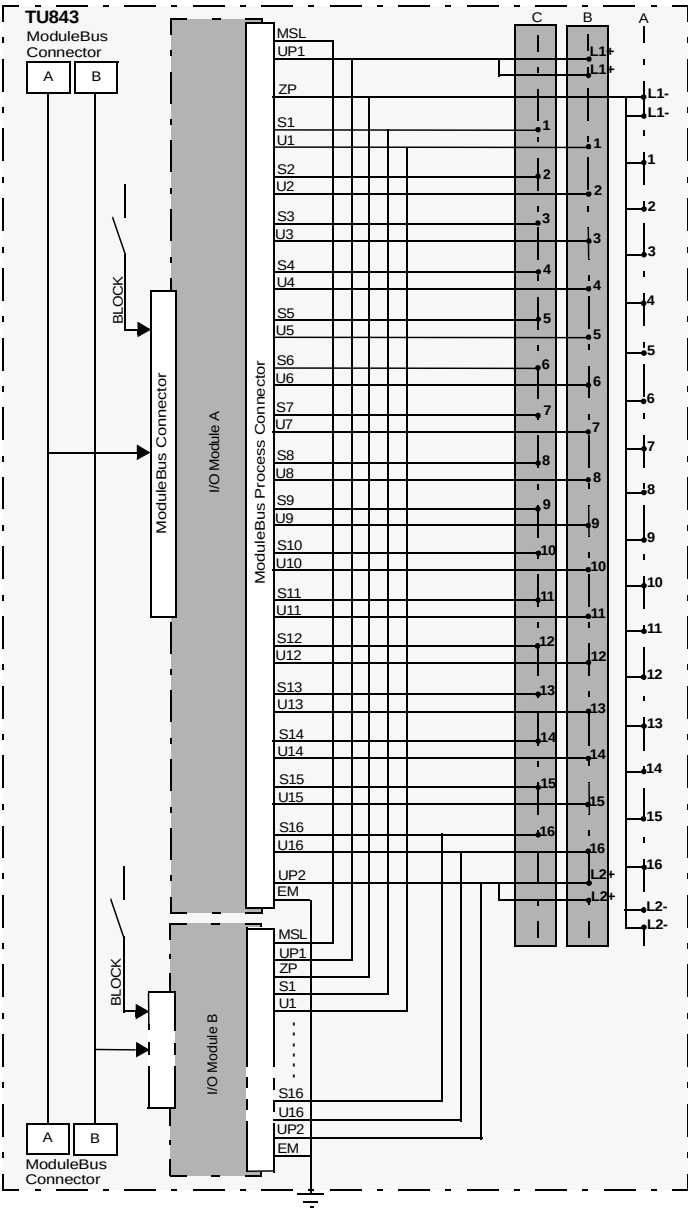
Table A-114 TU843 Process Connection Screw Terminals (X1)

Position	Row A	Row B	Row C
1	L1-	L1+	
2	L1-	L1+	
3	A1	B1	C1
4	2	2	2
5	3	3	3
6	4	4	4
7	5	5	5
8	6	6	6
9	7	7	7
10	8	8	8
11	9	9	9
12	10	10	10
13	11	11	11
14	12	12	12
15	13	13	13
16	14	14	14

Table A-114 TU843 Process Connection Screw Terminals (X1) (Continued)

Position	Row A	Row B	Row C
17	15	15	15
18	A16	B16	C16
19	L2-	L2+	
20	L2-	L2+	

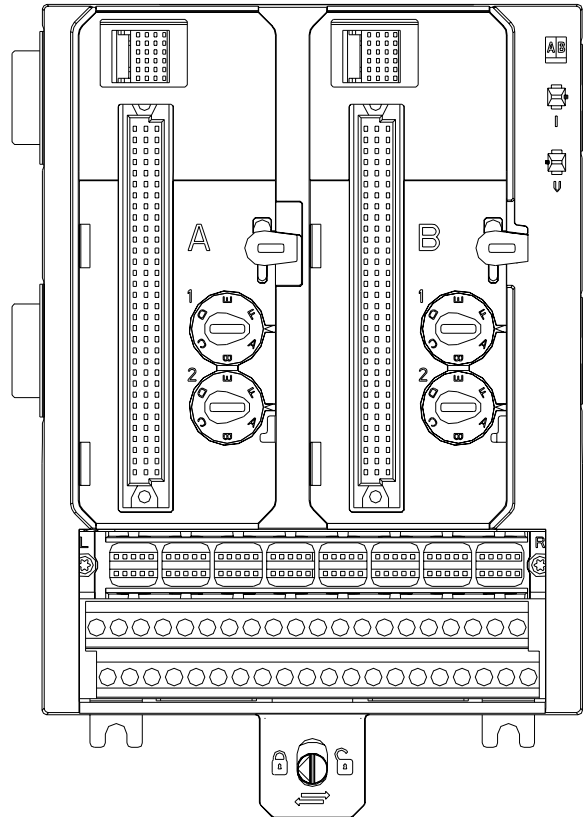
A.53.0.5 Block Diagram TU843



A.54 TU844 Redundant Horizontal MTU

A.54.0.1 Features

- 50 Volt applications - use with AI845, AI880 and DP840 modules
- Complete installation of I/O modules using 2-wire connections and field power distribution
- Up to 8 channels of field signals and process power connections
- Connections to two ModuleBuses and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting



A.54.0.2 Description

The TU844 is a 8 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a horizontal DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU844 MTU can have up to 8 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. Input signals are connected via individual shunt sticks, TY801. The shunt stick is used to

choose between voltage and current input. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel.

The MTU distributes the two ModuleBuses, one to each I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each I/O module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations.

The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

A.54.0.3 Technical Data*Table A-115 TU844 Redundant Horizontal MTU Specifications*

Item	Value
Process Connections	40 up to 8 I/O channels 4 Process terminals 20 Process power 0 V
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals

Table A-115 TU844 Redundant Horizontal MTU Specifications (Continued)

Item	Value
Height	186.5 mm (7.34") including locking device
Weight	0.6 kg (1.3 lbs.)

A.54.0.4 Connections

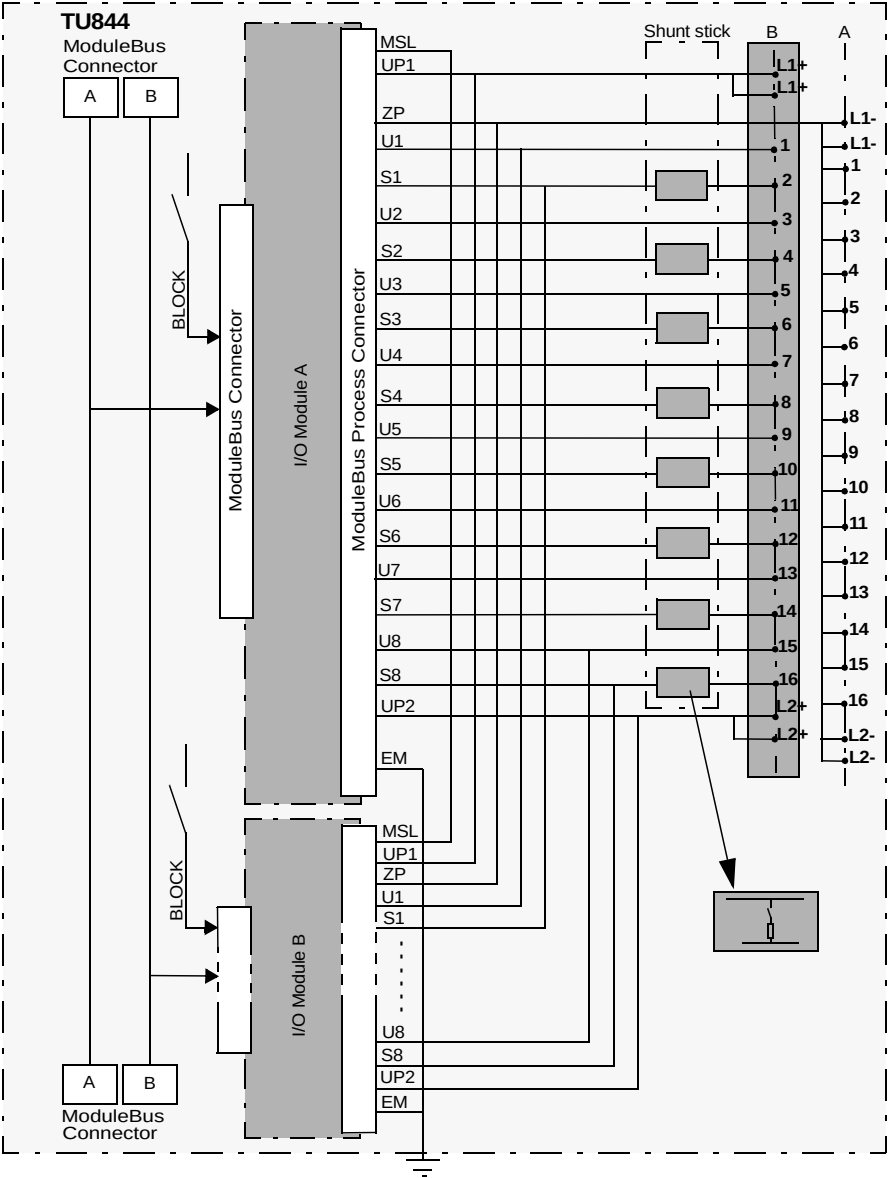
Table A-116 TU844 Process Connection Screw Terminals (X1)

Position	Row A	Row B
1	L1-	L1+
2	L1-	L1+
3	A1	B1
4	2	2
5	3	3
6	4	4
7	5	5
8	6	6
9	7	7
10	8	8
11	9	9
12	10	10
13	11	11
14	12	12
15	13	13
16	14	14

Table A-116 TU844 Process Connection Screw Terminals (X1) (Continued)

Position	Row A	Row B
17	15	15
18	A16	B16
19	L2-	L2+
20	L2-	L2+

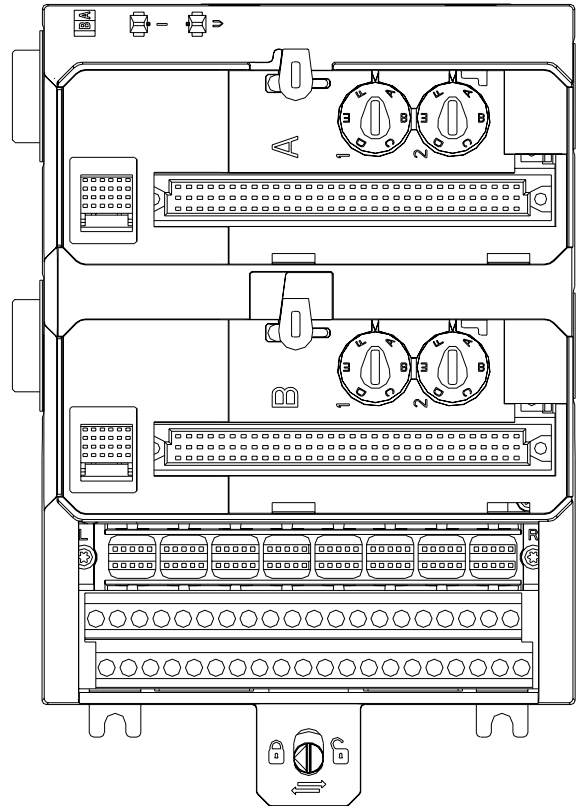
A.54.0.5 Block Diagram TU844



A.55 TU845 Redundant Vertical MTU

A.55.0.1 Features

- 50 Volt applications - use with AI845, AI880 and DP840 modules
- Complete installation of I/O modules using 2-wire connections and field power distribution
- Up to 8 channels of field signals and process power connections
- Connections to two ModuleBuses and I/O modules
- Mechanical keying prevents insertion of the wrong I/O module
- Latching device to DIN rail for grounding
- DIN rail mounting.
- Include 8 individual shunt sticks



A.55.0.2 Description

The TU845 is a 8 channel module termination unit (MTU) for redundant S800 I/O modules and for mounting on a vertical DIN rail. The MTU is a passive unit used for connection of the field wiring to the I/O modules. It also contains a part of the ModuleBus.

The TU845 MTU can have up to 8 I/O channels and 2+2 process voltage connections. Each channel has two I/O connections and one ZP connection. Input signals are connected via individual shunt sticks, TY801. The shunt stick is used to choose between voltage and current input. The maximum rated voltage is 50 V and maximum rated current is 2 A per channel.

The MTU distributes the two ModuleBuses, one to each I/O module and to the next MTU. It also generates the correct address to the I/O modules by shifting the outgoing position signals to the next MTU.

The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be released with a screwdriver.

Four mechanical keys, two for each I/O module, are used to configure the MTU for different types of I/O modules. This is only a mechanical configuration and it does not affect the functionality of the MTU or the I/O module. Each key has six positions, which gives a total number of 36 different configurations. The configuration can be changed with a screwdriver.

The MTU has a mechanical locking mechanism that locks the module in its position. This mechanism also gives the signal BLOCK to the I/O module that keeps the module in its init state until it is locked in its position.

A.55.0.3 Technical Data*Table A-117 TU845 Redundant Vertical MTU Specifications*

Item	Value
Process Connections	40 up to 8 I/O channels 4 Process terminals 20 Process power 0 V
Rated maximum continuous current per I/O channel	2 A
Rated maximum continuous current per process voltage connection (L+)	5 A
ModuleBus: Maximum 5 V current distribution Maximum 24 V current distribution	1.5 A 1.5 A
Acceptable wire sizes	Solid: 0.2 - 4 mm ² Stranded: 0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque 0.5 - 0.6 Nm
Mechanical keys (2+2)	36 different combinations
I/O module lock	Locks module and enables operation
Equipment class	Class I according to IEC 61140; (earth protected)
Protection rating	IP20 according to IEC 60529
Rated insulation voltage	50 V
Dielectric test voltage	500 V a.c.
Width	131 mm (5.16") including connector, 124 mm (4.88") edge to edge installed
Depth	64 mm (2.52") including terminals

Table A-117 TU845 Redundant Vertical MTU Specifications (Continued)

Item	Value
Height	186.5 mm (7.34") including locking device
Weight	0.6 kg (1.3 lbs.)

A.55.0.4 Connections

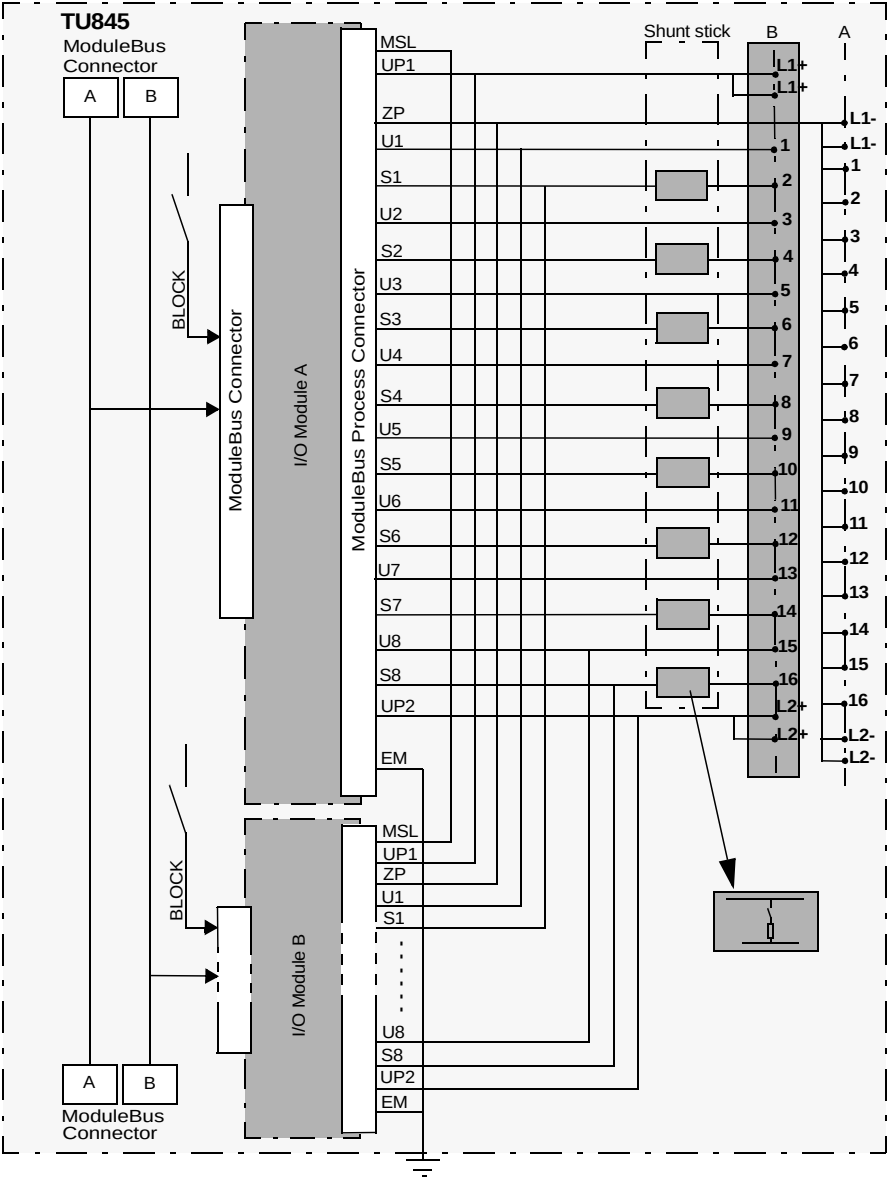
Table A-118 TU845 Process Connection Screw Terminals (X1)

Position	Row A	Row B
1	L1-	L1+
2	L1-	L1+
3	A1	B1
4	2	2
5	3	3
6	4	4
7	5	5
8	6	6
9	7	7
10	8	8
11	9	9
12	10	10
13	11	11
14	12	12
15	13	13
16	14	14

Table A-118 TU845 Process Connection Screw Terminals (X1) (Continued)

Position	Row A	Row B
17	15	15
18	A16	B16
19	L2-	L2+
20	L2-	L2+

A.55.0.5 Block Diagram TU845



A.56 TY801 Shunt Stick

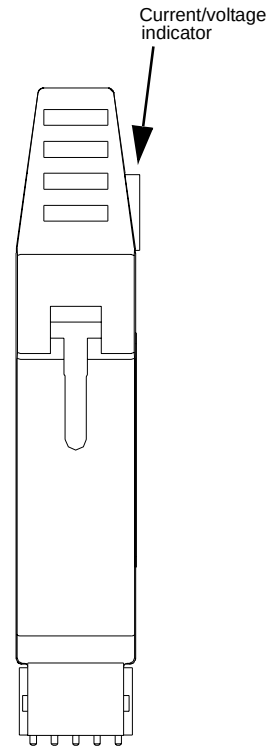
A.56.0.1 Features

- Passive unit used for configuration of signal type.
- Used with TU844 and TU845 together with AI845.

A.56.0.2 Description

The TY801 Shunt Stick is used to adjust the input for current or voltage signals.

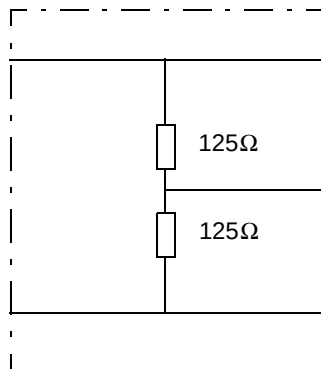
In the upper corner of the shunt stick there is a part of the circuit board that is visible. If the visible part is to the left, the shunt stick is configured for voltage and if it is to the right it is configured for current.



A.56.0.3 Technical Data

Table A-119 TY801 Shunt Stick Specifications

Item	Value
Module catch	Attaches module MTU TU844/TU845
Internal resistance	2 x 125 Ω, 0.05%
Equipment class	Class I according to IEC 61140; (earth protected)
Protection Rating	IP20 according to IEC 60529
Rated Insulation Voltage	50 V
Dielectric test voltage	500 V a.c.
Width	11 mm (0.43")
Depth	15,5 mm (0.61")
Height	62 mm (2.44")
Weight	6 g (0.013 lbs.)

A.56.0.4 Block Diagram TY801

A.57 TY804 Shunt Stick

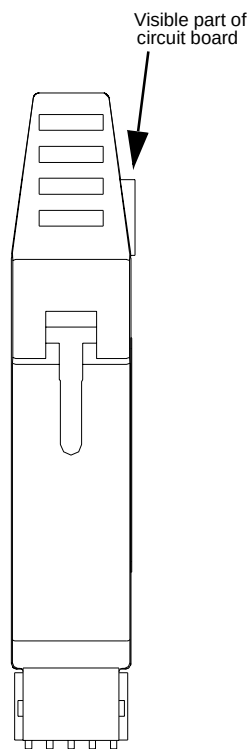
A.57.0.1 Features

- Passive unit used for configuration of signal type.
- Used on TU844 and TU845 together with DP840.

A.57.0.2 Description

The TY804 Shunt Stick is used to adjust the input current to a voltage signal.

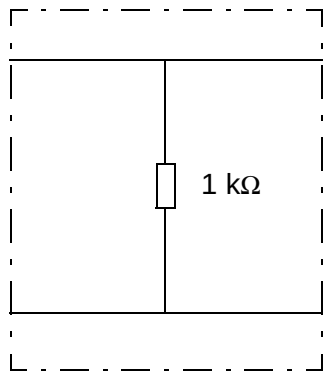
In the upper corner of the shunt stick there is a part of the circuit board that is visible. The visible part shall be turned to the right (current input) when the shunt stick is mounted.



A.57.0.3 Technical Data*Table A-120 TY804 Shunt Stick Specifications*

Item	Value
Module catch	Attaches module MTU TU844/TU845
Internal resistance	1.08 kΩ 1%
Equipment class	Class I according to IEC 61140; (earth protected)
Protection Rating	IP20 according to IEC 60529
Rated Insulation Voltage	50 V
Dielectric test voltage	500 V a.c.
Width	11 mm (0.43")
Depth	15,5 mm (0.61")
Height	62 mm (2.44")
Weight	6 g (0.013 lbs.)

A.57.0.4 Block Diagram TY804



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 - DO820 45, 386
 - DO821 45, 396
 - DO840 45, 406
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- DO814 44, 364
- DO815 44, 375
- DO820 45, 386
- DO821 45, 396
- DO840 45, 406
- DO880 45, 418
- DP820 46, 431
- DP840 46, 452

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 - TU833 35
 - TU835 35, 518
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- FCI 24

- Frequency measuring
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