Honeywell

Fail Safe Control
Hardware Manual

Revision 07

FS02-500
01/2003

Copyright, Notices and Trademarks

Revision 07 (01/2003)

Fail Safe Control

Hardware Manual

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Module Index

Module Index

This is a module index of the entire FSC Hardware Manual. The index is based on the module numbers or identifications. The numbers in front of the page numbers refer to the sections. For example, '2-19' refers of page 19 of section 2 ("Power Supplies").

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Functional Index

Functional Index

This is a general index of the entire FSC Hardware Manual. The index is based on the module functions. In many cases there will be more than one index entry to direct you to a particular module. For example, if you are looking for a 24 Vdc digital output module, you can look under '#' for 24 Vdc, 'D' for digital, or 'O' for output. The numbers in front of the page numbers refer to the sections. For example, '2-19' refers of page 19 of section 2 ("Power Supplies").

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Abbreviations

Abbreviations

A/D .... Analog/digital
AC .... Alternating current
AI .... Analog input
AK .... Anforderungsklasse (= requirement class)
AO .... Analog output
AWG .... American Wire Gage
BCD .... Binary coded decimal
c .... common
CE .... Conformité Européenne
Ch .... Channel
COM .... Communication
COSI .... Crimp-on snap-in
CP .... Central Part
CPU .... Central processor unit
D/A .... Digital/analog
DBM .... Diagnostic and battery module
DC .... Direct current
DCD .... Data carrier detect
DCF .... Digital Coded Frequency
DCS .... Distributed control system
DI .... Digital input
DIL .... Dual in-line
DIN .... Deutsche Industrienorm
DO .... Digital output
DOS .... Disk operating system
DSR .... Data set ready
DTR .... Data terminal ready
ECM .... Enhanced Communication Module
EEA .... European Economic Area
EEPROM .... Electrically erasable programmable read-only memory
ELD .... Earth leakage detector
EMC .... Electromagnetic compatibility
EN .... Europäische Norm (European standard)
EPM .... Enhanced Processor Module
EPROM .... Erasable programmable read-only memory
ESD .... Electrostatic discharge
ESD .... Emergency shutdown
EU .... European Union
ext. .... external
F .... Fuse(d)
FF .... Flip-flop
FM .... Factory Mutual
FS .... Fail-safe
FSC .... Fail Safe Control
FSC-DS .... FSC Development System
FSC-SM .... FSC Safety Manager
FSC-SMM .... FSC Safety Manager Module
FTA .... Field termination assembly
GND .... Ground

Abbreviations (continued)

HBD........ Horizontal bus driver
HE .... Höheneinheit (= U)
HP .... Horizontal pitch (= TE)
HSMS........ Honeywell Safety Management Systems
HW .... Hardware
H x W x D........ Height x width x depth
I/O .... Input/output
IC........ Integrated circuit
IEC .... International Electrotechnical Commission
int. .... internal
J .... Jumper
LED .... Light-emitting diode
LSB .... Least significant bit
MEM........ Memory
MUX .... Multiplexer
n/a .... not applicable
NC .... Normally closed
nc .... not connected
NFS .... Non fail-safe
NO........ Normally open
NTC........ Negative temperature coefficient
NVRAM .... Non-volatile random-access memory
P/N .... Part number
PCB........ Printed circuit board
PSD........ Power supply distribution
PSU........ Power supply unit
QMR........ Quadruple Modular Redundant
R........ Resistance / Resistor
RAM .... Random-access memory
RTS .... Request to send
SBD........ Single bus driver
S-Bus .... Single bus
SER........ Sequence-of-event recording
SIC .... System interconnection cable
SIL........ Safety integrity level
SM........ Safety Manager
SMM........ Safety Manager Module
SOE........ Sequence of events
STP .... Shielded twisted pair
SW .... Software
TE........ Teileinheit (= HP)
TIB........ Transformer isolated barrier
TPS .... TotalPlant Solutions
TTL........ Transistor-transistor logic
TTY .... Teletype
TÜV .... Technischer Überwachungsverein
U........ Unit (= HE)
UCN .... Universal Control Network
UL........ Underwriters Laboratories
UV .... Ultraviolet

Abbreviations
(continued)

READER COMMENTS

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You can communicate your thoughts to us by fax or mail using this form, or by sending an e-mail message. We would like to acknowledge your comments — please include your complete name, address and telephone number.

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Fail Safe Control Hardware Manual

Section 1: General Information

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Section 1: General Information

About the FSC Hardware Manual

About…

This is the FSC Hardware Manual Rev. 06 (02/2002). It provides technical information and specifications for all hardware components used in conjunction with Honeywell's Fail Safe Controller (FSC).
The FSC Hardware Manual Rev. 06 (02/2002) is also available on CD-ROM. The electronic manual is identical to the paper version, but has been fully hyperlinked for easy navigation. Also, the electronic version allows you to quickly search through the entire manual.
For more information on the electronic FSC Hardware Manual send an e-mail message to *sms-info@honeywell.com*.

Note:
The FSC Hardware Manual Rev. 06 (02/2002) supersedes all previous releases of the FSC Hardware Manual. These earlier releases are considered obsolete, and should no longer be used.

Information updates

Regular information updates to the FSC Hardware Manual are made available in order to keep its contents up to date.
There are several ways to obtain these updates:

- All information updates will be posted on the TotalPlant Solutions (TPS) Online website (*http://support.totalplant.honeywell.com/*).
- If you have access to the Honeywell Intranet, you can also download the latest version from the HSMS Intranet website at *http://web.iac.europe.honeywell.com/sms/*.
- You can send an e-mail message to *sms-info@honeywell.com*. The latest information update will then be sent to you.

Each newer version of the Information Updates will always contain all previous updates, which means that each new version supersedes all earlier ones.

Obsolete modules

A number of modules have become obsolete. Their data sheets are not contained in this release of the FSC Hardware Manual.
For details refer to the 'Obsolete modules' data sheet in Section 1 of this manual. A separate document (doc. ref.: FS02-501) is available which contains the data sheets of all obsolete modules. This document is part of the hardware documentation set.

Feedback

Honeywell Safety Management Systems B.V. welcomes your comments and suggestions to improve future editions of the FSC Hardware Manual.
You can communicate your thoughts to us by fax or e-mail:
fax: +31 (0)73-6219125 (attn. Worldwide Marketing dept.)
e-mail: *sms-info@honeywell.com*

Legend of symbols

Description

This Hardware Manual contains layout diagrams and wiring examples. The figure below explains some specific symbols used in these diagrams.

description	symbol
fuse terminal	
indication / alarm lamp	
indicator LED	
diode	
resistor	
alarm horn	
fan	
sheet connectors to FSC I/O module redundant central part	

description	symbol
crossing conductors without electric connection	
junction of conductors	
incoming or outgoing signals	
card connector	
solenoid valve	
interposing relay or motor-operated valve	
circuit breaker	
receptacle	

description	symbol
make contact	
break contact	
push button maintained	
pulse contact	
sheet connector connects from sheet 22 line 1	S22/1
transistor	
capacitor	
varistor	

description	symbol
level switch	
rotary switch	
proximity switch	
push button momentary	
keyswitch	
PCB relays relay + diode + LED	
temperature element	

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FSC operating conditions

FSC cabinets

FSC systems are generally built into steel cabinet enclosures for mechanical protection of the electronic equipment of the FSC system. Also, compliance with the CE directives requires the FSC systems to be properly enclosed.

FSC main components

An FSC system typically consists of the following main components:

- cabinet enclosure,
- field termination assemblies (FTAs) and/or terminals,
- central part (CP) racks with all CPU, memory and communication modules,
- input/output racks with all input and output modules, and
- power supply system consisting of power supply units (PSUs), main switches, circuit breakers and fuses.

FSC operating conditions

The operating conditions for FSC systems are as follows:

- Storage temperature: –25°C to +80°C (–13°F to +176°F)
- Operating temperature: 0°C to 60°C (32°F to 140°F)*
- Relative humidity: 5% to 95% (non-condensing)
- Vibration (sinusoidal): excitation: sine-shaped with sliding freq.
  frequency range: 10-150 Hz
  loads: 10 Hz - 57 Hz: 0.075 mm
  57 Hz - 150 Hz: 1 G
  no. of axes: 3 (x, y, z)
  traverse rate: 1 oct/min.
- Shock: 15 G in 3 axes (shock duration: 11 ms).

* Measured at the Central Part rack(s) by the Diagnostic and Battery Module (DBM).

Supply voltages

The supply voltages to the FSC system must be within the following ranges to ensure correct operation:

- 220 Vdc: +10% / –15%
- 110 Vdc: +25% / –15%
- 60 Vdc: +15% / –15%
- 48 Vdc: +15% / –15%
- 24 Vdc: +30% / –15%

If it cannot be guaranteed that the DC power supplied to the FSC system remains within the above ranges, additional voltage monitoring is required.

FSC environment

The most common environment for an FSC system cabinet is an air-conditioned equipment/control room.
If the FSC system cabinet is to be used in an outdoor environment, special attention should to paid to:

- minimum and maximum ambient temperatures,
- humidity, and
- protection grade (IP grading) against dust, water, etc.

FSC standards compliance

Description

This data sheet lists the standards that FSC complies with, and also provides some background information on CE marking (EMC directive and Low Voltage directive).

Table 1 FSC compliance to standards

DIN V 19250 (1/89, 5/94)	Measurement and control. Fundamental safety aspects to be considered for safety-related measurement and control equipment. *(German title: Leittechnik. Grundlegende Sicherheits-betrachtungen für MRS-Schutzeinrichtungen)*	Safety applications up to safety class AK 8
DIN V 0801 (1/90) and Amendment A (10/94)	Principles for computers in safety-related systems. *(German title: Grundsätze für Rechner in Systemen mit Sicherheitsaufgaben)*	Microprocessor-based safety systems
VDE 0116 (10/89)	Electrical equipment of furnaces. *(German title: Elektrische Ausrüstung von Feuerungsanlagen)*	
EN 54 part 2 (01/90)	Components of automatic fire detection systems, Introduction *(German title: Bestandteile automatischer Brandmeldeanlagen)*	
EN 50081-2-1994	Electromagnetic compatibility – Generic emission standard, Part 2: Industrial environment	
EN 50082-2-1995	Electromagnetic compatibility – Generic immunity standard, Part 2: Industrial environment	
IEC 61010-1-1993	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements	
IEC 61131-2-1994	Programmable controllers. Part 2: Equipment requirements and tests	
UL 1998	Safety-related software, first edition	Underwriters Laboratories
UL 508	Industrial control equipment, sixteenth edition	Underwriters Laboratories

Table 1 FSC compliance to standards (continued)

Standard	Title	Remarks
UL 991	Test for safety-related controls employing solid-state devices, second edition	Underwriters Laboratories
FM 3611 Class I, Division 2, Groups A, B, C & D Class II, Division 2, Groups F & G	Electrical equipment for use in Class I, Division 2, Class II, Division 2, and Class III, Division 1 and 2, hazardous locations	Factory Mutual Research Applies to the following modules (nonincendive filed wiring circuits): 10101/2/1, 10102/2/1, 10105/2/1, 10106/2/1and 10205/2/1.
CSA C22.2	Process control equipment. Industrial products.	Canadian Standards Association No. 142 (R1993)
IEC 60068-1	Basic environmental testing procedures	
IEC 60068-2-1	Cold test	0°C (32°F); 16 hours; system in operation; reduced power supply voltage (-15%) U=20.4 Vdc or (-10%); U=198 Vac
IEC 60068-2-1	Cold test	–10°C (14°F); 16 hours; system in operation
IEC 60068-2-2	Dry heat test	up to 65°C (149°F); 16 hours; system in operation; increased power supply voltage (+15%): U=27.6 Vdc or (+10%): U=242 Vac
IEC 60068-2-3	Test Ca: damp heat, steady state	21 days at +40°C (104°F), 93% relative humidity; function test after cooling
IEC 60068-2-3	Test Ca: damp heat, steady state	96 hours at +40°C (104°F), 93% relative humidity; system in operation
IEC 60068-2-14	Test Na: change of temperature — withstand test	–25°C to +55°C (–13°F to +131°F), 12 hours, 95% relative humidity, recovery time: max. 2 hours
IEC 60068-2-30	Test Db variant 2: cyclic damp heat test	+25°C to +55°C (+77°F to +131°F), 48 hours, 80-100% relative humidity, recovery time: 1-2 hours

Table 1 FSC compliance to standards (continued)

Standard	Title	Remarks
IEC 60068-2-6	Environmental testing – Part 2: Tests – Test Fc: vibration (sinusoidal)	Excitation: sine-shaped with sliding frequence; Frequency range: 10-150 Hz Loads: 10-57 Hz; 0.075 mm 57-150 Hz; 1 G Duration: 10 cycles (20 sweeps) per axis No. of axes: 3 (x, y, z) Traverse rate: 1 oct/min System in operation
IEC 60068-2-27	Environmental testing – Part 2: Tests – Test Ea: shock	Half sinus shock 2 shocks per 3 axes (6 in total) Maximum acceleration: 15 G Shock duration: 11 ms System in operation

CE marking

The CE mark (see Figure 1) is a compliance symbol which indicates that a product meets the requirements of the EU directives that apply to that product. CE (Conformité Européenne) marking is a prerequisite to marketing FSC systems in the European Union.

EU directives are documents issued on the authority of the Council of the European Union. They set out requirements and regulations for certain categories of products or problem areas. The directives apply not only to the member countries of the European Union but to the whole European Economic Area (EEA), which is made up of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom.

The directives have the following key objectives:

- free movement of goods within the EU/EEA geographical regions through harmonization of standards and elimination of trade barriers,
- safety of persons, their property and of animals, and
- protection of the environment.

Figure 1 CE mark

For control products like FSC, a number of EU directives apply. The FSC product is compliant with two of these: the Electromagnetic Compatibility (EMC) Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC). Each is discussed in more detail below.

EMC directive (89/336/EEC)

One of the EU directives that FSC complies with is the EMC directive, or *Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility* as it is officially called. It "applies to apparatus liable to cause electromagnetic disturbance or the performance of which is liable to be affected by such disturbance" (Article 2).
The EMC directive defines protection requirements and inspection procedures relating to electromagnetic compatibility for a wide range of electric and electronic items.
Within the context of the EMC directive, 'apparatus' means all electrical and electronic appliances together with equipment and installations containing electrical and/or electronic components.
'Electromagnetic disturbance' means any electromagnetic phenomenon which may degrade the performance of a device, unit of equipment or system. An electromagnetic disturbance may be electromagnetic noise, an unwanted signal or a change in the propagation medium itself.
'Electromagnetic compatibility' is the ability of a device, unit of equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

There are two sides to electromagnetic compatibility: emission and immunity. These two essential requirements are set forth in Article 4, which states that an apparatus must be constructed so that:
(a) the electromagnetic disturbance it generates does not exceed a level allowing radio and telecommunications equipment and other apparatus to operate as intended;
(b) the apparatus has an adequate level of intrinsic immunity of electromagnetic disturbance to enable it to operate as intended.

The EMC directive was originally published in the Official Journal of the European Communities on May 23, 1989. The directive became effective on January 1, 1992, with a four-year transitional period. During the transitional period, a manufacturer can choose to meet existing national laws (of the country of installation) or comply with the EMC directive (demonstrated by the CE marking and Declaration of Conformity). The transitional period ended on December 31, 1995, which meant that as of January 1, 1996 compliance with the EMC directive became **mandatory** (a legal requirement). All electronic products may now only be marketed in the European Union if they meet the requirements laid down in the EMC directive. This also applies to FSC system cabinets.

Low voltage directive (73/23/EEC)

The FSC product also complies with the low voltage directive, or *Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits* as it is officially called. It states that "electrical equipment may be placed on the market only if, having been constructed in accordance with good engineering practice in safety matters in force in the Community, it does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it was made" (Article 2).
The low voltage directive defines a number of principal safety objectives that electrical equipment must meet in order to be considered "safe".

Within the context of the low voltage directive, 'electrical equipment' means any equipment designed for use with a voltage rating of between 50 and 1,000 V for alternating current and between 75 and 1,500 V for direct current.

The low voltage directive was originally published in the Official Journal of the European Communities on March 26, 1973. It was amended by Council Directive 93/68/EEC, which became effective on January 1, 1995, with a two-year transitional period. During the transitional period, a manufacturer can choose to meet existing national laws (of the country of installation) or comply with the low voltage directive (demonstrated by the CE marking and Declaration of Conformity). The transitional period ended on December 31, 1996, which meant that as of January 1, 1997 compliance with the low voltage directive became **mandatory** (a legal requirement). All electronic products may now only be marketed in the European Union if they meet the requirements laid down in the low voltage directive. This also applies to FSC system cabinets.

Key coding

Introduction

There are basically two types of modules in the racks of an FSC cabinet:

- Central Part modules (see section 4 of this manual), and
- I/O modules (see section 5 and section 6 of this manual).

Central Part modules

The Central Part modules must be placed in the Central Part rack(s), at the locations calculated by the FSC user station software. Only then will the Diagnostic and Battery Module (DBM, 10006/1/1 or 10006/2/.) and the diagnostic program indicate faulty module positions correctly.

I/O modules

The locations of the I/O modules in the I/O rack(s) are not predetermined by the FSC user station software. They are user-defined using the 'Configure FSC system' option of the FSC user station software. To ensure proper interfacing with the field devices (wiring, etc.) and to prevent damage to equipment, the I/O modules ***must*** be placed at the I/O rack positions as defined in the FSC user station software. To prevent insertion of an incorrect module type on a certain I/O position, the I/O rack connector and the module connector are key-coded with coding pins.

Note:
If the coding pins of the module are bent, they must be removed. If you try to bend the pins back to their correct position, they will break, and the connector will then need to be replaced.

Coding system

There are two types of FSC modules:

- Plug-and-play modules (type number 10xxx/2/x), and
- Non plug-and-play modules (type number 10xxx/1/x) (i.e. modules with I/O wiring on the rack connectors).

FSC I/O modules are coded using coding system type 5159, make SOURIAU. The items used for key coding the modules depend on the I/O module type. Table 1 and Table 2 below list the items used for key coding plug-and-play modules and non plug-and-play modules.

Table 1 Items used for key coding plug-and-play I/O modules

Plug-and-play modules (10xxx/2/x)	**Souriau type no.**
Module part: 2 holes	
Rack part: large pins	5159.009.17.22 (use special insertion tool, type 5159.009.96)

The rack connector must be coded by inserting two large pins in the appropriate holes (see Table 3).

Table 2 Items used for key coding non plug-and-play I/O modules

Non plug-and-play modules (10xxx/1/x)	**Souriau type no.**
Module part: pins	5159.009.17.01 (use special insertion tool, type 5159.009.99)
Rack part: blind stops	5159.009.18.01 (use special insertion tool, type 5159.009.98)
Rack part: large pins	5159.009.17.22 (use special insertion tool, type 5159.009.96)

The indicated coding pins are inserted in the appropriate holes in the module connector. The rack connector must be coded by inserting blind stops and one large pin in the appropriate holes (see Table 4).

Connectors

Every I/O module is fitted with a connector that is plugged into the appropriate rack connector.

Plug-and-play I/O modules

Figure 1 and Figure 2 show the layout of the module connector and rack connector of plug-and-play I/O modules (10xxx/2/x).

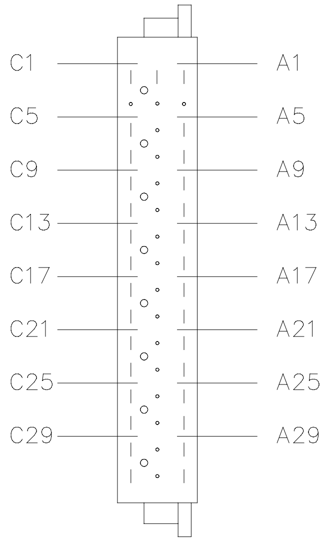

Figure 1 Module connector
(back view)

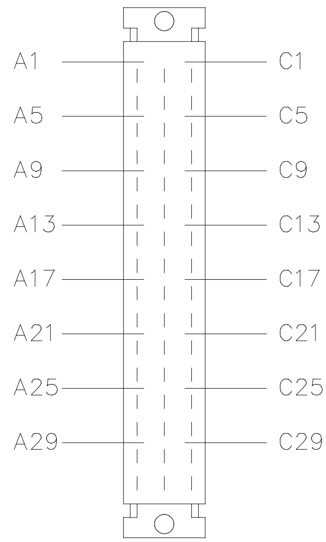

Figure 2 Rack connector
(front view)

Non plug-and-play I/O modules

Figure 3 and Figure 4 show the layout of the module connector and rack connector of non plug-and-play I/O modules (10xxx/1/x).

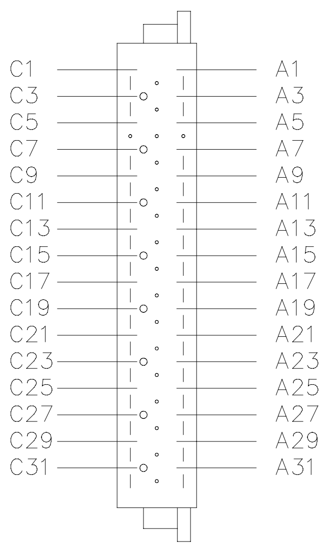

Figure 3 Module connector
(back view)

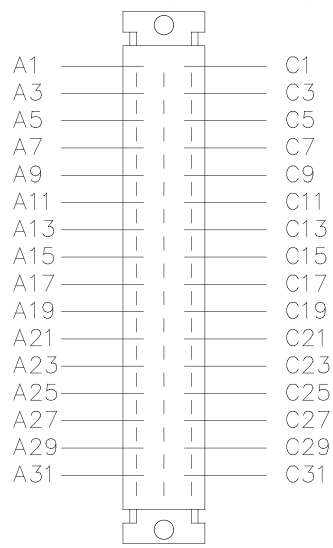

Figure 4 Rack connector
(front view)

Key coding

Plug-and-play modules

Table 3 below shows the key coding of plug-and-play FSC modules (with type number 10xxx/2/x).

Table 3 Key coding of plug-and-play I/O modules

Module type	Module code		Module type	Rack code	
	Holes			Large pins	
10100/2/1	A5	A7	10100/2/1	A5	A7
10101/2/1	A5	C5	10101/2/1	A5	C5
10101/2/2	A5	C9	10101/2/2	A5	C9
10101/2/3	A5	C13	10101/2/3	A5	C13
10102/2/1	A5	C17	10102/2/1	A5	C17
10104/2/1	A5	C21	10104/2/1	A5	C21
10105/2/1	A5	C25	10105/2/1	A5	C25
10106/2/1	A5	C29	10106/2/1	A5	C29
10201/2/1	A9	C9	10201/2/1	A9	C9
10205/2/1	A9	C5	10205/2/1	A9	C5
10206/2/1	A9	C13	10206/2/1	A9	C13
10208/2/1	A9	C17	10208/2/1	A9	C17
10209/2/1	A9	C21	10209/2/1	A9	C21
10213/2/1	A13	C17	10213/2/1	A13	C17
10213/2/2	A9	C25	10213/2/2	A9	C25
10213/2/3	A9	C29	10213/2/3	A9	C29
10215/2/1	A13	C5	10215/2/1	A13	C5
10216/2/1	A13	C9	10216/2/1	A13	C9
10216/2/3	A13	C13	10216/2/3	A13	C13
10302/2/1	A5	A9	10302/2/1	A5	A9
10310/2/1	A5	A11	10310/2/1	A5	A11
10311/2/1	A5	A13	10311/2/1	A5	A13

Non plug-and-play modules

Table 4 belows show the key coding of non plug-and-play FSC modules (with type number 10xxx/1/x).

Table 4 Key coding of non plug-and-play I/O modules

Module type	Module code				Module type	Rack code			
	Hole	Pins				Blind stops			Large pin
10100/1/1	A27	C3	C11	C27	10100/1/1	C19	C23	C31	A27
10101/1/1	A27	C3	C11	C23	10101/1/1	C19	C27	C31	A27
10101/1/2	A15	C3	C11	C23	10101/1/2	C19	C27	C31	A15
10101/1/3	A3	C3	C11	C23	10101/1/3	C19	C27	C31	A3
10102/1/1	A27	C3	C19	C27	10102/1/1	C11	C23	C31	A27
10102/1/2	A27	C11	C19	C31	10102/1/2	C3	C23	C27	A27
10103/1/1	A27	C3	C19	C31	10103/1/1	C11	C23	C27	A27
10103/1/2	A27	C3	C19	C31	10103/1/2	C11	C23	C27	A27
10104/1/1	A27	C11	C19	C23	10104/1/1	C3	C27	C31	A27
10201/1/1	A27	C3	C11	C31	10201/1/1	C19	C23	C27	A27
10205/1/1	A27	C3	C23	C27	10205/1/1	C11	C19	C31	A27
10206/1/1	A27	C3	C19	C23	10206/1/1	C11	C27	C31	A27
10207/1/1	A27	C3	C11	C19	10207/1/1	C23	C27	C31	A27
10208/1/1	A27	C3	C23	C31	10208/1/1	C11	C19	C27	A27
10209/1/1	A27	C3	C27	C31	10209/1/1	C11	C19	C23	A27
10212/1/1	A27	C11	C23	C31	10212/1/1	C3	C19	C27	A27
10213/1/1	A11	C3	C11	C19	10213/1/1	C23	C27	C31	A11
10213/1/2	A15	C3	C11	C19	10213/1/2	C23	C27	C31	A15
10213/1/3	A3	C3	C11	C19	10213/1/3	C23	C27	C31	A3
10214/1/2	A23	C3	C11	C23	10214/1/2	C19	C27	C31	A23
10215/1/1	A27	C19	C23	C31	10215/1/1	C3	C11	C27	A27
10216/1/1	A19	C3	C11	C23	10216/1/1	C19	C27	C31	A19
10302/1/1	A27	C11	C23	C27	10302/1/1	C3	C19	C31	A27
10305/1/1	A27	C11	C19	C27	10305/1/1	C3	C23	C31	A27
10305/1/2	A23	C3	C19	C23	10305/1/2	C11	C27	C31	A23

Obsolete Modules

Obsolete modules

A number of FSC modules have become obsolete. Some were declared obsolete in June 1999, others were declared obsolete at later dates.
Their data sheets are not included in the FSC Hardware Manual. The next few pages list the obsolete modules, and also provide information about alternatives that can be used (where possible).

Spare parts ordering

Spare parts or replacement parts of the obsolete modules are available in accordance with the standard Honeywell policies. If you have any questions, please contact your Honeywell SMS Regional Delivery Center (RDC).

Data sheets of obsolete modules

A separate document (doc. ref.: FS02-501) is available which contains the data sheets of all obsolete modules. This document is part of the hardware documentation set.

Obsolete Modules as of June 1999

Central Part modules

Table 1 below lists the Central Part modules that were withdrawn in June 1999.

Note:
The modules marked with '@' are no longer supported by FSC R510 and higher.

Table 1 Obsolete Central Part modules

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	**Description**	**Model+Suffix**	**Part No.**	**Model+Suffix**	**Part No.**
10001/1/1	Vertical bus driver (VBD)	10001/R/1	3400004	–	–
10002/1/1 @	Central processor unit (CPU)	10002/1/2 06002	3400181	–	–
10003/1/1 @	Memory module (MEM)	10002/1/2 06002	3400181	–	–
10005/O/1 + WDG cable + single wiring	Watchdog horizontal bus	10005/O/2 + WDG-C cable + ESD/RESET cable	3410412 4212118 4212119	–	–
10006/1/1	Diagnostic and battery module (DBM)	10006/2/1 08802	3400170	–	–
S5-bus	Central part system bus	none	–	S7-bus	3410202
10004/B/.	RS232C communication interface	–	–	10004/F/.	–
10004/B/B	Communication module with: two RS232C interfaces	none	–	10004/F/F 05201	3400186
10004/H/B	Communication module with: - interface between central parts and - RS232 interface	none	–	10004/H/F 05301	3400187
10004/E/.	Current loop communication interface	none	–	none	–
10004/E/1	Communication module with: one current loop interface	none	–	none	–
10004/E/E	Communication module with: two current loop interfaces	none	–	none	–
10004/F/E	Communication module (COM) with: - Tri-state RS232 interface and - current loop interface	none	–	none	–
10004/H/E	Communication module with: - interface between central parts and - current loop interface	none	–	none	–
10004/I/E	Communication module with: - RS422/485 interface and - current loop interface	none	–	None	–

Table 1 Obsolete Central Part modules (continued)

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	Description	Model+Suffix	Part No.	Model+Suffix	Part No.
10004/F/I	Communication module (COM) with: - Tri-state RS232 interface and - RS422/485 interface	none	–	10004/I/F 05502	3400192
10004/G/F	Communication module (COM) with: - glass fiber interface and - Tri-state RS232 interface	none	–	10004/F/G 06601	3400191
10004/1/F	Communication module (COM) with: One Tri-state RS232 interface	none	–	10004/F/F 05201	3400186
10004/F/1	Communication module (COM) with: One Tri-state RS232 interface	none	–	10004/F/F 05201	3400186
10004/H/1	Communication module with: one interface between central parts	none	–	10004/H/F 05301	3400187
10004/I/1	Communication module (COM) with: One RS422/485 interface	none	–	10004/I/I 05602	3400195
10004/G/1	Communication module (COM) with: One glass fiber interface	none	–	10004/G/G 13301	3400199

I/O modules

Table 2 below lists the I/O modules that were withdrawn in June 1999.

Note:
Conventional wiring method can still be applied with current I/O modules.

Table 2 Obsolete I/O modules

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	Description	Model+Suffix	Part No.	Type	Part No.
10100/A1	Horizontal Bus Driver for non-redundant I/O	none	–	10100/2/1 10900 + A1 cable	3400109 4211011
10100/A21	Horizontal Bus Driver for redundant I/O (1 rack per HBD)	none	–	10100/2/1 10900 + A21 cable	3400109 4211012
10100/A22	Horizontal Bus Driver for redundant I/O (2 racks per HBD)	none	–	10100/2/1 10900 + A22 cable	3400109 4211013
10101/1/1	FS digital input module (24 Vdc, 16 ch.)	none	–	10101/2/1 11000	3400110
10101/1/2	FS digital input module (60 Vdc, 16 ch.)	none	–	10101/2/2 11100	3400111
10101/1/3	FS digital input module (48 Vdc, 16 ch.)	none	–	10101/2/3 11200	3400112

Table 2 Obsolete I/O modules (continued)

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	Description	Model+Suffix	Part No.	Type	Part No.
10102/1/1	FS analog input module (4 channels)	none	–	10102/2/1 11301	3400142
10102/1/2	FS analog input module (4 channels)	none	–	10102/2/1 11301	3400142
10103/1/1	Intrinsically safe input module (4 ch.)	none	–	none	–
10103/1/2	Intrinsically safe input module (4 ch.)	none	–	none	–
10104/1/1	Digital input module (24 Vdc, 16 ch.)	none	–	10101/2/1 11000	3400110
10104/2/1	Digital input module (24 Vdc, 16 ch.)	10101/2/1 11000	3400110	–	–
10201/1/1	Fail-safe digital output module (24 Vdc, 0.55 A, 8 channels)	none	–	10201/2/1 11501	3400148
10203/1/2	Fail-safe output module with double switch-off (24 Vdc, 0.9 A, 4 channels)	none	–	none	–
10205/1/1	Fail-safe analog output module (0(4)-20 mA, 2 channels)	none	–	10205/2/1 11600	3400116
10206/1/1	Digital output module (24 Vdc, 0.55 A, 12 channels)	none	–	10206/2/1 11702	3400172
10207/1/1	Intrinsically safe optocoupler output module (8 channels)	none	–	none	–
10208/1/1	Relay output module (contacts, 36 Vdc, 2 A, 10 channels)	none	–	10208/2/1 11800	3400118
10209/1/1	Digital output module (24 Vdc, 0.1 A, 16 channels)	none	–	10209/2/1 11900	3400119
10212/1/1	Digital output module (24 Vdc, 0.9 A, 8 channels)	none	–	none	–
10213/1/1	Fail-safe digital output module (110 Vdc, 0.32 A, 4 channels)	none	–	10213/2/1 12002	3400173
10213/1/2	Fail-safe digital output module (60 Vdc, 0.67 A, 4 channels)	none	–	10213/2/2 12101	3400167
10213/1/3	Fail-safe digital output module (48 Vdc, 0.75 A, 4 channels)	none	–	10213/2/3 12201	3400168
10215/1/1	Fail-safe digital output module (24 Vdc, 2 A, 4 channels)	none	–	10215/2/1 12302	3400174
10216/1/1	Fail-safe loop-monitored digital output module (24 Vdc, 1 A, 4 channels)	none	–	10216/2/1 12400	3400124

FSC modules with special functions

Table 3 below lists the FSC modules with special functions that were withdrawn in June 1999.

Table 3 Obsolete FSC modules with special functions

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	Description	Model+Suffix	Part No.	Type	Part No.
10302/1/1	Watchdog repeater module (WDR)	none	–	10302/2/1 12600	3400126
10305/1/1	0-20 mA to 0-5 V analog input converter (16 channels)	none	–	none	–
10305/1/2	Loop-monitored input converter (16 channels)	none	–	none	–
10309/1/1	Dual BNC connector interface module	none	–	Weidmuller	–
07177/1/4	PC serial interface + key module with RS-232 / RS-485 serial interfaces and EPROM programmer interface	none	–	none	–
07177/1/5	PC serial interface + key module with RS-232 / RS-485 serial interfaces and EPROM programmer interface	none	–	none	–
07177/1/6	PC serial interface + key module with RS-232 / RS-485 serial interfaces and EPROM programmer interface	none	–	none	–

Cables

Table 4 below lists the cables that were withdrawn in June 1999.

Table 4 Obsolete cables

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	Description	Model+Suffix	Part No.	Type	Part No.
WDG cable	Interconnection cable 10313/1/1 ↔ 10005/0/1	none	–	WDG-C cable	4212118
51190896-100	UCN drop cable pair (51190896-100) (thin and flexible)	none	–	SMSUCN01	4010242
SIC-C-01	System interconnection cable terminating on FTAs	none	–	SIC-C-12	–
SIC-C-09	System interconnection cable terminating on FTAs	none	–	SIC-C-12	–
SIC-P-01	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–
SIC-P-02	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–
SIC-P-03	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–

Table 4 Obsolete cables (continued)

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	Description	Model+Suffix	Part No.	Type	Part No.
SIC-P-04	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–
SIC-P-05	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–
SIC-P-07	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–
SIC-P-08	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–
SIC-P-09	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–
SIC-P-11	System interconnection cable terminating on crimp pins	SIC-P-12	–	–	–

FTAs

Table 5 below lists the FTAs that were withdrawn in June 1999.

Table 5 Obsolete FTAs

Obsolete Module		Replaced by Module		Alternative Module	
Model ID	Description	Model+Suffix	Part No.	Type	Part No.
FTA-T-01	Fail-safe digital input FTA (24/48/60 Vdc, 24 channels)	none	–	FTA-T-21	3410724
FTA-T-06	Fail-safe active digital input FTA (115 Vac, 8 channels)	none	–	FTA-T-29	3410726
FTA-T-07	Fail-safe passive digital input FTA (115 Vac, 8 channels)	FTA-T-29	3410726	–	–
FTA-T-10	Digital output (relay contact) FTA (8 channels)	none	–	FTA-T-20	3410723
FTA-T-13	Current-limited digital input FTA (24 Vdc, 16 channels)	none	–	FTA-T-23	3410725

Obsolete Modules as of August 2000

10004/*x*/*x* modules

Table 6 below lists the 10004/*x*/*x* communication modules that were withdrawn in August 2000.

Table 6 Obsolete 10004/*x*/*x* modules

Current COM module with EPROM/RAM which will be withdrawn		Replaced by ECM module (pin-to-pin compatible)		
Model ID	**Description**	**Model+Suffix**	**Part No.**	**Description**
10004/F/F	Communication module (COM) with: - two Tri-state RS232 interfaces	10024/F/F 26500	3400265	Enhanced Communication Module (ECM) with : - two Tri–state RS232 interfaces
10004/F/G	Communication module (COM) with: - Tri-state RS232 interface and - glass fiber interface	10024/F/G 26600	3400266	Enhanced Communication module (ECM) with: - Tri-state RS232 interface and - glass fiber interface
10004/G/G	Communication module (COM) with: – two glass fiber interface	10024/G/G 26700	3400267	Enhanced Communication module (ECM) with: - two glass fiber interface
10004/H/F	Communication module (COM) with: - interface between Central Parts and - Tri-state RS232 interface	10024/H/F 26800	3400268	Enhanced Communication module (ECM) with: - interface between Central Parts and - Tri-state RS232 interface
10004/H/I	Communication module (COM) with: - interface between Central Parts and – RS422/485 interface	10024/H/I 26900	3400269	Enhanced Communication module (ECM) with: - interface between Central Parts and – RS422/485 interface
10004/H/G	Communication module (COM) with: - interface between Central Parts and - glass fiber interface	10024/H/G 27000	3400270	Enhanced Communication module (ECM) with: - interface between Central Parts and - glass fiber interface
10004/I/F	Communication module (COM) with: – RS422/485 interface and - Tri-state RS232 interface	10024/I/F 27100	3400271	Enhanced Communication module (ECM) with: – RS422/485 interface and - Tri-state RS232 interface
10004/I/G	Communication module (COM) with: – RS422/485 interface and - glass fiber interface	10024/I/G 27200	3400272	Enhanced Communication module (ECM) with: – RS422/485 interface and - glass fiber interface
10004/I/I	Communication module (COM) with: – two RS422/485 interface	10024/I/I 27300	3400273	Enhanced Communication module (ECM) with: – two RS422/485 interface

10014/*x*/*x* modules

Table 7 below lists the 10014/*x*/*x* communication modules that were withdrawn in August 2000.

Table 7 Obsolete 10014/*x*/*x* modules

Current COM module with FLASH which will be withdrwan		Replaced by ECM module (pin-to-pin compatible)		
Model ID	**Description**	**Model+Suffix**	**Part No.**	**Description**
10014/F/F	Communication module (COM) with: - two Tri-state RS232 interfaces	10024/F/F 26500	3400265	Enhanced Communication Module (ECM) with : - two Tri–state RS232 interfaces
10014/F/G	Communication module (COM) with: - Tri-state RS232 interface and - glass fiber interface	10024/F/G 26600	3400266	Enhanced Communication module (ECM) with: - Tri-state RS232 interface and - glass fiber interface
10014/G/G	Communication module (COM) with: – two glass fiber interface	10024/G/G 26700	3400267	Enhanced Communication module (ECM) with: - two glass fiber interface
10014/H/F	Communication module (COM) with: - interface between Central Parts and - Tri-state RS232 interface	10024/H/F 26800	3400268	Enhanced Communication module (ECM) with: - interface between Central Parts and - Tri-state RS232 interface
10014/H/I	Communication module (COM) with: - interface between Central Parts and – RS422/485 interface	10024/H/I 26900	3400269	Enhanced Communication module (ECM) with: - interface between Central Parts and – RS422/485 interface
10014/H/G	Communication module (COM) with: - interface between Central Parts and - glass fiber interface	10024/H/G 27000	3400270	Enhanced Communication module (ECM) with: - interface between Central Parts and - glass fiber interface
10014/I/F	Communication module (COM) with: – RS422/485 interface and - Tri-state RS232 interface	10024/I/F 27100	3400271	Enhanced Communication module (ECM) with: – RS422/485 interface and - Tri-state RS232 interface
10014/I/G	Communication module (COM) with: – RS422/485 interface and - glass fiber interface	10024/I/G 27200	3400272	Enhanced Communication module (ECM) with: – RS422/485 interface and - glass fiber interface
10014/I/I	Communication module (COM) with: – two RS422/485 interface	10024/I/I 27300	3400273	Enhanced Communication module (ECM) with: – two RS422/485 interface

Obsolete Modules as of December 2000

FTA modules

Table 8 below lists the module that was withdrawn in December 2000.

Table 8 Obsolete FTA

Obsolete Module		Replaced by Module		Alternative Module	
Model ID	Description	Model+Suffix	Part No.	Type	Part No.
FTA-T-09	Fail-safe passive digital input FTA (115 Vac/dc, 8 channels)	FTA-T-29	3410726	–	

Obsolete Modules as of January 2002

Central Part modules

Table 9 below lists the Central Part modules that were withdrawn in January 2002.

Table 9 Obsolete Central Part modules

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	Description	Model+Suffix	Part No.	Model+Suffix	Part No.
10002/1/2	Central processor unit (CPU)	–	–	10020/1/2 29100	3400291
10002/A/2	CPU flash memory card	–	–	10020/1/2 29100	3400291
10008/2/U	FSC Safety Manager Module (FSC-SMM)	10018/2/U 22702	3400284	10018/2/U 22702	3400284

Obsolete Modules as of August 2002

Central Part modules

Table 10 below lists the Central Part modules that were withdrawn in August 2002.

Table 10 Obsolete Central Part modules

Obsolete Module		Replaced by Module (pin-compatible)		Alternative Module (same functionality)	
Model ID	Description	Model+Suffix	Part No.	Model+Suffix	Part No.
10008/3/P	FSC to P-bus communication module	none	–	None	–
10008/P4/1	P-Bus backplane module	none	–	None	–

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Section 2:

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Section 2: Power Supplies

Honeywell

1200 S 24 P067 24 Vdc power supply (45 A)

Description

The 1200 S 24 P067 power supply is a switched-mode DC power supply with a high efficiency (88%). It accepts a wide range of input voltages to provide 24 Vdc, 45 A output.

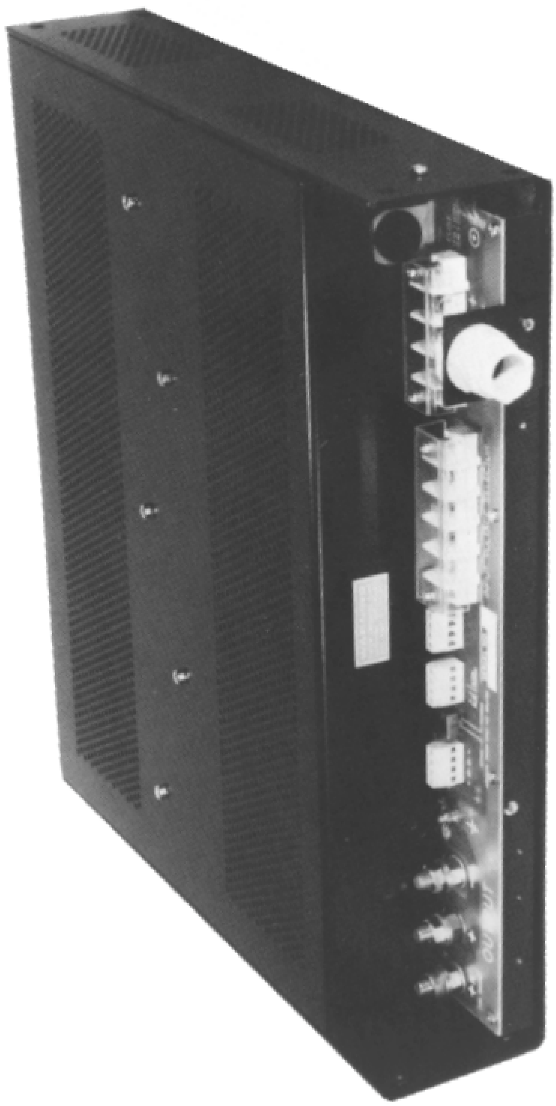


Figure 1 Full view

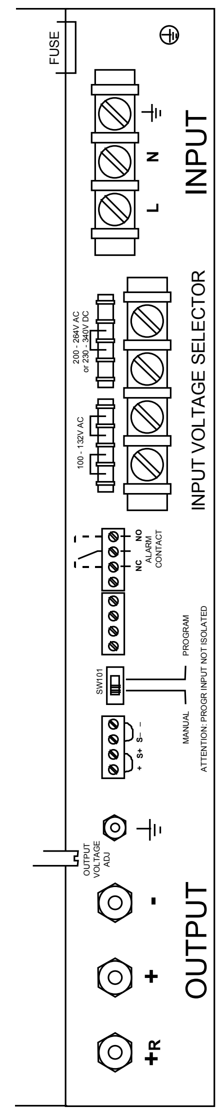


Figure 2 Connections

Main features

The unit's main features include:

- dual built-in overvoltage protection to comply with the strict functional safety requirements of the DIN V 19250 and VDE V 0801 standards,
- undervoltage alarm,
- redundant parallel operation (+R),
- serial operation (e.g. to create 48 Vdc), and
- optimum protection against continuous overload and short-circuiting.

Green LEDs in the front and rear panels are lit if the output voltage is present.

Installation

The 1200 S 24 P067 power supply can be mounted both vertically and horizontally, although vertical mounting is preferred for optimum cooling.
Convection cooling works best when the unit is mounted vertically, with the input connections facing upwards (see Figure 3). The unit is constructed in such a way that the heat generated in the semiconductors and transformer flows through a thick aluminum profile to both covers, which act as heat sinks. Thus, it is important that the air can flow freely along both vertical sides of the power supply unit. This design with natural convection cooling was chosen to avoid the use of forced ventilation, which has disadvantages like reliability, wear and tear, noise and dust filters. The unit is shipped with two H88 brackets for easy mounting.

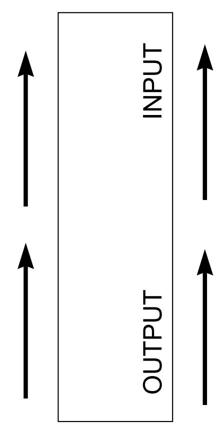


Figure 3 Vertical mounting

Although vertical mounting is preferred, the unit may also be mounted horizontally, providing that the maximum ambient temperature does not exceed 40°C (104°F) at full load (see Figure 4). When mounted in a 19" rack, the unit must have sufficient free space around it for optimum cooling (min. 1 HE, 1U).

Note:
If multiple power supplies are to be mounted above each other horizontally, it is recommended to use forced air cooling.

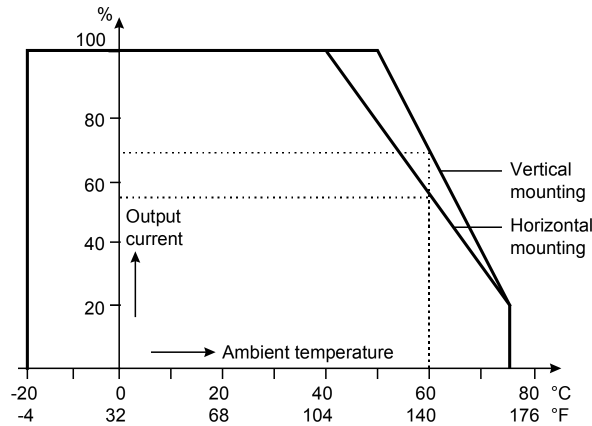


Figure 4 Derating curve
(percentage of load versus ambient temperature)

Recommended wire sizes

The table below shows the recommended wire sizes for the power supply's input and output wiring.

Table 1 Recommended wire sizes

INPUT		OUTPUT	
230 Vac	**115 Vac**	**24 Vdc**	**Voltage drop**
2.5 mm² (AWG 14)	4.0 mm² (AWG 12)	16 mm² (AWG 6)	50.4 mV/m at 45 A

Current limit

The unit has a current limit feature, which is used to limit the maximum output to 1100 W. Figure 5 shows the power supply's current limit curve.

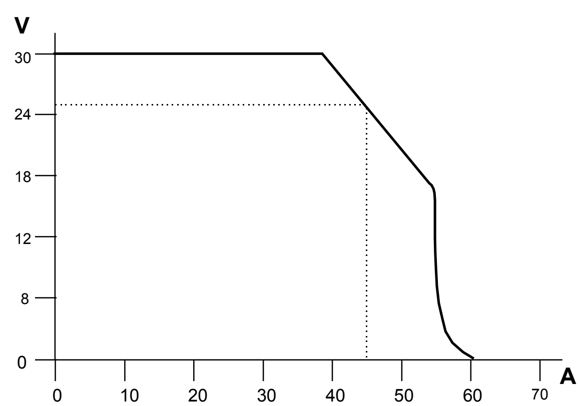


Figure 5 Current limit

Hardware control features

The 1200 S 24 P067 power supply has a number of features which allow the unit to be tailored to specific applications (see Figure 2). They are:

- an output adjustment selector switch (SW101),
- an input voltage selector block,
- a sense block, and
- an alarm contact.

Each of these features is discussed in more detail below.

Output adjustment selector switch (SW101)

For FSC applications, switch SW101 must be in the MANUAL position, which means that the output voltage can be adjusted using the potentiometer at the back (see Figure 2).

Input voltage selector block

The power supply accepts a wide input voltage range. The input voltage selector block (see Figure 2) is used to set the input voltage range.

With the jumper in the 230 V position (see Figure 6), the unit can be used at any line voltage between 200 and 264 Vac, 50/60 Hz (or between 230 and 340 Vdc). Place a 12.5 A fuse in the fuse holder.

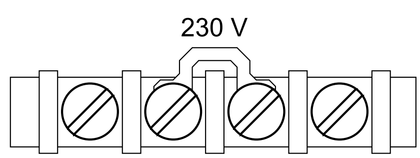


Figure 6 Selector block set at 230 V

With the two jumpers in the 115 V position (see Figure 7), the unit can be used at any line voltage between 100 and 132 Vac 50/60 Hz. Place a 25 A fuse in the fuse holder.

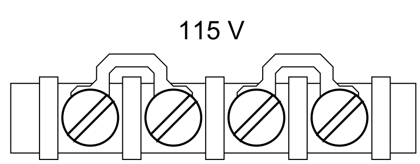


Figure 7 Selector block set at 115 V

Sense block

For FSC applications (no remote sensing), S+ on the sense block (see Figure 8) must be connected to + and S– to –. This is the default factory setting.

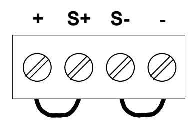


Figure 8 Sense block

Alarm contact

The alarm contact (see Figure 9) is used for voltage monitoring. The alarm contact diagram shows the relay energized, which means that the output voltage is above 90% of the output voltage setting.

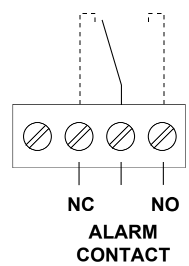


Figure 9 Relay contact alarm diagram

Technical data

The 1200 S 24 P067 power supply unit has the following specifications:

General	Type number:	1200 S 24 P067
	Approvals:	CE, TÜV, UL
Power	Power requirements:	200-264 Vac, 50/60 Hz; 8.2 A rms, 12.5 AT fuse (see Figure 6)
		100-132 Vac, 50/60 Hz; 16.4 A rms, 25 AT fuse (see Figure 7)
		230-340 Vdc (see Figure 6); 4.7 A dc, 12.5 AT fuse
	Power consumption at no load:	< 40 W
	Acceptable frequency variability:	48-62 Hz
Physical	Dimensions:	433 x 88 x 385 mm (W x H x D) 17.05 x 3.46 x 15.16 in (W x H x D)
	Weight:	11 kg (24.2 lb)
	Fuse dimensions:	32 x 6.3 mm (1.26 x 0.25 in)
Environment	Ambient temperatures:	
	– storage	–40°C to +85°C (–40°F to +185°F)
	– operating	–20°C to +75°C (–4°F to +167°F) (see Figure 4 for derating of output current as a function of ambient temperature)
Input	Inrush current:	< 40 A
Output	Output voltage:	24 Vdc with dual overvoltage protection
	Ripple and noise:	Max. 5 mV rms, 15 mV p-p

Technical data (continued)

Output (cont.)	Output current:	45 A at –20°C to +50°C (–4°F to +122°F) when mounted vertically
		45 A at –20°C to +40°C (–4°F to +104°F) when mounted horizontally
	Derating of output current:	to 68% at 60°C (140°F) when mounted vertically
		to 54% at 60°C (140°F) when mounted horizontally
		(see Figure 4 for derating curve)
	Hold-up time:	15 ms at 220 Vac input and full load 30 ms at half load
	Output voltage setting:	25 Vdc (+R output)
	Efficiency of +R output:	88% at 230 Vac
	Undervoltage alarm contact:	Relay de-energizes when output voltage drops below 90% of the output voltage setting. Contact rating: 100 mA / 30 V
	Voltage limit:	For safety, two independent regulation circuits limit the output voltage to approx. 31 V in case of malfunction of the normal regulation.
	Serial operation:	up to 500 V total voltage
Isolation	Input to output:	3750 V rms (1 min.)
	Input to case:	2500 V rms (1 min.)
	Output to case:	500 Vdc

Left blank intentionally.

M24-20HE 24 Vdc power supply (20 A)

Description

The power supply M24-20HE is a linear power supply with high efficiency (74%). It is available in a number of versions that accept different AC input voltages: 110, 117, 220, 230 or 240 Vac.

The power supply has an extra output (via a diode) for use in redundant operation. It also has a built-in overvoltage protection and a delayed foldback characteristic to prevent overheating in case of overload.

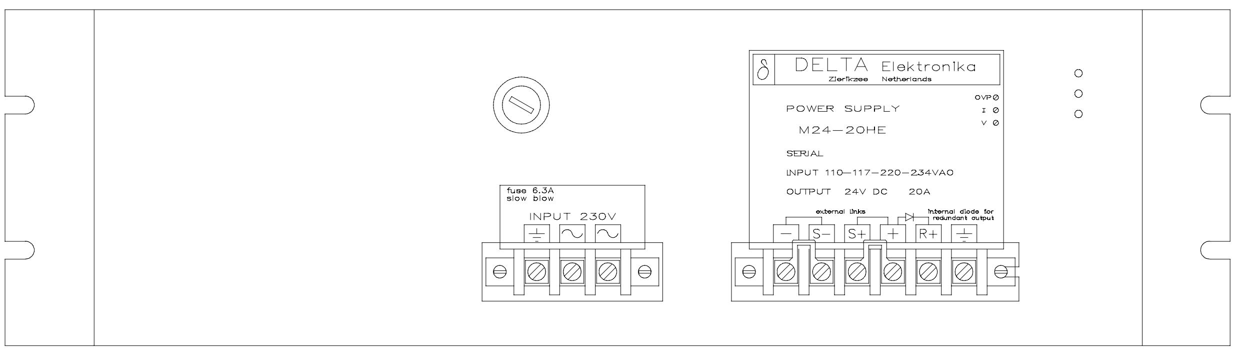


Figure 1 Front view

Delayed foldback

Delayed foldback means that, when the power supply is overloaded, it first goes into constant current and after a few hundred milliseconds into foldback (see Figure 2).

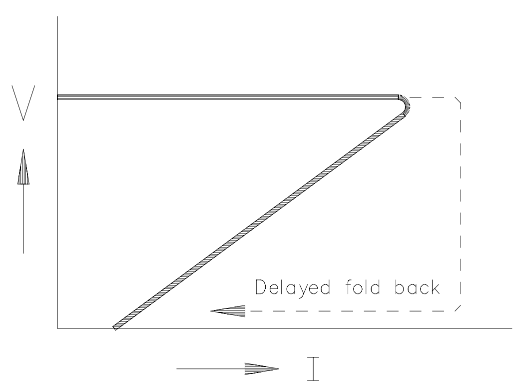


Figure 2 Delayed foldback

Derating curve

The derating curve of the M24-20HE power supply is as follows:

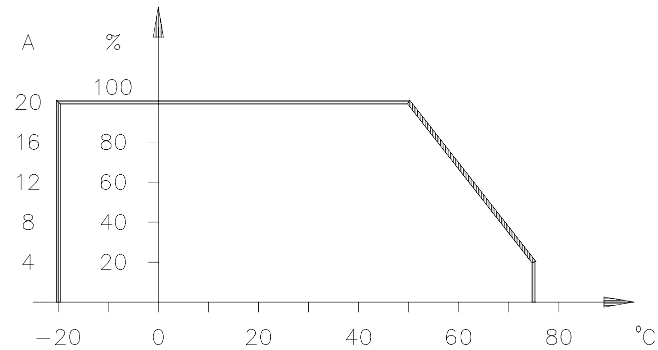


Figure 3 Derating curve (current & percentage of load vs. ambient temperature)

Connections

The transformer connections of the M24-20HE power supply are as follows:

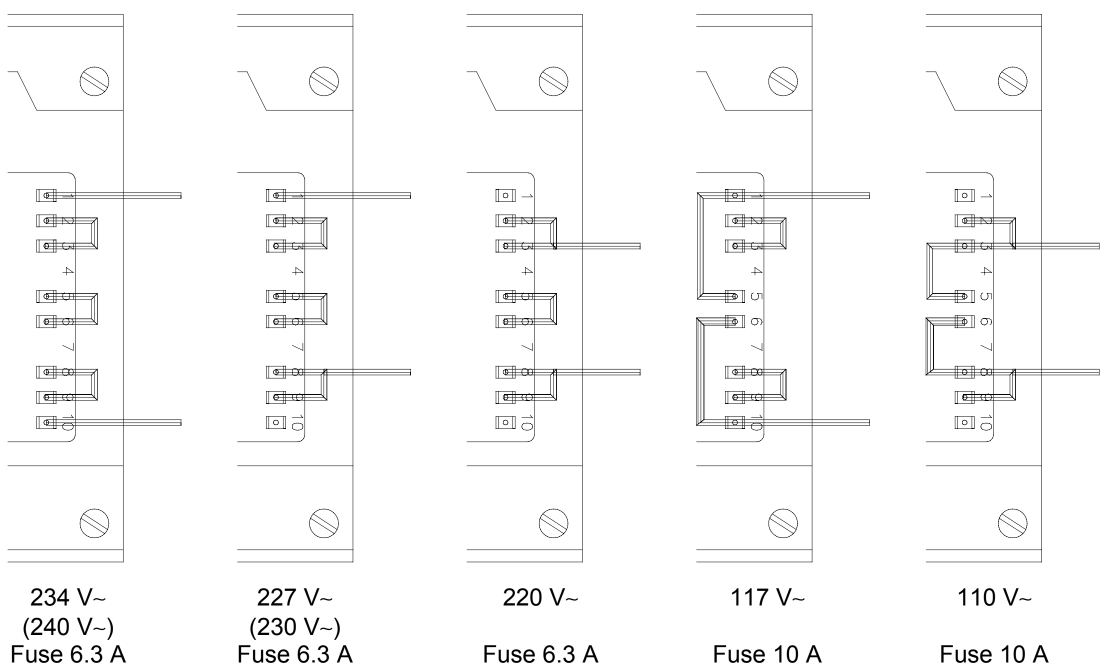


Figure 4 Transformer connections

Wiring example

Figure 5 shows an example of 24 Vdc power distribution for redundant Central Parts with redundant I/O (with common 0 V of 24 Vdc).

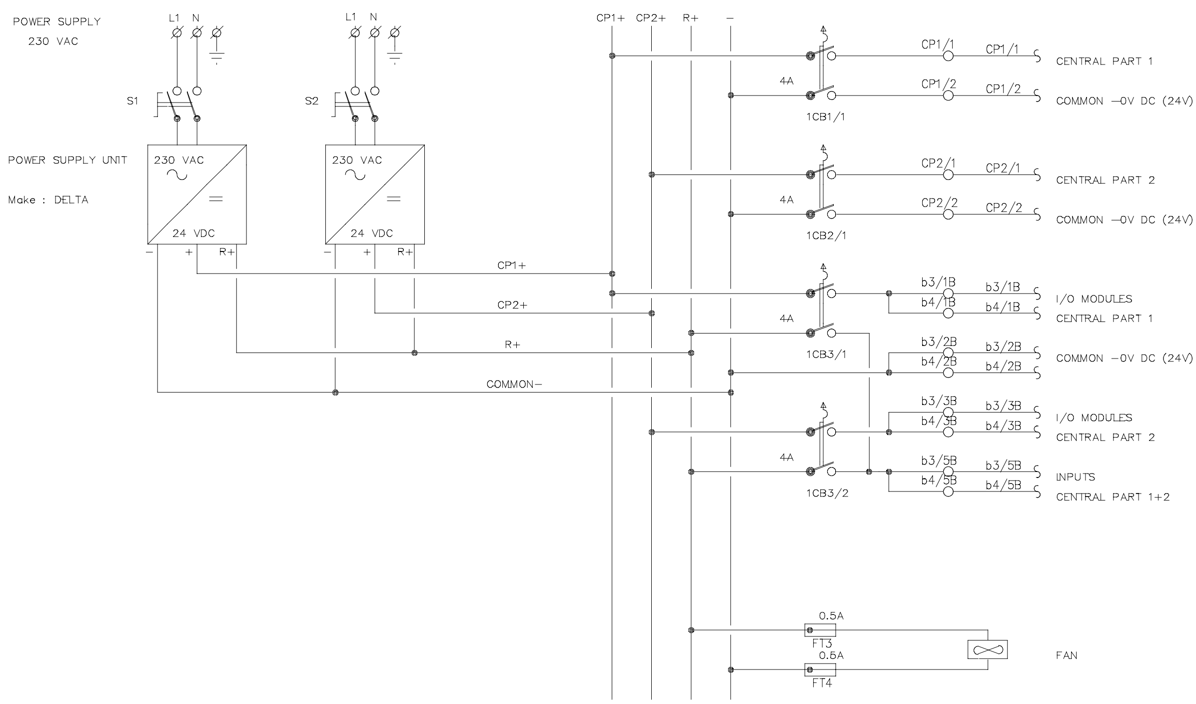


Figure 5   24 Vdc power distribution example

Technical data

The M24-20HE power supply has the following specifications:

General	Type number:	M24-20HE
	Approvals:	CE, TÜV, UL
Power	Power requirements:	110 or 117 Vac (10 AT fuse), ± 10% 220, 230 or 240 Vac (6.3 AT fuse), ± 10%
	Frequency:	50 / 60 Hz (48...62 Hz)
Physical	Space requirements:	84 TE (full rack), 3 HE, 260 mm 84 HP (full rack), 3U, 10.24 in
	Weight:	15.6 kg (34.3 lb)
	Fuse dimensions:	5 x 20 mm (0.20 x 0.79 in)

Technical data (continued)

Environment	Ambient temperature:	–20°C to +60°C (–4°F to +140°F)
Input	Input current:	3.7 A at 220 Vac
	Inrush current:	< 80 A at 220 Vac
	Crest factor:	1.9
Output	Output voltage:	24 Vdc with overvoltage protection
	Ripple content:	< 0.1 V p-p
	Output current:	20 A at –20°C to +50°C (–4°F to +122°F)
		13.5 A at 50°C to 60°C (122°F to 140°F)
	Hold-up time:	nominal AC input voltage, see Figure 4 20 ms at full load 50 ms at half load
	Output voltage setting:	25 Vdc (R+ output)
	Maximum current setting:	21 A
	Overvoltage protection:	26 Vdc
	Efficiency:	74%
Isolation	AC input to case:	2500 Vac
	DC output to case:	500 Vdc

M24-12HE 24 Vdc power supply (12 A)

Description

The power supply M24-12HE is a linear power supply with high efficiency (74%). It is available in a number of versions that accept different AC input voltages: 110, 117, 220, 230 or 240 Vac.

The power supply has an extra output (via a diode) for use in redundant operation. It also has a built-in overvoltage protection and a delayed foldback characteristic to prevent overheating in case of overload.

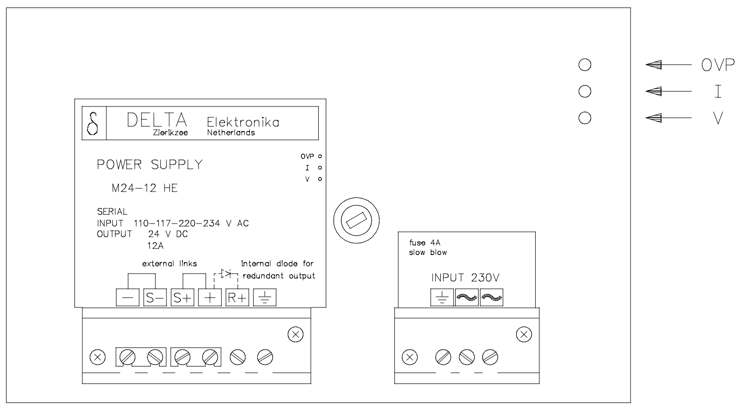


Figure 1 Back view

As the M24-12HE power supply uses only half a rack, the other half can be used for a second M24-12HE unit or an M60-5HE power supply. If the second half is not used, this space should be filled with an empty half rack, type M 1/2.
Mounting the two supply units (or one supply unit and an empty unit) in a cabinet requires two brackets, type number: H7-with grip.

Delayed foldback

Delayed foldback means that, when the power supply is overloaded, it first goes into constant current and after a few hundred milliseconds into foldback (see Figure 2).

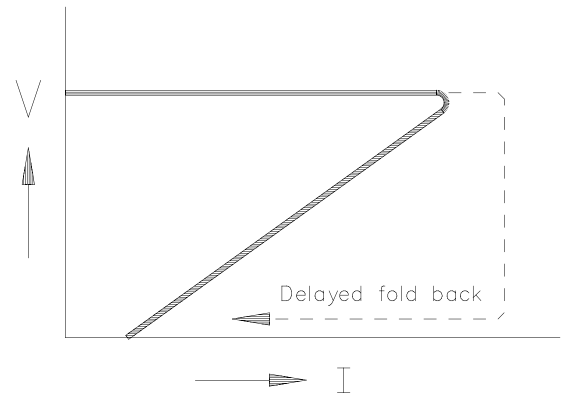


Figure 2 Delayed foldback

Derating curve

The derating curve of the M24-12HE power supply is as follows:

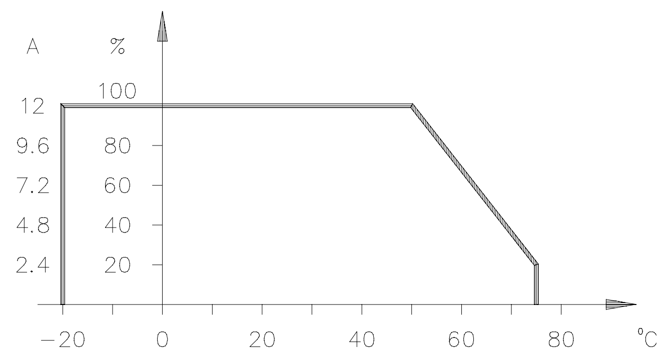


Figure 3 Derating curve (current & percentage of load vs. ambient temperature)

Connections

The transformer connections of the M24-12HE power supply are as follows:

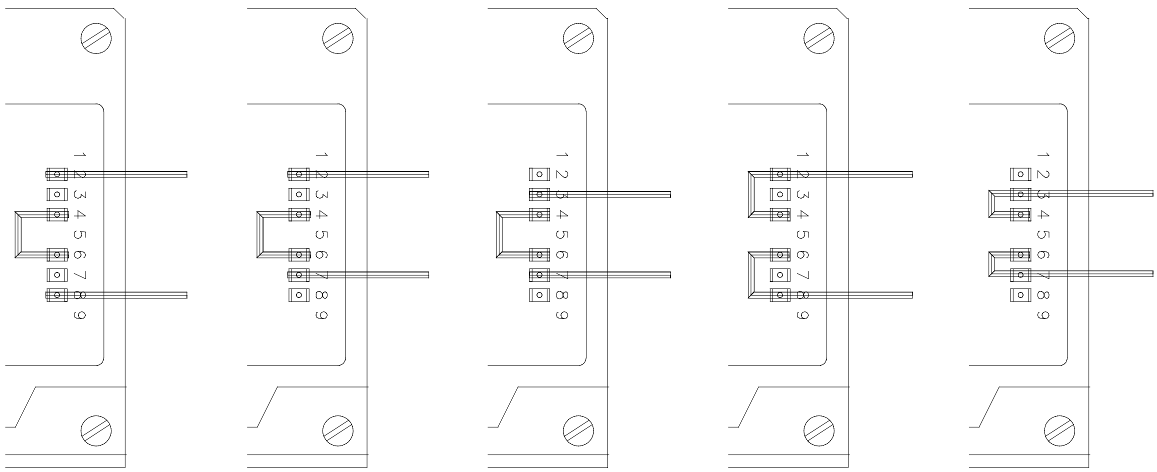


Figure 4 Transformer connections

Wiring example

Figure 5 shows an example of 24 Vdc power distribution for redundant Central Parts with redundant I/O (with common 0 V of 24 Vdc).

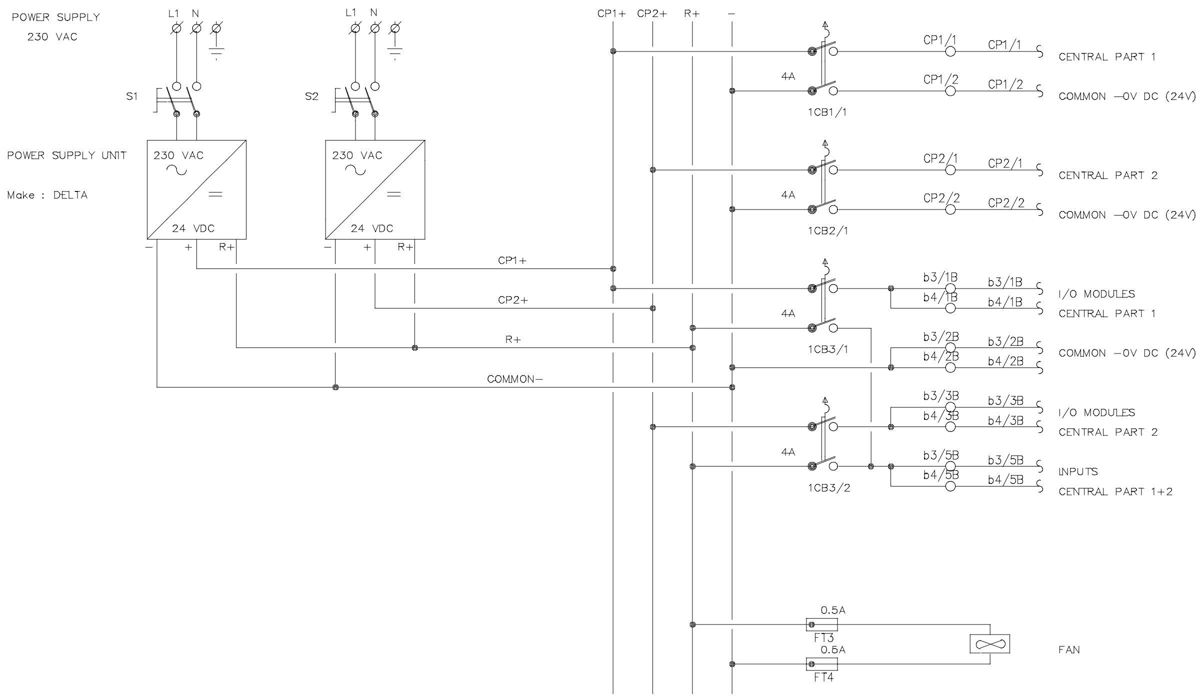


Figure 5 24 Vdc power distribution example

Technical data

The M24-12HE power supply has the following specifications:

General

Type number:	M24-12HE
Approvals:	CE, TÜV, UL

Power

Power requirements:	110 or 117 Vac (6.3 AT fuse), ± 10% 220, 230 or 240 Vac (4 AT fuse), ± 10%
Frequency:	50 / 60 Hz (48...62 Hz)

Physical

Space requirements:	42 TE (half rack), 3 HE, 275 mm 42 HP (half rack), 3U, 10.83 in
Weight:	8.8 kg (19.4 lb)
Fuse dimensions:	5 x 20 mm (0.20 x 0.79 in)

Technical data (continued)

Environment	Ambient temperature:	–20°C to +60°C (–4°F to +140°F)
Input	Input current:	2.2 A at 220 Vac
	Inrush current:	< 40 A at 220 Vac
	Crest factor:	1.8
Output	Output voltage:	24 Vdc with overvoltage protection
	Ripple content:	< 0.1 V p-p
	Output current:	12 A at –20°C to +50°C (–4°F to +122°F) 8.5 A at 50°C to 60°C (122°F to 140°F)
	Hold-up time:	Nominal AC input voltage, see Figure 4 20 ms at full load 50 ms at half load
	Output voltage setting:	25 Vdc (R+ output)
	Maximum current setting:	12.5 A
	Overvoltage protection:	26 Vdc
	Efficiency:	74%
Isolation	AC input to case:	2500 Vac
	DC output to case:	500 Vdc

Left blank intentionally.

M48-10HE 48 Vdc power supply (10 A)

Description

The power supply M48-10HE is a linear power supply with high efficiency (75%). It is available in a number of versions that accept different AC input voltages: 110, 117, 220, 230 or 240 Vac.

The power supply has an extra output (via a diode) for use in redundant operation. It also has a built-in overvoltage protection and a delayed foldback characteristic to prevent overheating in case of overload.

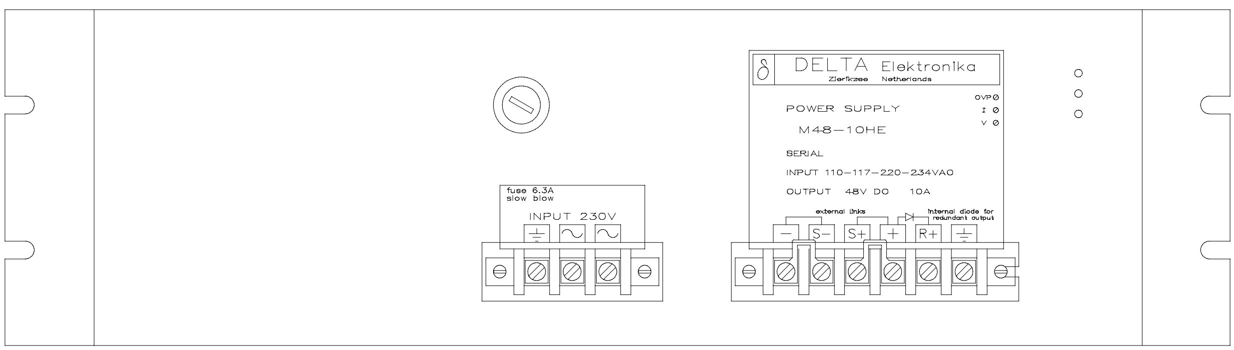


Figure 1 Front view

Delayed foldback

Delayed foldback means that, when the power supply is overloaded, it first goes into constant current and after a few hundred milliseconds into foldback (see Figure 2).

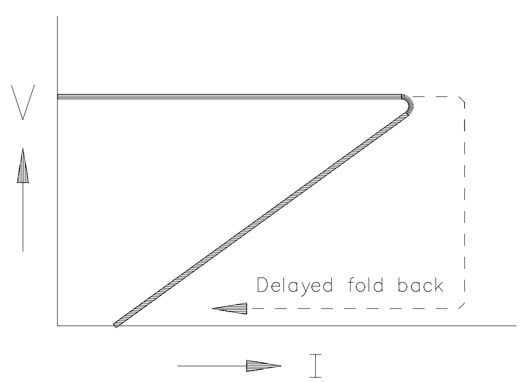


Figure 2 Delayed foldback

Derating curve

The derating curve of the M48-10HE power supply is as follows:

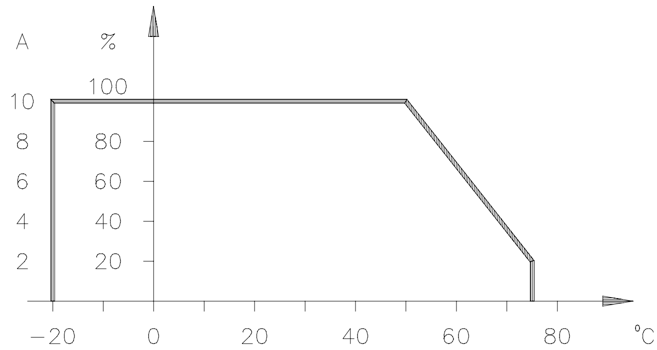


Figure 3 Derating curve (current & percentage of load vs. ambient temperature)

Connections

The transformer connections of the M48-10HE power supply are as follows:

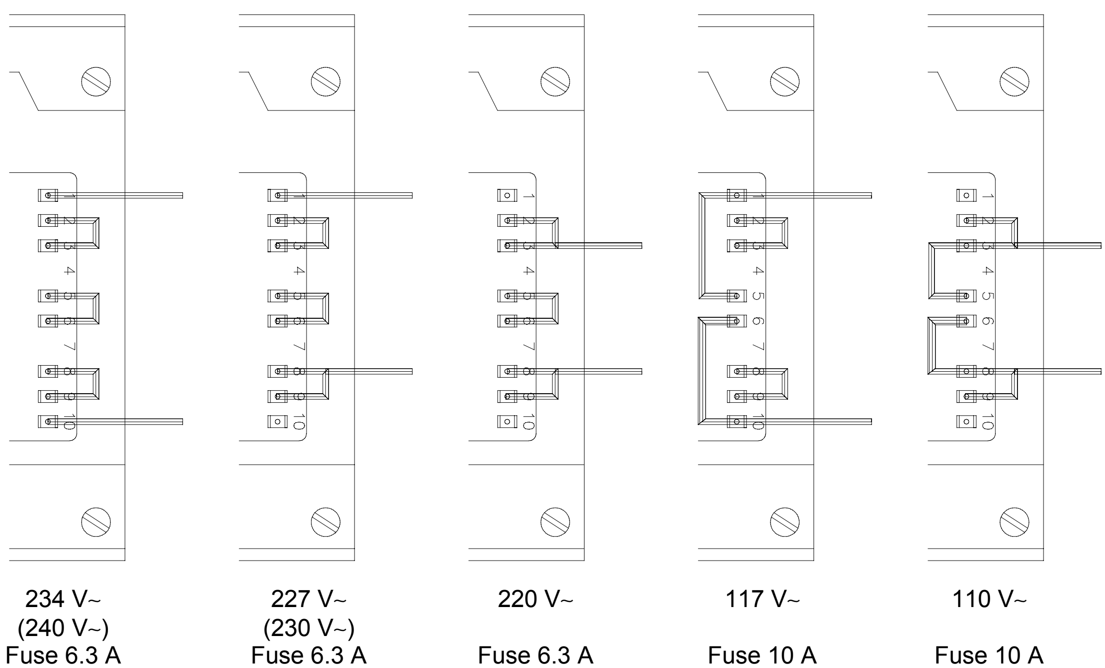


Figure 4 Transformer connections

Technical data

The M48-10HE power supply has the following specifications:

General	Type number:	M48-10HE
	Approvals:	CE, TÜV, UL
Power	Power requirements:	110 or 117 Vac (10 AT fuse), ± 10% 220, 230 or 240 Vac (6.3 AT fuse), ± 10%
	Frequency:	50 / 60 Hz (48...62 Hz)
Physical	Space requirements:	84 TE (full rack), 3 HE, 260 mm 84 HP (full rack), 3U, 10.24 in
	Weight:	15.6 kg (34.3 lb)
	Fuse dimensions:	5 x 20 mm (0.20 x 0.79 in)
Environment	Ambient temperature:	–20°C to +60°C (–4°F to +140°F)
Input	Input current:	3.7 A at 220 Vac
	Inrush current:	< 80 A at 220 Vac
	Crest factor:	1.9
Output	Output voltage:	48 Vdc with overvoltage protection
	Ripple content:	< 0.2 V p-p
	Output current:	10 A at –20°C to +50°C (–4°F to +122°F) 7 A at 50°C to 60°C (122°F to 140°F)
	Hold-up time:	Nominal AC input voltage, see Figure 4 15 ms at full load 30 ms at half load
	Output voltage setting:	49 Vdc (R+ output)
	Maximum current setting:	10.5 A
	Overvoltage protection:	50 Vdc
	Efficiency:	75%
Isolation	AC input to case:	2500 Vac
	DC output to case:	500 Vdc

M60-5HE 48/60 Vdc power supply (5 A)

Description

The power supply M60-5HE is a linear power supply with high efficiency (75%). It is available in a number of versions that accept different AC input voltages: 110, 117, 220, 230 or 240 Vac.
The output voltage of this power supply unit can be either 48 Vdc or 60 Vdc.

Note:
Changing the output voltage from 48 V to 60 V or vice versa requires changing a transformer tap (see Figure 5) and readjustment of the '0VP' and 'V' potentiometers.

The power supply has an extra output (via a diode) for use in redundant operation. It also has a built-in overvoltage protection and a delayed foldback characteristic to prevent overheating in case of overload.

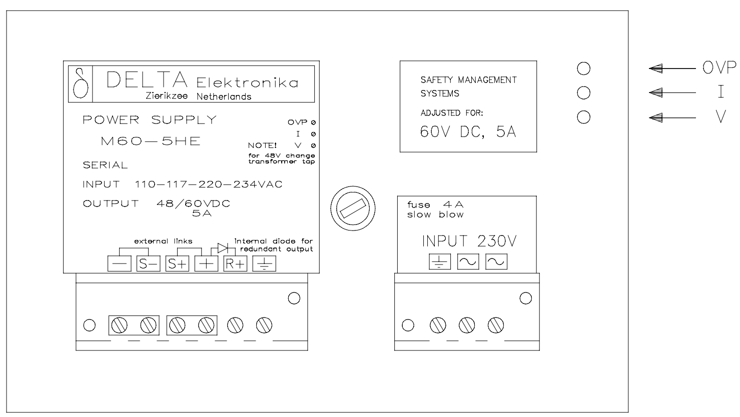


Figure 1 Back view

As the M60-5HE power supply uses only half a rack, the other half can be used for a second M60-5HE unit or an M24-12HE power supply. If the second half is not used, this space should be filled with an empty half rack, type M 1/2.
Mounting the two supply units (or one supply unit and an empty unit) in a cabinet requires two brackets, type number: H7-with grip.

Delayed foldback

Delayed foldback means that, when the power supply is overloaded, it first goes into constant current and after a few hundred milliseconds into foldback (see Figure 2).

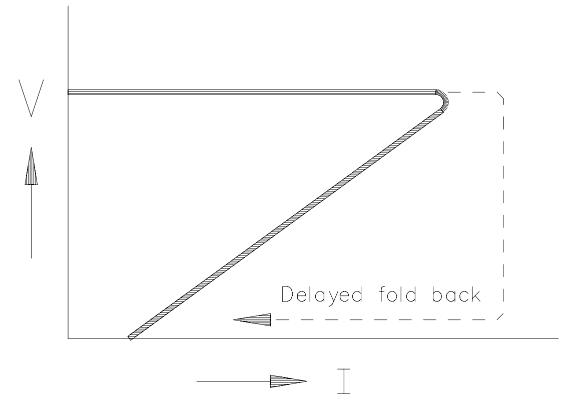


Figure 2 Delayed foldback

Derating curve

The derating curve of the M60-5HE power supply is as follows:

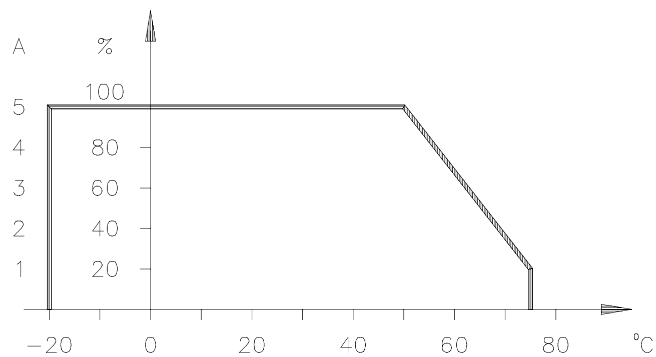
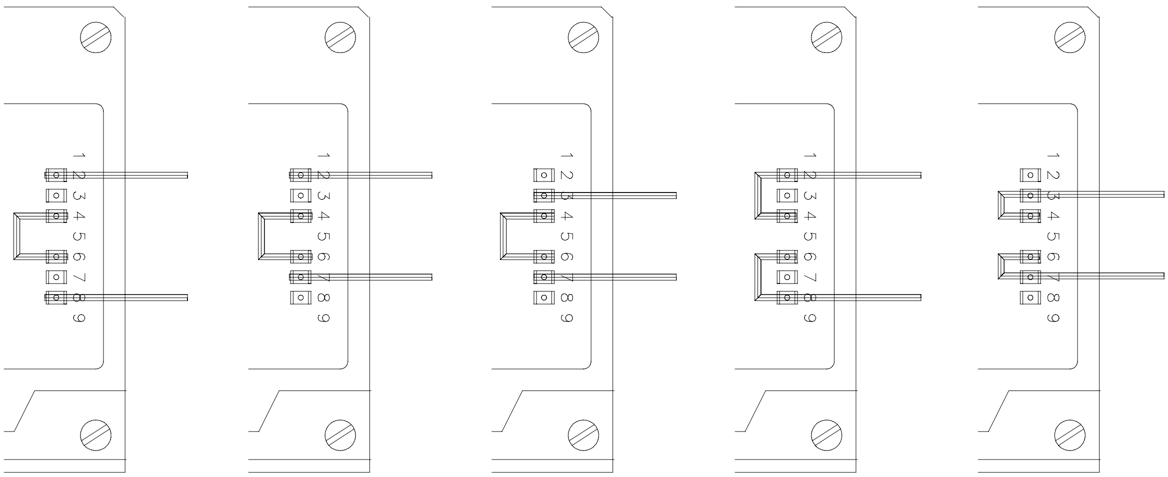


Figure 3 Derating curve (current & percentage of load vs. ambient temperature)

Connections

The transformer connections of the M60-5HE power supply are as follows:



234 V~ (240 V~) Fuse 4 A	227 V~ (230 V~) Fuse 4 A	220 V~ Fuse 4 A	117 V~ Fuse 6.3 A	110 V~ Fuse 6.3 A

Figure 4 Transformer connections: primary side

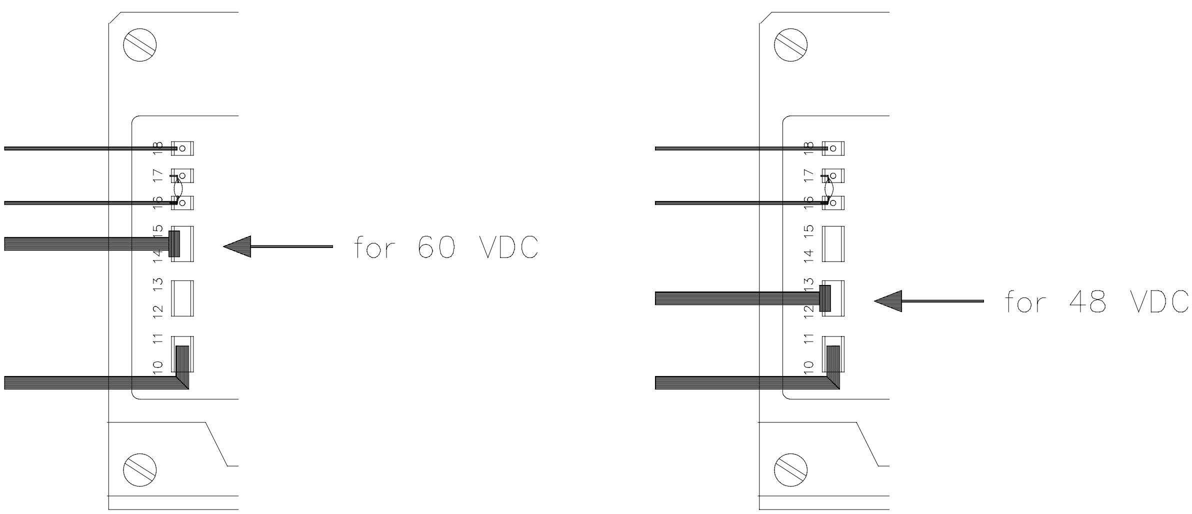


Figure 5 Transformer connections: secondary side

Technical data

The M60-5HE power supply has the following specifications:

General	Type number:	M60-5HE
	Approvals:	CE, TÜV, UL
Power	Power requirements:	110 or 117 Vac (6.3 AT fuse), ± 10% 220, 230 or 240 Vac (4 AT fuse), ± 10%
	Frequency:	50 / 60 Hz (48...62 Hz)
Physical	Space requirements:	42 TE (half rack), 3 HE, 275 mm 42 HP (half rack), 3U, 10.83 in
	Weight:	8.8 kg (19.4 lb)
	Fuse dimensions:	5 x 20 mm (0.20 x 0.79 in)
Environment	Ambient temperature:	–20°C to +60°C (–4°F to +140°F)
Input	Input current:	2.2 A at 220 Vac
	Inrush current:	< 40 A at 220 Vac
	Crest factor:	1.8
Output	Output voltage:	48 Vdc or 60 Vdc with overvoltage protection
	Ripple content:	< 0.2 V p-p
	Output current:	5 A at –20°C to +50°C (–4°F to +122°F) 3.5 A at 50°C to 60°C (122°F to 140°F)
	Hold-up time:	Nominal AC input voltage, see Figure 4 15 ms at full load 30 ms at half load

Technical data (continued)

Output (cont.)	Output voltage setting (48 V):	49 Vdc (R+ output)
	Output voltage setting (60 V):	61 Vdc (R+ output)
	Maximum current setting:	5.3 A
	Overvoltage protection (48 V):	50 Vdc
	Overvoltage protection (60 V):	62 Vdc
	Efficiency:	75%
Isolation	AC input to case:	2500 Vac
	DC output to case:	500 Vdc

Left blank intentionally.

10300/1/1 24 Vdc to 5 Vdc/12 A converter

Description

The supply voltage of the FSC system is 24 Vdc, which can be powered from the plant's 24 Vdc supply system with battery back-up. The FSC system uses an internal 5 Vdc to power the FSC modules. The 10300/1/1 DC/DC converter provides the internal 5 Vdc with galvanic isolation between the two supply voltages.

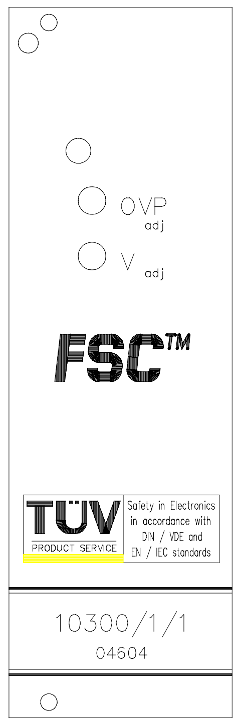


Figure 1 Front view

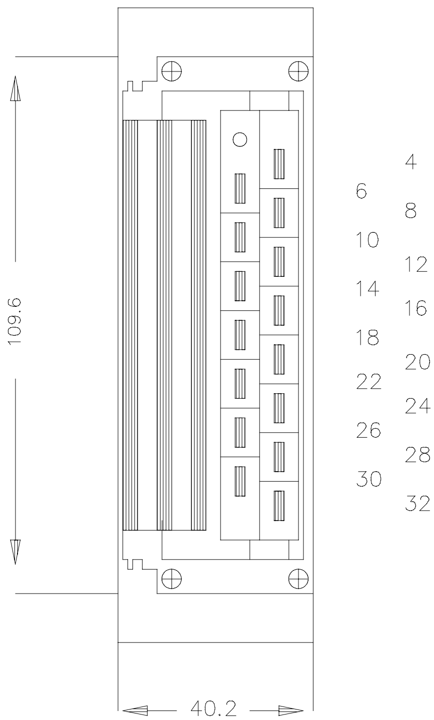
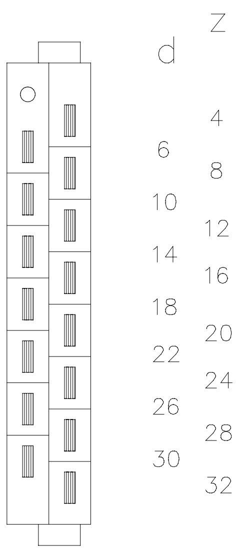


Figure 2 Back view

Note:
Keep 10300/1/1 modules off-line for at least 30 seconds after being on-line. 10300/1/1 modules have an NTC resistor as an inrush current limiter. Replacing (or repowering) the module within 30 seconds after removal (or power-off) may cause a supply voltage dip, which may trip the system (because the NTC resistor did not yet cool down sufficiently).

Pin allocation

The back view and pin allocation of the 10300/1/1 power connector are as follows:



d6	+ sense	z4	Supply 5 Vdc
d10	– sense	z8	Supply 5 Vdc
d14	*(see note below)*	z12	GND 5 Vdc
d18		z16	GND 5 Vdc
d22		z20	
d26	Supply 0 Vdc	z24	Supply 0 Vdc
d30	Supply 24 Vdc	z28	Supply 24 Vdc
		z32	Earth

Notes:
1. 10300/1/1 modules without a suffix code and with suffix code 04601 have an ON/OFF input on pin d14. This pin should not be connected.
2. The 10300/1/1 module is a pin-compatible upgraded version of the GK60 module.

Derating curve

The derating curve of the 10300/1/1 module is as follows:

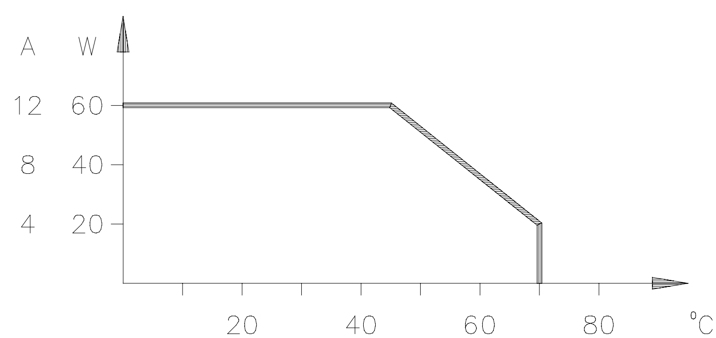


Figure 3 Derating curve (current and power vs. ambient temperature)

Wiring diagram

The 10300/1/1 module is wired in accordance with the wiring diagram below:

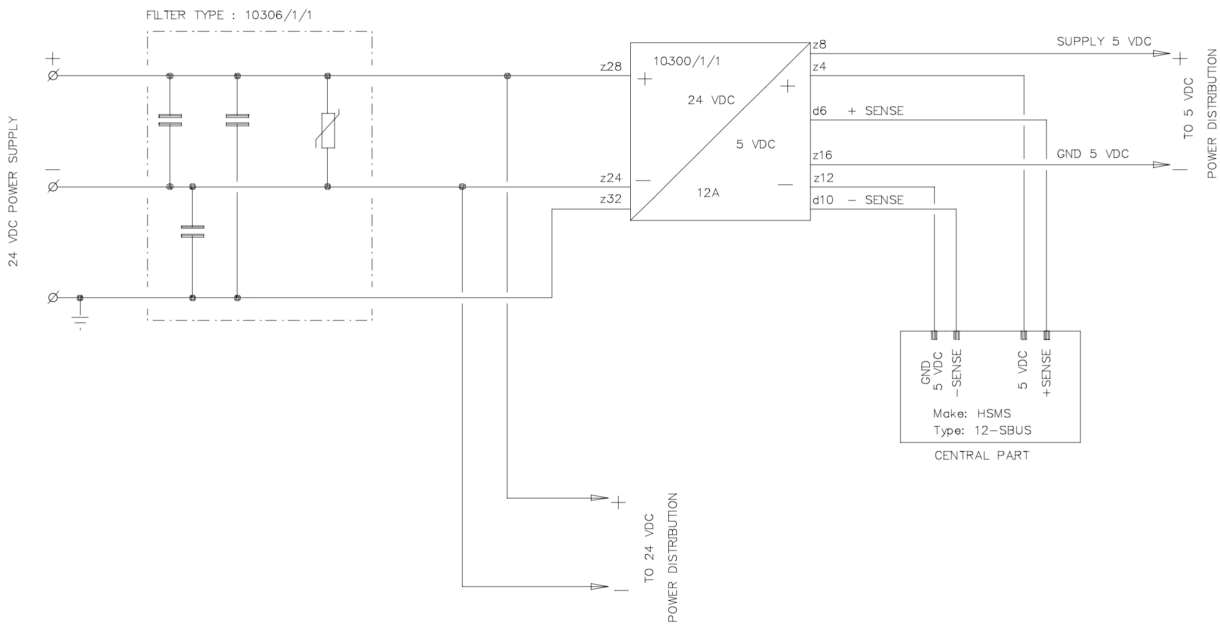


Figure 4 Wiring diagram

Note:
If the 24 Vdc is supplied from an M24-20HE, M24-12HE, or 1200S24 P067 power supply that is located in the same cabinet as the FSC system, the input filter is not mandatory.

As the limits on the 5 Vdc power supply are very tight (± 5%), this module must be placed closely to the system bus (e.g. 12-SBUS). Use the sense wires correctly and use short wires of proper wire diameter to minimize voltage drop over the wiring.
The minimum wire diameters for 'SUPPLY 5 VDC' and 'GND 5 VDC' to the system bus of the Central Part are as follows:

- up to 8 A: 2.5 mm² (AWG 14)
- up to 12 A: 6 mm² (AWG 10)

Technical data

The 10300/1/1 module has the following specifications:

General	Type number:	10300/1/1 04604*
	Approvals:	CE, TÜV, UL**
	Software versions:	all
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Power	Power requirements:	current < 3.9 A at 24 Vdc voltage 24 Vdc (–15%...+30%)
	Inrush current:	< 18 A
Environment	Ambient temperature:	-5°C to 60°C (23°F to 140°F) (see derating curve, Figure 3)
Output	Output voltage:	5 Vdc with overvoltage protection
	Ripple content:	< 40 mV p-p (at full load)
	Output current:	12 A at -5°C to 45°C (23°F to 113°F) 8 A at -5°C to 60°C (23°F to 140°F)
	Hold-up time:	≥ 0 ms
	Output voltage setting (V adj):	5.00 Vdc measured across system bus connections
	Over voltage protection (OVP adj):	5.75 Vdc
	Efficiency:	≥ 70%

Notes:

* For 10300/1/1 modules without a suffix code, the output LED may remain on in redundant configurations with single I/O, even if the 10300/1/1 is switched off (LED is energized by a redundant 10300/1/1 unit).
10300/1/1 modules with suffix code 04604 have minor board layout modifications to improve production yield and reliability. There are no functional changes.

** 10300/1/1 modules with suffix code 04602 or less are not CE-approved.

Fail Safe Control

Hardware Manual

Section 3:

Buses and Backplanes

Copyright, Notices and Trademarks

TABLE OF CONTENTS

Section 3: Buses and Backplanes

S-BUS Horizontal bus for I/O in Central Part rack

Description

The S-BUS is used to connect up to 14 I/O modules with a single bus driver (SBD). It has sixteen 16-pin connectors, one 14-pin connector and bus terminators at the front, and eight pins at the back.
The S-bus print is contained in a metal housing for easy mounting in a cabinet for standard 19-inch racks.

One 16-pin connector at the front and the eight pins at the back interconnect the watchdog flatcable (at the front) with the wiring for watchdog output, watchdog reset input (24 Vdc), watchdog ESD input (5 Vdc) and the ESD input (24 Vdc) terminals.

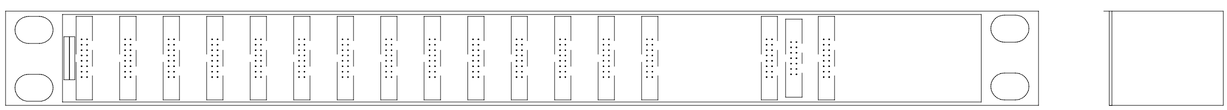


Figure 1 Front and side views

Connections

The pin connections of the S-BUS are as follows:

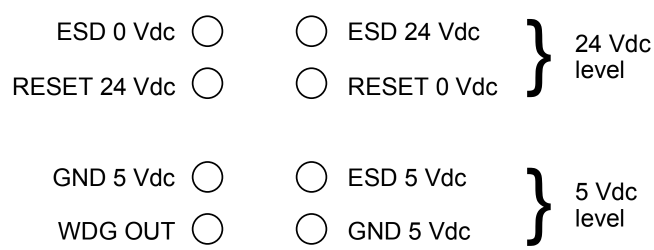


Figure 2 Back view of watchdog pins

The separation between the 5 Vdc and 24 Vdc wiring must be maintained in the same manner as for the I/O module terminations.

Watchdog wiring

The watchdog output must be connected to all the modules that have WDG inputs (see Figure 3).

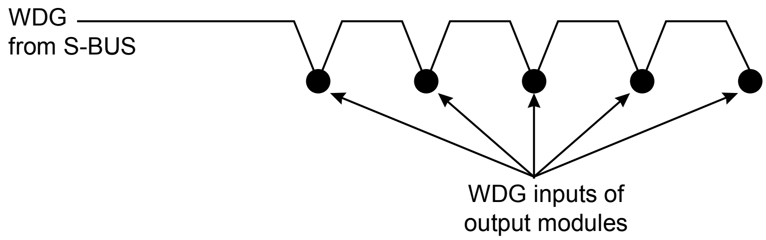


Figure 3 Watchdog wiring

Technical data

The S-BUS has the following specifications:

General

Type number:	S-BUS
Approvals:	CE, TÜV, UL
Space requirements:	84 TE (full rack), 1 HE (= 84 HP, 1U)

Power

Power requirements:	Included in SBD (10007/1/1) specification

1-BUS Horizontal bus in non-redundant I/O rack

Description

The 1-BUS is used to connect up to 18 I/O modules with a horizontal bus driver (HBD, 10100/1/1 or 10100/2/1). It has nineteen 16-pin connectors and bus terminators at the front, and one 20-pin connector at the back.
The 1-BUS print is contained in a metal housing for easy mounting in a cabinet for standard 19-inch racks. The housing has a hinged front plate, which can hold a tag strip.

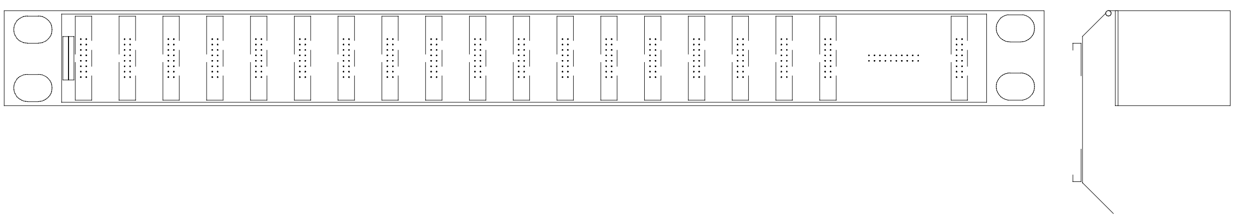


Figure 1 Front and side views

Technical data

The 1-BUS has the following specifications:

General

General	Type number:	1-BUS
	Approvals:	CE, TÜV, UL
	Space requirements:	84 TE (full rack), 1 HE (= 84 HP, 1U)
Power	Power requirements:	Included in HBD (10100/1/1 or 10100/2/1) specification

Left blank intentionally.

2-BUS Horizontal bus in redundant I/O rack

Description

The 2-BUS is used to connect up to 18 I/O modules with the horizontal bus drivers (HBD, 10100/1/1 or 10100/2/1). It has twenty 16-pin connectors and bus terminators at the front, and two 26-pin connectors at the back.
The 2-BUS print is contained in a metal housing for easy mounting in a cabinet for standard 19-inch racks. The housing has a hinged front plate, which can hold a tag strip.

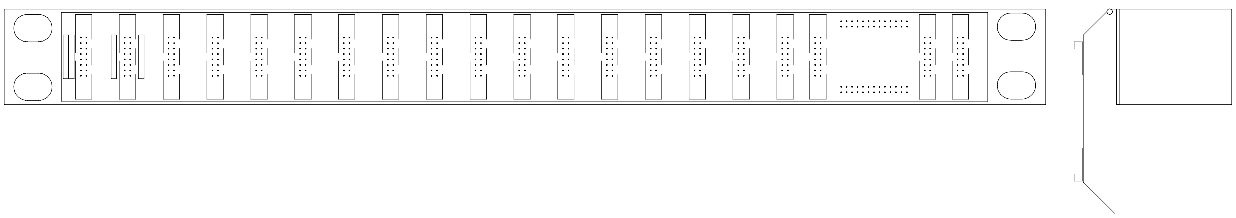


Figure 1 Front and side views

Technical data

The 2-BUS has the following specifications:

General

General	Type number:	2-BUS
	Approvals:	CE, TÜV, UL
	Space requirements:	84 TE (full rack), 1 HE (= 84 HP, 1U)
Power	Power requirements:	Included in HBD (10100/1/1 or 10100/2/1) specification

Left blank intentionally.

7-SBUS, 12-SBUS, 17-SBUS: Central Part system buses

Description

Central Part system buses are used to interconnect the modules of the Central Part. The buses have a number of 96-pin connectors as well as bus terminators on both ends of the system bus.

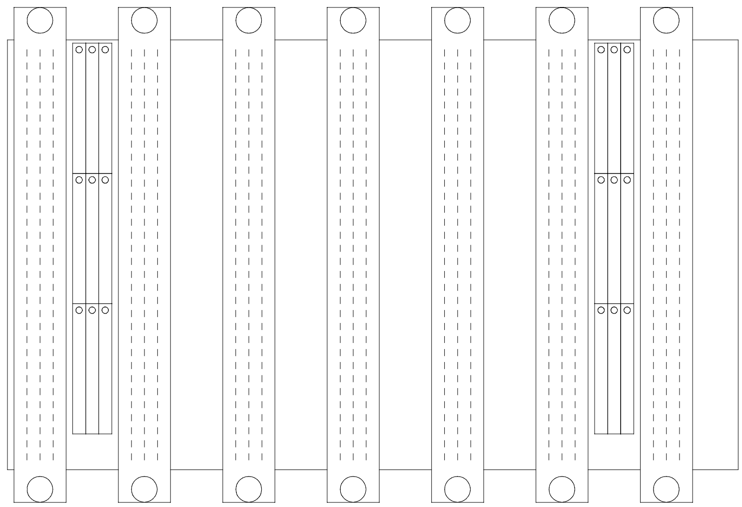


Figure 1 System bus (7-SBUS) front view

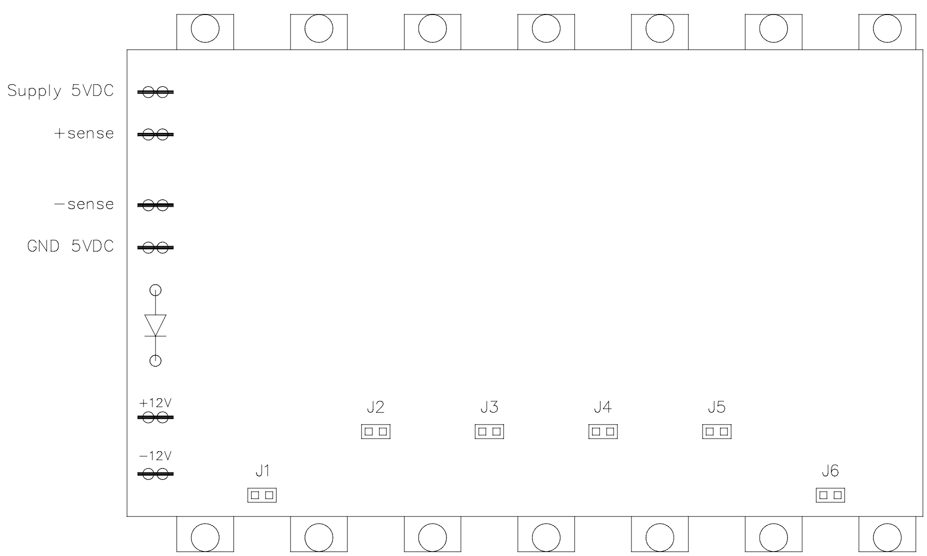


Figure 2 System bus (7-SBUS) back view with jumpers and faston terminations

The jumpers on the system bus are normally closed, except if one or more communication (COM) modules have been placed. Communication modules take up two rack positions. The jumper between the connectors that are used (covered) by the COM module must then be removed. (Seen from the back of the system bus, this jumper is located to the right of the COM module mainboard.)

7-SBUS

The 7-SBUS can be used for Central Parts which also contain I/O. It is also used when two Central Parts are placed in one Central Part rack. It has the following specifications:

Type number:	7-SBUS
Approvals:	CE, TÜV, UL
Number of positions:	7
Space requirements:	28 TE, 3 HE (= 28 HP, 3U)
Power requirements:	5 Vdc 1 A

12-SBUS

The 12-SBUS is normally used with one Central Part per Central Part rack. It has the following specifications:

Type number:	12-SBUS
Approvals:	CE, TÜV, UL
Number of positions:	12
Space requirements:	48 TE, 3 HE (= 48 HP, 3U)
Power requirements:	5 Vdc 1 A

17-SBUS

The 17-SBUS is only used if the number of Central Part modules exceeds the capacity of the 12-SBUS. It has the following specifications:

Type number:	17-SBUS
Approvals:	CE, TÜV, UL
Number of positions:	17
Space requirements:	68 TE, 3 HE (= 68 HP, 3U)
Power requirements:	5 Vdc 1 A

V-Buses — Vertical bus from CP rack to I/O rack

Description

The vertical buses (V-Buses) in the FSC system are the umbilical cord between the processor and the I/O modules. All scan, test and update actions between the Quad processor module and I/O modules in I/O racks are routed via one or more vertical buses.

The V-Bus is a 34-wire flatcable with connectors for the VBD(s), connectors for the HBD(s), and a connector for the vertical bus terminator (10307/1/1). Large systems (using more than one cabinet) need a V-Bus link from the cabinet with the CP part(s) to the cabinet that only contains I/O racks. This V-Bus link consists of a 34-wire round "flatcable" with connector(s) for the VBD(s) and a connector for the V-bus in the dedicated I/O cabinet.

The type of V-Bus that is required depends on three things:

- the configuration (redundant Central Parts and/or I/O),
- the cabinet layout (e.g. racks with redundant I/O followed by racks with non-redundant I/O), and
- the integration method (HBD type 10100/1/1 vs. 10100/2/1 with 10314, 10315, 10316 or 10317 backplanes).

Ordering V-Buses

Ordering a V-Bus flatcable requires all relevant cabinet layout data (including dimensions). As CE and TÜV approval is required in more and more systems, the use of standard cabinet layouts has become common practice. This enables simplified V-Bus ordering information.

The V-Bus code can only be used if the cabinet layout and the VBD positioning meet all of the following requirements:

- The VBD must be in rack position 14, 15 or 16.
- The VBDs of a V-Bus for configurations with redundant Central Parts and non-redundant I/O must have the same rack position number in both CP racks (e.g. VBD1: rack 1, position 15, and VBD2: rack 2, position 15).
- Every rack with its S-Bus, 1-Bus or 2-Bus is 4 HE (4U) high.
- The CP rack(s) must be the first rack or the first two racks.
- There are only FSC racks between the first CP rack and the last I/O rack.

- The redundant I/O racks are placed in one consecutive row of racks (per cabinet).
- The non-redundant I/O racks are placed in one consecutive row of racks (per cabinet).

If there is a deviation from any of these rules, the V-Bus order must include a full description of the required V-Bus (see example 4).

V-Bus ordering code

If the V-Bus meets the requirements listed above, it is possible to order that V-Bus by using its V-Bus code.
The V-Bus code is built up as follows:

VBUS □/□/□□

The first digit is the sum of VBDs (1 or 2) and HBDs that are to be connected via the V-Bus (in practice this will be a number between 1 and 9).

VBUS □/□/□□

The second digit represents the integration method:

1 = Use of 10100/1/1 HBDs, with V-Bus guided through the racks.
2 = Use of 10100/2/1 HBDs with I/O backplanes 10314/1/1, 10315/1/1 or HBD backplanes 10316/1/1 or 10317/1/1 guided via a duct on the side of the racks.
R = Round cable (see 'Round V-Bus ordering code' section below).

VBUS □/□/□□

The third digit represents the V-Bus configuration:

1 = Configuration with non-redundant CP and non-redundant I/O.
2 = Configuration with redundant CPs and non-redundant I/O.
3 = Central Part 1 of configuration with redundant CPs and redundant I/O.
4 = Central Part 2 of configuration with redundant CPs and redundant I/O.

VBUS ☐/☐/☐☐

The fourth digit refers to the distance between the (bottom) CP rack and the first involved I/O rack. The number represents the number of racks that are skipped:

0 = The first involved I/O rack is located directly below the (bottom) CP rack.

1 = One rack is placed between the (bottom) CP rack and the first involved I/O rack.

2 = Two racks are placed between the (bottom) CP rack and the first involved I/O rack.

3 = Three racks are placed between the (bottom) CP rack and the first involved I/O rack.

4 = Four racks are placed between the (bottom) CP rack and the first involved I/O rack.

5 = Five racks are placed between the (bottom) CP rack and the first involved I/O rack.

6 = Six racks are placed between the (bottom) CP rack and the first involved I/O rack.

7 = Seven racks are placed between the (bottom) CP rack and the first involved I/O rack.

9 = The V-Bus is placed in a dedicated I/O cabinet.

Round V-Bus ordering code

Ordering round cables requires a slightly different approach. The V-Bus code for round cables is built up as follows:

VBUS ☐/ R /☐☐

The first digit is the number of VBDs (1 or 2) connected via the V-Bus:

1 = one VBD for fully redundant or fully non-redundant configurations.

2 = two VBDs for configurations with redundant CPs and non-redundant I/O.

VBUS ☐/ R / ☐☐

The last two digits represent the required cable length between the (top) VBD connector and the connector on the I/O rack side in units of 10 cm (3.94 in) (see example 3).

The required length depends on a large number of factors, including:

- cabinet size (height and width),
- hinge position of CP cabinet (left or right),
- hinge position of I/O cabinet (left or right),
- relative position of I/O cabinet to CP cabinet (left or right),
- position of the first involved HBD (e.g. rack 11),
- position of the top VBD (usually rack 1, but in configurations with redundant CPs and redundant I/O, the V-Bus for CP2 starts in rack 2, and therefore the cable must be 20 cm / 7.9 in longer).

As the round cable only allows connector placement at specific distances, the ordered length must have a margin of at least 5 cm (2 in).

Note:
The maximum length of the round cable is 5 m (16.4 ft), since the maximum combined length of the round cable and the V-Bus is 8 m (26.2 ft).

Note:
The vertical buses mentioned above are all part of the standard HSMS hardware program. Customized V-Bus cables are available on request. When ordering customized vertical buses, detailed specifications should be provided as to their design and layout.

Ordering examples

The following examples will clarify the coding method.

Example 1:

An FSC cabinet with non-redundant Central Part and non-redundant I/O, with a rack layout as shown in Figure 1 (using 10100/2/1 HBDs).

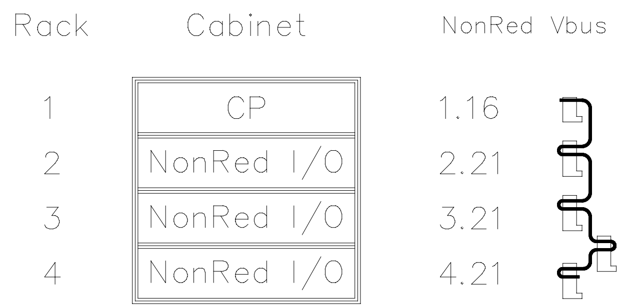


Figure 1 V-Buses example 1

The ordering code to be used is: **VBUS 4 / 2 / 1 0**

- 4: The V-Bus must connect the VBD (position 1.16) to the three HBDs (positions 2.21, 3.21 and 4.21).
- 2: 10100/2/1 HBDs
- 1: V-Bus for configuration with non-redundant CP and non-redundant I/O
- 0: No rack is skipped between the CP and the first I/O rack.

Example 2:

An FSC cabinet with redundant Central Parts and both redundant and non-redundant ("hybrid") I/O, with a rack layout as shown in Figure 2 using I/O backplanes (with 10100/2/1 HBDs).

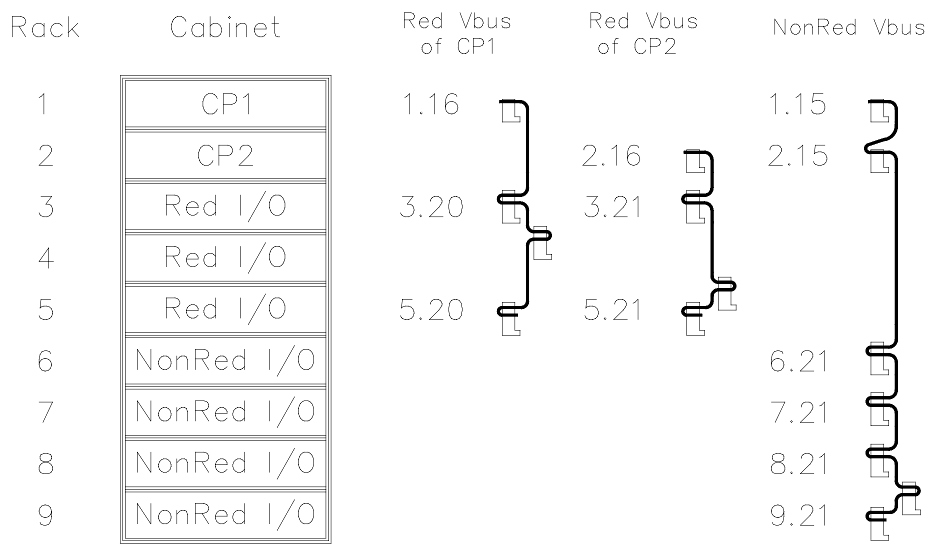


Figure 2 V-Buses example 2

This system has three V-Buses:

- V-Bus of redundant I/O part for CP1,
- V-Bus of redundant I/O part for CP2, and
- V-Bus of non-redundant I/O part.

The ordering code to be used for the V-Bus of the redundant I/O part for CP 1 is:

VBUS 3 / 2 / 3 0

- 3: This V-Bus must connect the VBD in position 1.16 to the HBDs in positions 3.20 and 5.20.
- 2: I/O backplanes with 10100/2/1 HBDs
- 3: V-Bus for Central Part 1 of configuration with redundant CPs and redundant I/O.
- 0: No rack is skipped between the (bottom) CP and the first involved I/O rack.

The ordering code to be used for the V-Bus of the redundant I/O part for CP 2 is:

VBUS 3 / 2 / 4 0

The only relevant difference between this cable and the first one is the Central Part number, so only the third digit changes to 4.

The ordering code to be used for the V-Bus of the non-redundant I/O part is:

VBUS 6 / 2 / 2 3

- This V-Bus must connect the VBDs in position 1.15 and 2.15 to the HBDs in positions 6.21, 7.21, 8.21 and 9.21.
- I/O backplanes with 10100/2/1 HBDs
- Configuration with redundant CPs and non-redundant I/O
- Three racks (3, 4 and 5) are skipped between the bottom CP and the first HBD involved.

Example 3:

An FSC cabinet with redundant Central Parts and both redundant and non-redundant ("hybrid") I/O, with a rack layout as shown in Figure 3 using I/O backplanes (with 10100/2/1 HBDs) and a 3 m (9.8 ft) round cable between CP1 and rack 11 (in cabinet 2).

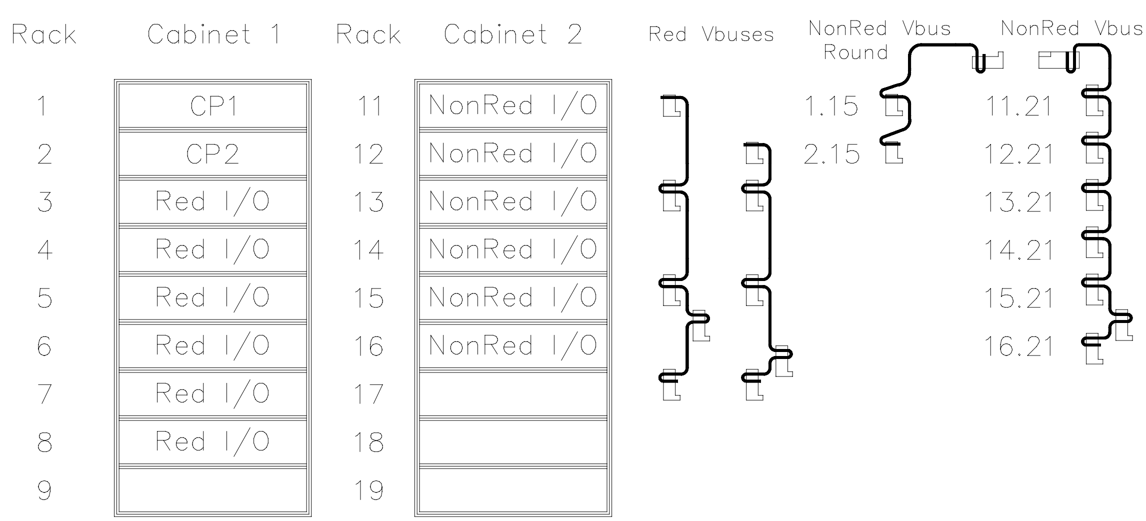


Figure 3 V-Buses example 3

This system has four V-Buses:

- V-Bus of redundant I/O part for CP1,
- V-Bus of redundant I/O part for CP2,
- V-Bus of non-redundant I/O part (round), and
- V-Bus of non-redundant I/O part.

The ordering code to be used for the V-Bus of the redundant I/O part for CP 1 is:

VBUS 4 / 2 / 3 0

(See example 2.)

The ordering code to be used for the V-Bus of the redundant I/O part for CP 2 is:

VBUS 4 / 2 / 4 0

(See example 2.)

The ordering code to be used for the V-Bus round cable of the non-redundant I/O part is:

VBUS 2 / R / 3 0

2	This V-Bus has two VBDs in positions 1.15 and 2.15.
R	Round cable
3 0	The length of the round cable must be 3 m (= 30 x 10 cm).

As the distance between the CP1 connector and the CP2 connector is 20 cm (7.9 in), the round cable will have a total length of approx. 320 cm (10.5 ft).

The ordering code to be used for the V-Bus of the non-redundant I/O part is:

VBUS $\boxed{6}$ / $\boxed{2}$ / $\boxed{2}$ $\boxed{9}$

- 6: This V-Bus has no VBDs and six HBDs in positions 11.21, 12.21, 13.21, 14.21, 15.21 and 16.21.
- 2: I/O backplanes with 10100/2/1 HBDs
- 2: Configuration with redundant CPs and non-redundant I/O
- 9: The involved I/O rack is placed in a dedicated I/O cabinet.

Example 4:

An FSC cabinet with redundant Central Parts and both redundant and non-redundant ("hybrid") I/O, with a 35 cm (13.8 in) high (CE-approved) annunciator display panel in rack 3, a mix of redundant/non-redundant I/O racks, and VBDs in positions 13 and 14. The cabinet layout does not meet the standard V-Bus coding requirements. As no V-Bus code is applicable, the V-Buses must be described.

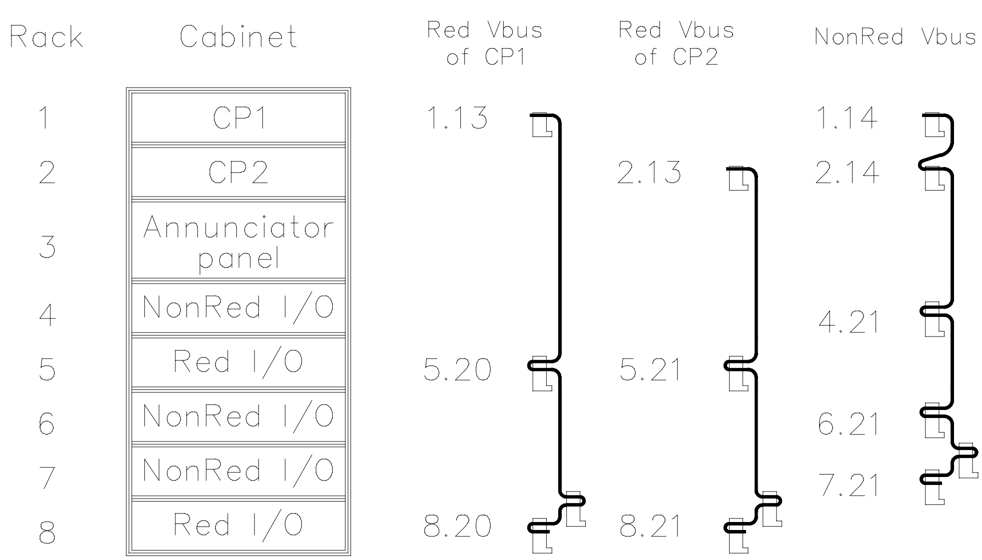


Figure 4 V-Buses example 4

The V-Bus of the redundant I/O part for CP 1 is sufficiently described as: "a V-Bus with a VBD in position 1.13, HBDs type 10100/2/1 in positions 5.20 and 8.20, and a 35 cm (13.8 in) high free-issue panel as rack 3".

The V-Bus of the redundant I/O part for CP 2 is sufficiently described as: "a V-Bus with a VBD in position 2.13, HBDs type 10100/2/1 in positions 5.21 and 8.21, and a 35 cm (13.8 in) high free-issue panel as rack 3".

The V-Bus of the non-redundant I/O part is sufficiently described as: "a V-Bus with VBDs in positions 1.14 and 2.14, HBDs type 10100/2/1 in positions 4.21, 6.21 and 7.21, and a 35 cm (13.8 in) high free-issue panel as rack 3".

10314/1/1 I/O backplane for non-redundant I/O

Description

The I/O backplane 10314/1/1 is used in non-redundant I/O racks.

Up to 18 I/O modules can be placed in the I/O backplane 10314/1/1 (rack positions 1 to 18). A horizontal bus driver (HBD, 10100/2/1) must be placed in rack position 21.

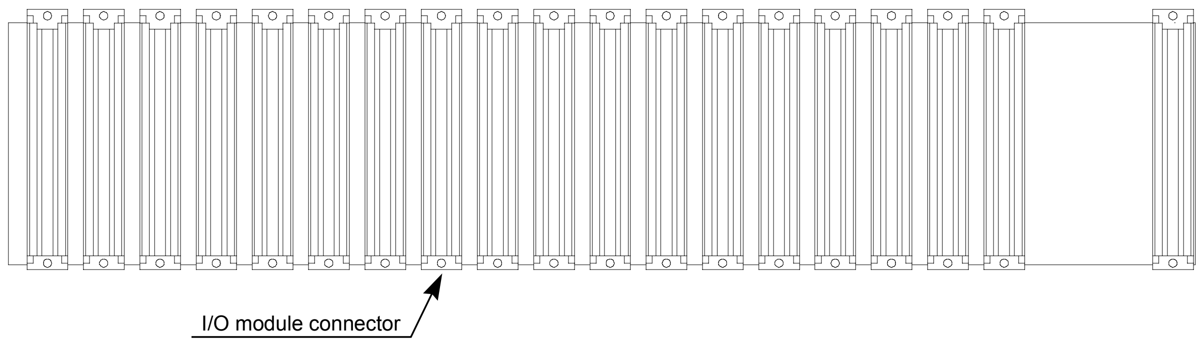


Figure 1 Front view

The back side (see Figure 2) has eighteen I/O connectors (CN1 to CN18) for system interconnection cables (SIC cables) and eighteen programming connectors (P1 to P18). These programming connectors are used for:

- current setting (e.g. range-setting module 10216/A/.), and
- signal conversion (e.g. analog input converter module 10102/A/.).

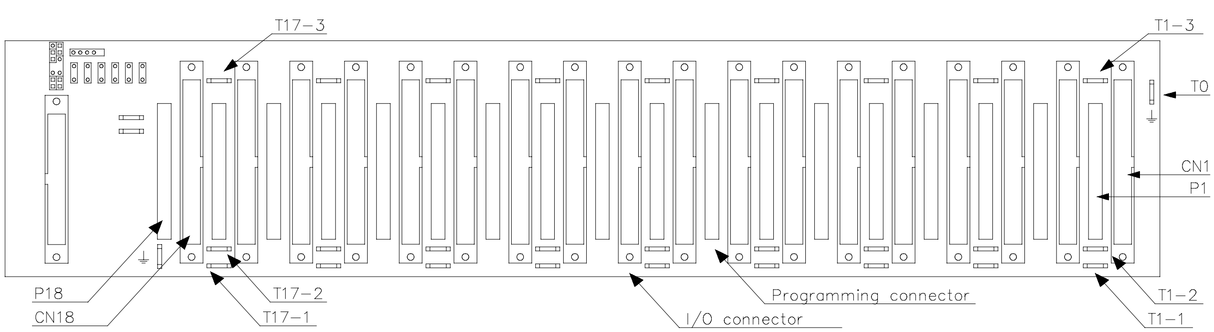


Figure 2 Back view

Connections

The diagram below shows the back view of the programming connectors (P), the I/O module connectors and the I/O backplane connectors (CN):

Programming (P)

	41 / earth
40 / d10	
	37 / z10
36 / d12	
	33 / z12
32 / d14	
	29 / z14
28 / d16	
	25 / z16
24 / d18	
	21 / z18
20 / d20	
	17 / z20
16 / d22	
	13 / z22
12 / d24	
	9 / z24
8 / d26	
	5 / z26
4 / d28	
	1 / z28

I/O module

d	b	z
2	2	2
–		–
6		6
8		8
10		10
12		12
14		14
16		16
18		18
20		20
22		22
24		24
26		26
28		28
30		30
32		32

I/O backplane (CN)

–	–
–	41 / earth
40 / d10	–
–	37 / z10
36 / d12	–
–	33 / z12
32 / d14	–
–	29 / z14
28 / d16	–
–	25 / z16
24 / d18	–
–	21 / z18
20 / d20	–
–	17 / z20
16 / d22	–
–	13 / z22
12 / d24	–
–	9 / z24
8 / d26	–
–	5 / z26
4 / d28	–
–	1 / z28

Between every I/O connector pair, three faston connectors are available (in nine groups) to connect power to the I/O module pairs. The faston connectors are marked as follows:

- Tx-1 (connected to d32 and z32 of the I/O connector left and right)
- Tx-2 (connected to d30 and z30 of the I/O connectors rack positions 1 to 18)
- Tx-3 (connected to d6 and z6 of the I/O connector left and right).

The Tx-2 pins are used for the common 0 Vdc and are all interconnected on the I/O backplane. Each faston pin can handle 10 A.

If any module in the rack requires 24 Vdc internal power (on pins d8 and z8), the internal power of 24 Vdc must be connected via two fastons:

- T19-3: 24 Vdc
- T19-2: common 0 Vdc

Note:
The internal 24 Vdc connections for the 10314/1/1 and 10315/1/1 backplanes differ:

Connector	10314/1/1	10315/1/1
T19-1	cabinet earth	cabinet earth
T19-2	common 0 Vdc	24 Vdc for I/O of CP 1
T19-3	24 Vdc for I/O of CP 1 or 2	common 0 Vdc
T19-4	not placed	24 Vdc for I/O of CP 2

The V-Bus connector is plugged into CN21 (see Figure 3).
The rack address of the HBD is programmed using the jumpers RA0 to RA3 (see 10100/2/1 data sheet).
The I/O backplane transfers the V-Bus signals and the rack address to the HBD (10100/2/1).

The watchdog (WDG), 5 Vdc and ground (GND) are connected to the I/O backplane via connector CN22 (see Figure 3 and Figure 4).

Note:
For connection details of CN22 refer to the data sheet of the 5 Vdc and watchdog distribution module 10313/1/1.

Watchdog separation is possible by removing jumpers WD1 to WD6 (six groups of three I/O modules) at the back of the backplane, and connecting a 5 Vdc or watchdog signal to the lower pin of the jumper.

WD1 is the watchdog for module positions 1 to 3 in the rack.
WD2 is the watchdog for module positions 4 to 6 in the rack.
WD3 is the watchdog for module positions 7 to 9 in the rack.
WD4 is the watchdog for module positions 10 to 12 in the rack.
WD5 is the watchdog for module positions 13 to 15 in the rack.
WD6 is the watchdog for module positions 16 to 18 in the rack.

The I/O backplane comes with two earth faston connections (T0 and T19-1). These earth connections should be terminated to the I/O rack frame using short wires (2.5 mm², AWG 14), e.g. directly to the nearest bolt on the 19-inch I/O rack.

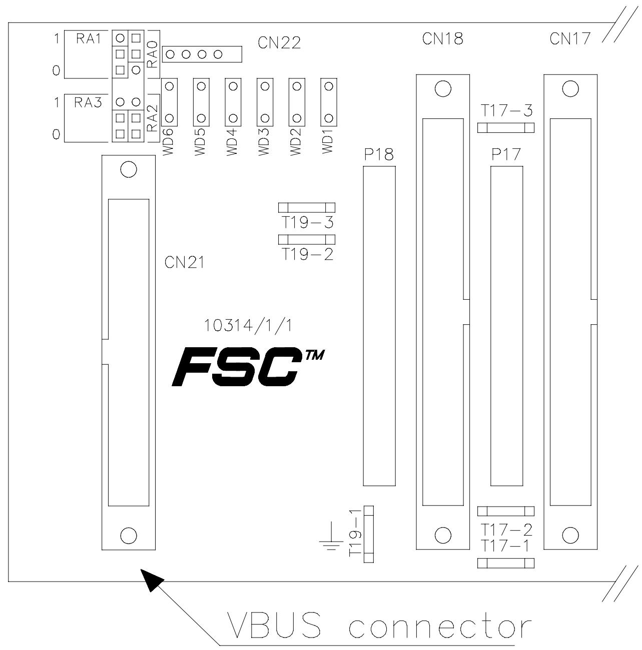


Figure 3 Back view detail

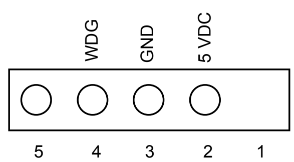


Figure 4 Connector CN22 (detail)

Important considerations

1. The number of Tx-2 pins that need to be wired to the common 0 Vdc busbar depends on the maximum total load of the I/O modules in the rack. The total current capacity of the Tx-2 connections should be higher than the maximum total load of all I/O modules in the rack. As each Tx-2 connection can handle 10 A, a demand total of 25 A would require three Tx-2 connections for optimum current distribution across the I/O modules.
2. The maximum number of modules that may be installed in a single I/O rack depends on their heat dissipation. The maximum allowed heat dissipation of one I/O rack is 125 W. The combined heat

dissipation of all modules installed in a rack should therefore not exceed 125 W. The total dissipation of a single module is made up of three components:

- the module's 24 V power consumption,
- the module's 5 V power consumption, and
- dissipation due to voltage drop across the output circuit (depending on the output load).

The sum of these three components will determine the module's total heat dissipation.

Example: how many 10215/2/1 modules may be installed in a single I/O rack?
Following the calculation method described above and using the technical data from the 10215/2/1 data sheet, the heat dissipation of a single 10215/2/1 module can be determined as:
$((24\ V_{int} * 0.035\ A) + (24\ V_{ext} * 2 * 0.025\ A)) + (5\ V * 0.012\ A) + (1.3\ V * 6\ A) = 9.9\ W$
Thus, the maximum number of 10215/2/1 modules in a single I/O rack is 12 (total heat dissipation: 119 W).

3. There should always be two 0 Vdc connections, one at each end of the backplane (connected to T1-2 and T17-2, respectively). If additional 0 Vdc connections are required, the extra connections should be connected as closely to the power user(s) as possible.

Technical data

The I/O backplane 10314/1/1 has the following specifications:

General

Type number:	10314/1/1 20501*
Approvals:	CE, TÜV, UL
Space requirements:	84 TE (full rack), 3 HE (= 84 HP, 3U)

Power

Current consumption:	none
Max. current on faston pin:	10 A
Max. current on I/O connector pin:	2 A

*** Note:**
10314/1/1 modules with suffix code 20500 have watchdog separation in three groups of six modules, and have only one earth faston connector.

10315/1/1 I/O backplane for redundant I/O

Description

The I/O backplane 10315/1/1 is used in redundant I/O racks.

Up to 18 I/O modules can be placed in the I/O backplane 10315/1/1 (rack positions 1 to 18). Two horizontal bus drivers (HBD, 10100/2/1) can be placed in rack positions 20 and 21.

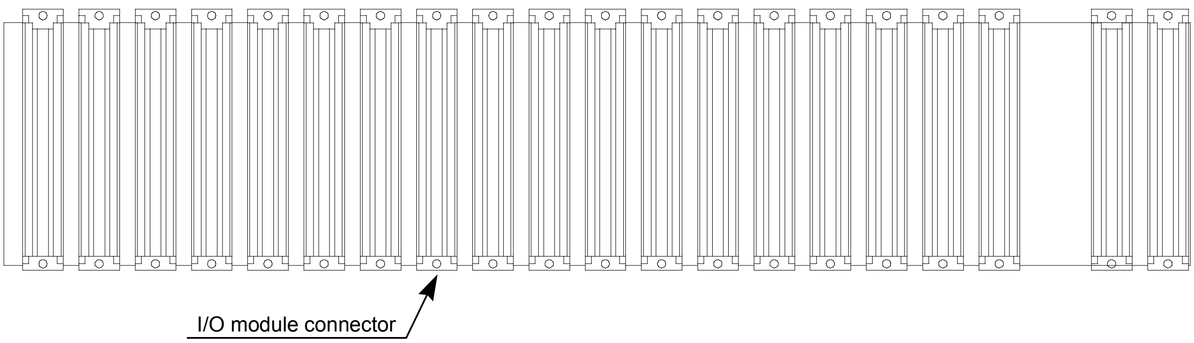


Figure 1 Front view

The back side (see Figure 2) has nine I/O connectors (CN1, CN3, etc., to CN17) for system interconnection cables (SIC cables) and nine programming connectors (P1, P3, etc., to P17). These programming connectors are used for:

- current setting (e.g. range-setting module 10216/A/.),
- signal conversion (e.g. analog input converter module 10102/A/.),
- communication I/O wiring (in configurations with exclusively redundant I/O),
- secondary switch-off wiring, and
- watchdog repeater (10302/2/1) wiring.

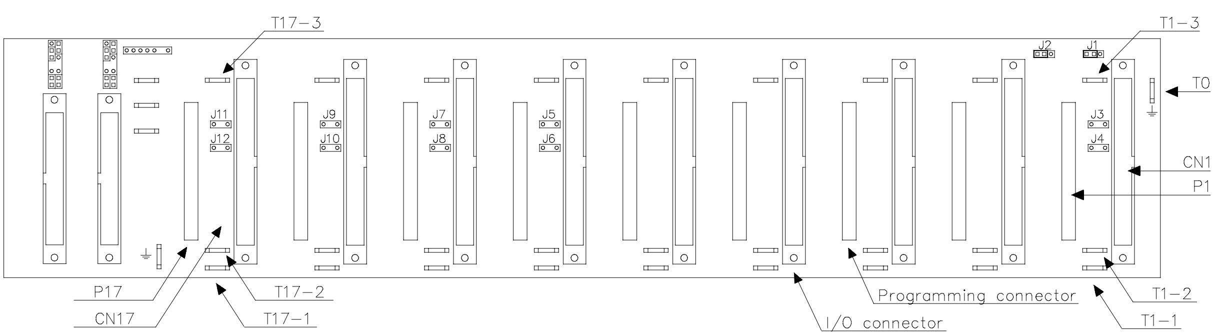


Figure 2 Back view

Connections

The diagram below shows the back view of the programming connectors (P), the I/O module connectors and the I/O backplane connectors (CN):

Programming (P)

	41 / earth
40 / d10	
	37 / z10
36 / d12	
	33 / z12
32 / d14	
	29 / z14
28 / d16	
	25 / z16
24 / d18	
	21 / z18
20 / d20	
	17 / z20
16 / d22	
	13 / z22
12 / d24	
	9 / z24
8 / d26	
	5 / z26
4 / d28	
	1 / z28

I/O module

d	b	z
2	2	2
–		–
6		6
8		8
10		10
12		12
14		14
16		16
18		18
20		20
22		22
24		24
26		26
28		28
30		30
32		32

I/O backplane (CN)

–	–
–	41 / earth
40 / d10	–
–	37 / z10
36 / d12	–
–	33 / z12
32 / d14	–
–	29 / z14
28 / d16	–
–	25 / z16
24 / d18	–
–	21 / z18
20 / d20	–
–	17 / z20
16 / d22	–
–	13 / z22
12 / d24	–
–	9 / z24
8 / d26	–
–	5 / z26
4 / d28	–
–	1 / z28

The I/O backplane connects the redundant I/O modules of CP1 and CP2 in parallel. These parallel links of d12 and d16 can be opened for I/O module positions 1-2, 11-12, 13-14, 15-16 and 17-18. For FSC configurations with ***exclusively*** redundant I/O, this is necessary for COM I/O wiring, secondary switch-off wiring and watchdog repeater wiring.
The connections to the CP1 module must be placed on the I/O connector.
The connections to the CP2 module must be placed on the programming connector.

Two connections of five redundant groups can be opened by removing a jumper. The jumpers are numbered and marked as follows (see Figure 2):

- J3 and J4 (connected to d12 and d16 on modules 1 and 2)
- J5 and J6 (connected to d12 and d16 on modules 11 and 12)
- J7 and J8 (connected to d12 and d16 on modules 13 and 14)
- J9 and J10 (connected to d12 and d16 on modules 15 and 16)
- J11 and J12 (connected to d12 and d16 on modules 17 and 18)

The following table shows the relation between the jumpers and the I/O channels of the I/O modules that can be selected:

Type	Fail-safe module	J3, J5, J7, J9, J11	J4, J6, J8, J10, J12
I	10101/2/1	channel 1	channel 5
O	10201/2/1	channel 1	channel 3

Example 1 (see Figure 3): Configuration of 'Com I/O'.

If: FS input modules, type 10101/2/1, are located on positions 15 and 16, and the input 'Com I/O' is allocated to positions 15 and 16, channel 1,

and: FS output modules, type 10201/2/1, are located on positions 17 and 18, and the output 'Com I/O' is allocated on positions 17 and 18, channel 3,

then: jumper J9 must be removed for the input 'Com I/O', jumper J12 must be removed for the output 'Com I/O', and two wires must be connected as shown in Figure 3.

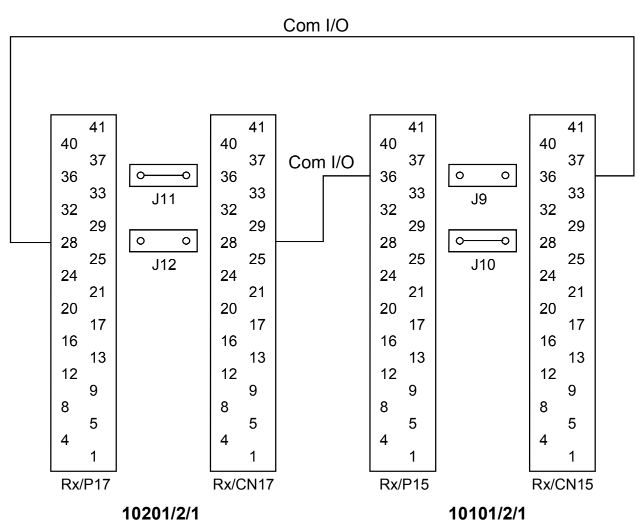


Figure 3 Example of 'Com I/O' configuration

Example 2: Configuration of 'Secondary switch-off'.

If: FS output modules, type 10201/2/1, are located on positions 1 and 2, and the output 'Secondary switch-off' is allocated to positions 1 and 2, channel 1,
then: jumper J3 must be removed for the output 'Secondary switch-off'.

Note:
Secondary switch-off also requires jumpers J1 and J2 to be set (see below). For details on the configuration of secondary switch-off refer to the FSC Safety Manual.

Between the I/O connector and programming connector, faston connectors are available (in nine groups) to connect power to the I/O module pairs. The faston connectors are marked as follows:

- Tx-1 (connected to d32 and z32 of the I/O connector left and right)
- Tx-2 (connected to d30 and z30 of the I/O connectors rack positions 1 to 18)
- Tx-3 (connected to d6 and z6 of the I/O connector left and right).

The Tx-2 pins are used for the common 0 Vdc and are all interconnected on the I/O backplane. Each faston pin can handle 10 A.

Important considerations

1. The number of Tx-2 pins that need to be wired to the common 0 Vdc busbar depends on the maximum total load of the I/O modules in the rack. The total current capacity of the Tx-2 connections should be higher than the maximum total load of all I/O modules in the rack. As each Tx-2 connection can handle 10 A, a demand total of 25 A would require three Tx-2 connections for optimum current distribution across the I/O modules.
2. The maximum number of modules that may be installed in one I/O rack depends on their heat dissipation. The maximum allowed heat dissipation of one I/O rack is 125 W. The combined heat dissipation of all modules installed in a rack should therefore not exceed 125 W. The total dissipation of a single module is made up of three components:
   - the module's 24 V power consumption,
   - the module's 5 V power consumption, and
   - dissipation due to voltage drop across the output circuit (depending on the output load).

The sum of these three components will determine the module's total heat dissipation.

Example: how many redundant 10215/2/1 module pairs may be installed in a 10315/1/1 I/O rack?
Following the calculation method described above and using the technical data from the 10215/2/1 data sheet, the heat dissipation of a redundant 10215/2/1 module pair can be determined as:
$((2 * (24\ V_{int} * 0.035\ A)) + (2 * (24\ V_{ext} * 2 * 0.025\ A))) + (2 * (5\ V * 0.012\ A)) + (1.3\ V * 6\ A) = 12\ W$
Thus, the maximum number of redundant 10215/2/1 module pairs in a 10315/1/1 I/O rack is 10 pairs (total heat dissipation: 120 W).

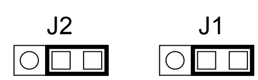
3. There should always be two 0 Vdc connections, one at each end of the backplane (connected to T1-2 and T17-2, respectively). If additional 0 Vdc connections are required, the extra connections should be connected as closely to the power user(s) as possible.

Secondary switch-off

Two jumpers (J1 and J2) are available for secondary switch-off functionality (see Figure 4). The jumper settings are as follows:

- Secondary switch-off disabled (= standard position).
  The watchdog inputs of the modules on rack positions 1 and 2 are linked to the watchdog signals from CP 1 and CP 2, respectively.

- Secondary switch-off enabled.
  The watchdog inputs of the modules on rack positions 1 and 2 are linked to the 5 Vdc signals from CP 1 and CP 2, respectively.



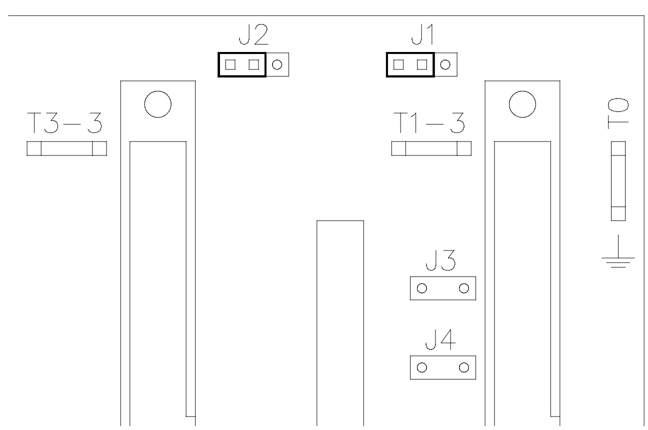


Figure 4 Location of jumpers J1 and J2 (set to their standard position)

The internal power of 24 Vdc can be connected via three fastons:

- T19-2: 24 Vdc for I/O of CP1
- T19-3: common 0 Vdc
- T19-4: 24 Vdc for I/O of CP2

Note:
The internal 24 Vdc connections for the 10315/1/1 and 10314/1/1 backplanes differ:

Connector	10315/1/1	10314/1/1
T19-1	cabinet earth	cabinet earth
T19-2	24 Vdc for I/O of CP 1	common 0 Vdc
T19-3	common 0 Vdc	24 Vdc for I/O of CP 1 or 2
T19-4	24 Vdc for I/O of CP 2	not placed

If the I/O backplane contains HBDs, the V-Bus connector of CP1 is plugged into CN20 and the V-Bus connector of CP2 into CN21.
The rack address of the HBDs is programmed using the jumpers RA0 to RA3 (see Figure 5 and 10100/2/1 data sheet). Jumpers RA0 to RA3 above connector CN20 are for Central Part 1. Jumpers RA0 to RA3 above connector CN21 are for Central Part 2.
The I/O backplane transfers the V-Bus signals and the rack address to the HBDs (10100/2/1).

Watchdog 1, watchdog 2, 5 Vdc 1, 5 Vdc 2 and ground (GND) are connected to the I/O backplane via connector CN22 (see Figure 5 and Figure 6).

Note:
For connection details of CN22 refer to the data sheet of the 5 Vdc and watchdog distribution module 10313/1/1.

The I/O backplane comes with two earth faston connections (T0 and T19-1). These earth connections should be terminated to the I/O rack frame using short wires (2.5 mm², AWG 14), e.g. directly to the nearest bolt on the 19-inch I/O rack.

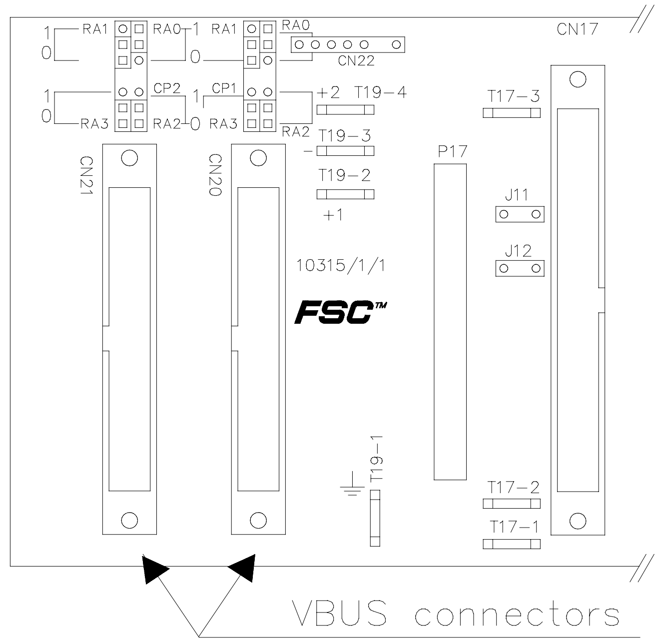


Figure 5 Back view detail

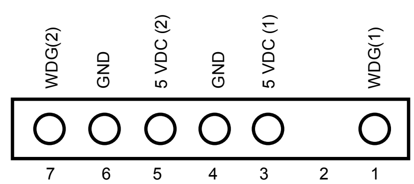


Figure 6 Connector CN22 (detail)

Technical data

The I/O backplane 10315/1/1 has the following specifications:

General

Type number:	10315/1/1 20601*
Approvals:	CE, TÜV, UL
Space requirements:	84 TE (full rack), 3 HE (= 84 HP, 3U)

Power

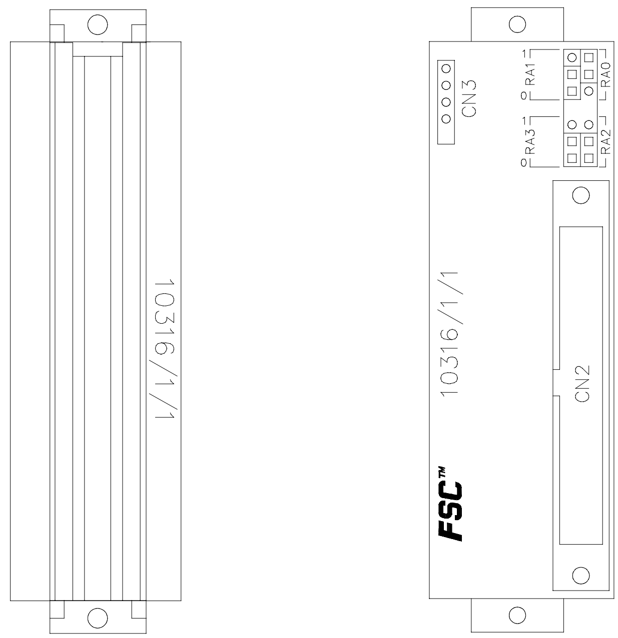
Current consumption:	none
Max. current on faston pin:	10 A
Max. current on I/O connector pin:	2 A

*** Note:**
10315/1/1 modules with suffix code 20600 has no jumpers for secondary switch-off functionality, only two pairs of jumpers for opening the link between I/O modules, and only one earth faston connector.

10316/1/1 HBD backplane for non-redundant I/O

Description

The horizontal bus driver (HBD) backplane 10316/1/1 is used in non-redundant I/O racks that do not have an I/O backplane. Up to 18 I/O modules can be placed in the I/O rack (rack positions 1 to 18). The I/O modules must be wired using conventional wiring techniques, e.g. crimp-on snap-in (COSI). The HBD module 10100/2/1 must be placed in rack position 21.



(front view) (back view)

Figure 1 Front and back views

The 10316/1/1 module is fixed in the I/O rack using two M2.5x6 screws.

The HBD backplane 10316/1/1 transfers the V-Bus signals and the rack address to the horizontal bus driver 10100/2/1. The rack address of the HBD module is programmed using the jumpers RA0 to RA3.

Note:
For programming details refer to the data sheet of the HBD module 10100/2/1.

Connections

The V-Bus connector is plugged into connector CN2 (see Figure 1). 5 Vdc and ground (GND) are connected to the I/O backplane via connector CN3 (see Figure 1 and Figure 2).

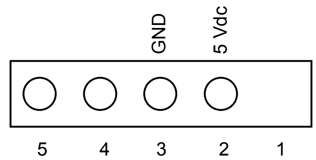


Figure 2 Connector CN3 (detail)

Note:
For connection details of CN3 refer to the data sheet of the 5 Vdc and watchdog distribution module 10313/1/1.

Technical data

The HBD backplane 10316/1/1 has the following specifications:

General

Type number:	10316/1/1 21100
Approvals:	CE, TÜV; UL approval pending
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Current consumption:	none

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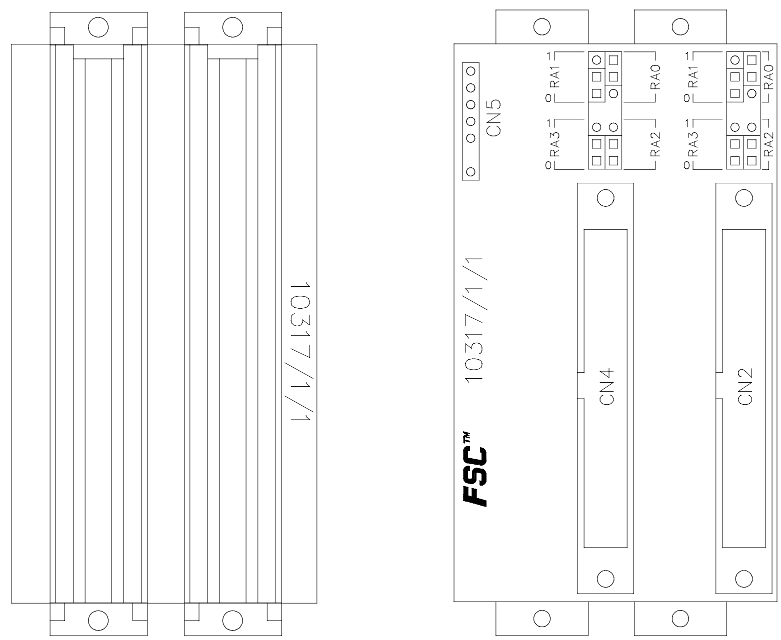
10317/1/1 HBD backplane for redundant I/O

Description

The horizontal bus driver (HBD) backplane 10317/1/1 is used in redundant I/O racks that do not have an I/O backplane. Up to 18 I/O modules can be placed in the I/O rack (rack positions 1 to 18). The I/O modules must be wired using conventional wiring techniques, e.g. crimp-on snap-in (COSI). Two HBD modules 10100/2/1 must be placed in rack positions 20 and 21.



(front view) *(back view)*

Figure 1 Front and back views

The 10317/1/1 module is fixed in the I/O rack using four M2.5x6 screws.

The HBD backplane 10317/1/1 transfers the V-Bus signals and the rack addresses to the horizontal bus driver 10100/2/1. The rack addresses of the HBD modules are programmed using the jumpers RA0 to RA3. Jumpers RA0 to RA3 above connector CN2 are for Central Part 1. Jumpers RA0 to RA3 above connector CN4 are for Central Part 2.

Note:
For programming details refer to the data sheet of the HBD module 10100/2/1.

Connections

The V-Bus connector of Central Part 1 (CP1) is plugged into connector CN2 and the V-Bus connector of Central Part 2 (CP2) into connector CN4 (see Figure 1).

5 Vdc (1), 5 Vdc (2) and ground (GND) are connected to the I/O backplane via connector CN5 (see Figure 1 and Figure 2).

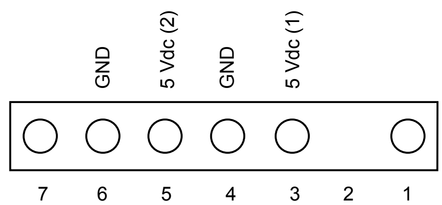


Figure 2   Connector CN5 (detail)

Note:
For connection details of CN5 refer to the data sheet of the 5 Vdc and watchdog distribution module 10313/1/1.

Technical data

The HBD backplane 10317/1/1 has the following specifications:

General

Type number:	10317/1/1 21200
Approvals:	CE, TÜV; UL approval pending
Space requirements:	8 TE, 3 HE (= 8 HP, 3U)

Power

Current consumption:	none

10318/1/1 I/O backplane for non-redundant I/O (10 slots)

Description

The I/O backplane 10318/1/1 for non-redundant I/O is used in two configurations:

- Central Part (CP) with I/O, in combination with 7-SBUS (see Figure 5), or
- non-redundant I/O racks in combination with the HBD backplane 10316/1/1 (see Figure 6).

Up to 10 FSC I/O modules can be placed in the I/O backplane 10318/1/1 (rack positions 1 to 10).

If the 10318/1/1 backplane is used in a system with I/O in the Central Part rack, the CP modules can be placed in the 7-SBUS (rack positions 12 to 18), which is located next to the I/O backplane 10318/1/1.
If the 10318/1/1 backplane is used in non-redundant I/O racks, rack positions 12 to 18 are available for other components, e.g. an additional DC/DC converter 10300/1/1.

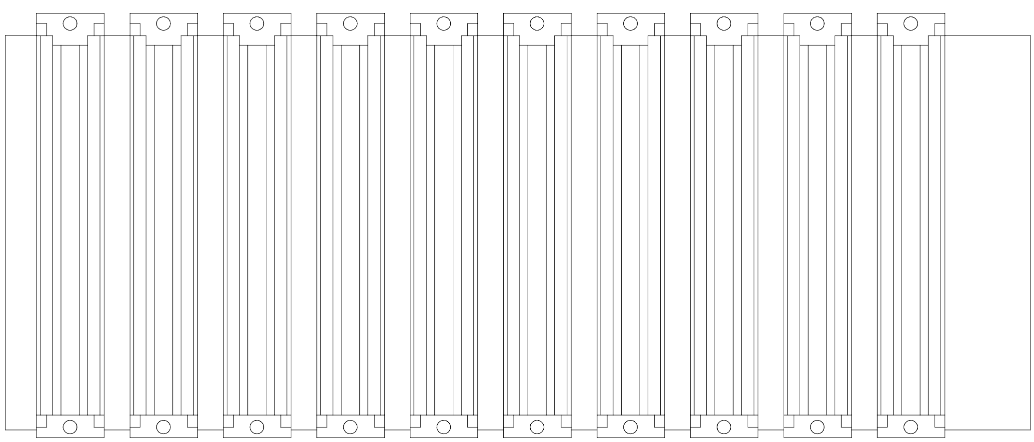


Figure 1 Front view

The back side (see Figure 2) has ten I/O connectors (CN1 to CN10) for system interconnection cables (SIC cables) and ten programming connectors (P1 to P10). These programming connectors are used for:

- current setting (e.g. range-setting module 10216/A/.), and
- signal conversion (e.g. analog input converter module 10102/A/.).

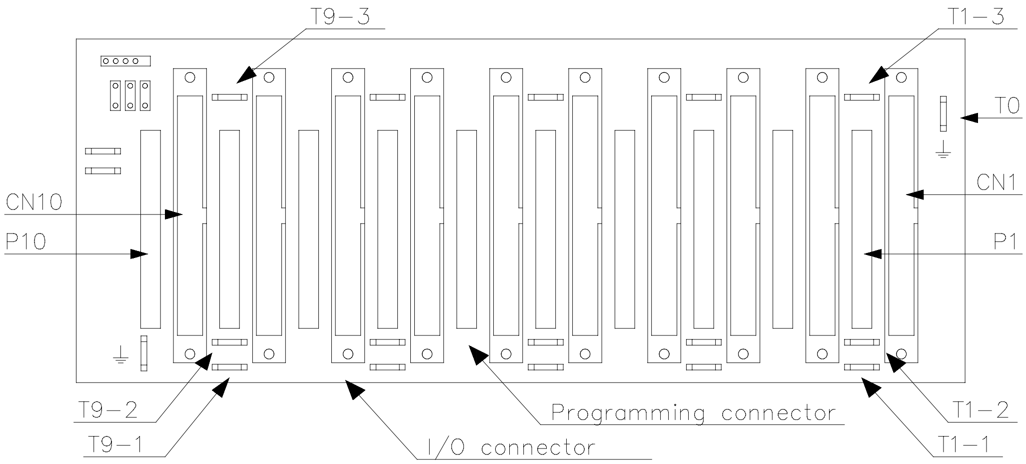


Figure 2 Back view

Connections

The diagram below shows the back view of the programming connectors (P), the I/O module connectors and the I/O backplane connectors (CN):

Programming (P)

	41 / earth
40 / d10	
	37 / z10
36 / d12	
	33 / z12
32 / d14	
	29 / z14
28 / d16	
	25 / z16
24 / d18	
	21 / z18
20 / d20	
	17 / z20
16 / d22	
	13 / z22
12 / d24	
	9 / z24
8 / d26	
	5 / z26
4 / d28	
	1 / z28

I/O module

d	b	z
2	2	2
–		–
6		6
8		8
10		10
12		12
14		14
16		16
18		18
20		20
22		22
24		24
26		26
28		28
30		30
32		32

I/O backplane (CN)

–	–
–	41 / earth
40 / d10	–
–	37 / z10
36 / d12	–
–	33 / z12
32 / d14	–
–	29 / z14
28 / d16	–
–	25 / z16
24 / d18	–
–	21 / z18
20 / d20	–
–	17 / z20
16 / d22	–
–	13 / z22
12 / d24	–
–	9 / z24
8 / d26	–
–	5 / z26
4 / d28	–
–	1 / z28

Between every I/O connector pair, three faston connectors are available (in five groups) to connect power to the I/O module pairs. The faston connectors are marked as follows:

- Tx-1 (connected to d32 and z32 of the I/O connector left and right)
- Tx-2 (connected to d30 and z30 of the I/O connectors rack position 1 to 10)
- Tx-3 (connected to d6 and z6 of the I/O connector left and right).

The Tx-2 pins are used for the common 0 Vdc and are all interconnected on the I/O backplane. Each faston pin can handle 10 A.

If any module in the rack requires 24 Vdc internal power (on pin d8 and z8), the internal power of 24 Vdc must be connected via two fastons:

- T11-3: 24 Vdc, and
- T11-2: common 0 Vdc.

The watchdog (WDG), 5 Vdc and ground (GND) are connected to the I/O backplane via connector CN11 (see Figure 3 and Figure 4). Watchdog separation is possible by removing jumpers WD1 to WD3 and connecting a 5 Vdc or watchdog signal to the lower pin of the jumper.

Jumper WD1 is the watchdog for the modules in rack positions 1 to 3 (group of three).
Jumper WD2 is the watchdog for the modules in rack positions 4 to 6 (group of three).
Jumper WD3 is the watchdog for the modules in rack positions 7 to 10 (group of four).

The I/O backplane comes with two earth faston connections (T0 and T11-1). These earth connections should be terminated to the I/O rack frame using short wires (2.5 mm², AWG 14), e.g. directly to the nearest bolt on the 19-inch I/O rack.

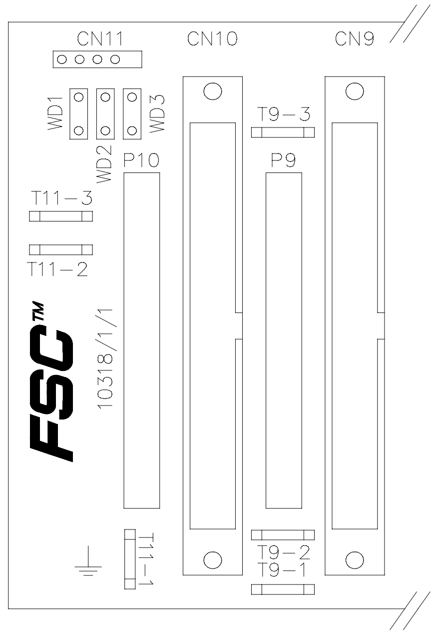


Figure 3 Back view detail

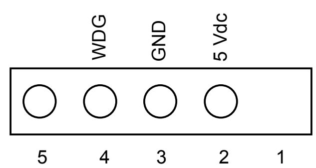


Figure 4 Connector CN11 (detail)

Note:
For connection details of CN11 refer to the data sheet of the 5 Vdc and watchdog distribution module 10313/1/1.

Important considerations

1. The number of Tx-2 pins that need to be wired to the common 0 Vdc busbar depends on the maximum total load of the I/O modules in the rack. The total current capacity of the Tx-2 connections should be higher than the maximum total load of all I/O modules in the 10318/1/1 backplane. As each Tx-2 connection can handle 10 A, a demand total of 25 A would require three Tx-2 connections for optimum current distribution across the I/O modules.
2. There should always be two 0 Vdc connections, one at each end of the backplane (connected to T1-2 and T9-2, respectively). If additional 0 Vdc connections are required, the extra connections should be connected as closely to the power user(s) as possible.

Application examples

Figure 5 and Figure 6 below show typical applications of the I/O backplane 10318/1/1.

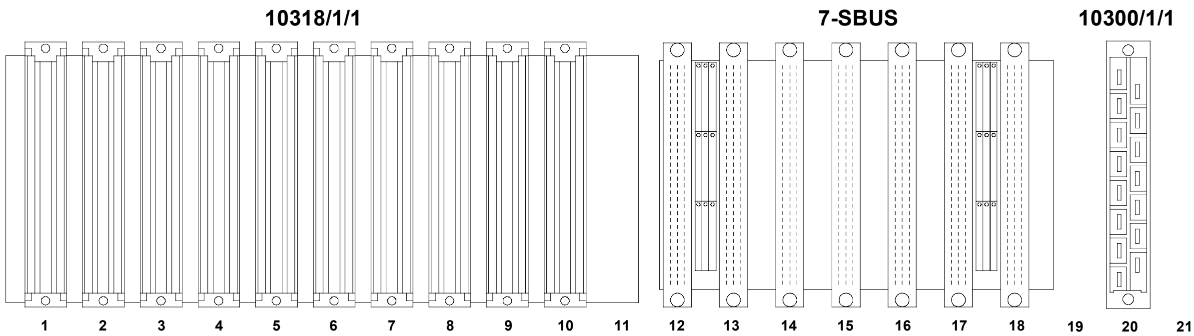


Figure 5 Front view of Central Part with I/O backplane and system bus

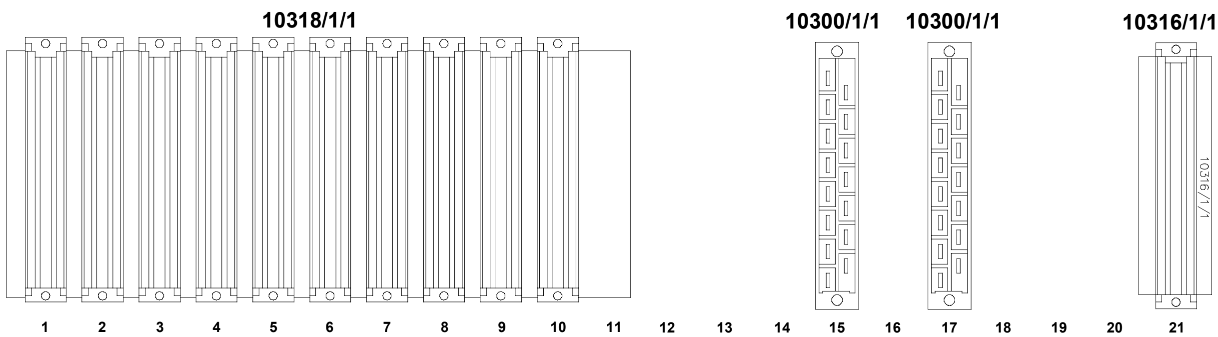


Figure 6 Front view of non-redundant I/O rack with HBD and I/O backplane

Technical data

The I/O backplane 10318/1/1 has the following specifications:

General

Type number:	10318/1/1 21300
Approvals:	CE, TÜV; UL approval pending
Space requirements:	44 TE, 3 HE (= 44 HP, 3U)

Power

Current consumption:	none
Max. current on faston pin:	10 A
Max. current on I/O connector pin:	2 A

Honeywell

Fail Safe Control
Hardware Manual

Section 4:
Central Part Modules

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Section 4: Central Part Modules

10001/R/1 Vertical bus driver (VBD)

Description

The Central Part (CP) of the FSC system is connected to the I/O level via the vertical bus driver (VBD) modules, which are located in the Central Part rack. A maximum of 6 vertical bus drivers can be installed per Central Part. Each vertical bus driver can support up to 10 horizontal bus driver (HBD) modules.

The maximum distance between a vertical bus driver and any I/O rack on the vertical bus is 5 m (16.4 ft).

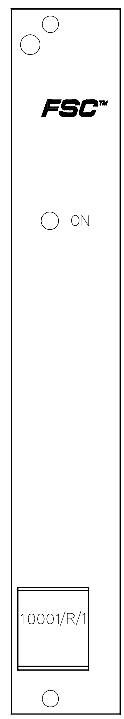


Figure 1 Front view

The 10001/R/1 module consists of two parts (see Figure 2):

- electronic part (mainboard), and
- wiring part (10001/A/1).

The bolts on the 96-pin connector are used to secure the 10001/A/1 part of the VBD to the 19-inch rack. This allows exchange of the electronic part of the VBD without disconnecting the vertical bus flatcable.

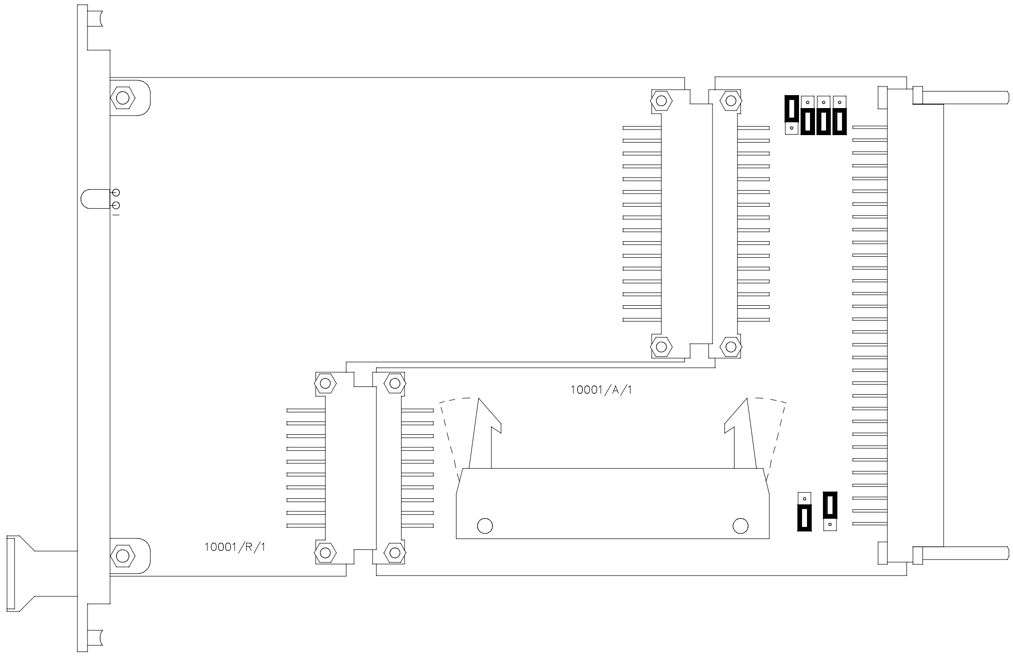


Figure 2 Module layout

Jumpers

Jumpers J1 to J4 on the wiring part (10001/A/1) are used to set the VBD number (see Figure 3).
Jumpers J5 and J6 on the wiring part (10001/A/1) are used to set the Central Part (CP) number (see Figure 3).

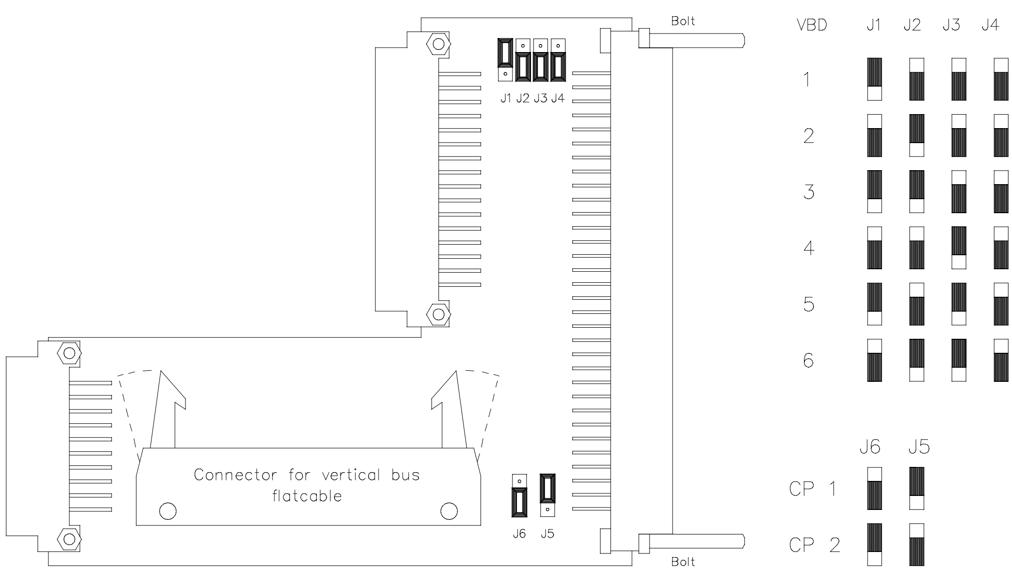


Figure 3 Jumper setting on 10001/A/1 module for CP 1, VBD 1

Vertical bus

The vertical bus flatcable connects the 10001/R/1 vertical bus drivers to the horizontal bus drivers (HBDs, 10100/1/1 or 10100/2/1). For details on vertical buses refer to the 'V-Buses' data sheet.

Technical data

The 10001/R/1 module has the following specifications:

General

Type number:	10001/R/1
Approvals:	CE, TÜV, UL
Software versions:	all
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 275 mA
Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

Left blank intentionally.

10005/1/1 Watchdog module (WD)

Description

The watchdog module monitors system parameters including:

- the application loop maximum execution time in order to detect if the process is executing its program correctly and is not looping (hang-up).
- the application loop minimum execution time in order to detect if the processor is executing its program correctly and is not skipping program parts.
- 5 Vdc voltage monitoring for overvoltage and undervoltage (5 Vdc ± 5 %).
- memory error logic from CPU, COM and MEM modules. In case of a memory error, the watchdog output is de-energized.
- ESD input to de-energize the watchdog output independently from the processor. This ESD input is 24 Vdc and galvanically isolated from the internal 5 Vdc.

In order to be able to test the WD module for all functions, the WD module itself is a 2-out-of-3-voting system. Each section monitors the parameters described above.

The maximum WDG OUT output current is 900 mA (fuse 1A) 5 Vdc. If the number of output modules on the same 5 Vdc supply require a higher current (total of WD input currents of the output modules), then a watchdog repeater (WDR, 10302/1/1) must be used, and the load must be divided over the WD and the WDR.

Connections

For safety-relevant applications, the plant ESD can be connected directly to the WD module. In case of an ESD, the outputs will be de-energized independently from the processor.

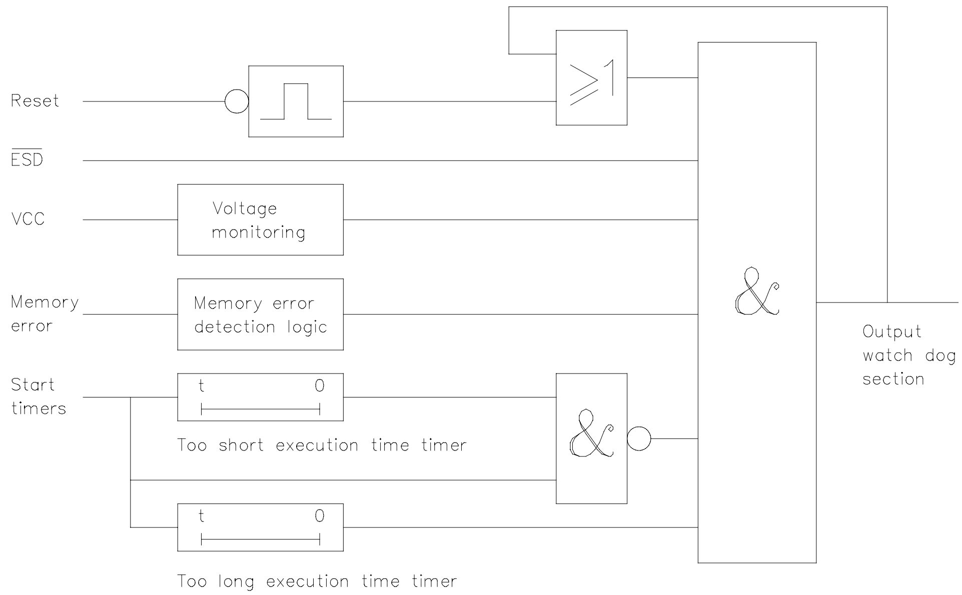


Figure 1 Watchdog section

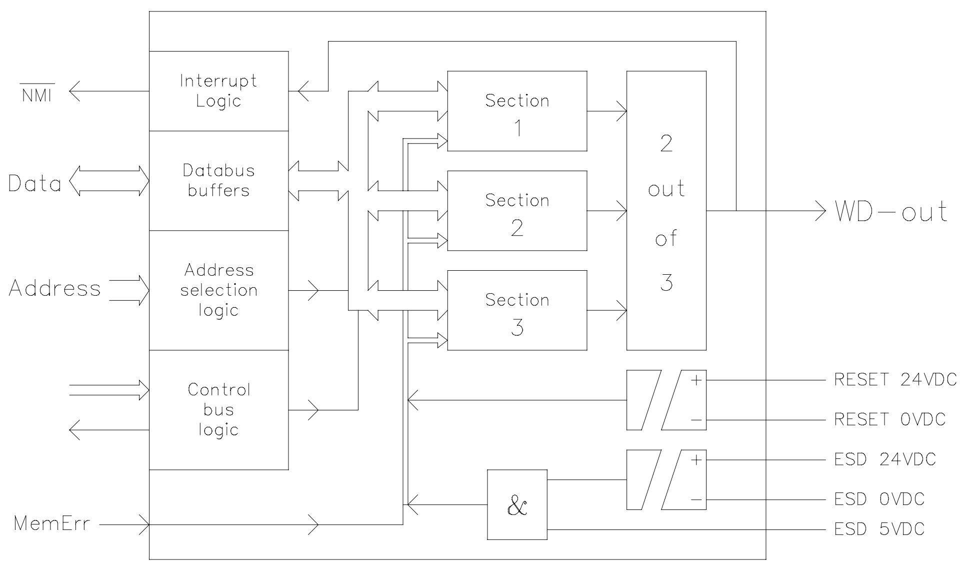


Figure 2 Watchdog module

The watchdog module terminates on the front to a 10005/O/· watchdog horizontal bus or the S-BUS located on top of the Central Part rack.

Jumpers

The jumper settings of the 10005/1/1 module are as follows:

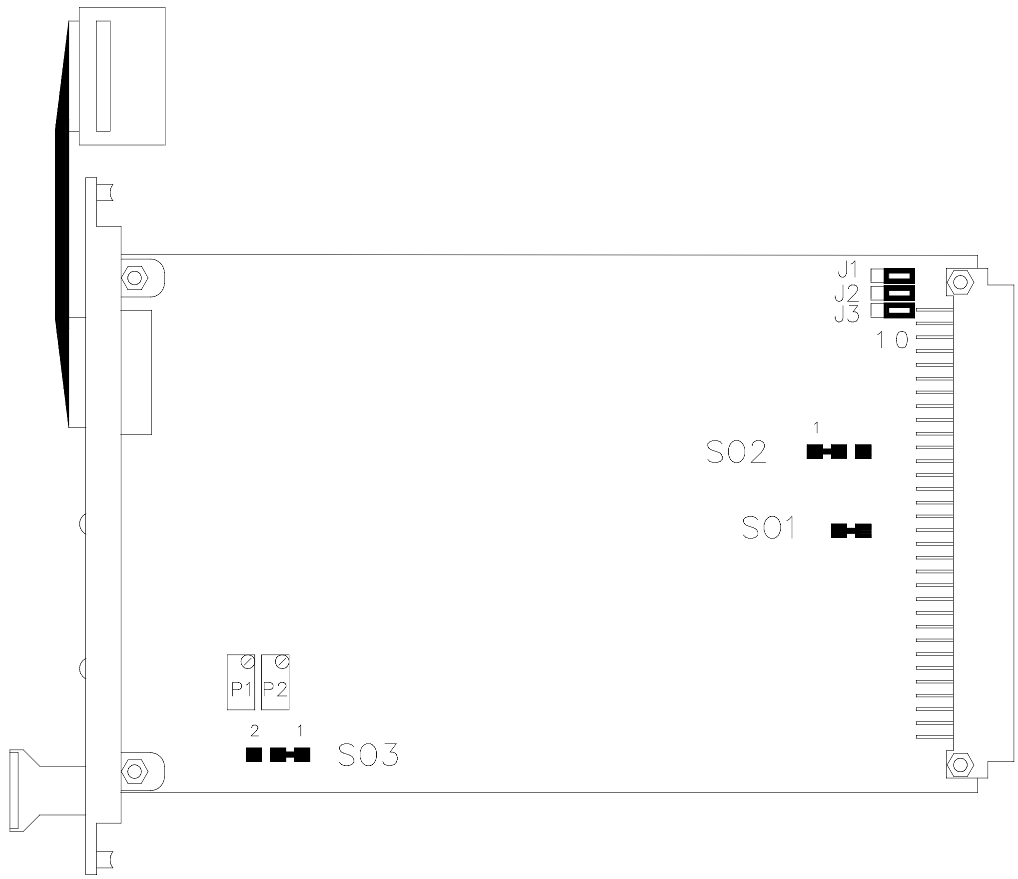


Figure 3 Jumper settings on 10005/1/1 module

The solder jumpers SO1 and SO2 are factory-set.

Position 1 (as shown in Figure 3) of the solder jumper SO3 is used for those applications that always require a manual start command.
The solder jumper SO3 in position 2 is used for those applications that have to start automatically after power-up (warm start). In the latter case, a manual reset is still required after a system trip. An automatic start is not executed if the system was powered off with a fault present (VDE 0116). In that case it still requires a manual reset (resulting in cold start).

Jumpers J1 to J3 must be positioned as shown in Figure 3.

Technical data

The 10005/1/1 module has the following specifications:

General	Type number:	10005/1/1 01302* 10005/1/1 01303*
	Approvals:	CE, TÜV, UL
	Software versions:	all
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 175 mA (without WDGOUT output current)
	Ripple content:	< 50 mV p-p
WDG OUT	Max. output current:	900 mA
Input	ESD1 input:	24 Vdc 5 mA
	Reset input:	24 Vdc 10 mA
	ESD2 input:	5 Vdc 10 mA

*** Note:**
- 10005/1/1 modules with a suffix code are functionally identical to 10005/1/1 modules without a suffix code. The changes involve improved production yield and reliability.
- 10005/1/1 modules with suffix code 01301 support the 10005/O/1 watchdog horizontal bus.
- 10005/1/1 modules with suffix code 01302 support the 10005/O/2 watchdog horizontal bus with ESD key switch.
- 10005/1/1 modules with suffix code 01303 support the 10005/O/3 watchdog horizontal bus without ESD key switch.

Note:
Do not remove or replace this module while the power on its Central Part is on.

10005/O/2 Watchdog horizontal bus with ESD key switch

Description

The watchdog horizontal bus interconnects the watchdog flatcable (at the front) with the 5 Vdc & watchdog distribution module (10313/1/1), the watchdog reset input (24 Vdc), and the plant ESD input (24 Vdc) terminals.
The ESD key switch on the 10005/O/2 module is used to shut down the Central Part in a safe manner.

The watchdog horizontal bus is mounted in an HC housing on top of the Central Part rack by means of four screws. A watchdog horizontal bus is required for each watchdog module except for the watchdog module in those configurations where a single bus driver (SBD, 10007/1/1) is placed.

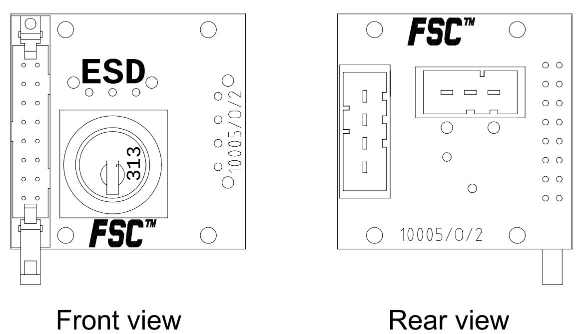


Figure 1 Mechanical layout

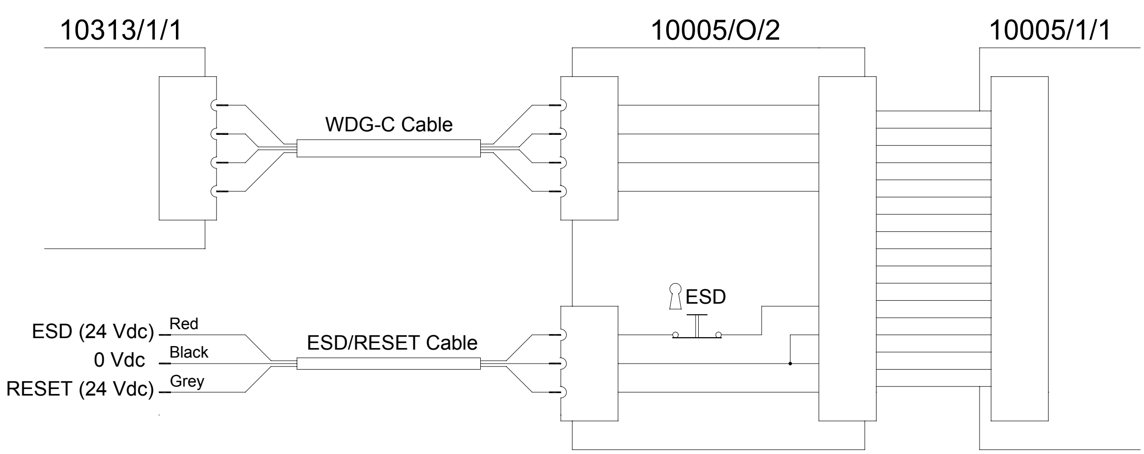


Figure 2 Schematic diagram

Connections

Figure 3 below shows the connections of the 10005/O/2 module.

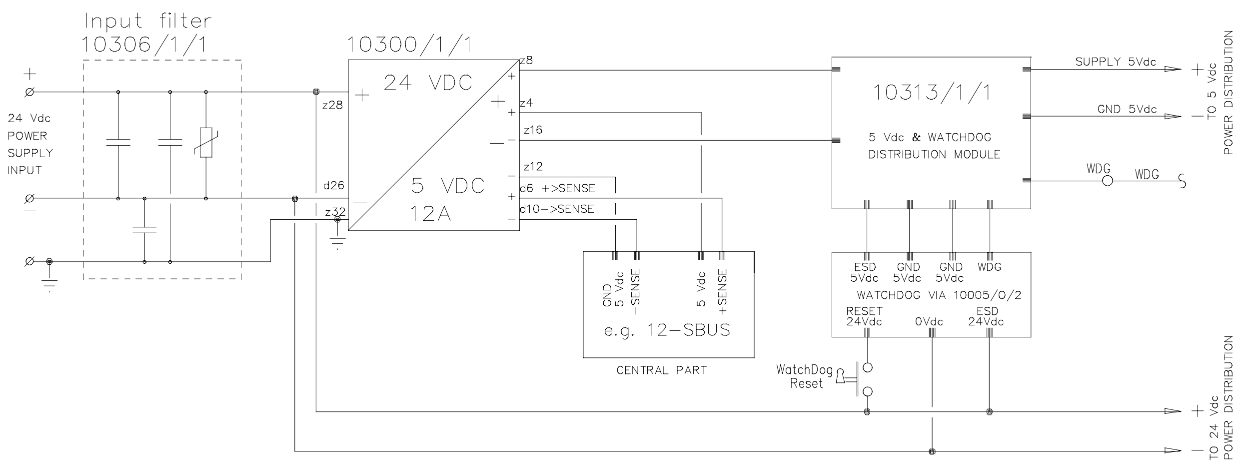


Figure 3   Connection details of 10005/O/2 for one Central Part

The separation between the 5 Vdc level and the 24 Vdc level must be maintained in the same manner as for the I/O module terminations.

Technical data

The 10005/O/2 module has the following specifications:

General

Type number:	10005/O/2 41200
Approvals:	CE, UL, TÜV
Software versions:	not applicable
Space requirements:	8 TE (= 8 HP) (in horizontal bus module for Central Part)

Power

Power requirements:	none

10005/O/3 Watchdog horizontal bus

Description

The watchdog horizontal bus interconnects the watchdog flat cable (at the front) with the 5 Vdc & watchdog distribution module (10313/1/1), the watchdog reset input (24 Vdc), and the plant ESD input (24 Vdc) terminals.

The watchdog horizontal bus is mounted in an HC housing on top of the Central Part rack by means of four screws. A watchdog horizontal bus is required for each watchdog module except for the watchdog module in those configurations where a single bus driver (SBD, 10007/1/1) is placed.

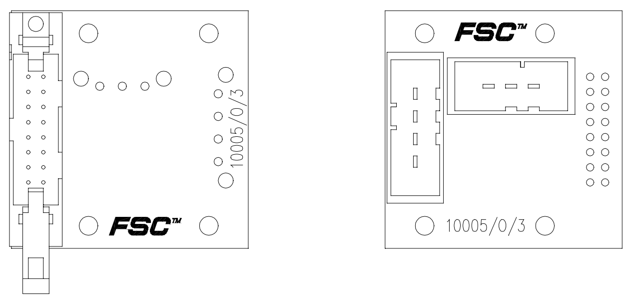


Figure 1 Mechanical layout

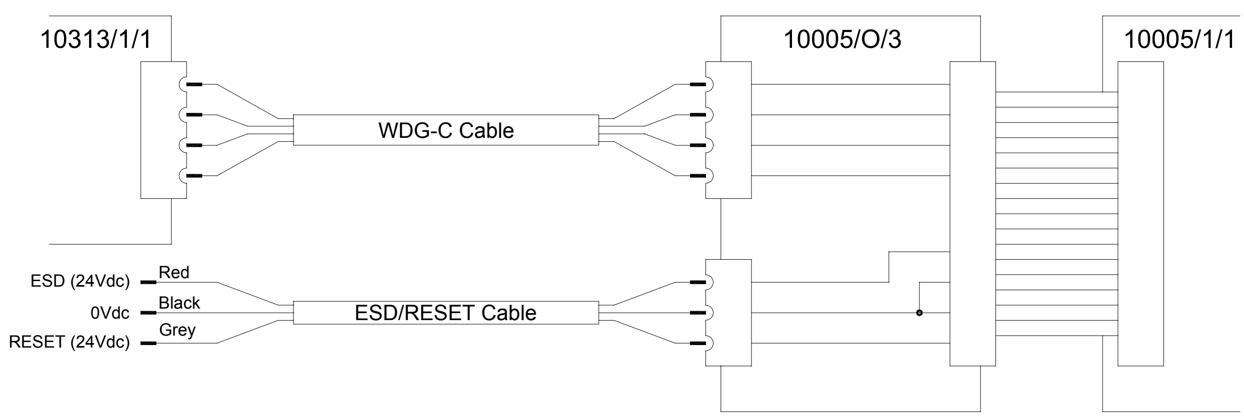


Figure 2 Schematic diagram

Connections

Figure 3 below shows the connections of the 10005/O/3 module.

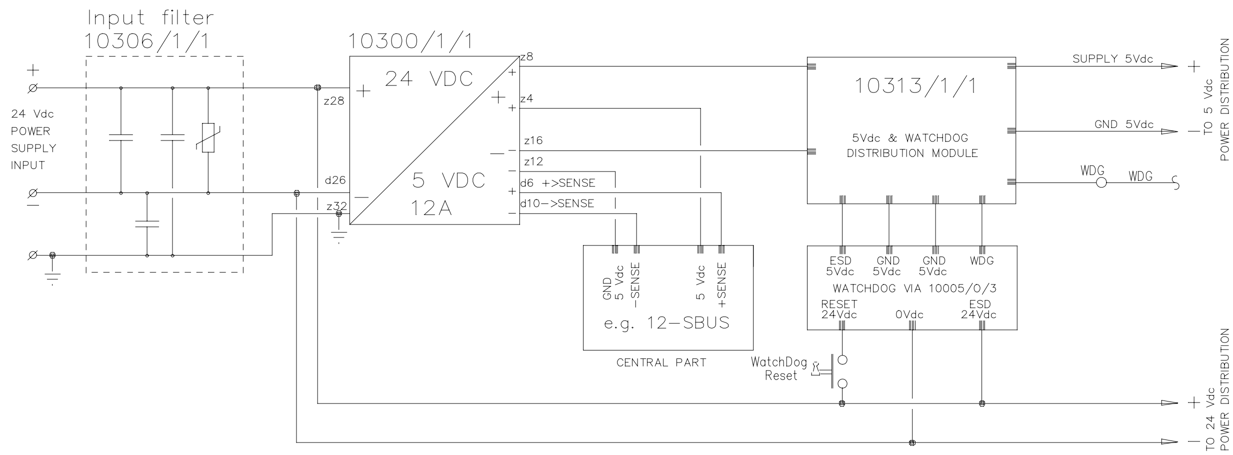


Figure 3 Connection details of 10005/O/3 for one Central Part

The separation between the 5 Vdc level and the 24 Vdc level must be maintained in the same manner as for the I/O module terminations.

Technical data

The 10005/O/3 module has the following specifications:

General

Type number:	10005/O/3 41500
Approvals:	CE, UL, TÜV
Software versions:	not applicable
Space requirements:	8 TE (= 8 HP) (in horizontal bus module for Central Part)

Power

Power requirements:	none

10006/2/1 Diagnostic and battery module (DBM)

Description

The diagnostic and battery module (DBM) 10006/2/1 provides a low-cost interface to the user for diagnosing the FSC system.
The displays on the front of the module are used to display messages about the faults found by the diagnostic routines. The message gives type, rack and position number of the module found to be faulty.

In addition to the diagnostic messages, the DBM module is provided with a real-time clock function which gives the current date and time. Both date and time can be displayed on the front of the DBM module and can be read by the application program.
The DBM module is able to display the temperature values measured by two independent temperature sensors on the DBM of the FSC system, as well as the 5 Vdc level and the battery voltage. High and low alarm points and high and low trip points can be entered for the temperature measurement during DBM configuration in the system configuration option of the FSC user software.

The switch at the front of the DBM module can be operated to retrieve system information (switch upwards) or diagnostic information (switch downwards).
To get all information, the switch must be operated several times.

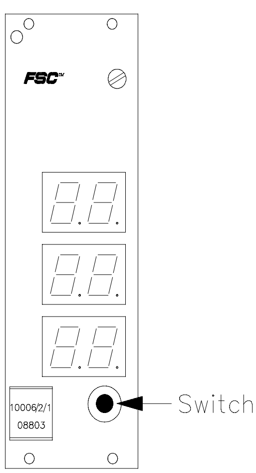


Figure 1
Front view

The diagnostic information is displayed as follows:

Top display:	Signal type:
AI	Analog input fault
dI	Digital input fault
Ao	Analog output fault
do	Digital output fault
CP	Central part fault
tL	Temperature low
tH	Temperature high
cE	HBD correlation (address HBD not set correct)
hb	HBD fault

Middle display: Rack number
Bottom display: Position number

The display will normally show the time (hours, minutes, seconds) and will automatically return to this mode when the switch is not used for approx. 30 seconds.

A flashing display indicates that a system fault is present and diagnostic information is available.
A blank display means that no diagnostic information is present or diagnostic information was read before.

The system information cycle has five stages which can be called up by (repeatedly) moving the switch upward (see Table 1).

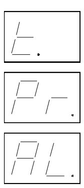
Table 1 Switch operation for system information

Switch moved upward →	**1x (≥ R510)**	**1x (< R510)**	**2x**	**3x**	**4x**	**5x**
Top display	[1]	Weekday[2]			5 Vdc units	Battery units
Middle display	[1]	Date	Degree 1	Degree 2	5 Vdc decimals	Battery decimals
Bottom display	[1]	Month	Unit	Unit		

1) The displays will show the year (last two digits, e.g. 99), the month and the day. The order depends on the date format on the FSC user station. For details refer to Section 4 of the FSC Software Manual.
2) Sunday = 0, Monday = 1, Tuesday = 2, etc.

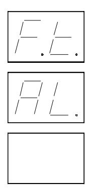
Diagnostic messages, if they are available, can be retrieved by (repeatedly) moving the switch downward:

Temperature alarm



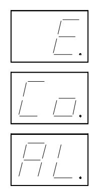
Temperature
Pre
Alarm

Second fault timer started



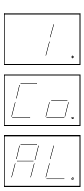
Fault timer
Alarm

External communication error



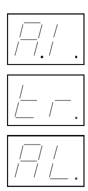
External
Communication
Alarm

Internal communication error



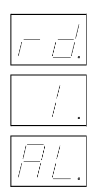
Internal
Communication
Alarm

Transmitter fault alarm



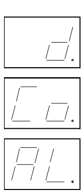
Analog input
Transmitter
Alarm

Redundant input fault alarm



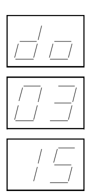
Redundant
Input
Alarm

Device communication error



Device
Communication
Alarm

Module faulty (example)



Digital output fault
Rack 3
Position 15

Jumpers

Jumper J1 switches the batteries in stock (OFF) or in circuit (ON).
Jumpers J2 and J3 are factory-set (closed).

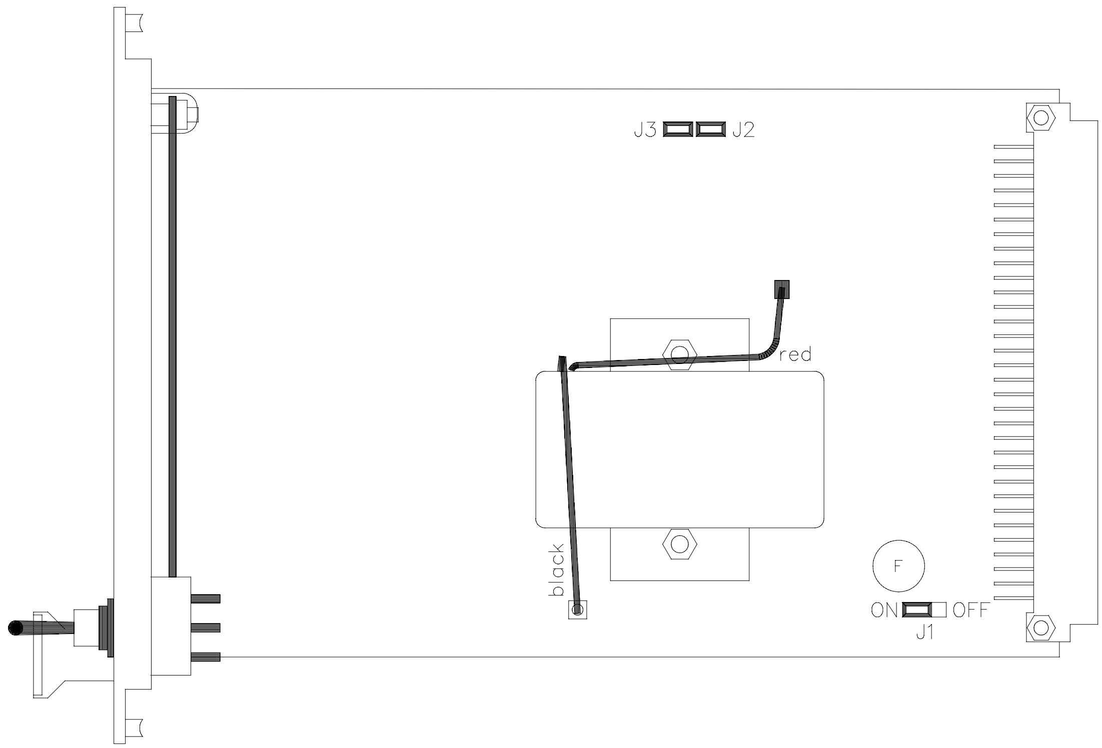


Figure 2 Jumper settings on 10006/2/1 module (08804 shown)

Batteries

The DBM module has rechargeable batteries that supply the back-up power for the RAM memory on the CPU (100x2/·/·, 10020/·/1) and COM modules (100x4/·/·).
It is recommended that the batteries are replaced every four years.

Warning:
Always assure that batteries are charged when placing the DBM module in a system that has the other central part running.

Note:
If the cabinet temperature exceeds 50°C (122°F) for an extended time period (>24 hours), the batteries may be damaged and lose their power backup capabilities.

Technical data

The 10006/2/1 module has the following specifications:

General

Type number:	10006/2/1 08804 [1)]
Approvals:	CE, TÜV, UL
Software versions:	≥ 2.90
Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Time drift:	< 1 sec/day

Power

Power requirements:	5 Vdc 300 mA
Ripple content:	< 50 mV p-p

Batteries

Type:	NiCad battery pack 3.6 V-600 mAh
Back-up capacity:	0.5 Ah [2)]

Notes:

1) 10006/2/1 modules with suffix code 08801 and higher have improved noise immunity.
   10006/2/1 modules with suffix code 08802 are equipped with a special battery holder, which allows easy exchange of the batteries.
   10006/2/1 modules with suffix code 08803 are equipped with a battery pack for higher reliability and an increased temperature range up to 65 °C (148 °F).
   10006/2/1 modules with suffix code 08804 are equipped with battery pack that is connected to the main board by means of connectors. This allows easy exchange of the batteries.
2) If the cabinet temperature exceeds 55°C (131°F) for an extended time period (>24 hours), the batteries may be damaged and lose their power backup capabilities.

Note:
Do not remove or replace this module while the power to its Central Part is on.

10006/2/2 Diagnostic and battery module (DBM) with DCF-77 interface

Description

The diagnostic and battery module (DBM) 10006/2/2 provides a low-cost interface to the user for diagnosing the FSC system.
The displays on the front of the module are used to display messages about the faults found by the diagnostic routines. The message gives type, rack and position number of the module found to be faulty.

In addition to the diagnostic messages, the DBM module is provided with a real-time clock function, which is synchronized to the DCF-77 radio time beacon. This time beacon is transmitted at a frequency of 77.5 kHz (long wave) from a transmitter near Frankfurt (Germany), and has a time deviation of less than 1 second in 300,000 years.
During bad radio receive conditions, the 10006/2/2 module will switch to the local (DCF-synchronized, quartz-controlled) real-time clock to continue providing the current time.
By synchronizing to the time beacon, it is easy to use a variety of process control systems without getting differences in their real-time clock value. Both date and time can be displayed on the front of the DBM module and can be read by the application program.
The 10006/2/2 module requires a Hopf aerial or a DCF-77 equivalent signal to be connected to the coax connector on the module front.

A green LED on the module front indicates an absolute time accuracy within 10 ms (either DCF-synchronized or crystal-controlled).
A time and date download is possible providing the real-time clock module has not (yet) found a validated DCF signal (green LED is off).

The DBM module is able to display the temperature values measured by two independent temperature sensors on the DBM of the FSC system, as well as the 5 Vdc level and the battery voltage. High and low alarm points and high and low trip points can be entered for the temperature measurement during DBM configuration in the system configuration option of the FSC user software.

The switch at the front of the DBM module can be operated to retrieve system information (switch upwards) or diagnostic information (switch downwards).
To get all information, the switch must be operated several times.

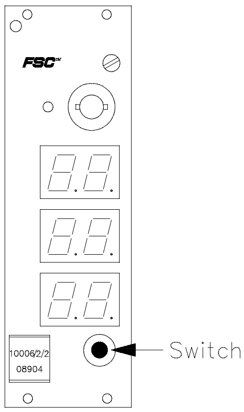


Figure 1
Front view

The diagnostic information is displayed as follows:

Top display:	Signal type:
AI	Analog input fault
dI	Digital input fault
Ao	Analog output fault
do	Digital output fault
CP	Central part fault
tL	Temperature low
tH	Temperature high
cE	HBD correlation (address HBD not set correct)
hb	HBD fault

Middle display: Rack number
Bottom display: Position number

The display will normally show the time (hours, minutes, seconds) and will automatically return to this mode when the switch is not used for approx. 30 seconds.
A flashing display indicates that a system fault is present and diagnostic information is available.
A blank display means that no diagnostic information is present or diagnostic information was read before.

The system information cycle has five stages which can be called up by (repeatedly) moving the switch upward (see Table 1).

Table 1 Switch operation for system information

Switch moved upward →	**1x (≥ R510)**	**1x (< R510)**	**2x**	**3x**	**4x**	**5x**
Top display	1)	Weekday 2)			5 Vdc units	Battery units
Middle display	1)	Date	Degree 1	Degree 2	5 Vdc decimals	Battery decimals
Bottom display	1)	Month	Unit	Unit		

1) The displays will show the year (last two digits, e.g. 99), the month and the day. The order depends on the date format on the FSC user station. For details refer to Section 4 of the FSC Software Manual.
2) Sunday = 0, Monday = 1, Tuesday = 2, etc.

Diagnostic messages, if they are available, can be retrieved by (repeatedly) moving the switch downward:

Temperature alarm

t.	Temperature
Pr.	Pre
AL.	Alarm

Second fault timer started

F.t.	Fault timer
AL.	Alarm

External communication error

E.	External
Co.	Communication
AL.	Alarm

Internal communication error

I.	Internal
Co.	Communication
AL.	Alarm

Transmitter fault alarm

A.I.	Analog input
tr.	Transmitter
AL.	Alarm

Redundant input fault alarm

rd.	Redundant
I.	Input
AL.	Alarm

Device communication error

d.	Device
Co.	Communication
AL.	Alarm

Module faulty (example)

do	Digital output fault
03	Rack 3
15	Position 15

At power-on, the green LED will stay off for 16 seconds and then switch to the 'Aerial positioning' mode.
In this mode the green LED flashes (at 1 Hz) giving an indication of the received radio signal level (the ON time becomes longer if the radio signal level goes up).
After approximately four minutes, the green LED switches to 'DCF accurate' mode. The LED stays off until the DCF receiver knows it holds the current time. Then it goes on (and stays on).

Jumpers

Jumper J1 switches the batteries in stock (OFF) or in circuit (ON).
Jumpers J2 and J3 are factory-set (closed).

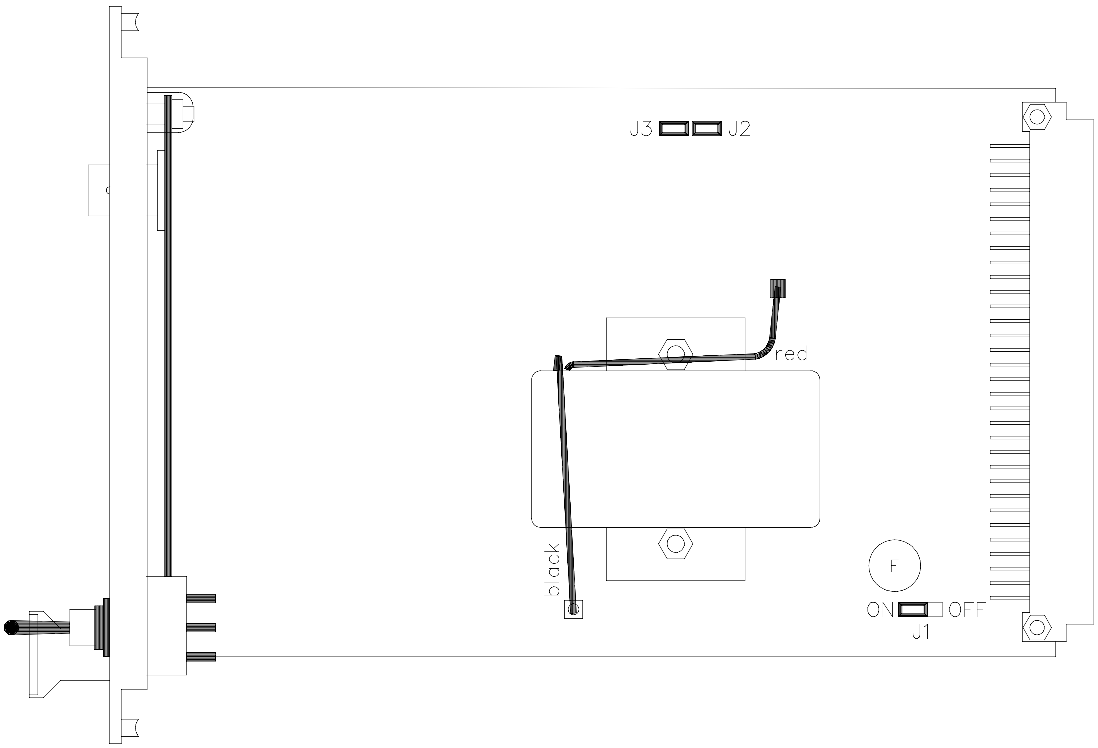


Figure 2 Jumper settings on 10006/2/2 module (08905 shown)

Batteries

The DBM module has rechargeable batteries that supply the back-up power for the RAM memory on the CPU (100x2/·/·), COM modules (100x4/./.) and MEM modules (10003/1/1).
It is recommended that the batteries are replaced every four years.

Warning:
Always assure that batteries are charged when placing the DBM module in a system that has the other central part running.

Note:
If the cabinet temperature exceeds 50°C (122°F) for an extended time period (>24 hours), the batteries may be damaged and lose their power backup capabilities.

DCF signal

The 10006/2/2 DBM module is provided with a real-time clock function which is synchronized to the DCF-77 radio time beacon. The inner circle in Figure 3 shows the region of Europe where reception of the DCF radio signal is usually good. The outer circle in Figure 3 shows the region where the reception of the DCF radio signal is usually possible.

Figure 3 Receive radius of DCF atomic clock radio near Frankfurt

Do not place the aerial in the neighborhood of TVs or PC monitors, elevator shafts, radio transmitters, fluorescent lamps, phase shift controlled equipment, switching cabinets for inductive loads, or ignition equipment for combustion engines. Use of an outdoor aerial is also recommended in reinforced concrete buildings.

Technical data

The 10006/2/2 module has the following specifications:

General	Type number:	10006/2/2 08905 [1)]
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 2.90
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Power	Power requirements:	5 Vdc 350 mA
	Ripple content:	< 50 mV p-p
DCF	Receiver sensitivity:	10 µV
	Time offset:	± 2.5 ms after DCF synchronization
	Quartz accuracy:	± 10 ppm at installation start ± 2 ppm after DCF synchronization

Technical data (continued)

Aerial 2)	Aerial connector:	BNC female
	Aerial type:	active ferrite
	Max. cable length:	500 m (547 yd) (50 Ohm)
	Input isolation:	500 Vdc (to 0 V of 5 Vdc supply)
Batteries	Type:	NiCad battery pack 3.6 V 600 mAh
	Back-up capacity:	0.5 Ah 3)

Notes:

1) 10006/2/2 modules with suffix code 08901 and higher have been modified to meet CE requirements.
   10006/2/2 modules with suffix code 08902 and higher have improved noise immunity.
   10006/2/2 modules with suffix code 08903 are equipped with a special battery holder, which allows easy exchange of the batteries.
   10006/2/2 modules with suffix code 08904 are equipped with a battery pack for higher reliability and an increased temperature range up to 65 °C (148 °F).
   10006/2/1 modules with suffix code 08905 are equipped with battery pack that is connected to the main board by means of connectors. This allows easy exchange of the batteries.
2) Weatherproof outdoor aerials and lightning protection units are supplied by Hopf Elektronik GmbH in Lüdenscheid, Germany.
3) If the cabinet temperature exceeds 55°C (131°F) for an extended time period (>24 hours), the batteries may be damaged and lose their power backup capabilities.

Note:
Do not remove or replace this module while the power to its Central Part is on.

10006/O/1 DBM-to-aerial assembly

Description

The DBM-to-aerial assembly (10006/O/1) transfers the aerial connection on the front of the diagnostic and battery module (DBM, 10006/2/2) to a BNC connector inside the cabinet.
The print is placed in an HC housing on top of the central part rack.
The male right-angled BNC connector is placed on the DBM front connector.
The female chassis BNC connector is available for the 50 Ohm coax cabinet wiring.

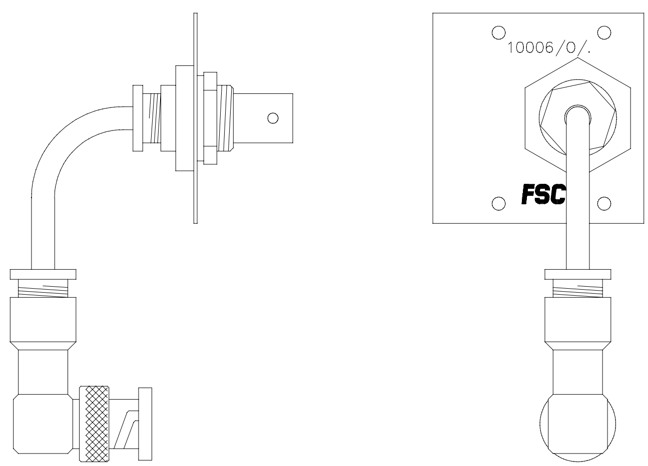


Figure 1 Side and front views

Technical data

The 10006/O/1 module has the following specifications:

General

Type number:	10006/O/1 41000
Approvals:	CE, TÜV, UL
Space requirements:	8 TE (= 8 HP) (in horizontal bus module for Central Part)
Cabinet connector:	BNC female 50 Ohm

Power

Power requirements:	none

10007/1/1 Single bus driver (SBD)

Description

The single bus driver is placed in the Central Part and combines the function of the vertical bus driver (VBD, 10001/1/1) and the horizontal bus driver (HBD, 10100/1/1) in one module without the need of a vertical bus.
The SBD is used in configurations with I/O modules in the Central Part rack(s). This may be useful for small applications or if placing a few I/O modules in the CP rack will save an I/O rack.
The SBD module can only drive the I/O modules which are placed on the left side in the Central Part rack (max. 14).

The SBD module provides rechargeable batteries that supply the back-up power for the RAM memory on the CPU (100x2/1/2, 10020/./.) and COM modules (100x4/./.).

Typical layout

Figure 1 shows a typical schematic layout for configurations with I/O modules in the Central Part rack(s).
A diagnostic and battery module (DBM, 10006/./.) is optional for both single and redundant configurations. A communication module (COM, 100x4/./.) is optional for single configurations.

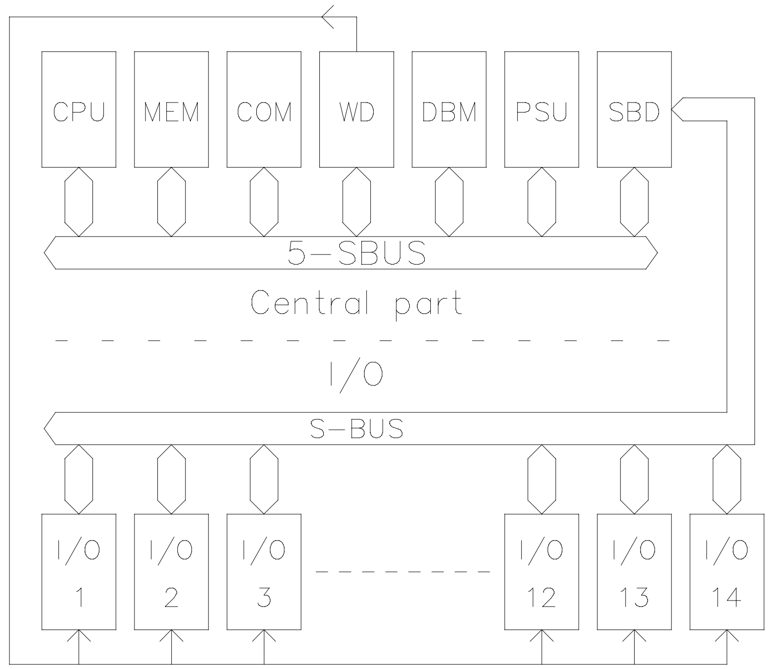


Figure 1 Typical layout

Jumpers

The solder links are factory-set.

Jumper J1 switches the batteries in stock (OFF) or in circuit (ON). Jumpers J5 and J6 are used to set the Central Part number (factory-set at Central Part 1).

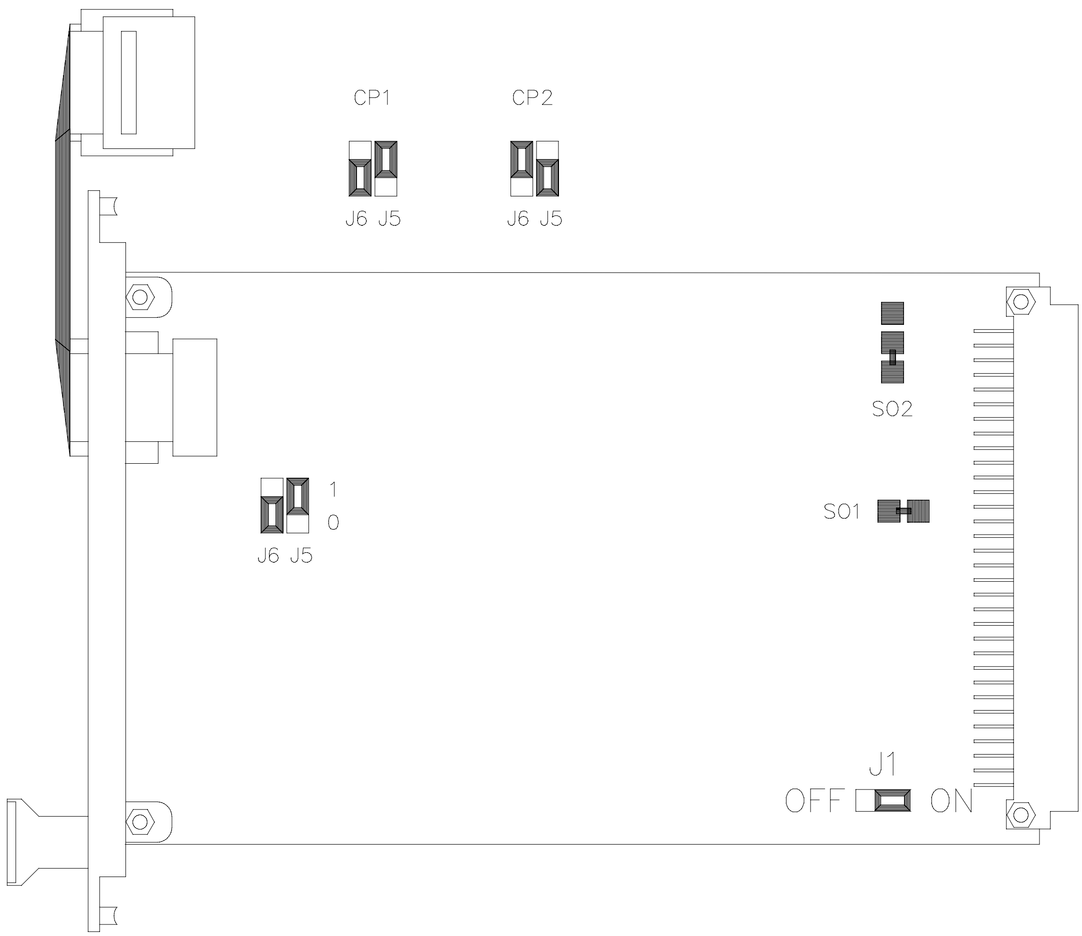


Figure 2 Jumper setting on 10007/1/1

Technical data

The 10007/1/1 module has the following specifications:

General	Type number:	10007/1/1
	Approvals:	CE, TÜV, UL
	Software versions:	all
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 35 mA
	Ripple content:	< 50 mV p-p
Batteries	Back-up capacity:	1 Ah

Note:
Do not remove or replace this module while the power to its Central Part is on.

Left blank intentionally.

10018/2/U FSC-SMM communication module

Description

The 10018/2/U communication module is used for communication with the Honeywell TotalPlant Solution (TPS) System, via the Universal Control Network (UCN).
The module is placed in the Central Part of the FSC system, and consists of:

- a Motorola 68360 Quad Integrated Communication Controller (running on 25 MHz),
- flash memory (4 Mbit) for the FSC firmware program (see Figure 2),
- local RAM on battery backup (16 Mbit with parity) for the application-specific data,
- shared RAM (2 Mbit) for all data exchange between this module and the FSC control processor,
- a Motorola 68824 token bus controller (running on 10 MHz),
- a Motorola 68194 carrierband modem, and
- an isolated redundant communication link.

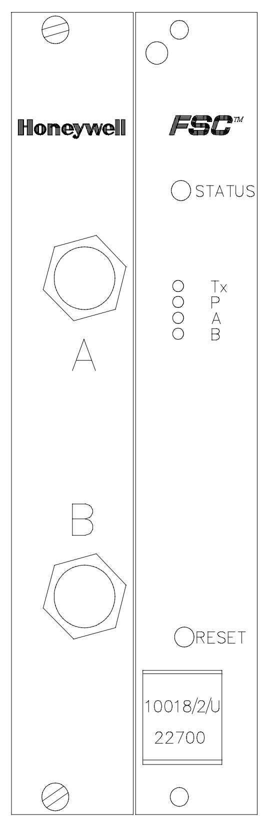


Figure 1 Front view

After power-up, the application program is automatically downloaded from the FSC control processor into local RAM.

The redundant link to the TPS system is made on the two connections (A and B) at the module front (see Figure 1). The top connector is linked to a tab of cable A. The bottom connector is linked to a tab of cable B.

LED indicators

The module has a (red/green) 'STATUS' LED and four additional (red) LEDs.

The 'STATUS' LED is:

– off when the 5 Vdc power on the FSC Central Part system bus is down,

– red when the module is offnet or alive,

– green when the UCN program is running (idle or OK),

– red/green flashing when the UCN program has failed.

If the 'STATUS' LED is green, the four small LEDs provide additional information about the UCN communication:

– The 'Tx' LED is on when data is being transmitted.

– The 'P' LED is on when the node is primary (and off when the node is secondary).

– The 'A' LED is on when the A channel is the active channel.

– The 'B' LED is on when the B channel is the active channel.

Note:
If the node is not redundant, the 'P' LED will always be off.

Jumpers

The FSC-SMM communication module can operate as COM1, COM2, COM3 or COM4. The COM number is set using jumpers J1 and J2 on the board (see Figure 2).

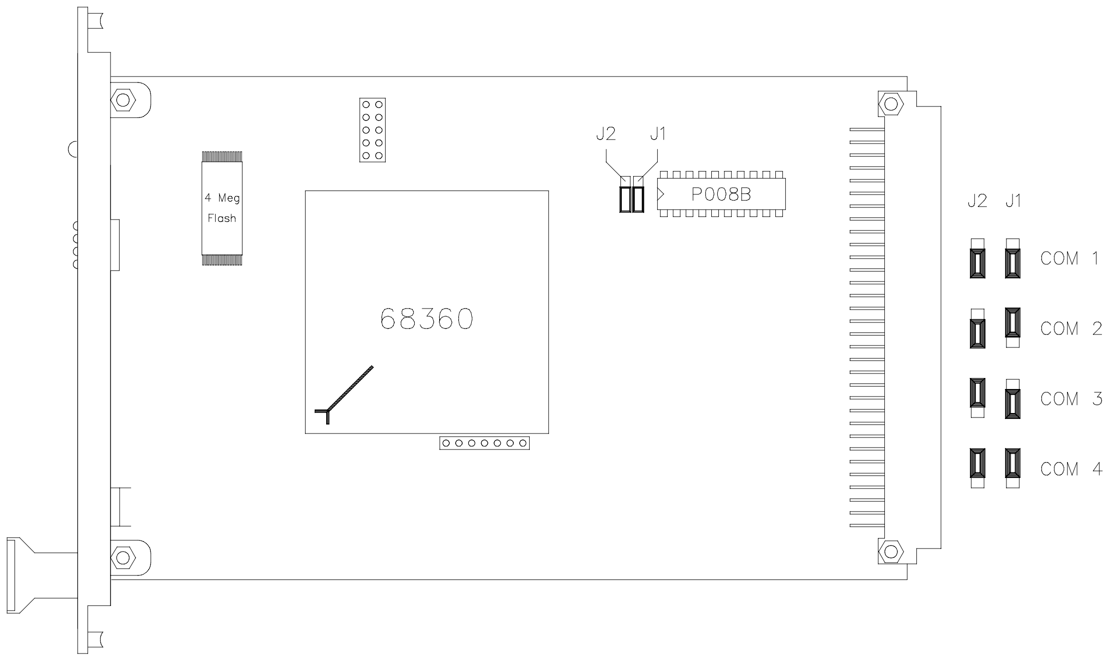


Figure 2 Jumper positions on 10018/2/U

The jumper on the Central Part system bus (7-SBUS, 12-SBUS or 17-SBUS) must be opened (see the 'Central Part system buses' data sheet).

Note:
The two screws on the left module front section must be used to meet the CE requirements.

Technical data

The 10018/2/U module has the following specifications:

General	Type number:	10018/2/U 22702*
	Approvals:	CE, UL, TÜV
	FSC software version:	≥ 510
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Power	Power requirements:	5 Vdc 2 A
	Ripple content:	< 50 mV p-p

*** Note:**
– 10018/2/U modules with suffix code 22701 and higher have minor motherboard design changes to improve reliability. There are no functional changes.
– 10018/2/U modules with suffix code 22702 have minor motherboard design changes due to component updates. There are no functional changes.

Note:
Do not remove or replace this module while the power to its Central Part is on.

10018/E/. Communication module (COM)

Description

The 10018/E/1 and 10018/E/E communication modules are used for communication with the Honeywell PlantScape system. The module is placed in the Central Part of the FSC system, and consists of:

- a Motorola 68EN360 Quad Integrated Communication Controller (running on 25 MHz),
- flash memory (4 Mbit) for the FSC firmware program (see Figure 2),
- local RAM on battery backup (16 Mbit with parity) for the application-specific data,
- shared RAM (2 Mbit) for all data exchange between this module and the FSC control processor, and
- one or two Ethernet serial interfaces (type 10018/E/.).

Module layout

A 10018/E/1 and 10018/E/E communication module will always take up two card positions in a rack. They consist of two parts:

- the main board (10018/1/., right), and
- one or two isolated Ethernet serial interfaces (10018/E/., left).

Figure 1 on the next page shows what a 10018/E/E communication module looks like. The right half is the main board, and the left half accommodates the two Ethernet interfaces. The 10018/E/E module provides connection redundancy in the FSC interface with the PlantScape system.
The 10018/E/1 module is identical to the 10018/E/E module, except it only has one Ethernet interface (on position A). Position B is then empty.

Note:
The two screws on the left module front section must be used to meet the CE requirements.

Main board

The main board controls the Ethernet interface between FSC and PlantScape. It has its own processor and memory to relieve the central processor and to offer optimum support for the external equipment.

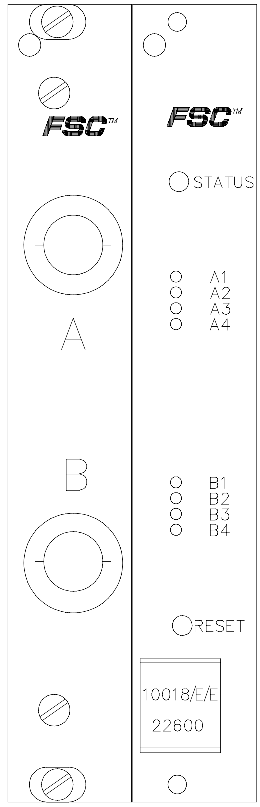


Figure 1 Front view of 10018/E/E module

LED indicators

The main board of a 10018/E/1 and 10018/E/E communication module has a red/green 'STATUS' LED and two sets of four red LEDs.

The 'STATUS' LED is:
- **off** when the 5 Vdc power on the FSC Central Part system bus is down,
- **red** when the module is down or not running *(see also note below)*,
- **green** when the module is running,
- **red/green flashing** when the software has detected a software or hardware fault.

If the 'STATUS' LED is green, the small LEDs provide additional information about the communication:
- The top four red LEDs (marked 'A1' to 'A4') are for channel A.
- The bottom four red LEDs (marked 'B1' to 'B4') are for channel B.

Each of the four LEDs provides information about the channel communication *(see also note below)*:

– The 'A1' and 'B1' LEDs are on when data is being transmitted.

– The 'A2' and 'B2' LEDs are on when data is being received.

– The 'A3' and 'B3' LEDs are on as long as a connection with the PlantScape server is present for process data *(process scan)*.

– The 'A4' and 'B4' LEDs are on as long as a connection with the PlantScape server is present for FSC system information and extended diagnostics *(information scan)*.

Note:
If the 'STATUS' LED is red and the 'A1' and 'B1' LEDs are both on (while all other 'A' and 'B' LEDs are off), this indicates a CPU failure.

Jumpers

The 10018/E/1 and 10018/E/E communication module can operate as COM1, COM2, COM3 or COM4. The COM number is set using jumpers J1 and J2 on the main board. Their location and settings are shown in Figure 2 below.

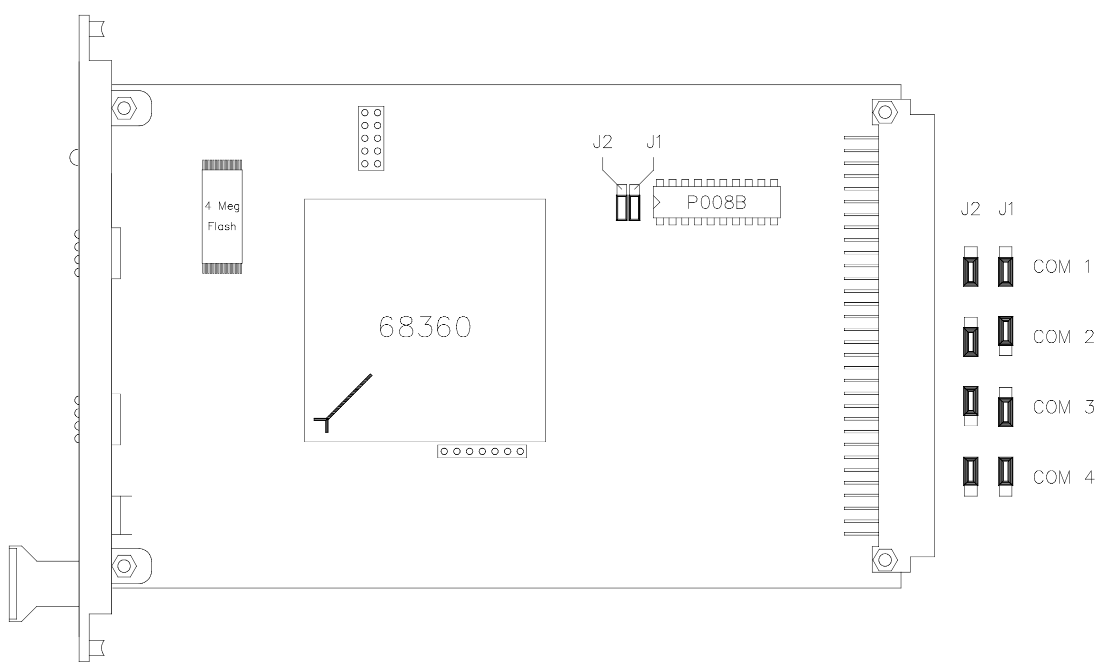


Figure 2 Jumper positions on 10018/E/1 & 10018/E/E main board

Jumpers on system bus

Please note that when you are installing a new communication module, you need to remove a jumper from the Central Part system bus (7-SBUS, 12-SBUS, or 17-SBUS). For details refer to the Central Part system buses data sheet in Section 3 of the FSC Hardware Manual.

Isolated Ethernet serial interface (10018/E/.)

The isolated Ethernet serial interface (10018/E/.) is used to connect an FSC system to a PlantScape server. The 10018/E/1 communication module has one such interface, and the 10018/E/E module two.

Features

The Ethernet interface is provided with an on-board jabber circuit. This circuit monitors the activity on the coax tap and inhibits transmission if the driver is active for a longer period of time than the jabber time. This will prevent the communication network from being blocked by a faulty interface.
The Ethernet interface provide galvanic isolation, which allows connecting 230 Vac powered devices according to IEC 61010 (VDE 0160/0110).

The output specifications of the Ethernet driver are in accordance with ISO/IEC 68802-3.

Connections

The connections of the Ethernet serial interface are as follows:

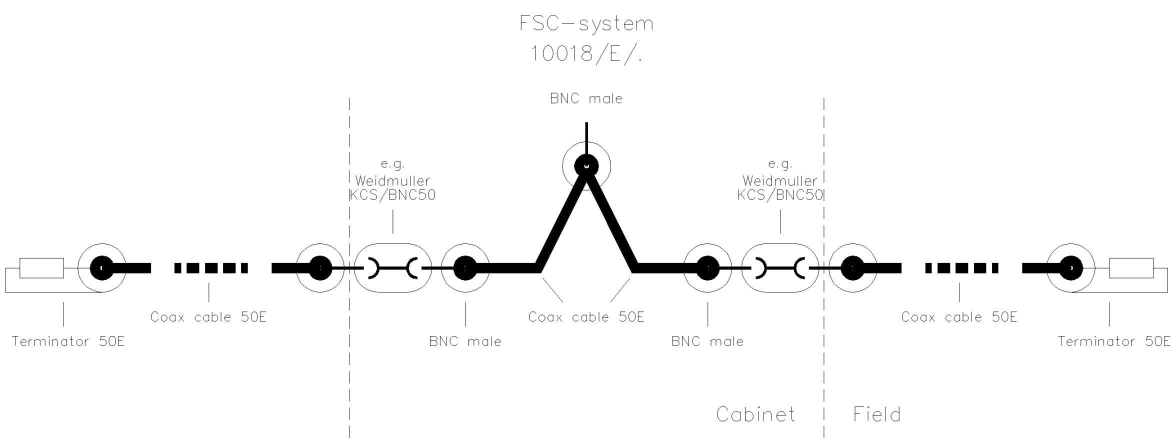


Figure 3 Point-to-point (duplex) communication cable between FSC system and field

Each Ethernet communication network (coax) must be terminated with 50 Ohm terminators, one at each end of the network.
Terminator types: 5%, ≥ 0.25 W. Preferred coax cable: 50E, RG58.

Technical data (10018/E/1)

The 10018/E/1 communication module has the following specifications:

General	Type number:	10018/E/1 22502*
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 520
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Connection	Max. number of systems:	see ISO/IEC 68802-3
Communication	Maximum baud rate:	
	– Ethernet interface (A) *(Position B is empty)*	10 Mbaud
Isolation	Galvanic isolation:	> 6 kV
Power	Power requirements:	5 Vdc 1500 mA
	Ripple content:	< 50 mV p-p

*** Note:**
– 10018/E/1 modules with suffix code 22501 and higher have minor motherboard design changes to improve reliability. There are no functional changes.
– 10018/E/1 modules with suffix code 22502 have minor motherboard design changes due to component updates. There are no functional changes.

Note:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10018/E/E)

The 10018/E/E communication module has the following specifications:

General	Type number:	10018/E/E 22602*
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 520
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Connection	Max. number of systems:	see ISO/IEC 68802-3
Communication	Maximum baud rate:	
	– Ethernet interface (A)	10 Mbaud
	– Ethernet interface (B)	10 Mbaud
Isolation	Galvanic isolation:	> 6 kV
Power	Power requirements:	5 Vdc 2000 mA
	Ripple content:	< 50 mV p-p

*** Note:**
- 10018/E/E modules with suffix code 22601 and higher have minor motherboard design changes to improve reliability. There are no functional changes.
- 10018/E/E modules with suffix code 22602 have minor motherboard design changes due to component updates. There are no functional changes.

Note:
Do not remove or replace this module while the power to its Central Part is on.

10020/1/1 Quad processor module (QPM)

Description

The quad processor module (QPM) is the heart of the FSC system. It controls all system operations.
The QPM module has two processors and two memory sets. Hardware compare logic compares every read and write action of the processors, and trips the watchdog if any difference in the data is detected. Additional test hardware enables full testing of the QPM module to achieve diagnostic coverage higher than 99%. This allows one QPM module to run applications up to and including AK6 without time limitation. Redundant CP configurations result in a 2oo4D voting architecture.

Memory

The QPM module has the following on-board memory (per processor):

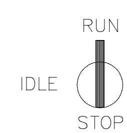
- 256 Kbytes of RAM for the system and application variables (for I/O, markers, counters, timers, and registers), and
- 1 Mbyte of non-volatile flash memory for the system and application program.

The QPM module is provided with battery back-up circuits for the RAM memory, which enables back-up supply from the batteries on the diagnostic and battery module (DBM, 10006/2/.) or single bus driver (SBD, 10007/1/1).

Key switch

The module has a key switch in the front which provides a software-controlled 'idle' state as well as a hardware reset of the processor. The key switch has three positions:

- Vertical up: (ready to) run
- Horizontal: idle (software-controlled)
- Vertical down: stop (CPU reset)



LED indicator

The QPM module has an LED indicator on the module front, which can be in either of three states:

- **Off**: The processor is in stop mode.
- **Green**: The module has no faults.
- **Red**: The module has one or more hardware faults.

Technical data

The 10020/1/1 module has the following specifications:

General

Type number:	10020/1/1 24100
Approvals:	CE, UL, TÜV
Software versions:	≥ 530
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 300 mA
Ripple content:	< 50 mV p-p

Memory

System RAM:	256 Kbytes
System and application flash memory:	1 Mbyte

Note:
Do not remove or replace this module while the power to its Central Part is on.

10020/1/2 Quad processor module (QPM)

Description

The quad processor module (QPM) is the heart of the FSC system. It controls all system operations.
The QPM module has two processors and two memory sets. Hardware compare logic compares every read and write action of the processors, and trips the watchdog if any difference in the data is detected. Additional test hardware enables full testing of the QPM module to achieve diagnostic coverage higher than 99%. This allows one QPM module to run applications up to and including AK6 without time limitation. Redundant CP configurations result in a 2oo4D voting architecture.

The 10020/1/2 is a 10020/1/1 module with an increased application memory size (133%).

Memory

The QPM module has the following on-board memory (per processor):

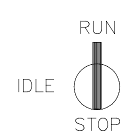
- 256 Kbytes of RAM for the system and application variables (for I/O, markers, counters, timers, and registers), and
- 2 Mbyte of non-volatile flash memory for the system and application program.

The QPM module is provided with battery back-up circuits for the RAM memory, which enables back-up supply from the batteries on the diagnostic and battery module (DBM, 10006/2/.) or single bus driver (SBD, 10007/1/1).

Key switch

The module has a key switch in the front, which provides a software-controlled 'idle' state as well as a hardware reset of the processor. The key switch has three positions:

- Vertical up: (ready to) run
- Horizontal: idle (software-controlled)
- Vertical down: stop (CPU reset)



LED indicator

The QPM module has an LED indicator on the module front, which can be in either of three states:

- **Off**: The processor is in stop mode.
- **Green**: The module has no faults.
- **Red**: The module has one or more hardware faults.

Technical data

The 10020/1/2 module has the following specifications:

General

Type number:	10020/1/2 29100
Approvals:	CE; UL, TÜV approvals pending
Software versions:	≥ 600
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 300 mA
Ripple content:	< 50 mV p-p

Memory

System RAM:	256 Kbytes
System and application flash memory:	2 Mbyte

Note:
Do not remove or replace this module while the power to its Central Part is on.

10024/./. Enhanced communication module (ECM)

Description

The 10024/./. enhanced communication modules (ECM) are used for:

- communication between redundant Central Parts in an FSC configuration,
- communication between a master FSC system and slave FSC systems,
- external communication with distributed control systems (DCSs) and peripherals such as printers, and
- external communication with the FSC user station.

To achieve these functions, the 10024/./. enhanced communication modules support serial communication links for either RS-422, RS-232C, RS-485, or glass fiber.

Module layout

A 10024/./. enhanced communication module will always take up two card positions in a rack. It consists of two parts (see Figure 2):

- the main board (10024/1/1, right), and
- two communication interfaces (10024/*x*/1, left).

Figure 1 and Figure 2 below show what a 10024/./. module looks like. The right half is the main board, and the left half accommodates the communication interfaces.

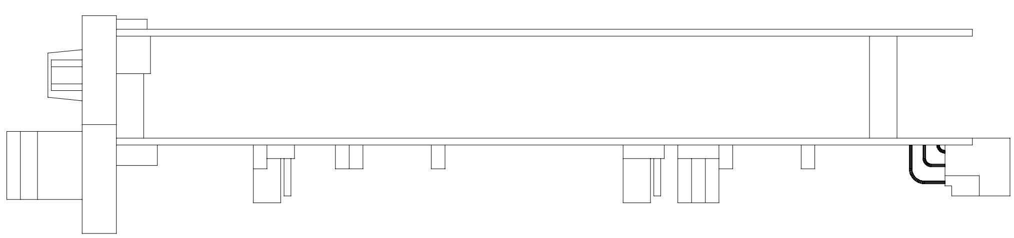


Figure 1 Top view of 10024/./. enhanced communication module with interfaces

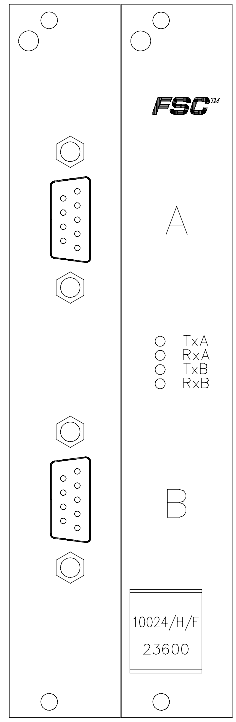


Figure 2 Front view of 10024/./. enhanced communication module with two interfaces

Main board

The main board of a 10024/./. enhanced communication module has its own processor and memory to relieve the central processor and to offer optimum support for the external equipment.
The 10024/./. module supports both EPROMs and flash memory.

Features

The extensive memory capacity of this module allows many special features to be included in the software, e.g.:

- communication protocols:
  - FSC-FSC
  - FSC-DS
  - ModBus RTU
  - ModBus H&B
  - RKE3964R
- sequence of event recording (SER),
- report generation, and
- support of printers.

LEDs

The LEDs on the module front indicate activity on the channel.

Jumpers

The main board of a 10024/./. enhanced communication module has five jumpers. Their location and settings are shown in Figure 3 below.
Jumpers J1 and J2 define the module number.
Jumper J3 defines the system and application program source (0 = flash, 1 = EPROM).
Jumpers J4 and J5 define the EPROM type that is used on the 10024/./. module (0 = 2 Mb/4 Mb EPROMs, 1 = other).

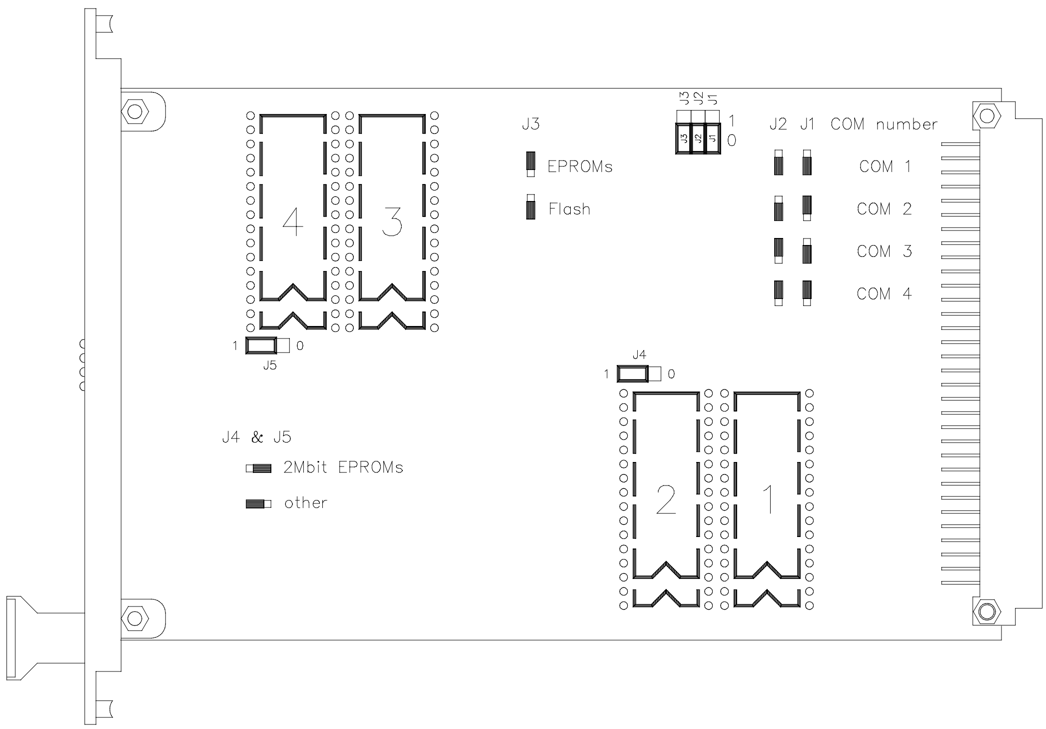


Figure 3 Location of jumpers and EPROM sockets on 10024/./. main board

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EPROM types

The main board of a 10024/./. enhanced communication module supports the following EPROM types:

- 27C512: 64 k ∗ 8 (512 Kb) or equivalent
- 27C1001: 128 k ∗ 8 (1 Mb) or equivalent
- 27C2001: 256 k ∗ 8 (2 Mb) or equivalent

The maximum access time for all EPROM types is 150 ns.

Flash memory

The 10024/./. enhanced communication module has 512 k ∗ 16 (8 Mb) flash memory for the system and application program.

Jumpers on system bus

Please note that when you are installing a new communication module, you need to remove a jumper from the Central Part system bus (7-SBUS, 12-SBUS, or 17-SBUS). For details refer to the Central Part system buses data sheet in Section 3 of the FSC Hardware Manual.

Communication interfaces

The full type code of the 10024/./. module is determined by the communication interfaces that are used. The following interfaces are supported:

- **F-interface:** Tri-state RS-232C interface
- **G-interface:** Glass fiber interface
- **H-interface:** RS-422 interface with readback
- **I-interface:** Isolated RS-485/RS-422 interface

```
10024 / . / .
        |  └── Letter of interface (B) bottom
        └───── Letter of interface (A) top
```

For example, 10024/H/F is a communication module with:

– Top interface (A): H-interface (RS-422 interface with readback)
– Bottom interface (B): F-interface (tri-state RS-232C interface)

Table 1 Supported interface combinations

Type code	Top interface (A)	Bottom interface (B)
10024/F/F	Tri-state RS-232C interface	Tri-state RS-232C interface
10024/F/G	Tri-state RS-232C interface	Glass fiber interface
10024/G/G	Glass fiber interface*	Glass fiber interface
10024/H/F	RS-422 interface with readback	Tri-state RS-232C interface
10024/H/G	RS-422 interface with readback	Glass fiber interface
10024/H/I	RS-422 interface with readback	Isolated RS-485/RS-422 interface
10024/I/F	Isolated RS-485/RS-422 interface	Tri-state RS-232C interface
10024/I/G	Isolated RS-485/RS-422 interface	Glass fiber interface
10024/I/I	Isolated RS-485/RS-422 interface	Isolated RS-485/RS-422 interface

* Requires special guiding of the optic cable.

Each of the communication interfaces is discussed in more detail below.

F-interface
(10024/F/.)

The F-interface (tri-state RS-232C) can be used to connect another device to the FSC system, e.g. the FSC user station or a distributed control system (DCS). The F-interface provides galvanic isolation, which allows connecting 230 Vac powered devices according to IEC 61010 (VDE 0160/0110).

The F-interface can be used to connect the FSC user station or DCS to both Central Parts in a redundant configuration. In that case the Central Parts decide between each other, which Central Part will answer if a communication request is made to the FSC system. This will guarantee optimum availability if an F-interface goes faulty. An on-board watchdog circuit disconnects the communication line when the communication processor (on the ECM's main board) goes into software hangup or hardware reset.

Cable lengths

The maximum cable length for the F-interface (RS-232) depends on the communication baud rate:

- ≤ 19k2: 15 m (49.2 ft)
- 38k4: 10 m (32.8 ft)
  (providing proper cable types, e.g. Belden 8723, are used)

Pin allocation

Figure 4 shows the pin allocation of the female F-interface connector.

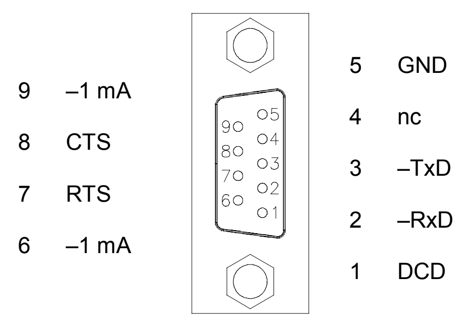

Figure 4 Front view of F-interface connector

G-interface
(10024/G/.)

The G-interface (glass fiber) can be used to interconnect two FSC systems with multimode fiber optic cable in order to avoid magnetic interference and earth loops. The interface supports encoded serial communication at 1 or 2 Mbaud. The module requires a symmetrical coding system (Manchester, FM0 and FM1 coding are supported).

G-interfaces are equipped with Honeywell transmitters (top) and receivers (bottom). They allow a maximum permissible transmission loss of 23.5 dB and require a minimum loss of 8 dB. The G-interfaces are designed for use with 100/140 fibers.

Cable lengths

The maximum distance that can be bridged depends on the type and number of connectors used, the fiber optic quality, and the fiber type.

The transmission loss is the sum of the connector attenuations ($n * Ac$), the fiber attenuation ($L * Af$) and the transmitter-fiber mismatch (Am). The total calculated transmission loss ($\sum A$) may not exceed the maximum permissible loss.

$$\sum A = (n * A_c) + (L * A_f) + A_m \leq A_{max}$$

To give some calculation examples, we assume the following values:
- Connector attenuation (A_c) = 2 dB.
- 100/140 µm fiber attenuation (A_f) = 5.5 dB/km (at 820 nm).
- 50/125 µm fiber attenuation (A_f) = 3 dB/km (at 820 nm).
- 100/140 transmitter to 50/125 fiber mismatch (A_m) = 6 dB.

Using these values, we can calculate the maximum distance we can bridge using a 100/140 fiber with two connectors (at begin and end point).

$$\sum A = (2 * 2) + (L * 5.5) + 0 = 23.5 \rightarrow L = 3.5 \text{ km } (= 2.18 \text{ mi})$$

Using the modern 50/125 fiber and two connectors we can bridge:

$$\sum A = (2 * 2) + (L * 3) + 6 = 23.5 \rightarrow L = 4.5 \text{ km } (= 2.80 \text{ mi})$$

Using more connectors in the loop, other types of connectors and/or other fiber qualities will result in other maximum distance calculation results.

Connector

The connector on the G-interface looks as follows:

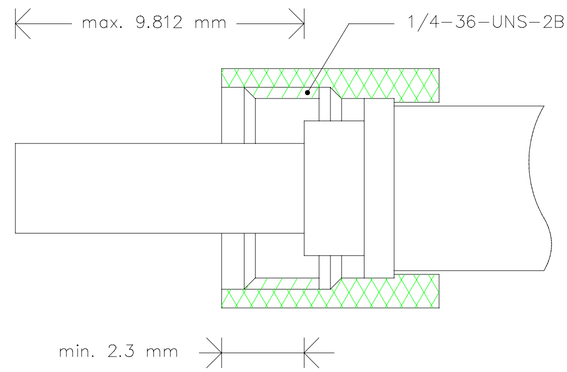

Figure 5 Cable connector type FSMA

Jumpers

The G-interface has one jumper, which is located on the component side. It is used to program Auto, 1-Mbaud or 2-Mbaud decoding. The jumper location and setting is shown in Figure 6 below. The Auto mode is reserved for future applications.

Figure 6 Jumper settings on G-interface

H-interface
(10024/H/.)

The H-interface (RS-422 with readback) is only used for internal communication in redundant Central Part configurations. In case of an internal communication failure, the correct functioning of the interface is tested. If an interface is faulty, the Central Part with the faulty interface will be switched off.
The H-interface has no galvanic isolation, and may therefore not be used for external communication links.

Cable lengths

The H-interface is suitable for cable lengths up to 1.5 m (4.9 ft) at 2 Mbaud using Belden 9728 or Belden 8314 cable.

Pin allocation

Figure 7 shows the pin allocation of the male H-interface connector.

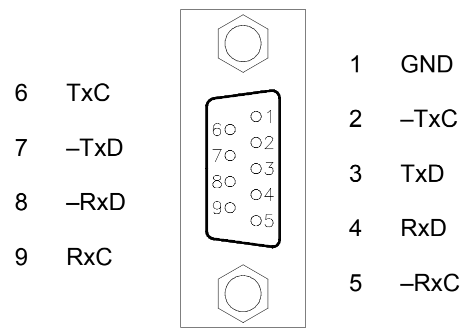

Figure 7 Front view of H-interface connector

I-interface
(10024/I/.)

The I-interface (isolated RS-485/RS-422) can be used to connect the FSC system to, for example, the FSC user station and/or other FSC systems.
The RS-422 option provides a duplex communication link between the FSC system and one other device.
The RS-485 option provides a simplex or duplex communication link between several other devices.
The RS-422 master with RS-485 slave option provides a duplex communication link between the master and any slave in a multidrop FSC network. The slaves can only communicate with the master.

The RS-485 interface can be used to connect the FSC user station or a DCS, to both Central Parts in a redundant configuration. In that case the Central Parts decide between each other which Central Part will answer if a communication request is made to the FSC system. This will guarantee optimum availability if an I-interface goes faulty. An on-board watchdog circuit disconnects the communication line when the communication processor (on the ECM's main board) goes into software hangup or hardware reset.
The I-interface provides galvanic isolation, which allows connecting 230 Vac powered devices according to IEC 61010 (VDE 0160/0110).

Cable lengths

The maximum cable length for the I-interface (RS-422/RS-485) depends on the communication baud rate:
- ≤ 100 Kbaud: 1.2 km (0.75 mi)
- 125 Kbaud: 1 km (0.63 mi)
- 1 Mbaud: 120 m (131.2 yd)
- 2 Mbaud: 60 m (65.6 yd)

Pin allocation

Figure 8 shows the pin allocation of the male I-interface connector.

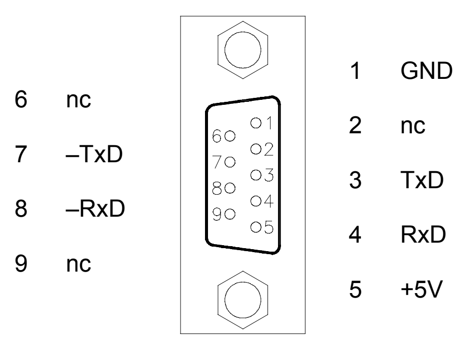

Figure 8 Front view of I-interface connector

Jumpers

The I-interface has one jumper, which is located on the component side. It is used to program Auto, 1-Mbaud or 2-Mbaud decoding. The jumper location and setting is shown in Figure 9 below.
The Auto mode is reserved for future applications.

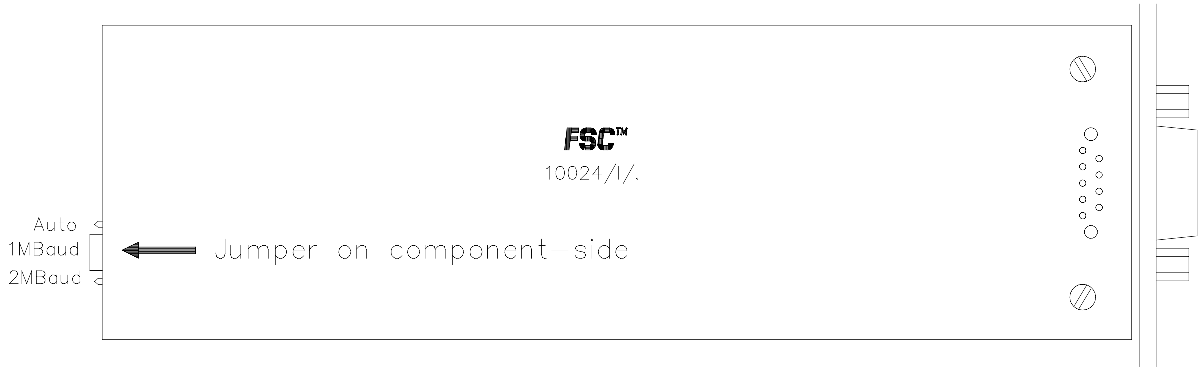

Figure 9 Jumper on I-interface

Connections

There are several types of communication connections:

1. Between an FSC system and another FSC system,
2. Between both Central Parts in a redundant FSC configuration,
3. Between an FSC system and the FSC user station,
4. Between an FSC system and a DCS,
5. Between an FSC system and a printer.

Each of these is explained in more detail below.

Wire colors

The wire colors in the drawings on the next pages refer to Belden cable type 8723. IBM P/N 4716748 (IBM Nº1) cable may also be used, as well as TKF cable type 4 x 2 x 0.5 PVLVDVmb-2af (see Table 2 for wire assignment and colors). Make sure that you only use one cable type per communication loop.

Table 2 Color reference and terminator resistor

Wire	Belden 8723	IBM Nº1	TKF
TxD	Red	Orange	White (1)
–TxD	Black	Black	Black (1)
RxD	White	Red	White (2)
–RxD	Green	Green	Black (2)
Term. res. R	56 Ohm	150 Ohm	100 Ohm

Considerations for I-interface

For connections that are made using the I-interface, the following considerations apply:

- In RS-422 applications, use one terminator resistor (R) and two 1-kOhm resistors per wire pair.
- In RS-485 applications, use two terminator resistors (R) and two 1-kOhm resistors per wire pair.
- The terminator resistors should be placed at the cable ends. The 1-kOhm resistors must be placed on the master side of the communication cable. Resistor types: 5%, 0.25 W.
- The shield must be connected to instrument earth close to the master.

1:
FSC system ↔ FSC system

An external connection between FSC systems requires a **G-interface** (glass fiber) or an **I-interface** (isolated RS-485/RS-422). Several connections are possible:

- **Glass fiber** (using a **G-interface**) (see Figure 10)
- **RS-485** communication (using an **I-interface**):
  - Point-to-point, duplex (see Figure 11)
  - Multidrop, duplex (between master and max. 15 slaves) (see Figure 12)
- **RS-232** communication (using an **F-interface**) (see Figure 13)

Glass fiber (G-interface)

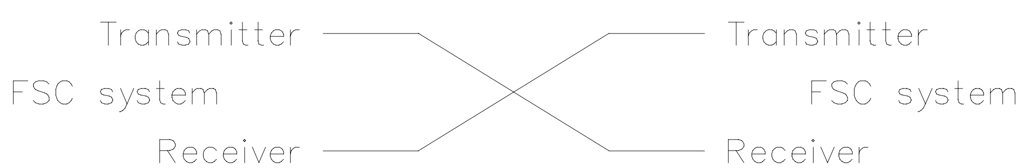

Figure 10 Connection between two FSC systems: optical glass-fiber link (using a G-interface)

RS-485 (I-interface), point-to-point

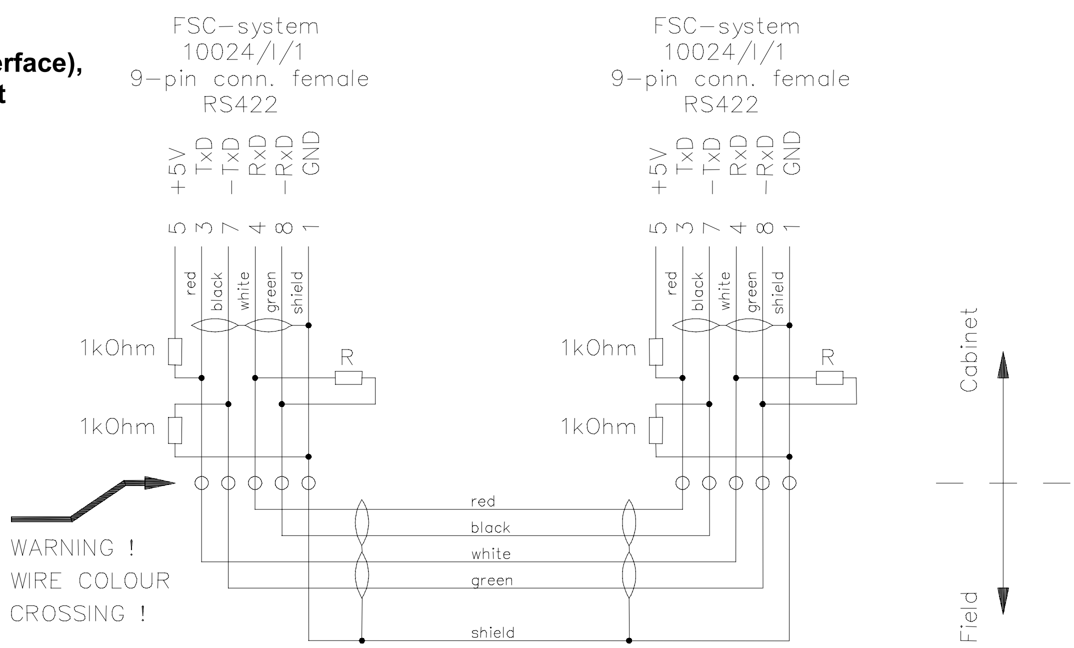

Figure 11 Connection between two FSC systems: point-to-point RS-485 link (using an I-interface)

RS-485/RS-422 (I-interface), multidrop

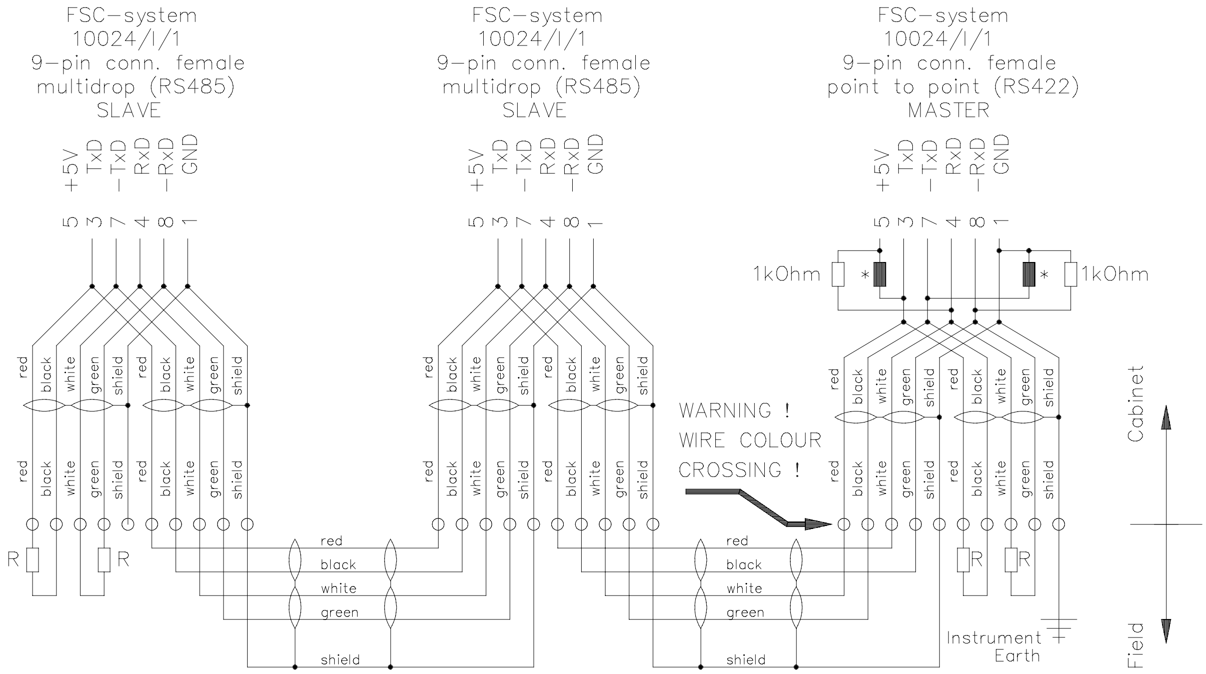

Figure 12 Connection between FSC master and max. 15 FSC slaves: multidrop RS-485 link (using an I-interface)

Note:

∗ The black resistors (1 kOhm) are always allowed. They are, however, ***required*** for FSC Release 420.

RS-232 (F-interface), multidrop

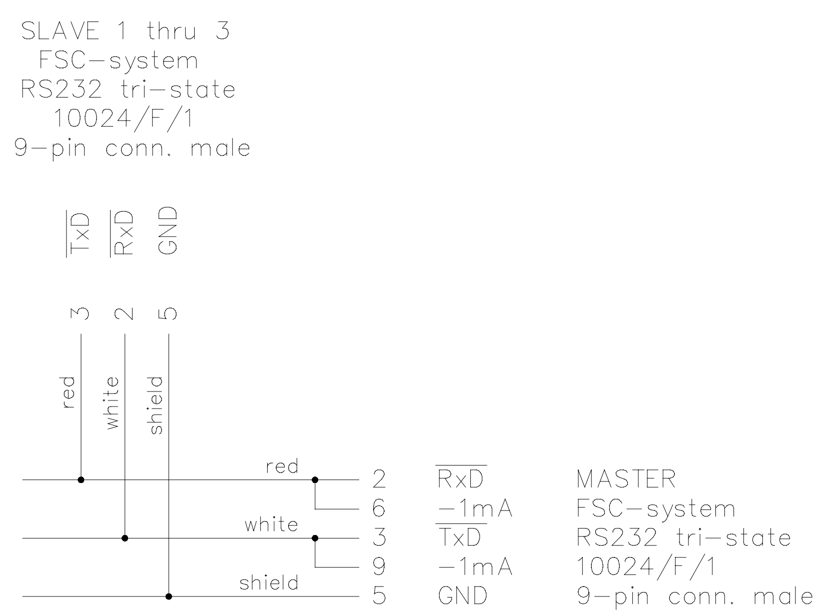

Figure 13 Connection between FSC master and max. 3 FSC slaves: RS-232 link (using an F-interface)

2:
Central Part ↔ Central Part

A connection between both Central Parts in a redundant FSC configuration requires an **H-interface** (RS-422 with readback). The connections are as follows:

RS-422 (H-interface)

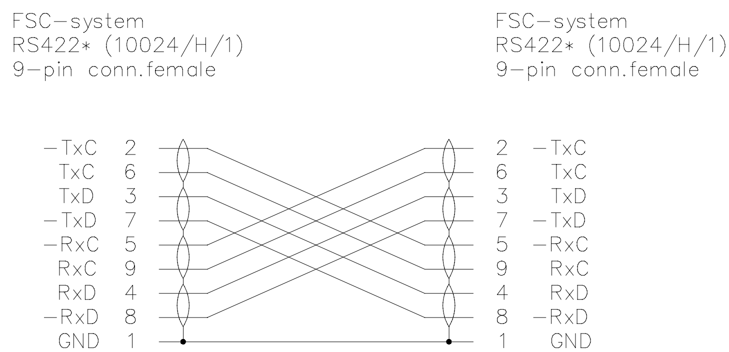

Figure 14 Connection between two Central Parts in redundant FSC configurations (using an H-interface)

3:
FSC system ↔ FSC user station

A connection between an FSC system and the FSC user station requires an **F-interface** (Tri-state RS-232C) or an **I-interface** (isolated RS-485/RS-422). Several connections are possible:

- **RS-232** communication (using an **F-interface**):
  - Using a 25-pin connector without hardware handshake (see Figure 15).
  - Using a 25-pin connector with hardware handshake (see Figure 16).
  - Using a 9-pin connector without hardware handshake (see Figure 17).
  - Using a 9-pin connector with hardware handshaking (see Figure 18).
- **RS-485** communication (using an **I-interface**):
  - Using a simplex communication cable (see Figure 19).

RS-232 (F-interface), 25-pin, no handshake

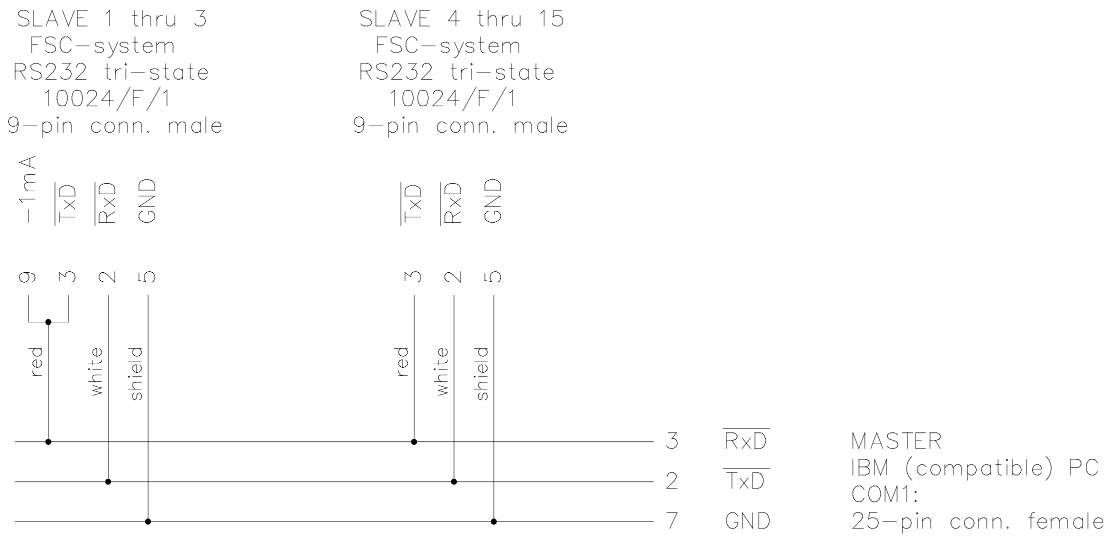

Figure 15 Connection between FSC system and FSC user station: 25-pin connector without hardware handshake (using an F-interface)

RS-232 (F-interface), 25-pin, handshake

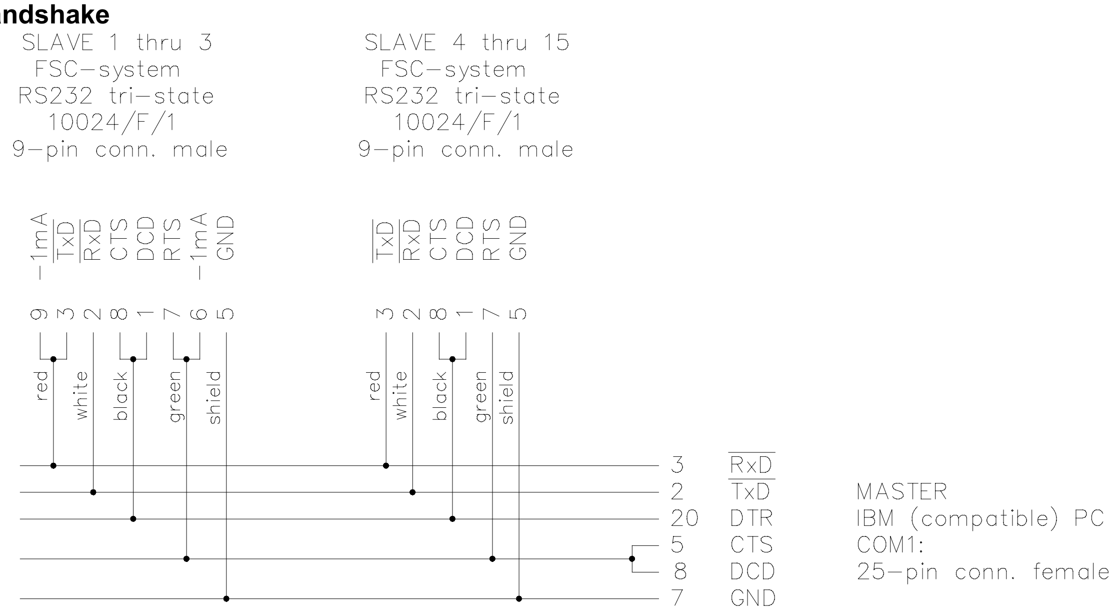

Figure 16 Connection between FSC system and FSC user station: 25-pin connector with hardware handshake (using an F-interface)

RS-232 (F-interface),
9-pin, no handshake

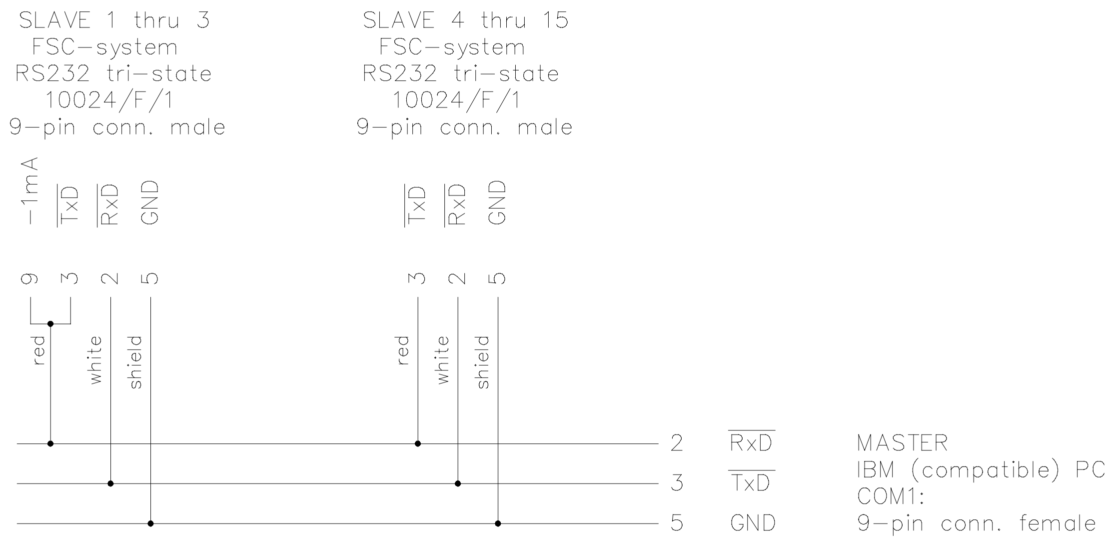

Figure 17 Connection between FSC system and FSC user station: 9-pin connector without hardware handshake (using an F-interface)

RS-232 (F-interface),
9-pin, handshake

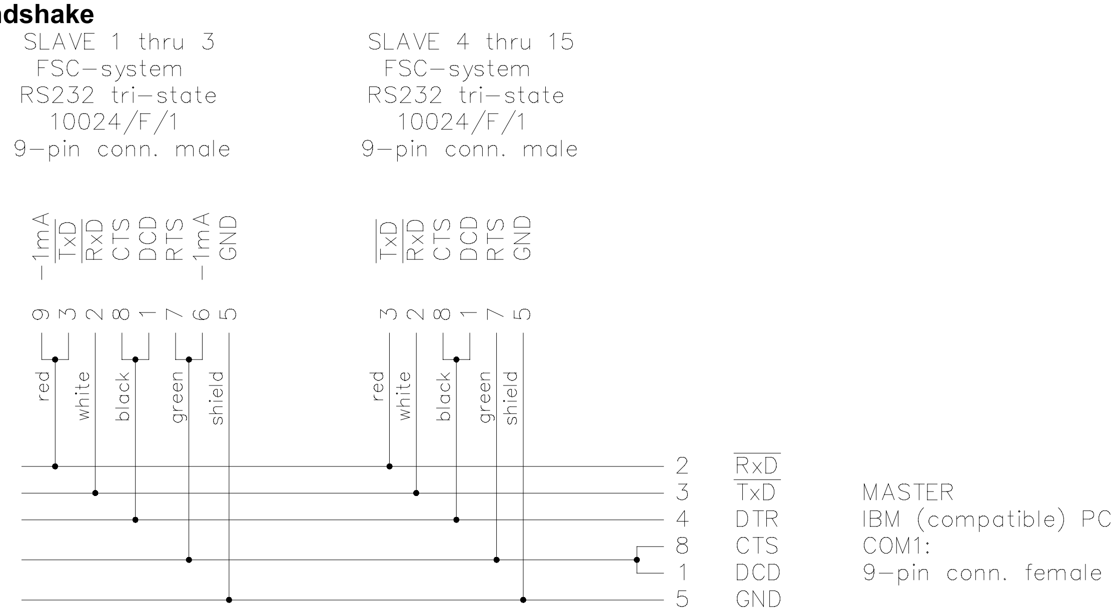

Figure 18 Connection between FSC system and FSC user station: 9-pin connector with hardware handshaking (using an F-interface)

RS-485 (I-interface)

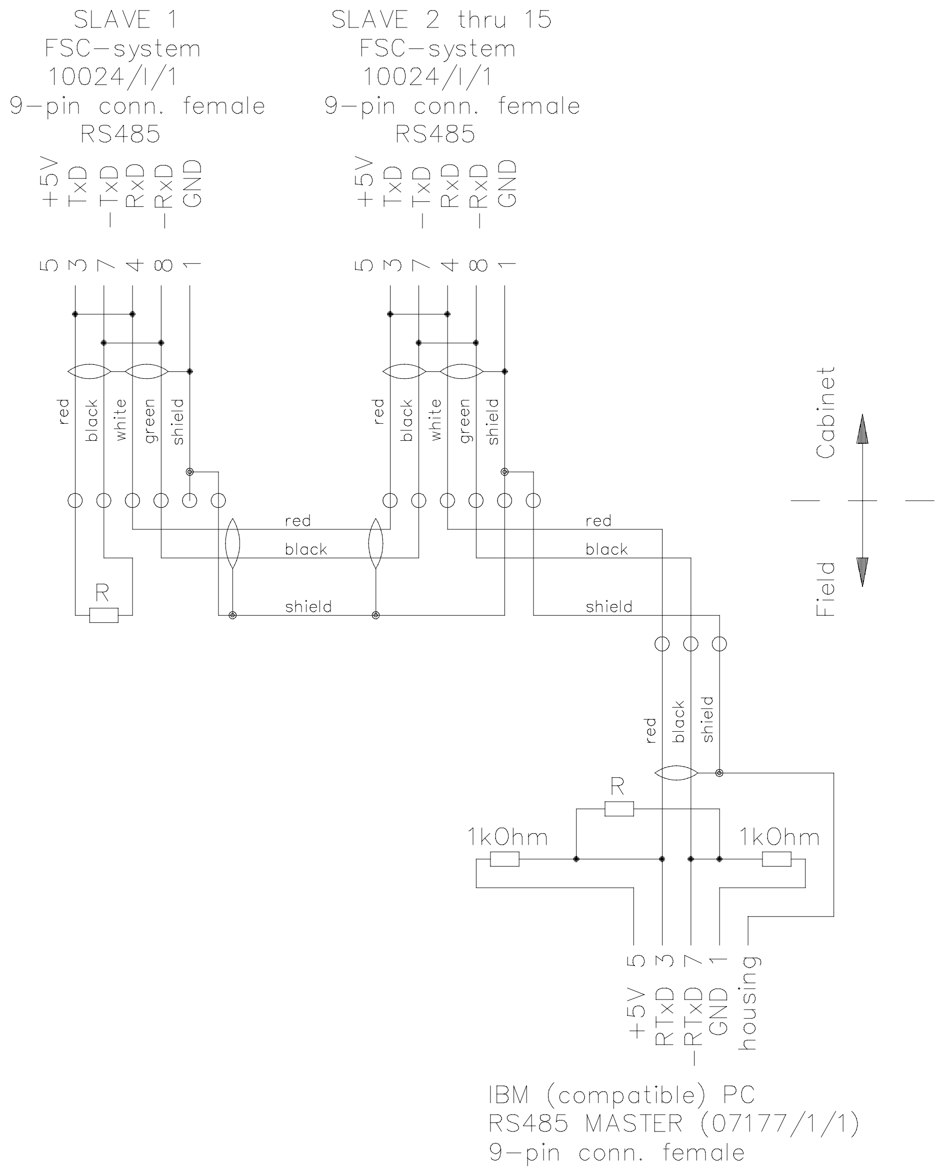

Figure 19 Connection between FSC system and FSC user station: simplex communication (using an I-interface)

4:
FSC system ↔ DCS

A connection between an FSC system and a DCS requires an **F-interface** (Tri-state RS-232C) or an **I-interface** (isolated RS-485/RS-422). Several connections are possible:

- **RS-232** communication (using an **F-interface**):
  - With hardware handshake (see Figure 20).
  - Without hardware handshake (see Figure 21).
- **RS-485** communication (using an **I-interface**) (see Figure 22).

RS-232 (F-interface), handshake

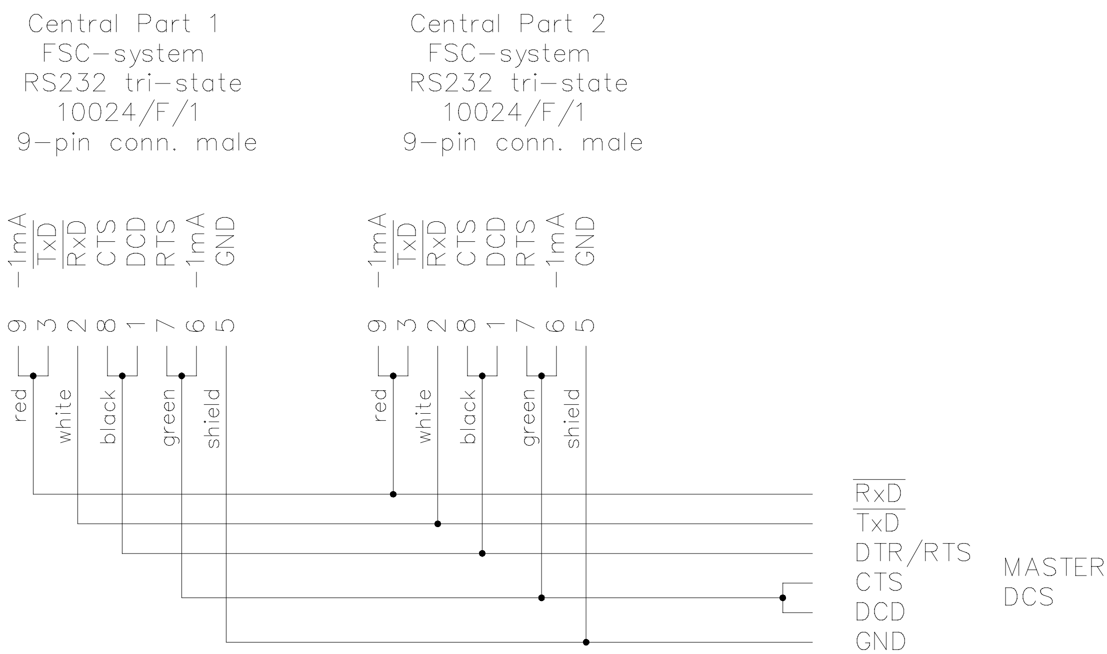

Figure 20 Connection between FSC system and DCS: with hardware handshake, using an F-interface (RS-232)

RS-232 (F-interface), no handshake

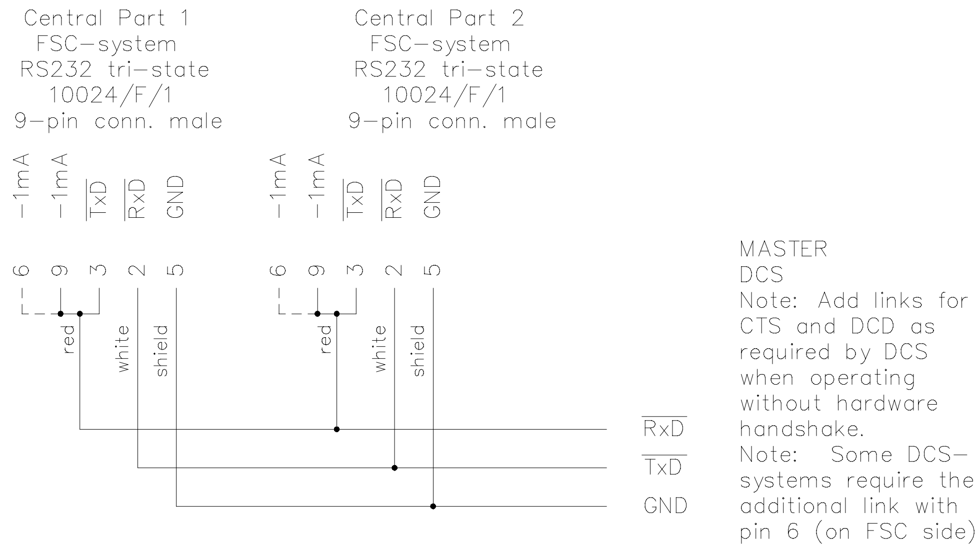

Figure 21 Connection between FSC system and DCS: without hardware handshaking, using an F-interface (RS-232)

RS-485 (I-interface)

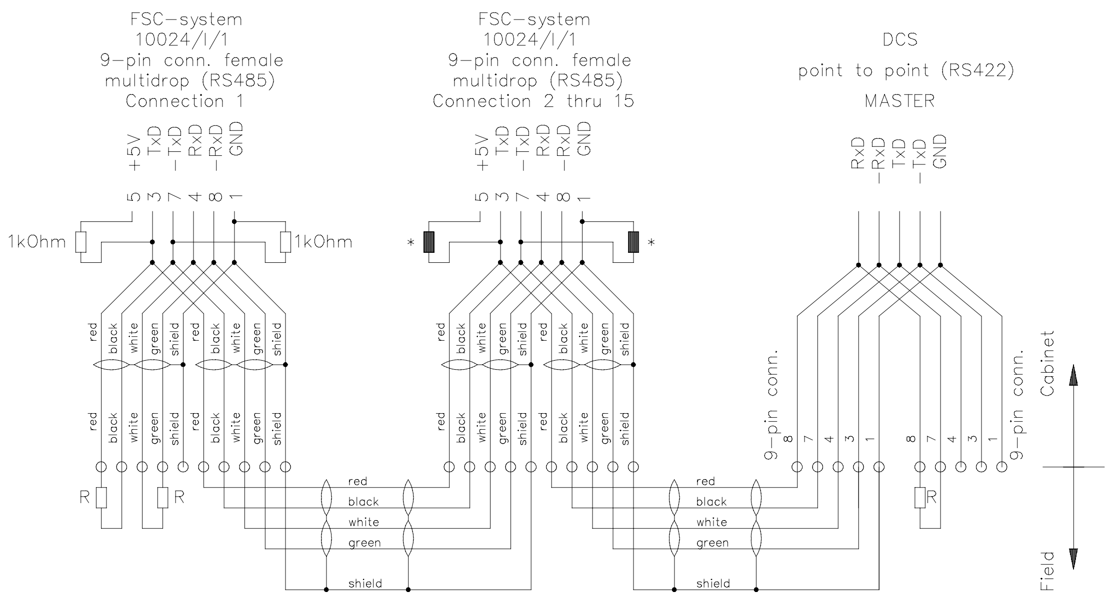

Figure 22 Connection between redundant FSC system and DCS using Belden 8723 cable and an I-interface (RS-485/RS-422)

Notes:

* Place the black resistor pair (2 x 1 kOhm) in only one of the connections 2 to 15. For optimal availability, this resistor pair should be placed as far from connection 1 as possible.

** Figure 22 is only an example. The exact RS-485 connections between an FSC system and a DCS may vary, depending on the DCS connection requirements.

5: FSC system ↔ printer

A connection between the FSC system and a printer requires an **F-interface** (Tri-state RS-232C). The connections are as follows:

RS-232 (F-interface)

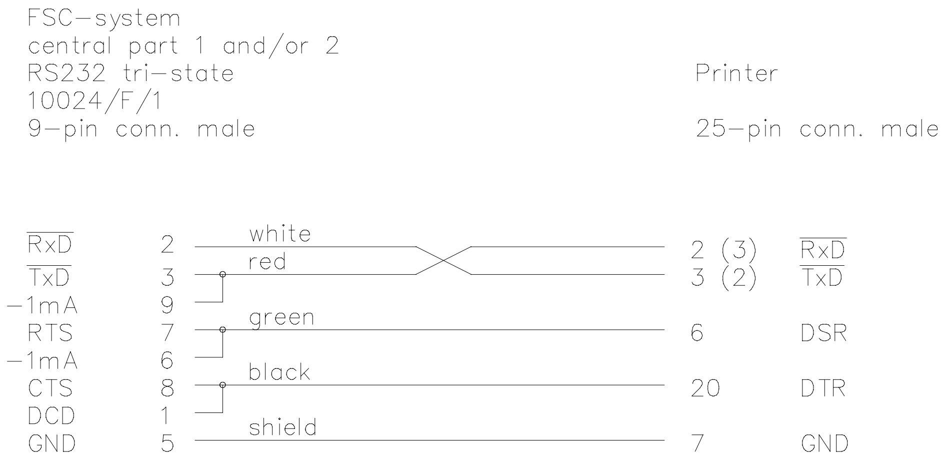

Figure 23 Connection between FSC system and printer:
25-pin connector with hardware handshake (using F-interface)

Note:
Pins 2 and 3 of some printer types are interchanged.

Technical data (10024/F/F)

The 10024/F/F enhanced communication module has the following specifications:

General	Type number:	10024/F/F 26500
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 2.78f (configuration ≥ 530)
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Communication	Maximum baud rate:	
	– F-interface (A)	38.4 Kbaud
	– F-interface (B)	38.4 Kbaud
Isolation	Galvanic isolation (for each F-interface):	> 6 kV
Cable lengths	F-interface (A + B):	
	– ≤ 19k2	max. 15 m (49.2 ft)
	– 38k4	max. 10 m (32.8 ft) (if proper cable types are used)
Connectors	Connector type:	
	– F-interface (A):	female, 9 pins
	– F-interface (B):	female, 9 pins
Power	Power requirements:	5 Vdc 475 mA
	Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10024/F/G)

The 10024/F/G enhanced communication module has the following specifications:

General	Type number:	10024/F/G 26600
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 2.78f (configuration ≥ 530)
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Communication	Maximum baud rate:	
	– F-interface (A)	19.2 Kbaud
	– G-interface (B)	2 Mbaud
	Peak emission/responsivity wave length (G-interface only):	820 nm
Isolation	Galvanic isolation (F-interface only):	> 6 kV
Cable lengths	F-interface (A):	max. 15 m (49.2 ft)
	G-interface (B):	see 'G-interface' section of this data sheet
Connectors	Connector type:	
	– F-interface (A):	female, 9 pins
	– G-interface (B):	FSMA (fiber optic)
Power	Power requirements:	5 Vdc 550 mA
	Ripple content:	< 50 mV p-p

Notes:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10024/G/G)

The 10024/G/G enhanced communication module has the following specifications:

General	Type number:	10024/G/G 26700
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 2.78f (configuration ≥ 530)
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Communication	Maximum baud rate:	
	– G-interface (A)	2 Mbaud
	– G-interface (B)	1 Mbaud
	Peak emission/responsivity wave length (for each G-interface):	820 nm
Cable lengths	G-interface (A + B):	see 'G-interface' section of this data sheet
Connectors	Connector type:	
	– G-interface (A):	FSMA (fiber optic)
	– G-interface (B):	FSMA (fiber optic)
Power	Power requirements:	5 Vdc 650 mA
	Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10024/H/F)

The 10024/H/F enhanced communication module has the following specifications:

General	Type number:	10024/H/F 26800
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 2.78f (configuration ≥ 530)
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
Communication	Maximum baud rate:	
	– H-interface (A)	2 Mbaud
	– F-interface (B)	38.4 Kbaud
Isolation	Galvanic isolation (F-interface only):	> 6 kV
Cable lengths	H-interface (A):	max. 1.5 m (4.9 ft) at 2 Mbaud (using Belden 9728 or Belden 8314 cable)
	F-interface (B):	
	– ≤ 19k2	max. 15 m (49.2 ft)
	– 38k4	max. 10 m (32.8 ft) (if proper cable types are used)
Connectors	Connector type:	
	– H-interface (A):	male, 9 pins
	– F-interface (B):	female, 9 pins
Power	Power requirements:	5 Vdc 500 mA
	Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10024/H/G)

The 10024/H/G enhanced communication module has the following specifications:

General

Type number:	10024/H/G 27000
Approvals:	CE, UL, TÜV
Software versions:	≥ 2.78f (configuration ≥ 530)
Space requirements:	8 TE, 3 HE (= 8 HP, 3U)

Communication

Maximum baud rate:	
– H-interface (A)	2 Mbaud
– G-interface (B)	1 Mbaud
Peak emission/responsivity wave length (G-interface only):	820 nm

Cable lengths

H-interface (A):	max. 1.5 m (4.9 ft) at 2 Mbaud (using Belden 9728 or Belden 8314 cable)
G-interface (B):	see 'G-interface' section of this data sheet

Connectors

Connector type:	
– H-interface (A):	male, 9 pins
– G-interface (B):	FSMA (fiber optic)

Power

Power requirements:	5 Vdc 575 mA
Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10024/H/I)

The 10024/H/I enhanced communication module has the following specifications:

General	Type number:	10024/H/I 26900
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 2.78f (configuration ≥ 530)
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
	Maximum number of I-interfaces in system:	16
Communication	Maximum baud rate:	
	– H-interface (A)	2 Mbaud
	– I-interface (B)	1 Mbaud
Isolation	Galvanic isolation (I-interface only):	> 6 kV
Cable lengths	H-interface (A):	max. 1.5 m (4.9 ft) at 2 Mbaud (using Belden 9728 or Belden 8314 cable)
	I-interface (B):	
	– ≤ 100 Kbaud	max. 1.2 km (0.75 mi)
	– 125 Kbaud	max. 1 km (0.63 mi)
	– 1 Mbaud	max. 120 m (131.2 yd)
	– 2 Mbaud	max. 60 m (65.6 yd)
Connectors	Connector type:	
	– H-interface (A):	male, 9 pins
	– I-interface (B):	male, 9 pins
Power	Power requirements:	5 Vdc 675 mA
	Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10024/I/F)

The 10024/I/F enhanced communication module has the following specifications:

General	Type number:	10024/I/F 27100
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 2.78f (configuration ≥ 530)
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
	Maximum number of I-interfaces in system:	16
Communication	Maximum baud rate:	
	– I-interface (A)	2 Mbaud
	– F-interface (B)	38.4 Kbaud
Isolation	Galvanic isolation (I-interface only):	> 6 kV
Cable lengths	I-interface (A):	
	– ≤ 100 Kbaud	max. 1.2 km (0.75 mi)
	– 125 Kbaud	max. 1 km (0.63 mi)
	– 1 Mbaud	max. 120 m (131.2 yd)
	– 2 Mbaud	max. 60 m (65.6 yd)
	F-interface (B):	
	– ≤ 19k2	max. 15 m (49.2 ft)
	– 38k4	max. 10 m (32.8 ft) (if proper cable types are used)
Connectors	Connector type:	
	– I-interface (A):	male, 9 pins
	– F-interface (B):	female, 9 pins
Power	Power requirements:	5 Vdc 650 mA
	Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10024/I/G)

The 10024/I/G enhanced communication module has the following specifications:

General	Type number:	10024/I/G 27200
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 2.78f (configuration ≥ 530)
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
	Maximum number of I-interfaces in system:	16
Communication	Maximum baud rate:	
	– I-interface (A)	2 Mbaud
	– G-interface (B)	1 Mbaud
Isolation	Galvanic isolation (I-interface only):	> 6 kV
Cable lengths	I-interface (A):	
	– ≤ 100 Kbaud	max. 1.2 km (0.75 mi)
	– 125 Kbaud	max. 1 km (0.63 mi)
	– 1 Mbaud	max. 120 m (131.2 yd)
	– 2 Mbaud	max. 60 m (65.6 yd)
	G-interface (B):	see 'G-interface' section of this data sheet
Connectors	Connector type:	
	– I-interface (A):	male, 9 pins
	– G-interface (B):	FSMA (fiber optic)
Power	Power requirements:	5 Vdc 750 mA
	Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

Technical data (10024/I/I)

The 10024/I/I enhanced communication module has the following specifications:

General	Type number:	10024/I/I 27300
	Approvals:	CE, UL, TÜV
	Software versions:	≥ 2.78f (configuration ≥ 530)
	Space requirements:	8 TE, 3 HE (= 8 HP, 3U)
	Maximum number of I-interfaces in system:	16
Communication	Maximum baud rate:	
	– I-interface (A)	2 Mbaud
	– I-interface (B)	1 Mbaud
Isolation	Galvanic isolation (for each I-interface):	> 6 kV
Cable lengths	I-interface (A + B):	
	– ≤ 100 Kbaud	max. 1.2 km (0.75 mi)
	– 125 Kbaud	max. 1 km (0.63 mi)
	– 1 Mbaud	max. 120 m (131.2 yd)
	– 2 Mbaud	max. 60 m (65.6 yd)
Connectors	Connector type:	
	– I-interface (A):	male, 9 pins
	– I-interface (B):	male, 9 pins
Power	Power requirements:	5 Vdc 850 mA
	Ripple content:	< 50 mV p-p

Note:
Do not remove or replace this module while the power to its Central Part is on.

10100/2/1 Horizontal bus driver (HBD)

Description

The horizontal bus driver (HBD) module is a basic module which is installed in the I/O racks.
The horizontal bus driver consists of two parts:

- electronic part (10100/2/1), and
- an A1, A21 or A22 flatcable.

The vertical bus flatcable between the Central Part and the I/O rack is connected to the HBD module via the back connector CN1 (see Figure 2).
The flatcable which extends from the front of the module connects the HBD module to the horizontal bus above the I/O rack.
The address selection lines of the I/O modules terminate on the back of the horizontal bus(es) via a flatcable on connector CN3.

The HBDs are used as follows:

– 10100/2/1 with flatcable A1	used for non-redundant I/O
– 10100/2/1 with flatcable A21	used for redundant I/O (one rack per HBD)
– 10100/2/1 with flatcable A22	used for redundant I/O (two racks per HBD)

The HBD may be replaced with the power switched on, but the Central Part will shut down if the HBD is safety-related.

Pin allocation

The HBD is fitted with a male connector according to DIN 41612 type F, with the 'd', 'b' and 'z' rows used.
The back view of the 10100/2/1 rack connector is as follows:

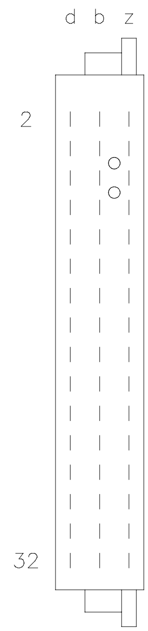

Figure 1 Back view of 10100/2/1 connector

Address setting

The rack address of the HBD is programmed by means of jumpers on the 10314/1/1, 10315/1/1, 10316/1/1 or 10317/1/1 modules (RA0 to RA3).

Table 1 Address setting for HBD

	RA3	RA2	RA1	RA0
HBD1	0	0	0	1
HBD2	0	0	1	0
HBD3	0	0	1	1
HBD4	0	1	0	0
HBD5	0	1	0	1
HBD6	0	1	1	0
HBD7	1	0	0	0
HBD8	1	0	0	1
HBD9	1	0	1	0
HBD10	1	1	0	0

0 = GND 5 Vdc 1 = Supply 5 Vdc

Flatcable routing

Figure 2 to Figure 4 below show the flatcable routing for the various configurations.

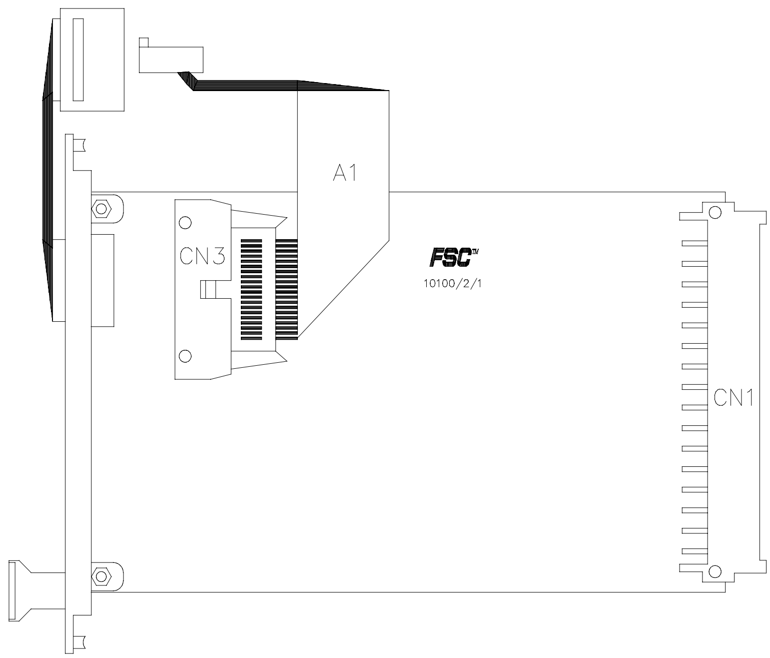

Figure 2 Schematic diagram for flatcable routing from the HBD (non-redundant I/O)

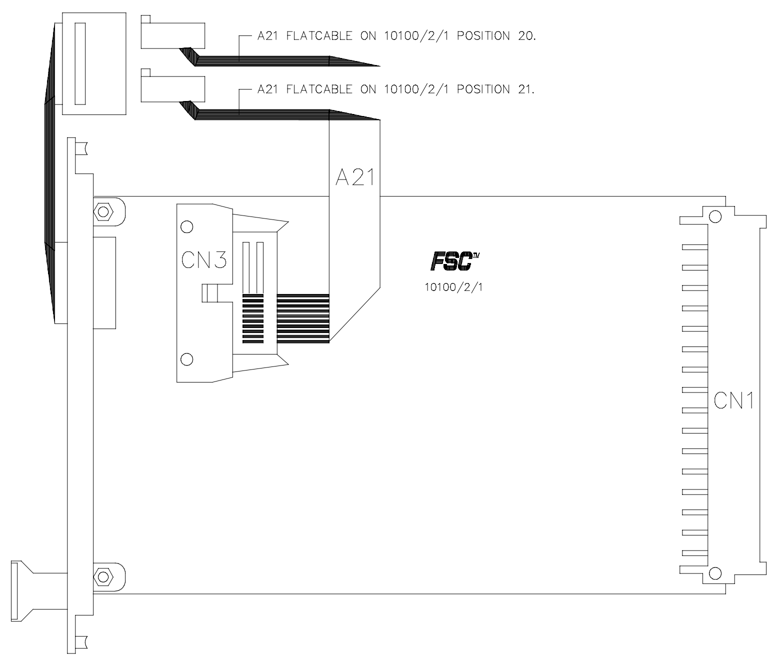

Figure 3 Schematic diagram for flatcable routing from the HBD (redundant I/O with one rack per HBD)

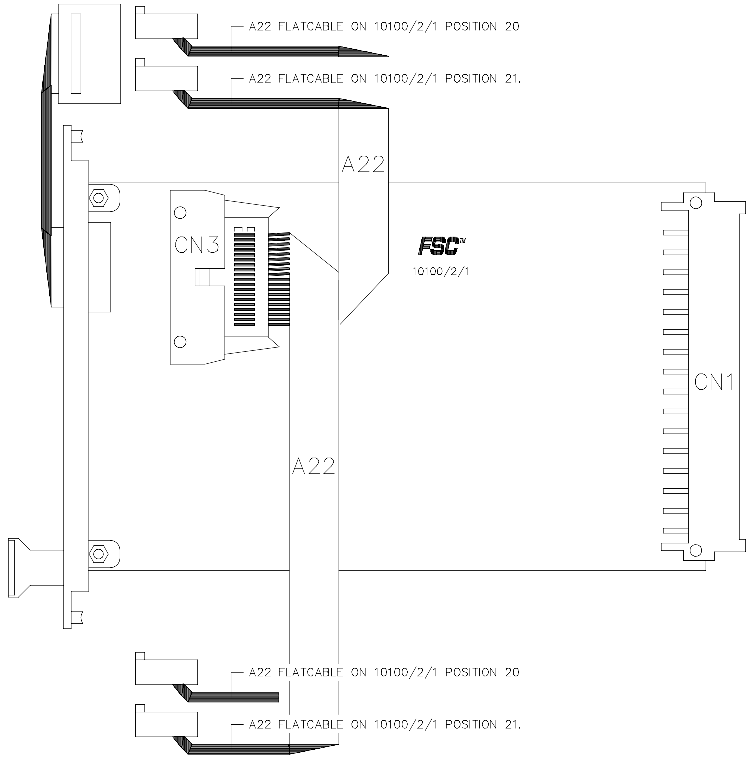

Figure 4 Schematic diagram for flatcable routing from the HBD (redundant I/O with two racks per HBD)

Technical data

The 10100/2/1 module has the following specifications:

General

Type number:	10100/2/1 10900
Approvals:	CE, TÜV, UL
Software versions:	≥ 3.00
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	10100/2/1 + A1 cable	5 Vdc 35 mA
	10100/2/1 + A21 cable	5 Vdc 35 mA
	10100/2/1 + A22 cable	5 Vdc 65 mA
Ripple content:	< 50 mV p-p	

Key coding

(See 'Key coding' data sheet)

Module code:

– holes A5, A7

Rack code:

– large pins A5, A7

Left blank intentionally.

Fail Safe Control
Hardware Manual

Section 5:
FSC Input Modules

Honeywell

Copyright, Notices and Trademarks

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Section 5: FSC Input Modules

FSC input modules

General information

All the input modules are European standard size (100 x 160 mm) instrument modules. The width of the module front is 4 TE (20.32 mm) (= 4 HP, 0.8 in), which is one position in a standard 19-inch I/O rack.

Each input module is connected to the horizontal bus via a flat cable, which protrudes from the module front. Digital input modules have status LEDs for each input channel. The LEDs are placed in the module front, below the flat cable.

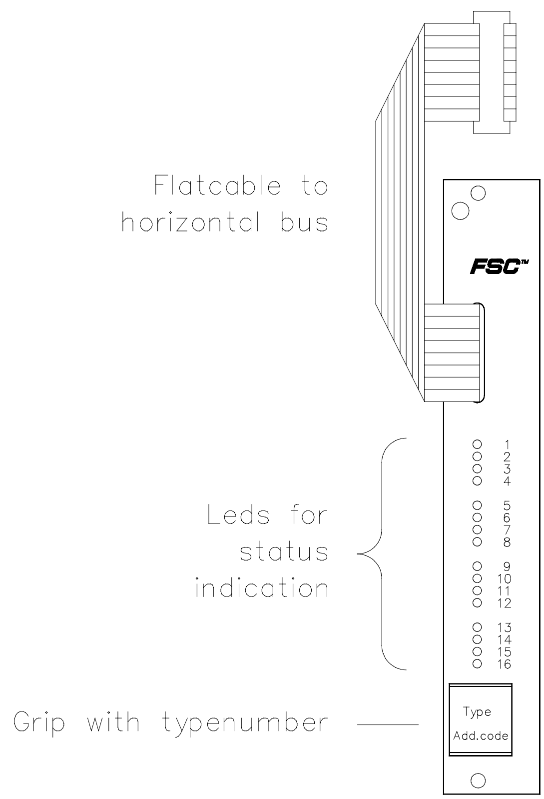


Figure 1 Front of a digital input module

There are digital input modules for 24 Vdc, 48 Vdc, 60 Vdc and Namur signals. The modules are powered with 5 Vdc for the circuits associated with the horizontal bus logic, and with 24 Vdc for the circuits associated with the input signals.
There are analog inputs for 0-20 mA, 0-5 V and 0-10 V signals.
All input modules have galvanic isolation between the 5 Vdc circuitry and the field inputs.

The input modules are fitted with a male connector according to DIN 41612, type F, with the d, (b) and z rows used.

The following items are terminated on the rack connector:
- the internal power supply of 5 Vdc,
- the internal power supply of 24 Vdc,
- the external power supply of 24 Vdc, 48 Vdc or 60 Vdc (if needed), and
- the wiring for the input signals.

The 5 Vdc signals are physically separated from the I/O connections and supply.

Supply voltages

The supply voltages to the FSC system must be within the following ranges to ensure correct operation of the FSC input modules:
- 60 Vdc: +15% / –15%
- 48 Vdc: +15% / –15%
- 24 Vdc: +30% / –15%

If it cannot be guaranteed that the DC power supplied to the FSC system remains within the above ranges, additional voltage monitoring is required.

Addressing

The addressing of an input module is determined by the module's position in the I/O rack. This means that the input modules have no jumpers or switches for setting the address. Each input module can be replaced by any module of the same type.

Replacing an input module

All input modules can be replaced with the power switched on. Depending on the input signal function and the system I/O configuration, process operation may be affected.
When removing an input module, first disconnect the flatcable from the horizontal bus, then carefully pull the module from the rack.
When placing an input module, carefully push the module into the rack until it is flush with the rack, then connect the flatcable to the horizontal bus.

10101/2/1 Fail-safe digital input module (24 Vdc, 16 channels)

Description

The fail-safe digital input module 10101/2/1 has sixteen 24 Vdc digital input channels. The input stage of the module is of a 'fail-to-safe' nature. This means that a component failure results in a de-energized input signal to the processor, which is the safe condition in a normally energized system.

The remaining logic circuitry on the module is completely covered by the self-test functions of the system. Within the configured process safety time, the modules are tested for:

- ability to receive logic level '0' signals,
- ability to receive logic level '1' signals, and
- crosstalk between inputs.

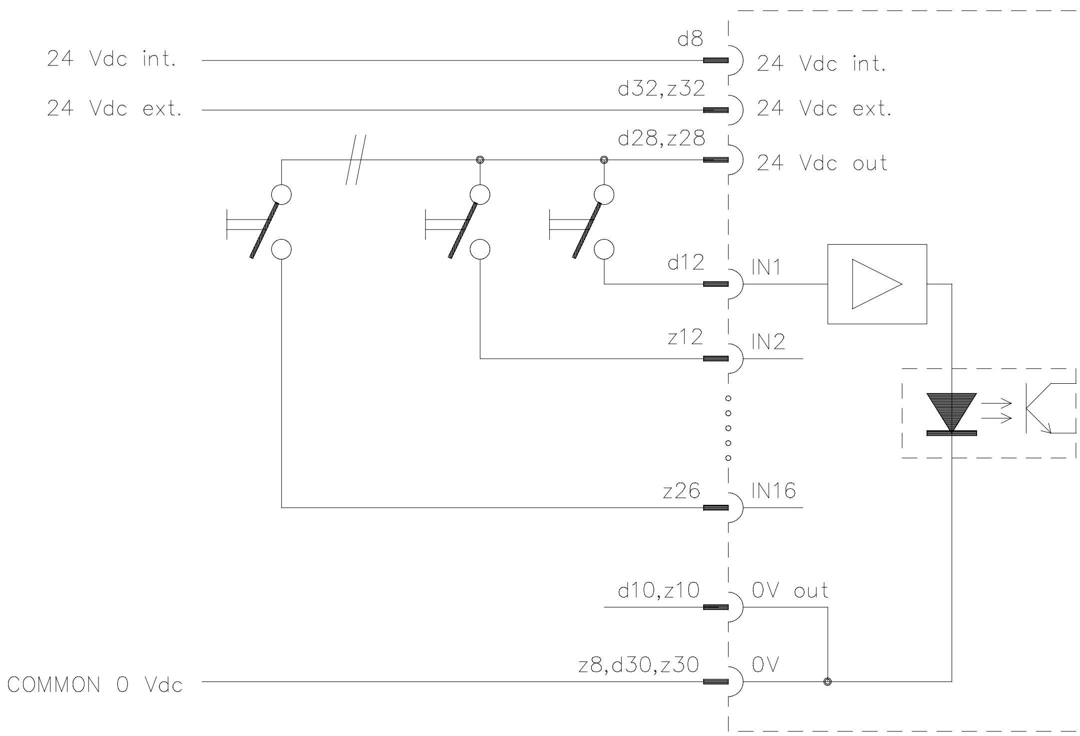
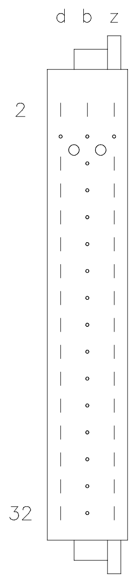


Figure 1 Schematic diagram for connection of inputs to the 10101/2/1 module

Pin allocation

The back view and pin allocation of the 10101/2/1 module connector are as follows:



d2		b2	GND	z2	5 Vdc
d4	–			z4	–
d6				z6	
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10	0 Vdc out			z10	0 Vdc out
d12	IN 1			z12	IN 2
d14	IN 3			z14	IN 4
d16	IN 5			z16	IN 6
d18	IN 7			z18	IN 8
d20	IN 9			z20	IN 10
d22	IN 11			z22	IN 12
d24	IN 13			z24	IN 14
d26	IN 15			z26	IN 16
d28	24 Vdc ext. out			z28	24 Vdc ext. out
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 24 Vdc ext.			z32	Supply 24 Vdc ext.

Connection examples

The figures below show a number of connection examples for the fail-safe digital input module 10101/2/1.

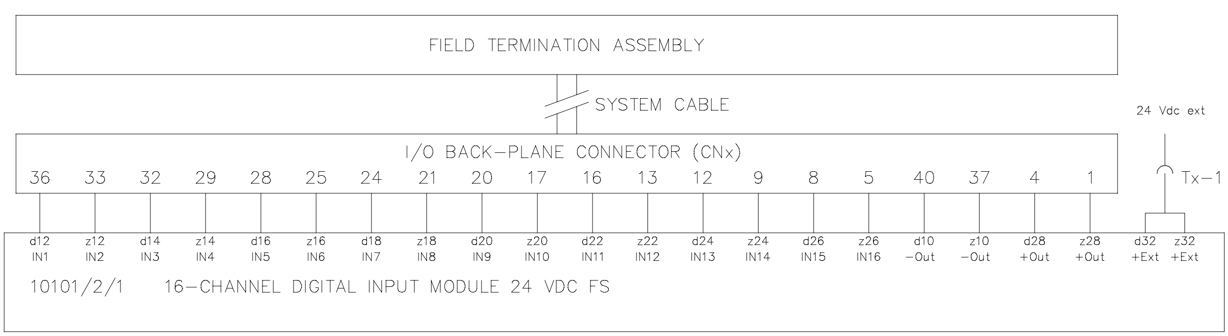


Figure 2 Connection example of 10101/2/1 module to FTA for both non-redundant and redundant I/O configurations

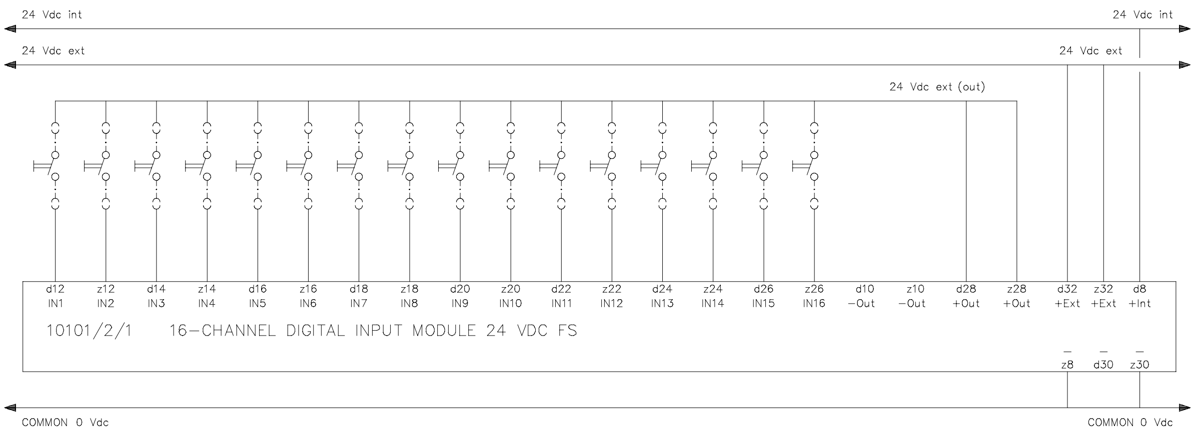
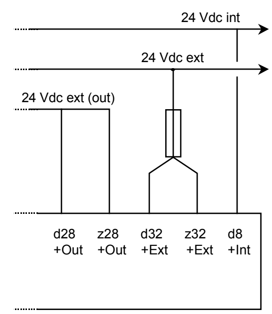


Figure 3 I/O connection example of 10101/2/1 module for non-redundant I/O configurations

Important!
If the external power pins (24 Vdc ext. out, connected to pins z28 and d28) are used without an FTA, a 500 mA fuse must be used to limit the combined field current (as shown on the right). If you use a fuse higher than 500 mA, the module may be damaged.



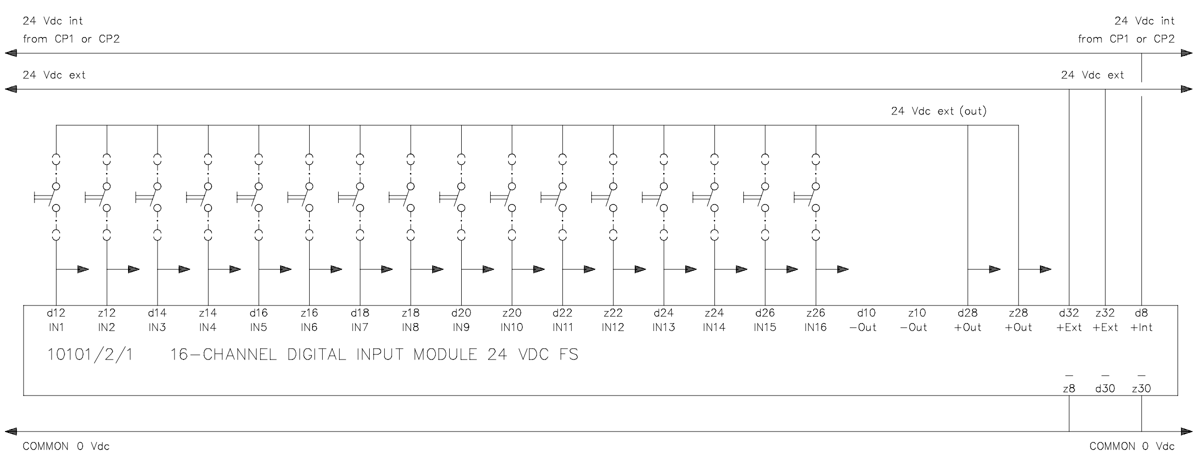
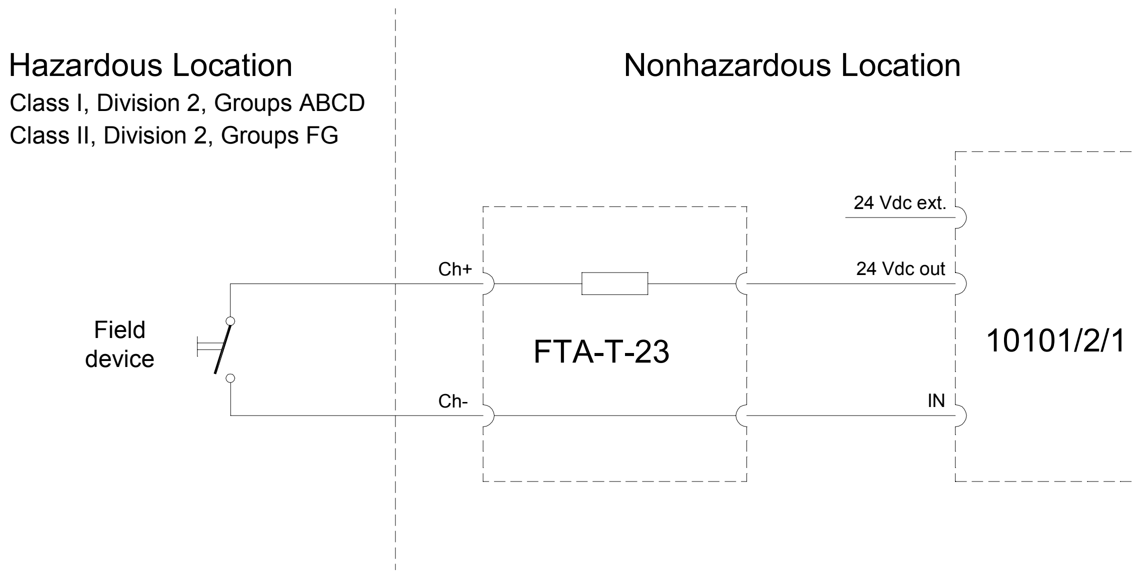


Figure 4 I/O connection example of 10101/2/1 module for redundant I/O configurations

Note:
The 24 Vdc (internal) supply must be connected to prevent fault detection during the self-test.

Hazardous locations (FM 3611)

To use the 10101/2/1 digital input module in nonhazardous areas for nonincendive field circuits to Division 2 locations in compliance with FM 3611 (Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG), the module must be connected to the field device via an FTA-T-23 as indicated in Figure 5. The 24 Vdc power-limited circuit is delivered via an external resistor on the FTA-T-23. The field devices, including field wiring, must adhere to the capacitance and inductance levels as given in Figure 5.



Non-Incendive Field Wiring Parameters:

Voc (V)	ISC (mA)	Gas Groups	Ca (µF)	La (mH)
31.2	100.0	A and B	0.24	6.96
		C	0.71	27.15
		D, F and G	1.89	54.92

Figure 5 Connection of input in hazardous locations

Considerations for FM approval

Please note the following constraints that are required for FM approval:

1. No revisions to drawings may be carried out without prior FMRC approval.
2. The Non-Incendive Field Wiring Parameter Concept allows interconnection of Non-Incendive Apparatus with Associated Non-Incendive Apparatus not specifically examined in combination as system when: Vmax ≥ Voc; Imax ≥ Isc; Ca ≥ Ci + Ccable; La ≥ Li + Lcable.
3. Modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01.

4. Control equipment connected to modules must not use or generate more than 250 Vrms or Vdc.
5. Installation should be in accordance with the National Electrical Code (ANSI/NFPA 70).
6. Non-Incendive Apparatus manufacturer's installation drawings must be followed when installing this equipment.
7. Non-Incendive Field Device must be FMRC Entity Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW, or 20 µJ, ex. switches, thermocouples, LEDs and RTDs)

Technical data

The 10101/2/1 module has the following specifications:

General

Type number:	10101/2/1 11000
Approvals:	CE, TÜV, UL, FM*
Software versions:	≥ 3.00
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 8 mA 24 Vdc int. 110 mA 24 Vdc ext. 110 mA (input currents)
Ripple content (on 5 Vdc):	< 0.5 Vp-p (0-360 Hz)

Input

Number of input channels:	16
Maximum input voltage:	36 Vdc
Input current:	7 mA at 24 Vdc
Input HIGH:	> 15 Vdc
Input LOW:	< 9 Vdc (I < 2 mA)
Input delay:	typically 10 ms

Key coding

(See 'Key coding' data sheet)

Module connector code:	
– holes	A5, C5
Rack connector code:	
– large pins	A5, C5

*** Note:**
For FM approval please note the considerations on page 6.

10101/2/2 Fail-safe digital input module (60 Vdc, 16 channels)

Description

The fail-safe digital input module 10101/2/2 has sixteen 60 Vdc digital input channels, but an internal supply voltage of 24 Vdc. The input stage of the module is of a 'fail-to-safe' nature. This means that a component failure results in a de-energized input signal to the processor, which is the safe condition in a normally energized system.

The remaining logic circuitry on the module is completely covered by the self-test functions of the system. Within the configured process safety time, the modules are tested for:

- ability to receive logic level '0' signals,
- ability to receive logic level '1' signals, and
- crosstalk between inputs.

Note:
The 24 Vdc (internal) and the 60 Vdc (external) must have a common 0 Vdc connection.

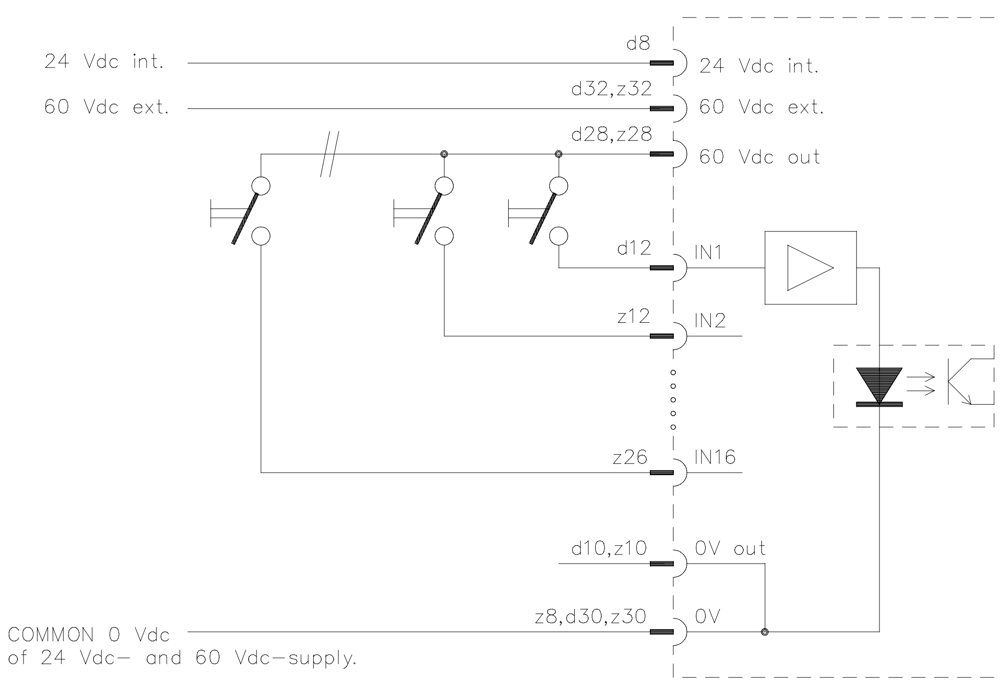
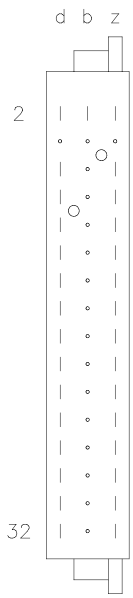


Figure 1 Schematic diagram for connection of inputs to the 10101/2/2 module

Pin allocation

The back view and pin allocation of the 10101/2/2 module connector are as follows:



d2		b2	GND	z2	5 Vdc
d4	–			z4	–
d6				z6	
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10	0 Vdc out			z10	0 Vdc out
d12	IN 1			z12	IN 2
d14	IN 3			z14	IN 4
d16	IN 5			z16	IN 6
d18	IN 7			z18	IN 8
d20	IN 9			z20	IN 10
d22	IN 11			z22	IN 12
d24	IN 13			z24	IN 14
d26	IN 15			z26	IN 16
d28	60 Vdc ext. out			z28	60 Vdc ext. out
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 60 Vdc ext.			z32	Supply 60 Vdc ext.

Connection examples

The figures below show a number of connection examples for the fail-safe digital input module 10101/2/2.

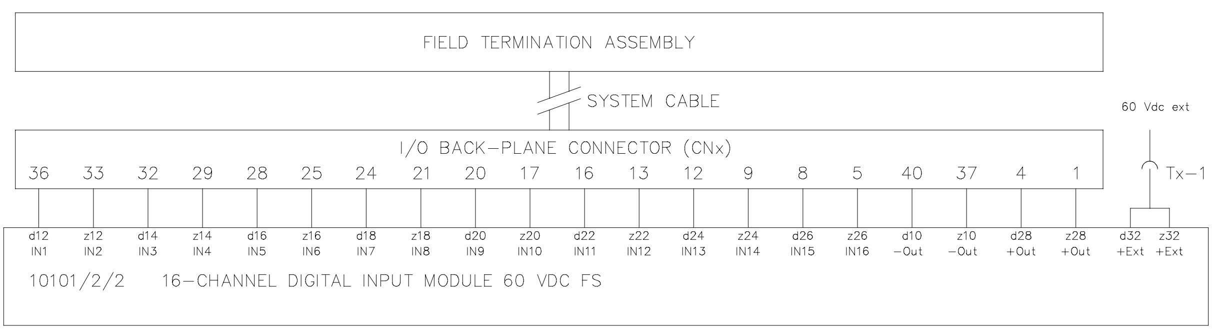


Figure 2 Connection example of 10101/2/2 module to FTA for both non-redundant and redundant I/O configurations

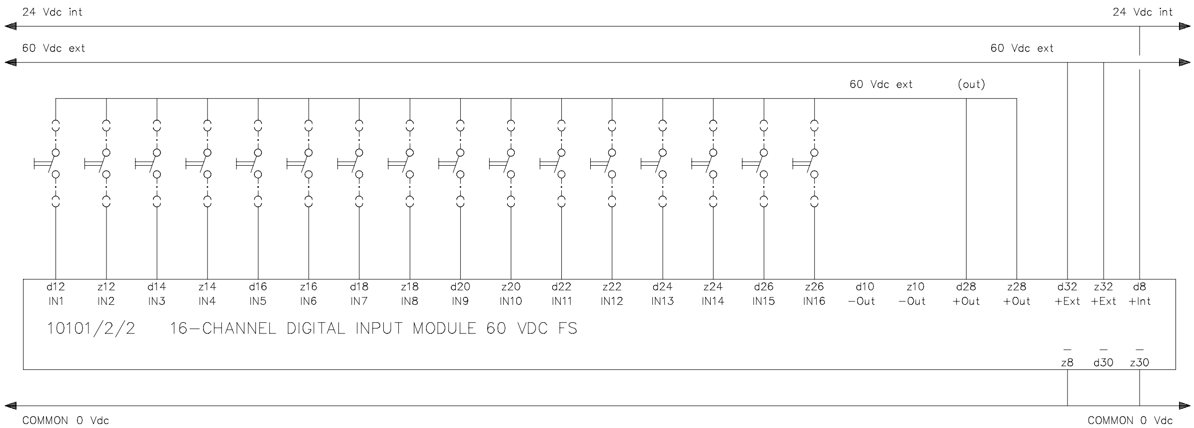
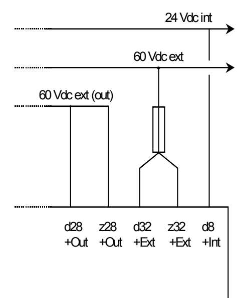


Figure 3 I/O connection example of 10101/2/2 module for non-redundant I/O configurations

Important!
If the external power pins (60 Vdc ext. out, connected to pins z28 and d28) are used without an FTA, a 500 mA fuse must be used to limit the combined field current (as shown on the right). If you use a fuse higher than 500 mA, the module may be damaged.



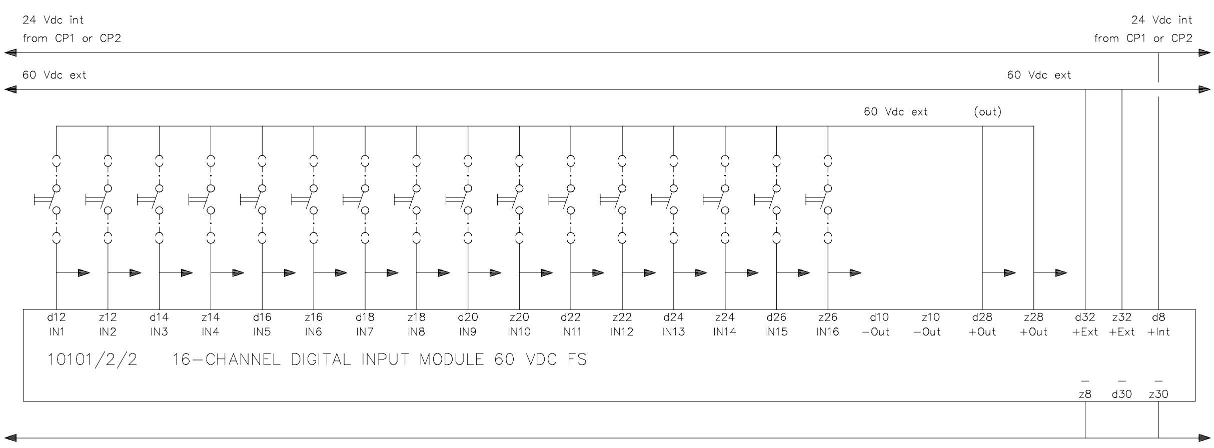


Figure 4 I/O connection example of 10101/2/2 module for redundant I/O configurations

Note:
The 24 Vdc (internal) supply must be connected to prevent fault detection during the self-test.

Technical data

The 10101/2/2 module has the following specifications:

General	Type number:	10101/2/2 11100
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 8mA
		24 Vdc int. 80 mA
		60 Vdc ext. 55 mA (input currents)
	Ripple content (on 5 Vdc):	< 0.5 Vp-p (0-360 Hz)
Fuse	Fuse value:	1x 100 mA
	Fuse type:	Round, TR5-F/19370K
	Fuse dimensions:	∅ 8.2 mm (0.32 in), height 7.7 mm (0.3 in)
Input	Number of input channels:	16
	Maximum input voltage:	85 Vdc
	Input current:	3.3 mA at 60 Vdc
	Input HIGH:	> 40 Vdc
	Input LOW:	< 20 Vdc (I < 1 mA)
	Input delay:	typically 10 ms
Key coding	(See 'Key coding' data sheet)	
	Module connector code:	
	– holes	A5, C9
	Rack connector code:	
	– large pins	A5, C9

10101/2/3 Fail-safe digital input module (48 Vdc, 16 channels)

Description

The fail-safe digital input module 10101/2/3 has sixteen 48 Vdc digital input channels, but an internal supply voltage of 24 Vdc. The input stage of the module is of a 'fail-to-safe' nature. This means that a component failure results in a de-energized input signal to the processor, which is the safe condition in a normally energized system.

The remaining logic circuitry on the module is completely covered by the self-test functions of the system. Within the configured process safety time, the modules are tested for:

- ability to receive logic level '0' signals,
- ability to receive logic level '1' signals, and
- crosstalk between inputs.

Note:
The 24 Vdc (internal) and the 48 Vdc (external) must have a common 0 Vdc connection.

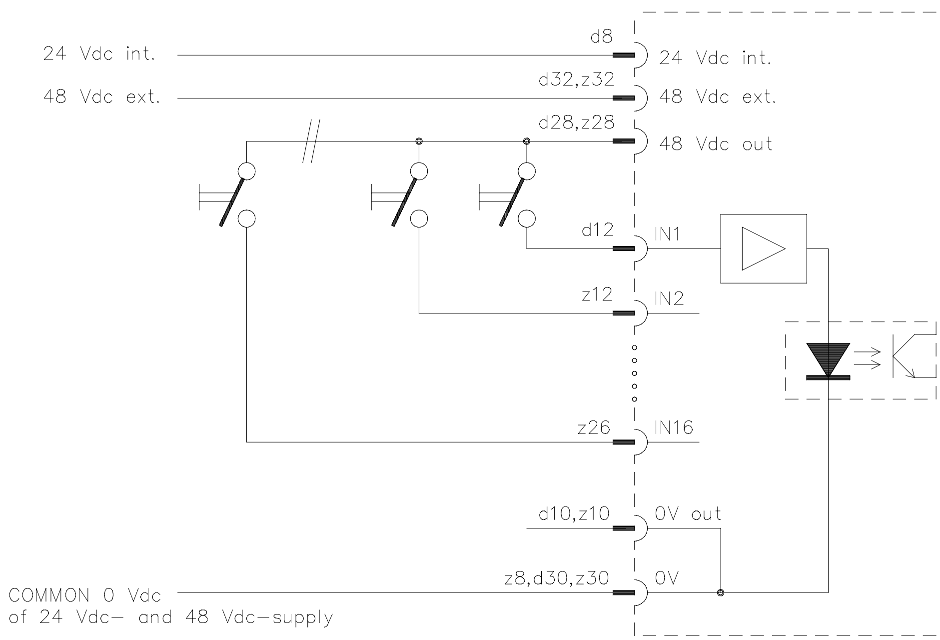
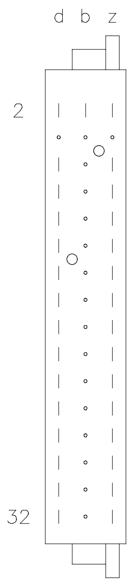


Figure 1 Schematic diagram for connection of inputs to the 10101/2/3 module

Pin allocation

The back view and pin allocation of the 10101/2/3 module connector are as follows:



d2		b2	GND	z2	5 Vdc
d4	–			z4	–
d6				z6	
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10	0 Vdc out			z10	0 Vdc out
d12	IN 1			z12	IN 2
d14	IN 3			z14	IN 4
d16	IN 5			z16	IN 6
d18	IN 7			z18	IN 8
d20	IN 9			z20	IN 10
d22	IN 11			z22	IN 12
d24	IN 13			z24	IN 14
d26	IN 15			z26	IN 16
d28	48 Vdc ext. out			z28	48 Vdc ext. out
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 48 Vdc ext.			z32	Supply 48 Vdc ext.

Connection examples

The figures below show a number of connection examples for the fail-safe digital input module 10101/2/3.

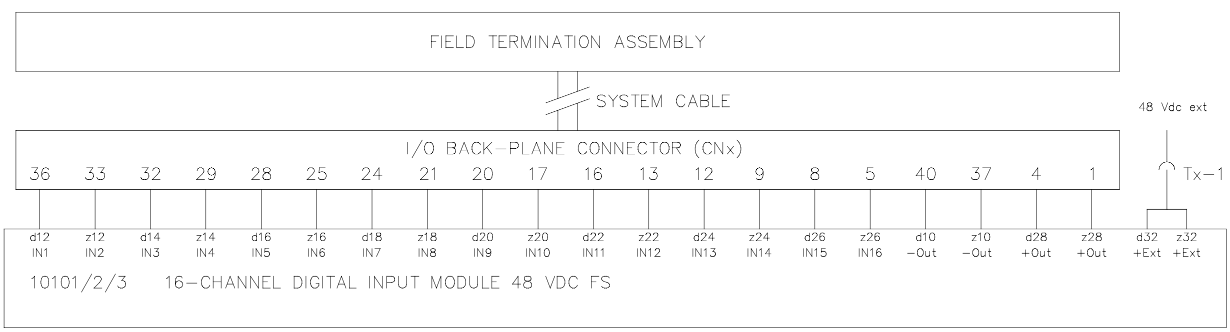


Figure 2 Connection example of 10101/2/3 module to FTA for both non-redundant and redundant I/O configurations

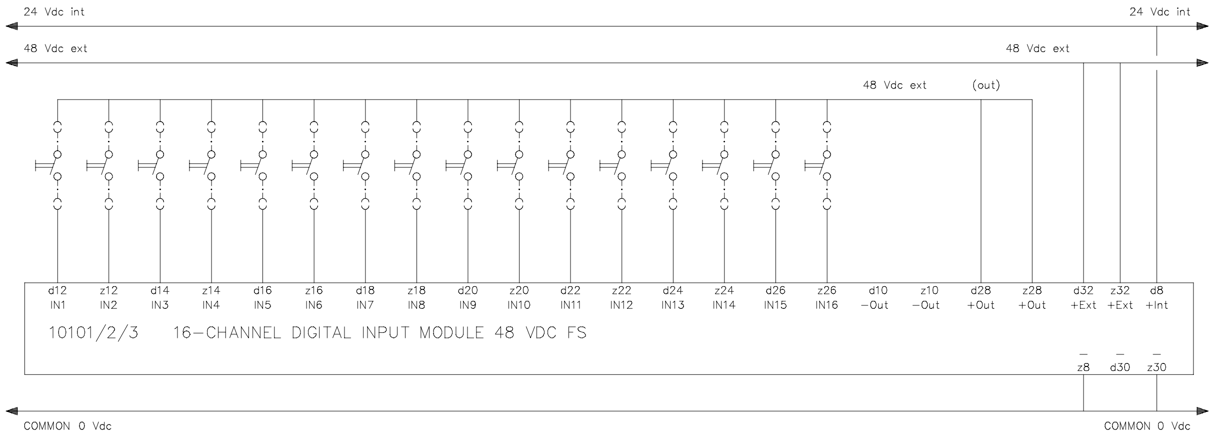
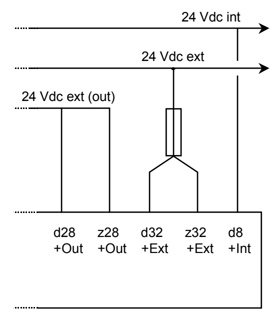


Figure 3 I/O connection example of 10101/2/3 module for non-redundant I/O configurations

Important!
If the external power pins (24 Vdc ext. out, connected to pins z28 and d28) are used without an FTA, a 500 mA fuse must be used to limit the combined field current (as shown on the right). If you use a fuse higher than 500 mA, the module may be damaged.



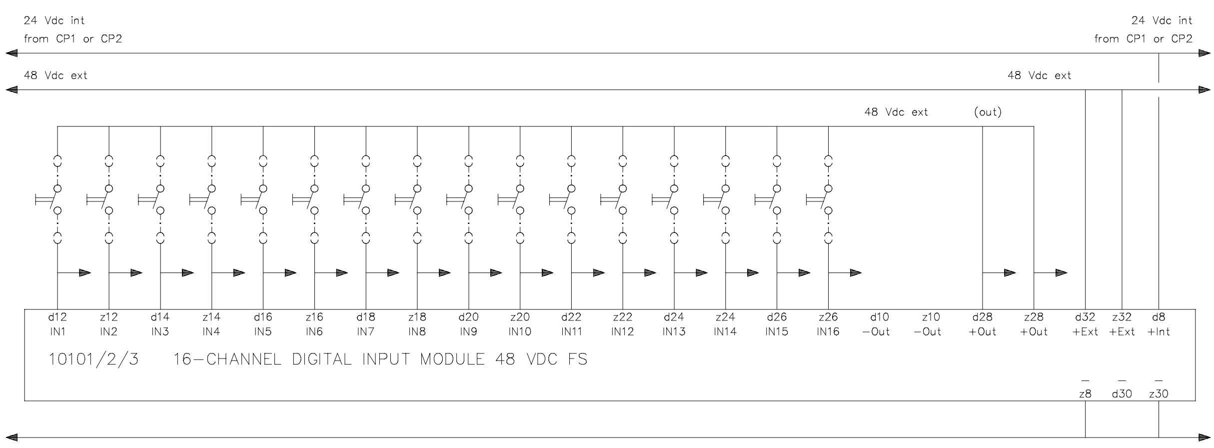


Figure 4 I/O connection example of 10101/2/3 module for redundant I/O configurations

Note:
The 24 Vdc (internal) supply must be connected to prevent fault detection during the self-test.

Technical data

The 10101/2/3 module has the following specifications:

General	Type number:	10101/2/3 11200
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 8 mA
		24 Vdc int. 80 mA
		48 Vdc ext. 65 mA (input currents)
	Ripple content (on 5 Vdc):	< 0.5 Vp-p (0-360 Hz)
Input	Number of input channels:	16
	Maximum input voltage:	70 Vdc
	Input current:	4 mA at 48 Vdc
	Input HIGH:	> 30 Vdc
	Input LOW:	< 16 Vdc (I < 1.1 mA)
	Input delay:	typically 10 ms
Key coding	(See 'Key coding' data sheet)	
	Module connector code:	
	– holes	A5, C13
	Rack connector code:	
	– large pins	A5, C13

10101/A/1 Adapter module for normally open digital inputs with ELD function (16 channels)

Description

The 10101/A/1 adapter module for normally open (NO) digital inputs with earth leakage detection (ELD) provides sixteen transient voltage suppressor diodes for the input channels of a 10101/2/. digital input module.
The diodes enable earth fault detection by the 10310/./1 module in case of earth faults to the input wires of an input signal with an open field contact. Earth faults to the power supply or to input wires of inputs signals with closed field contacts are already detected by the 10310/./1 module without the use of the 10101/A/1 module.

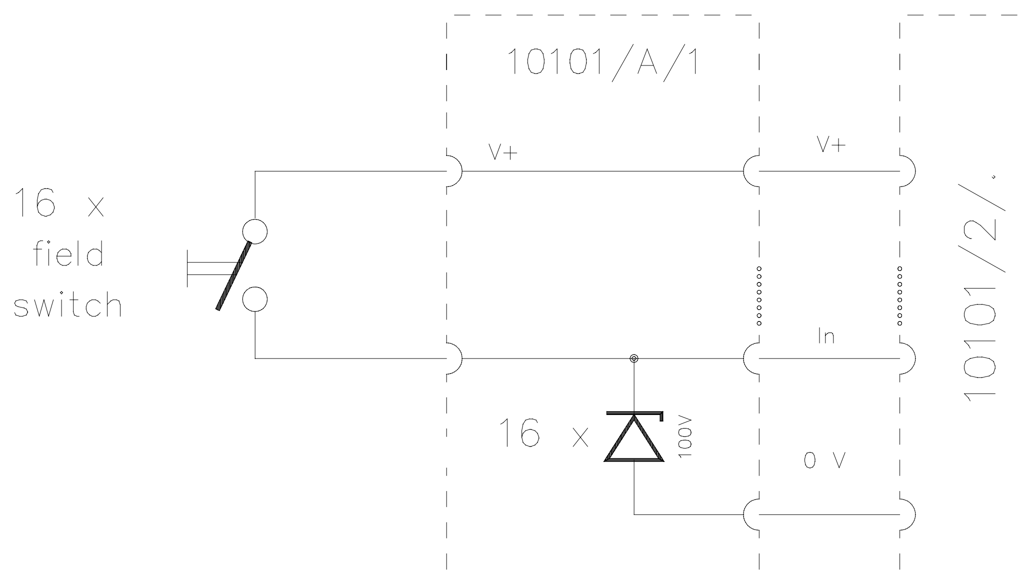


Figure 1 Schematic diagram

Technical data

The 10101/A/1 module has the following specifications:

General	Type number:	10101/A/1
	Approvals:	CE, UL; TÜV approval pending
Power	Power requirements:	none
Digital input	Number of input channels:	16
	Input voltage:	max. 90 V
	Reverse current:	max. 200 mA
	Reverse voltage drop:	< 1 V
Physical	Dimensions:	54 x 28 x 9 mm (L x W x H) 2.10 x 1.10 x 0.35 in (L x W x H)
	Rack space requirements:	none (placed on programming connector on I/O backplane)

10102/2/1 Fail-safe analog input module (4 channels)

Description

The fail-safe analog input module 10102/2/1 has four 0-2 V analog input channels. The analog inputs have a common 0 V connection, but are galvanically isolated from the 24 Vdc and 5 Vdc.
The analog inputs can either be used actively (i.e. each input has a separate 26 Vdc, > 20 mA short-circuit protected output) or passively (i.e. the supply is directly connected to the transmitter).
The 10102/2/1 input stage has a high input impedance. It is therefore allowed to connect two 10102/2/1 modules in parallel. Each input requires an analog input converter module 10102/A/. (see the 10102/A/. data sheets).

Note:
As the inputs require a 10102/A/. converter module, the 10102/2/1 module can only be used in combination with an I/O back plane in the rack.

The analog input module scans the analog inputs, the 26 V output voltages, the internal supply voltages, and a reference voltage generated by a D/A converter. This D/A converter generates several reference voltages, which are used to test the analog input module completely. The self-test includes a leakage test of the input filter as this could influence the accuracy of the analog input value.

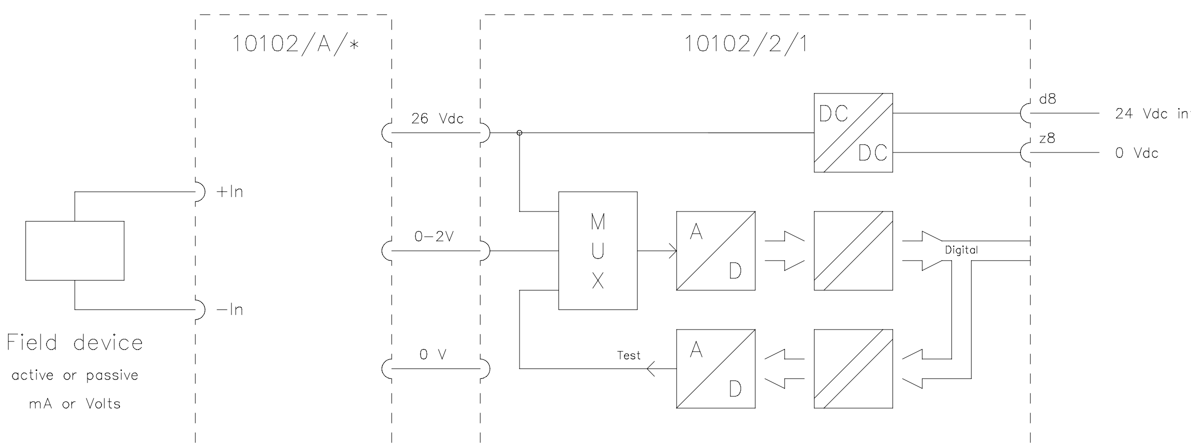


Figure 1 Schematic diagram for connection of inputs to the 10102/2/1 module

Within the configured process safety time, the analog inputs are tested for:

- absolute accuracy,
- correct conversion over full range,
- cross talk between inputs, and
- output voltage of the 26 Vdc outputs.

The 26 Vdc outputs are generated by the DC/DC converter and stabilized at 26 Vdc. They are therefore independent of the voltage of the incoming 24 Vdc.

Note:
The maximum output current is at least 21 mA. If the transmitters require a higher supply current, the input channel must be used in passive mode (= external supply).

Analog input ranges for FSC

Table 1 provides an overview of the analog input ranges for the FSC system, and how the 10102/2/1 module can be used for each of these ranges.

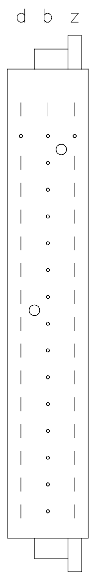
Table 1 Overview of analog inputs for FSC

0(4)-20 mA	Internal power	10102/2/1 + 10102/A/1
0(4)-20 mA	External power	10102/2/1 + 10102/A/2
0(1)-5 V	External power	10102/2/1 + 10102/A/3
0(2)-10 V	External power	10102/2/1 + 10102/A/4
Loop-monitored digital input		10102/2/1 + 10102/A/5

Other analog input signals such as thermocouple, PT-100, etc. can only be used after conversion to one of the analog input ranges that the FSC system can handle.

Pin allocation

The back view and pin allocation of the 10102/2/1 module connector are as follows:



d2		b2	GND	z2	5 Vdc
d4	–			z4	–
d6				z6	
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10	(IN1–)			z10	(IN 1+)
d12	26 Vdc 1			z12	IN 1
d14	0 V 1			z14	0 V 2
d16	IN 2			z16	26 Vdc 2
d18	(IN 2+)			z18	(IN 2–)
d20	(IN 3–)			z20	(IN 3+)
d22	26 Vdc 3			z22	IN 3
d24	0 V 3			z24	0 V 4
d26	IN 4			z26	26 Vdc 4
d28	(IN 4+)			z28	(IN 4–)
d30				z30	
d32				z32	

Connection example

Figure 2 shows a connection example for the fail-safe analog input module 10102/2/1.

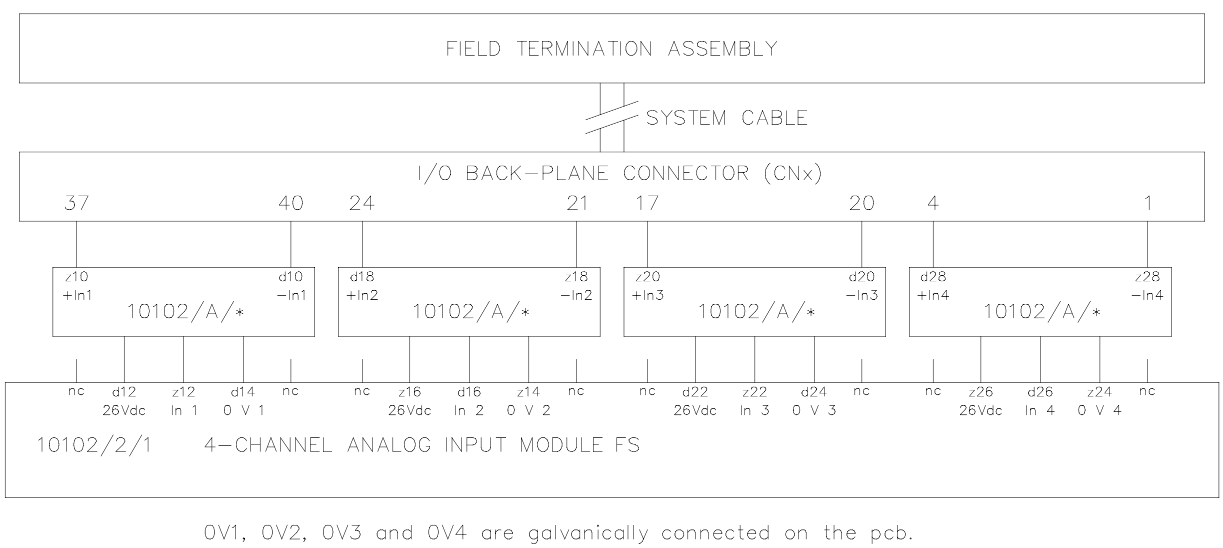
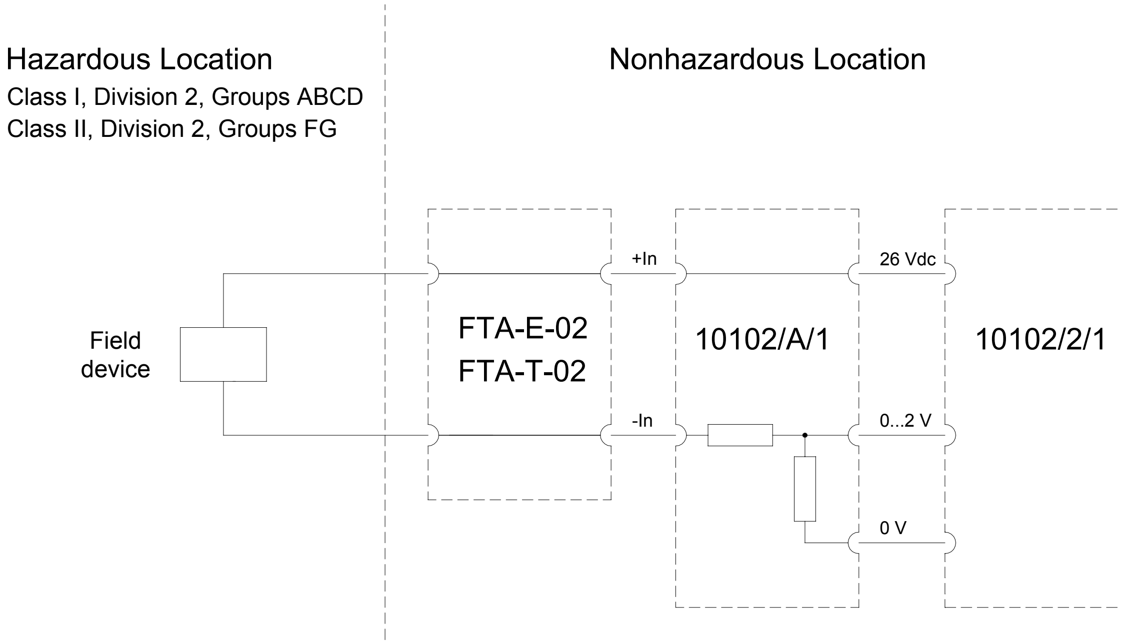


Figure 2 Connection example of 10102/2/1 module to FTA for both non-redundant and redundant I/O configurations

Hazardous locations (FM 3611)

To use the 10102/2/1 analog input module in non hazardous areas for non-incendive field circuits to Division 2 locations in compliance with FM 3611 (Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG), the module must be connected to the passive field device via an FTA-T-02 / FTA-E-02 and a 10102/A/1 analog input converter as indicated in Figure 3. The field devices, including field wiring, must adhere to the capacitance and inductance levels as given in Figure 3.



Non-Incendive Field Wiring Parameters:

Voc (V)	ISC (mA)	Gas Groups	Ca (µF)	La (mH)
28.0	33.0	A and B	0.31	60.59
		C	0.94	223.6
		D	2.51	498.5

Figure 3 Connection of input in hazardous locations

Considerations for FM approval

Please note the following constraints that are required for FM approval:

1. No revisions to drawings may be carried out without prior FMRC approval.
2. The Non-Incendive Field Wiring Parameter Concept allows interconnection of Non-Incendive Apparatus with Associated Non-Incendive Apparatus not specifically examined in combination as system when: Vmax ≥ Voc; Imax ≥ Isc; Ca ≥ Ci + Ccable; La ≥ Li + Lcable.

3. Modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01.
4. Control equipment connected to modules must not use or generate more than 250 Vrms or Vdc.
5. Installation should be in accordance with the National Electrical Code (ANSI/NFPA 70).
6. Non-Incendive Apparatus manufacturer's installation drawings must be followed when installing this equipment.
7. Non-Incendive Field Device must be FMRC Entity Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW, or 20 µJ, ex. switches, thermocouples, LEDs and RTDs)

Calibration

The 10102/2/1 module has potentiometers for calibration purposes (P1, P2, P4, P5). The module can be calibrated using the calibration option of the 'View FSC system and process status' program, an external calibrator, an extender module and an extender flatcable.

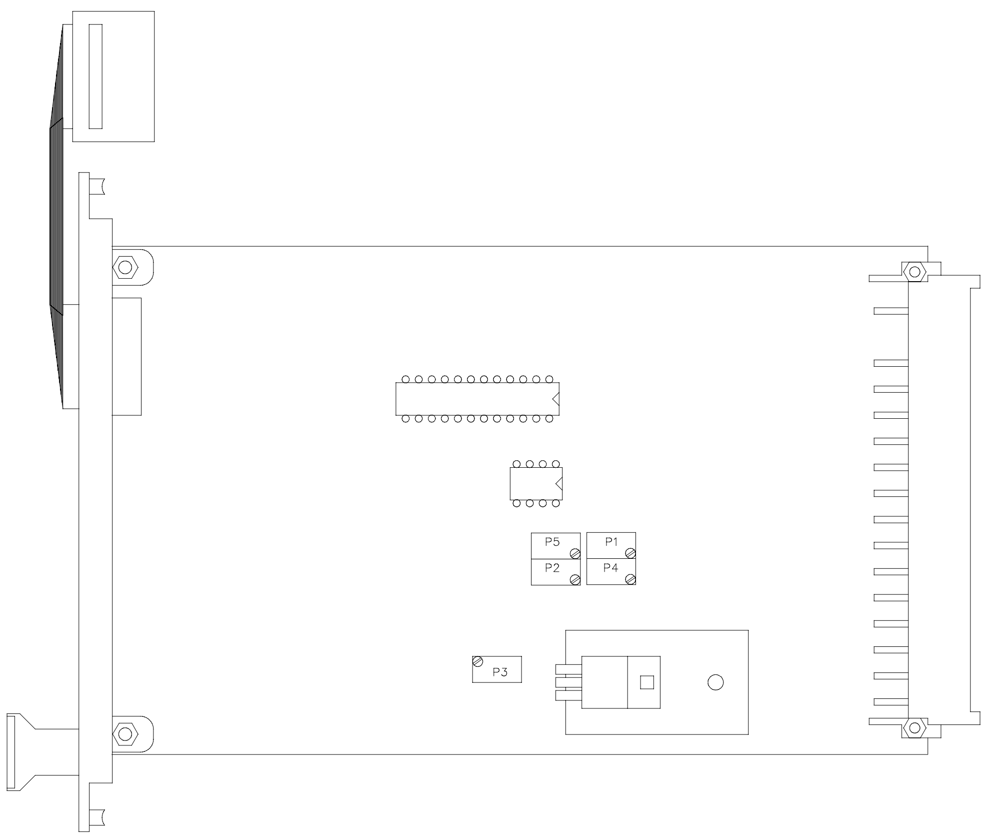


Figure 4 Location of potentiometers on 10102/2/1 module

Technical data

The 10102/2/1 module has the following specifications:

General	Type number:	10102/2/1 11302*
	Approvals:	CE, TÜV, UL, FM**
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 30 mA 24 Vdc 175 mA + 25 mA for each active input
Input	Number of input channels:	4
	Input specification (V):	0-2 Vdc
	Input resistance:	> 100 kOhm
	Loop powering:	26 Vdc (±1 V for 0.2 mA < I < 20 mA), short-circuit protected
	Loop current limit:	> 21 mA solid state
	A/D converter:	12-bit
	Inaccuracy:	≤ 0.75%
	Absolute max. input signal:	± 5 Vdc
Key coding	(See 'Key coding' data sheet)	
	Module connector code:	
	– holes	A5, C17
	Rack connector code:	
	– large pins	A5, C17

Notes:
* 10102/2/1 modules with suffix code 11301 and higher have improved EMC behavior.
10102/2/1 modules with suffix code 11302 have minor board layout modifications to improve production yield and reliability. There are no functional changes.
** For FM approval please note the considerations on page 22.

10102/A/. Analog input converter modules

Description

The analog inputs of a 10102/2/1 module require 10102/A/. analog input converter modules to convert the field signal to a 0-2 V signal for the 10102/2/1module.
The 10102/A/. modules are placed on a programming connector (Px) on the back of the I/O backplane in the 19-inch rack. To assist proper placement of these 10102/A/. modules, a 10102 positioning print can be placed on the programming connector.

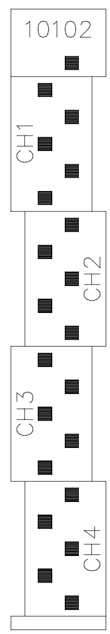


Figure 1 10102 positioning print

The printed circuit board of a 10102/A/. module should be oriented to slide into the cut-out zone of the appropriate channel.
Redundant channels require only one 10102/A/. module per channel.

10102/A/1 0(4)-20 mA internal power

Description

The 10102/A/1 analog input converter converts a 0(4)-20 mA field signal to 0-2 V signal for one 10102/2/1 input channel.
The 10102/A/1 module supplies the 26 Vdc power to the field.

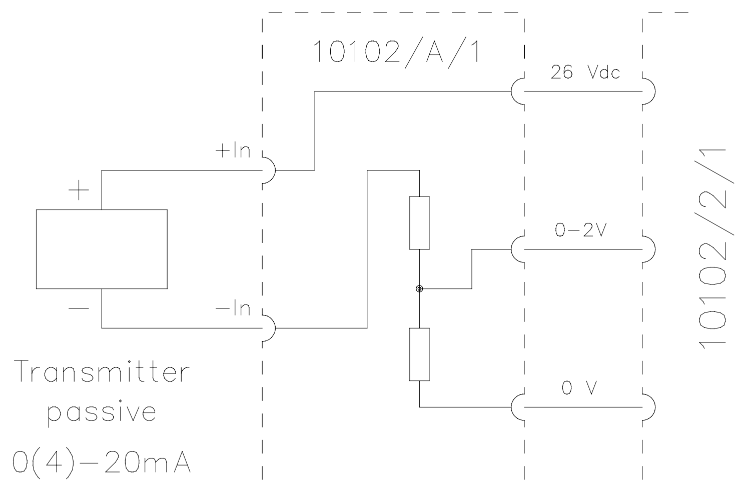


Figure 2 Schematic diagram of 10102/A/1 module

Technical data

The 10102/A/1 module has the following specifications:

General

Type number:	10102/A/1
Approvals:	CE, TÜV, UL
Dimensions:	23 x 12.7 x 9 mm (0.91 x 0.5 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	26 Vdc (supplied by 10102/2/1 module)

Input

Number of input channels:	1
Input current:	0-20 / 4-20 mA
Maximum loop resistance:	800 Ohm
Input resistance:	250 Ohm 0.1%
Transmitter voltage:	21 Vdc (± 1 V at 20 mA)
Loop current limit:	> 20 mA solid state
Absolute max. input signal:	± 50 mA

10102/A/2 0(4)-20 mA external power

Description

The 10102/A/2 analog input converter module converts a 0(4)-20 mA field signal to a 0-2 V signal for one 10102/2/1 input channel.
The 10102/A/2 module does not supply energy to the field.

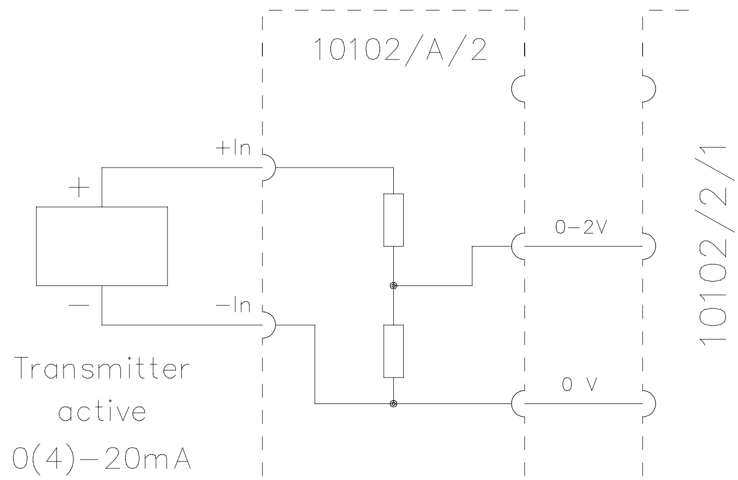


Figure 3 Schematic diagram of 10102/A/2 module

Technical data

The 10102/A/2 module has the following specifications:

General

Type number:	10102/A/2
Approvals:	CE, TÜV, UL
Dimensions	23 x 12.7 x 9 mm (0.91 x 0.5 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	none

Input

Number of input channels:	1
Input current:	0-20 / 4-20 mA
Input resistance:	250 Ohm 0.1%
Absolute max. input signal:	± 50 mA

10102/A/3 0(1)-5 Vdc external power

Description

The 10102/A/3 analog input converter module converts a 0(1)-5 Vdc field signal to a 0-2 V signal for one 10102/2/1 input channel.
The 10102/A/3 module does not supply energy to the field.

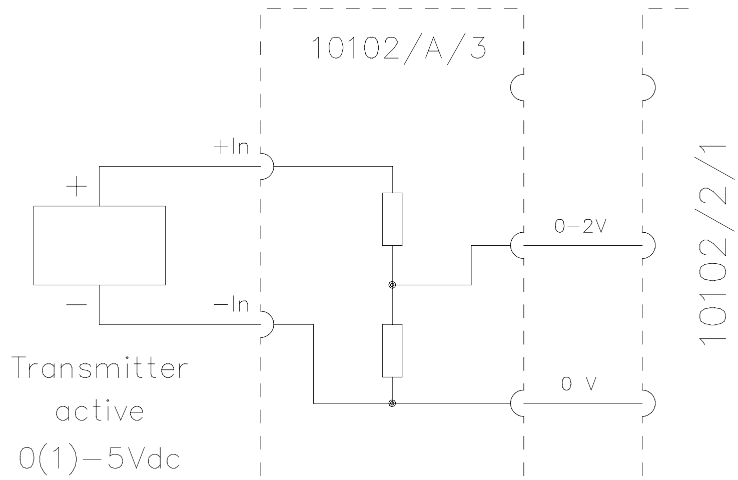


Figure 4 Schematic diagram of 10102/A/3 module

Technical data

The 10102/A/3 module has the following specifications:

General

Type number:	10102/A/3
Approvals:	CE, TÜV, UL
Dimensions	23 x 12.7 x 9 mm (0.91 x 0.5 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	none

Input

Number of input channels:	1
Input voltage:	0-5 / 1-5 V
Input resistance:	2.5 kOhm 1%
Absolute max. input signal:	± 12.5 Vdc

10102/A/4 0(2)-10 Vdc external power

Description

The 10102/A/4 analog input converter module converts a 0(2)-10 Vdc field signal to a 0-2 V signal for one 10102/2/1 input channel. The 10102/A/4 module does not supply energy to the field.

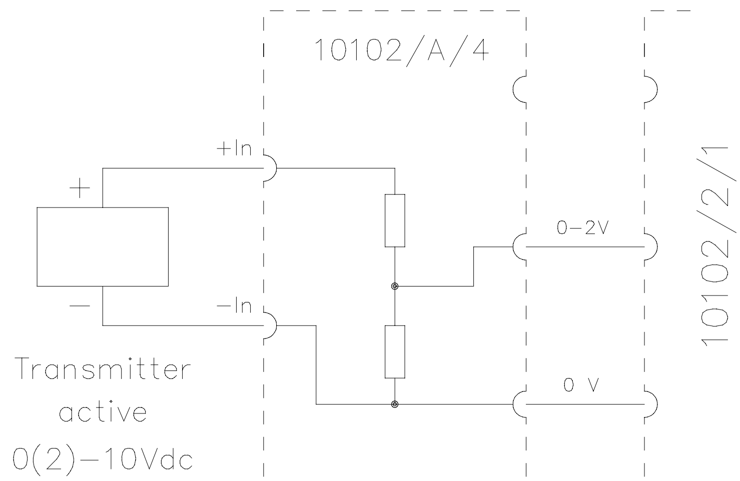


Figure 5 Schematic diagram of 10102/A/4 module

Technical data

The 10102/A/4 module has the following specifications:

General

Type number:	10102/A/4
Approvals:	CE, TÜV, UL
Dimensions	23 x 12.7 x 9 mm (0.91 x 0.5 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	None

Input

Number of input channels:	1
Input voltage:	0-10 / 2-10 V
Input resistance:	5 kOhm 1%
Absolute max. input signal:	± 25 Vdc

10102/A/5 Loop-monitored digital input

Description

The 10102/A/5 digital input converter module converts a field contact with appropriate resistors to a 0-2 V signal for one 10102/2/1 input channel
The field resistors must be at least 0.25 W, 10%, and should be placed as close to the actual field contact as possible.
The 10102/A/5 module supplies the 26 Vdc power to the field.
The actual 'loop-monitored' digital input result is obtained by assigning a functional block to this input (in the application program).

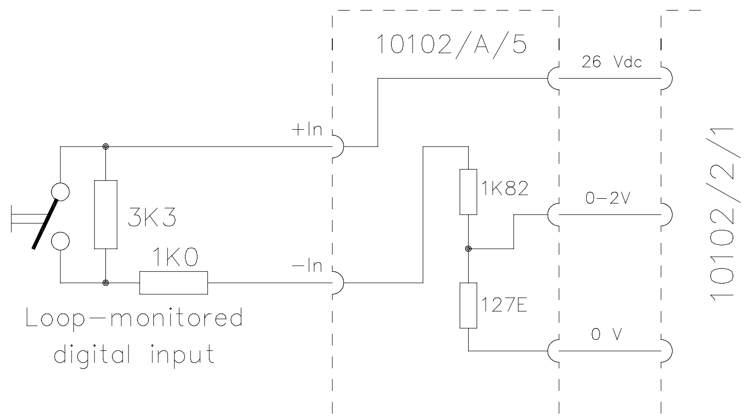


Figure 6 Schematic diagram of 10102/A/5 module

Technical data

The 10102/A/5 module has the following specifications:

General

Type number:	10102/A/5
Approvals:	CE, TÜV, UL
Dimensions:	23 x 12.7 x 9 mm (0.91 x 0.5 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	26 Vdc (supplied by 10102/2/1 module)

Input

Number of input channels:	1
Lead breakage voltage:	approx. 26 Vdc
Input resistance:	approx. 2 kOhm
Short-circuit current:	approx. 13 mA

Left blank intentionally.

10105/2/1 Fail-safe high-density analog input module (24 Vdc, 16 channels)

Description

The analog input module 10105/2/1 has sixteen analog inputs (0-4 V) and an external voltage readback input (0-4 V). The sixteen channels are fail-safe (safety class AK6) and have an isolated analog 0 V common to all sixteen channels.

The analog inputs of the 10105/2/1 module require the field signals to be converted from 0-20 mA to a level that can be used by the 10105/2/1 module. This conversion can be established in two ways:

- on the field termination assembly module FTA-T-14, or
- using the analog input conversion module 10105/A/1, which is placed on a programming connector (P_x) on the back of the I/O backplane in the 19-inch rack.

Analog input signals such as thermocouple, PT-100, etc. can only be used after conversion to 0(4)-20 mA using a dedicated converter (and an FTA-T-14 or 10105/A/1 module).

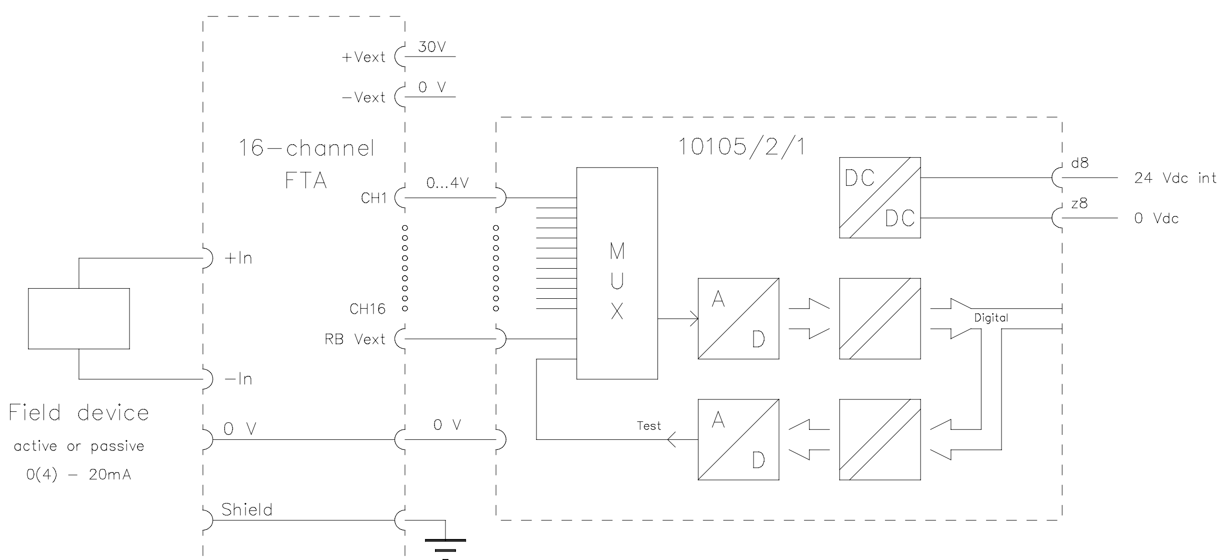


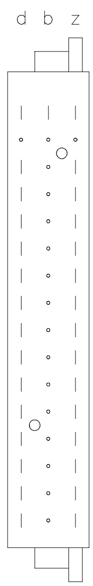
Figure 1 Schematic diagram for connection of inputs to 10105/2/1 module

The self-test of the module, which is controlled by the FSC system's central processor unit (CPU), includes:

- absolute accuracy,
- correct conversion over the full range,
- crosstalk between inputs,
- channel input filters, and
- internal supply voltages.

Pin allocation

The back view and pin allocation of the 10105/2/1 module connector are as follows:



d2		b2	GND	z2	5 Vdc
d4	–			z4	–
d6				z6	
d8	Int. 24 Vdc supply			z8	Int. 0 Vdc supply
d10	Analog ground			z10	Analog ground
d12	IN 1			z12	IN 2
d14	IN 3			z14	IN 4
d16	IN 5			z16	IN 6
d18	IN 7			z18	IN 8
d20	IN 9			z20	IN 10
d22	IN 11			z22	IN 12
d24	IN 13			z24	IN 14
d26	IN 15			z26	IN 16
d28	Analog ground			z28	Readback external power
d30				z30	
d32				z32	

Connection examples

Figure 2 and Figure 3 below show typical connection examples for the 10105/2/1 module.

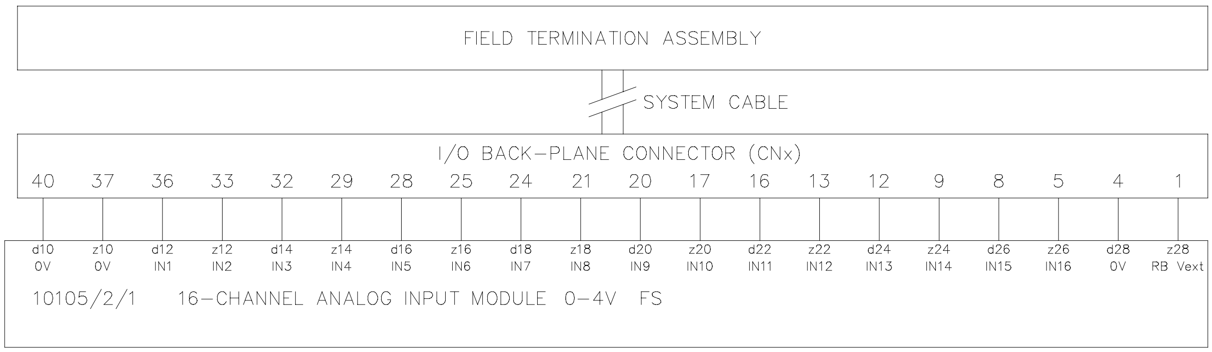


Figure 2 Connection example of 10105/2/1 module to FTA

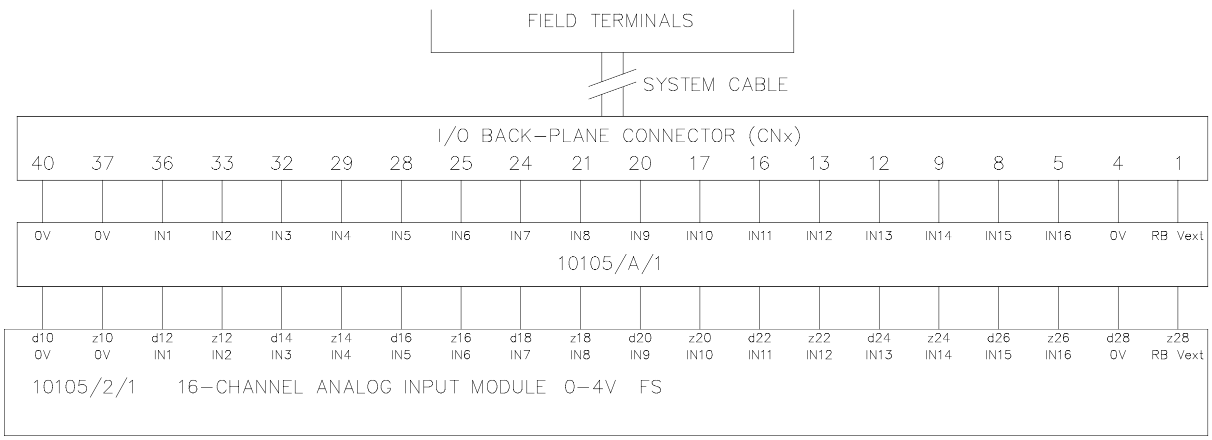
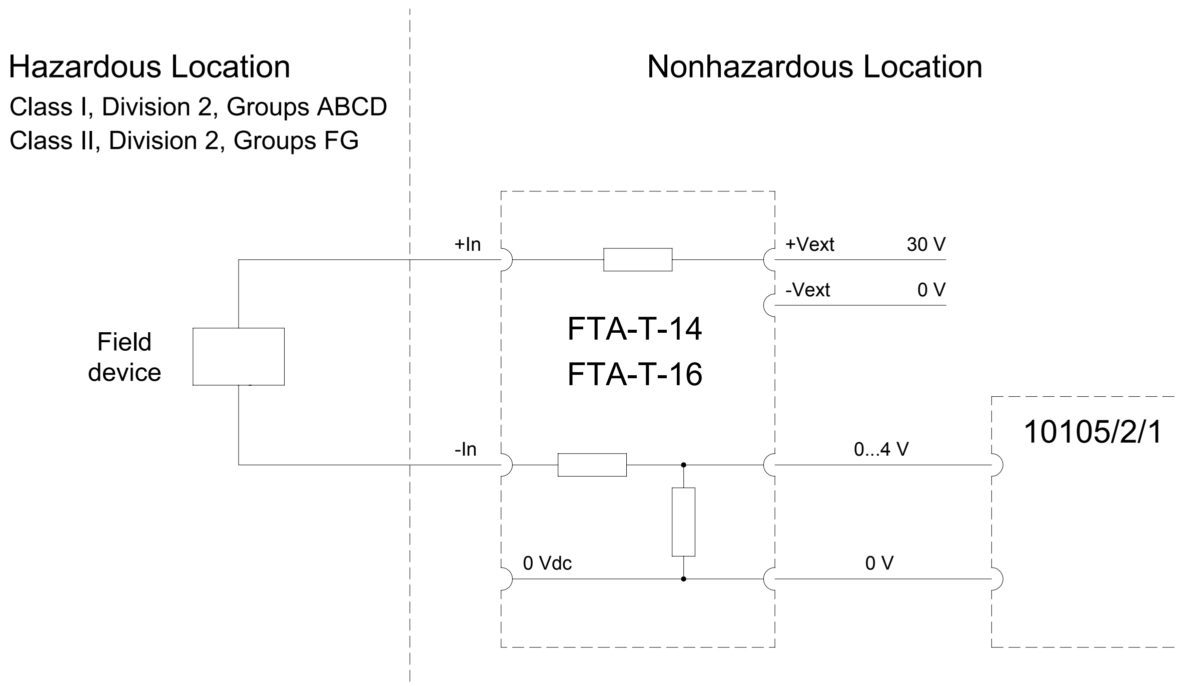


Figure 3 Connection example of 10105/2/1 module with signal converter 10105/A/1

Hazardous locations (FM 3611)

To use the 10105/2/1 analog input module in nonhazardous areas for non-incendive field circuits to Division 2 locations in compliance with FM 3611 (Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG), the module must be connected to the field device via an FTA-T-14 / FTA-T-16 as indicated in Figure 4. The 30 Vdc power-limited circuit is delivered via an external resistor on the FTA-T-14 / FTA-T-16. The field devices, including field wiring, must adhere to the capacitance and inductance levels as given in Figure 4.



Non-Incendive Field Wiring Parameters:

Voc (V)	ISC (mA)	Gas Groups	Ca (µF)	La (mH)
32.0	125.0	A and B	0.22	4.50
		C	0.66	17.76
		D	1.77	35.23

Figure 4 Connection of input in hazardous locations

Considerations for FM approval

Please note the following constraints that are required for FM approval:

1. No revisions to drawings may be carried out without prior FMRC approval.
2. The Non-Incendive Field Wiring Parameter Concept allows interconnection of Non-Incendive Apparatus with Associated

Non-Incendive Apparatus not specifically examined in combination as system when: Vmax ≥ Voc; Imax ≥ Isc; Ca ≥ Ci + Ccable; La ≥ Li + Lcable.

3. Modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01.
4. Control equipment connected to modules must not use or generate more than 250 Vrms or Vdc.
5. Installation should be in accordance with the National Electrical Code (ANSI/NFPA 70).
6. Non-Incendive Apparatus manufacturer's installation drawings must be followed when installing this equipment.
7. Non-Incendive Field Device must be FMRC Entity Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW, or 20 µJ, ex. switches, thermocouples, LEDs and RTDs)

Technical data

The 10105/2/1 module has the following specifications:

General

Type number:	10105/2/1 16900
Approvals:	CE, TÜV, FM*; UL
Safety class:	AK1-6
Software versions:	≥ 500
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 35 mA 24 Vdc 35 mA

Input

Number of input channels:	16
Input range:	0 to 4.1 V
Input resistance:	> 1 MOhm
A/D converter:	12-bit
A/D converter inaccuracy:	± 1 LSB
Module inaccuracy:	< 0.25%
Absolute max. input signal:	± 36 Vdc
Cross talk between channels:	> 60 dB**
External voltage read back:	
– range	0 to 4.1 V
– input resistance	typically 1 MOhm

Technical data (continued)

Key coding	(See 'Key coding' data sheet)	
	Module connector code:	
	– holes	A5, C25
	Rack connector code:	
	– large pins	A5, C25

Notes:

* For FM approval please note the considerations on page 5-36.

** Cross talk is defined as follows:
A step response on one channel from 0 to 100% v.v. shall not influence any other analog input channel beyond its two least significant bits (LSBs), i.e. 20 ∗ log (4 / 4096).

10105/A/1 0-25 mA to 0-4.1 V analog input converter module (16 channels)

Description

The analog input converter module 10105/A/1 converts sixteen 0(4)-20 mA field signals to 0(0.66)-3.3 V signals for the fail-safe high-density analog input module 10105/2/1. It has only to be used when the FTA-T-14 or FTA-T-16 are not used.

All inputs are passive and have a common 0 V connection. The converter module 10105/A/1 has been prepared for external power read back. This only requires one extra resistor of 9.09 kOhm (1%) to prescale the voltage range (0-41 V).

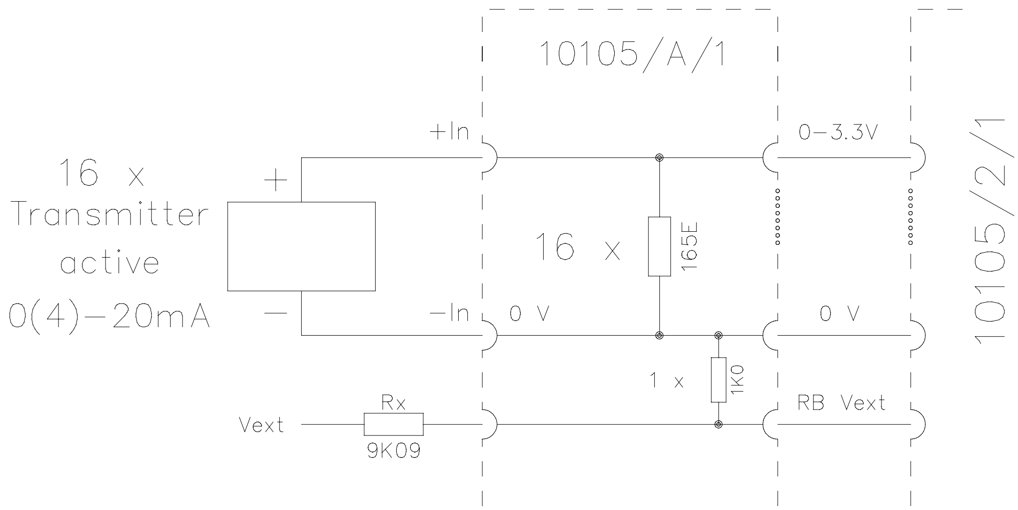


Figure 1 Schematic diagram

Technical data

The 10105/A/1 module has the following specifications:

General	Type number:	10105/A/1
	Approvals:	CE, TÜV, UL
Power	Power requirements:	none
Analog input	Number of input channels:	16
	Input current:	0-20 / 4-20 mA (full scale = 25 mA)
	Input resistance:	165 Ohm 0.1%
	Absolute maximum input current:	± 50 mA
Read back input	R_x resistor:	9k09 1%, 0.6 W
	Input voltage (Vext):	0 to 41 V
	Input resistance (Vext):	10k1 1%
	Absolute maximum (Vext):	80 V
Physical	Dimensions:	56 x 28 x 9 mm (L x W x H) 2.20 x 1.10 x 0.35 in (L x W x H)
	Rack space requirements:	none (placed on programming connector on I/O back plane)

10106/2/1 Fail-safe line-monitored digital input module with earth fault monitor (16 channels)

Description

The digital input module 10106/2/1 has sixteen channels for either line-monitored loops or status signals derived from proximity switches according to DIN 19234 (NAMUR). The module also supports monitoring of any earth faults that occur within these sixteen loops.
The module design meets the safety requirements of DIN 19250 (AK5/6). The 10106/2/1 module can be used in applications up to SIL 3 according to IEC 61508.

The power required to feed the connected field devices is provided by an on-board DC/DC converter which is common to all sixteen channels.
LEDs in the module front indicate the status of the channel, loop and module diagnostics.

The inputs of the 10106/2/1 module require a conversion of the proximity switch signals to a level that can be used by the 10106/2/1 module. This conversion is established by placing the signal converter module 10106/A/· on a programming connector (P_x) on the back of the I/O backplane in the 19-inch rack.

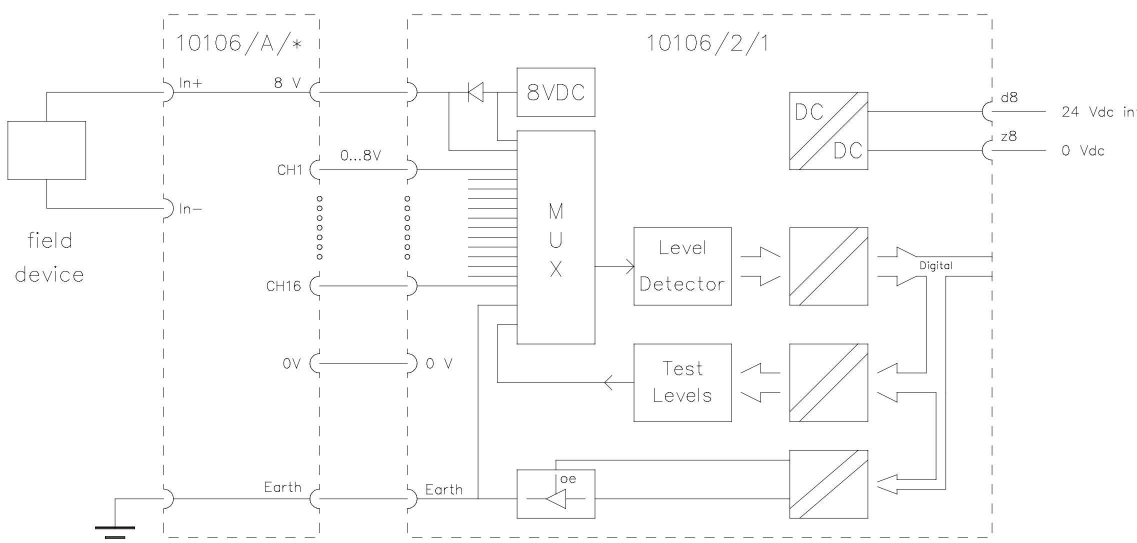


Figure 1 Schematic diagram for connection of inputs to 10106/2/1 module

Self-test

The self-test of the module, which is controlled by the FSC system's central processor unit (CPU), includes:

- functional tests of various trip levels applied,
- channel independence,
- monitoring of supply voltage to input devices,
- earth connection correctness, and
- correctness of supply voltages utilized.

Field devices

The types of field devices that can be connected to the channels of the 10106/2/1 module depend on the signal converter that is used, as shown in Table 1 below.

Table 1 Connection of field devices

Type of field signal	Converter type used 10106/A/1	Converter type used 10106/A/2
Dry contacts with line-monitoring function *(see note 1 below)*	✔	✔
Dry contacts without line-monitoring function	✔	✔ 3)
Proximity switches according to DIN 19234 (NAMUR), e.g. Pepperl+Fuchs (P+F) N-series	✔	
Pepperl+Fuchs (P+F) SN-series fail-safe proximity switches (ferrometal sensing) *(see note 2 below)*		✔
Pepperl+Fuchs (P+F) S1N-series fail-safe proximity switches (non-ferrometal sensing) *(see note 2 below)*		✔

Notes:

1. This requires a line terminator with a 10 kOhm resistor and a 1 kOhm resistor ±10%, 0.25 W(see table 3).
2. The combination of fail-safe sensors with the fail-safe input module 10106/2/1 meets the safety integrity requirements as laid down in IEC 61508.
3. Max. 8 channels per 10106/A/2 converter may be used for dry contacts without line-monitoring function.

Earth fault monitor

The earth fault monitor requires a connection with earth on pin z28 of the 10106/2/1 module, as well as software activation of the monitor.

With floating field sensors, the earth fault monitor detects (and indicates) a connection between any of the 2x16 input wires and earth. In zener-barrier applications, the earth fault monitor detects (and indicates) a loss of connection between the '8 Vdc' of the 10106/2/1 module and earth.

LED indicators

The module front has a number of LED indicators that indicate the channel, loop and module status.

The channel status is indicated by means of two LEDs per channel.
The **green** channel LED indicates whether the channel status is 'high' (ON) or 'low' (OFF).
The **red** channel LED indicates a channel fault (ON) if lead breakage or short circuit is detected. For inputs without active line monitors, these LEDs will always be off.
Table 2 and Table 3 below show the behavior of the green and red channel LEDs for the various field situations.

The bicolor 'Earth' LED indicates whether the earth connection test is 'OK' (green), 'false' (red) or disabled (OFF).
The bicolor 'Status' LED indicates whether the module is 'OK' (green) or faulty/not running (red).

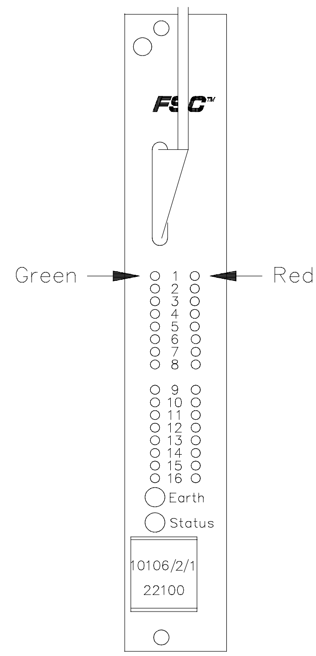


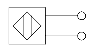
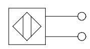
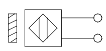
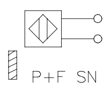
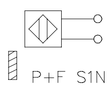
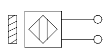
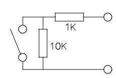
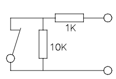
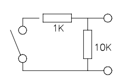
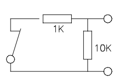
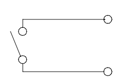
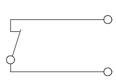
Figure 2 Module front

Table 2 Status LED behavior for line-monitored inputs

Field status	Green channel LED	Red channel LED
Normal	See Table 3 below	ON/OFF*
Lead breakage	OFF	ON
Short circuit	ON	ON

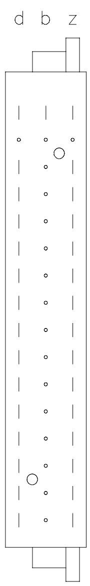
* OFF if no channel fault has been detected since the last fault reset.
ON if a channel fault has been detected since the last fault reset.

Table 3 Green channel LED behavior

	field situation	green channel LED	loop monitored
 IN+ IN− DIN 19234 NAMUR	sensor I < 1.2mA	OFF	YES
 IN+ IN− DIN 19234 NAMUR	sensor I > 2.1mA	ON	
 IN+ IN− P+F SN sensor	sensor covered (safe state)	OFF	YES
 IN+ IN− P+F SN sensor	sensor uncovered (active state)	ON	
 IN+ IN− P+F S1N sensor	sensor uncovered (safe state)	OFF	YES
 IN+ IN− P+F S1N sensor	sensor covered (active state)	ON	
 1K 10K IN+ IN−	switch open	OFF	YES
 1K 10K IN+ IN−	switch closed	ON	
 1K 10K IN+ IN−	switch open	OFF	YES
 1K 10K IN+ IN−	switch closed	ON	
 IN+ IN−	switch open	OFF	NO
 IN+ IN−	switch closed	ON	
 IN+ IN− Spare	any	OFF	NO

Pin allocation

The back view and pin allocation of the 10106/2/1 module connector are as follows:



d2		b2	GND	z2	5 Vdc
d4	–			z4	–
d6				z6	
d8	Int. 24 Vdc supply			z8	Int. 0 Vdc supply
d10	0 Vdc Out			z10	0 Vdc Out
d12	IN 1			z12	IN 2
d14	IN 3			z14	IN 4
d16	IN 5			z16	IN 6
d18	IN 7			z18	IN 8
d20	IN 9			z20	IN 10
d22	IN 11			z22	IN 12
d24	IN 13			z24	IN 14
d26	IN 15			z26	IN 16
d28	8 Vdc Out			z28	Earth
d30				z30	
d32				z32	

Connection example

Figure 3 below shows a typical connection example for the 10106/2/1 module.

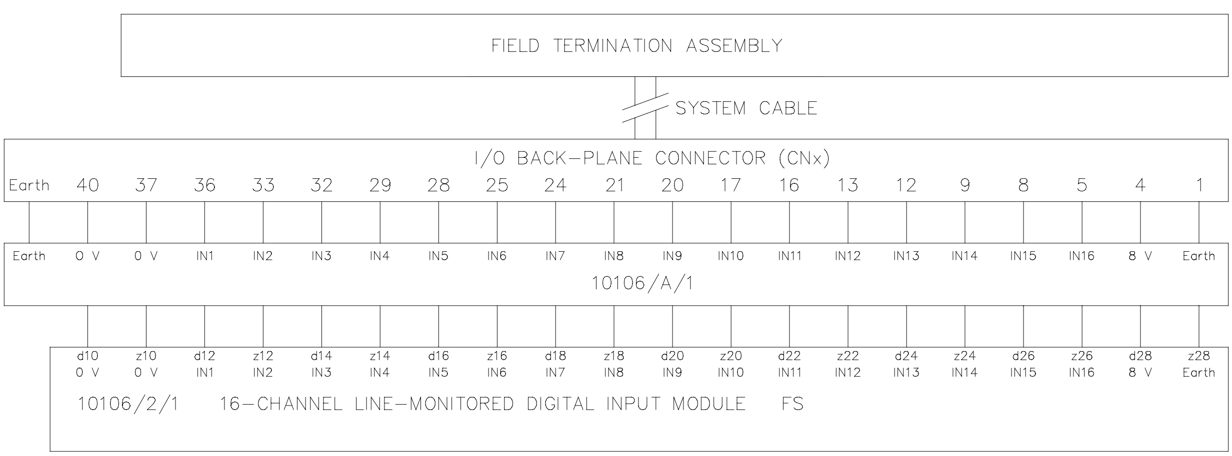
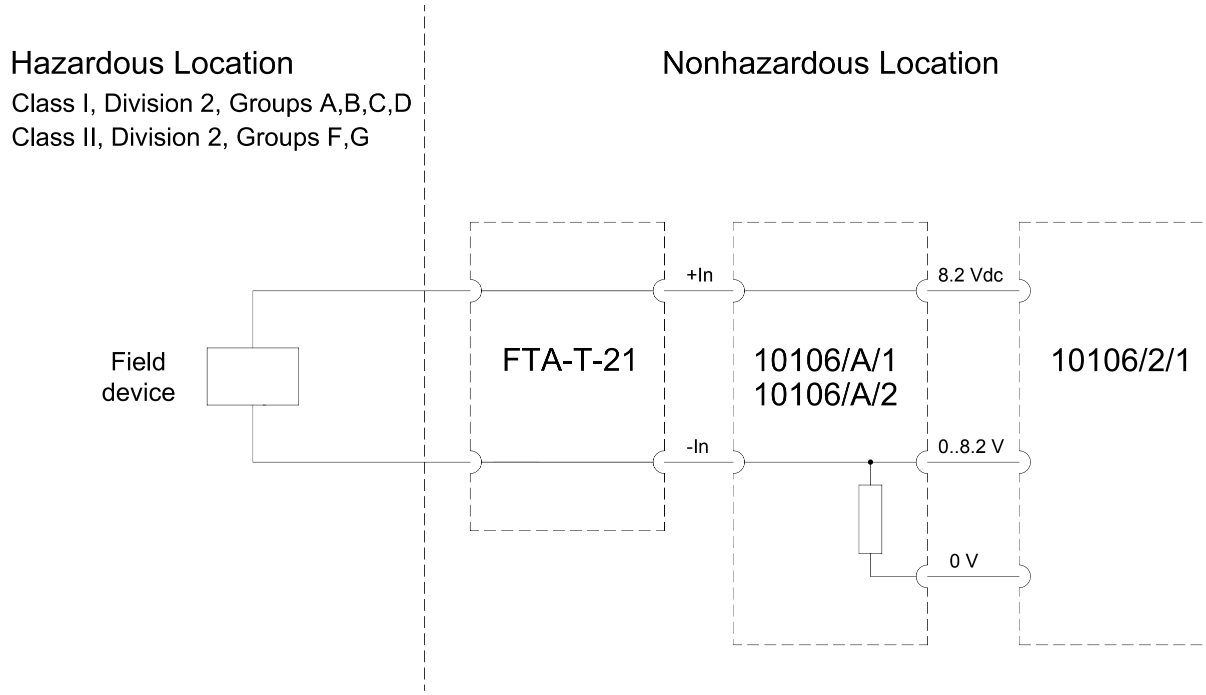


Figure 3 Connection example of 10106/2/1 module with signal converter 10106/A/1

Hazardous locations (FM 3611)

To use the 10106/2/1 digital input module in non-hazardous areas for non-incendive field circuits Division 2 locations in compliance with FM 3611 (Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG), the module must be connected to the passive field device via an FTA-T-21 and a 10106/A/1 or 10106/A/2 signal converter as indicated in Figure 4. The field devices, including field wiring, must adhere to the capacitance and inductance levels as given in Figure 4.



Non-Incendive Field Wiring Parameters:

Voc (V)	ISC (mA)	Gas Groups	Ca (µF)	La (mH)
8.66	230	A and B	11.00	0.66
		C	60.70	6.87
		D, F and G	181.86	13.04

Figure 4 Connection of input in hazardous locations

Considerations for FM approval

Please note the following constraints that are required for FM approval:

1. No revisions to drawings may be carried out without prior FMRC approval.
2. The Non-Incendive Field Wiring Parameter Concept allows interconnection of Non-Incendive Apparatus with Associated Non-Incendive Apparatus not specifically examined in

combination as system when: Vmax ≥ Voc; Imax ≥ Isc;
Ca ≥ Ci + Ccable; La ≥ Li + Lcable.

3. Modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01.
4. Control equipment connected to modules must not use or generate more than 250 Vrms or Vdc.
5. Installation should be in accordance with the National Electrical Code (ANSI/NFPA 70).
6. Non-Incendive Apparatus manufacturer's installation drawings must be followed when installing this equipment.
7. Non-Incendive Field Device must be FMRC Entity Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW, or 20 µJ, ex. switches, thermocouples, LEDs and RTDs)

Technical data

The 10106/2/1 module has the following specifications:

General

Type number:	10106/2/1 22101*
Approvals:	CE, UL, TÜV, FM**
Safety class:	AK1-6
Software versions:	≥ 510
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 160 mA 24 Vdc 110 mA

Input

The following specifications are all in combination with 10106/A/1.

Number of input channels:	16
Input type:	according to DIN 19234 (= NAMUR)
Switch level:	1.4 to 1.9 mA
Hysteresis:	0.2 mA ± 0.05 mA
Field wire resistance:	max. 50 Ohm
8 V loop supply:	
– output voltage	7.9 to 8.7 V
– output current	170 mA (short-circuit proof)

Technical data (continued)

Earth	Connection monitor:	1
	Input resistance:	typically 0.5 MOhm (–40V < U < 40V)
	Test current:	typically 0.5 mA
	Output voltage:	typically 0.5 Vdc
	Field fault voltage:	max. 250 Vac
Key coding	(See 'Key coding' data sheet)	
	Module connector code:	
	– holes	A5, C29
	Rack connector code:	
	– large pins	A5, C29

Notes:

* 10106/2/1 modules with suffix code 22100 should not be used in combination with 10106/A/2 converter modules.

** For FM approval please note the considerations on page 46.

10106/A/1 NAMUR signal converter module (16 channels)

Description

The NAMUR signal converter module 10106/A/1 converts sixteen NAMUR field signals to 0-8 V signals for the fail-safe line-monitored digital input module 10106/2/1.
All inputs are passive and have a common 8 V connection.
The 10106/A/1 module connects the Earth pin of the 10106/2/1 module with earth of the I/O backplane.

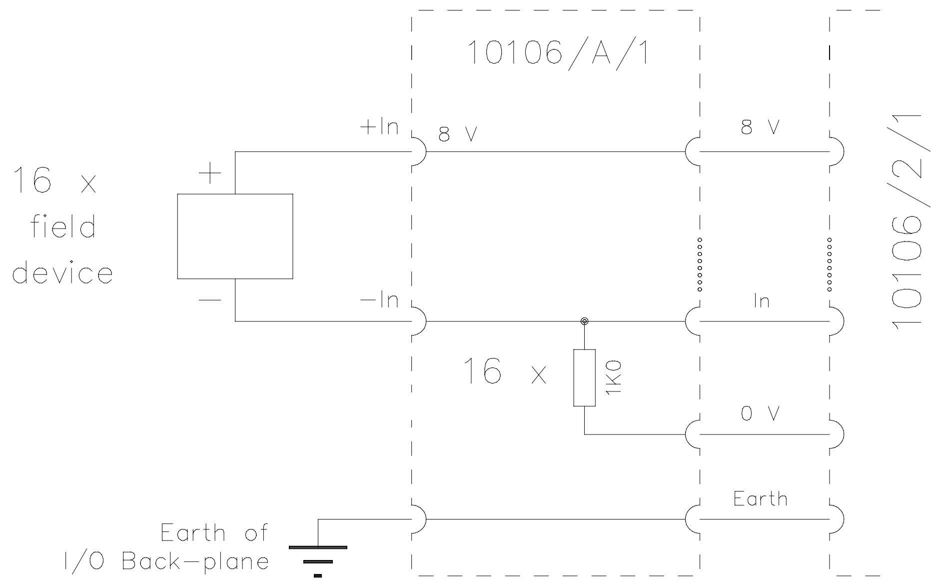


Figure 1 Schematic diagram

Technical data

The 10106/A/1 module has the following specifications:

General	Type number:	10106/A/1
	Approvals:	CE, TÜV, UL
Power	Power requirements:	none
Analog input	Number of input channels:	16
	Input current:	0-8 mA
	Input resistance:	1 kOhm 0.1%
	Absolute maximum input current:	± 20 mA
Physical	Dimensions:	54 x 28 x 9 mm (L x W x H) 2.10 x 1.10 x 0.35 in (L x W x H)
	Rack space requirements:	none (placed on programming connector on I/O back plane)

10106/A/2 Fail-safe 'NAMUR' sensor signal converter module (16 channels)

Description

The fail-safe 'NAMUR' sensor signal converter module 10106/A/2 converts sixteen Pepperl+Fuchs (P+F) fail-safe sensor signals to 0-8 V signals for the fail-safe line-monitored digital input module 10106/2/1.
All inputs are passive and have a common 8 V connection.
The 10106/A/2 module connects the Earth pin of the 10106/2/1 module with earth of the I/O back plane.

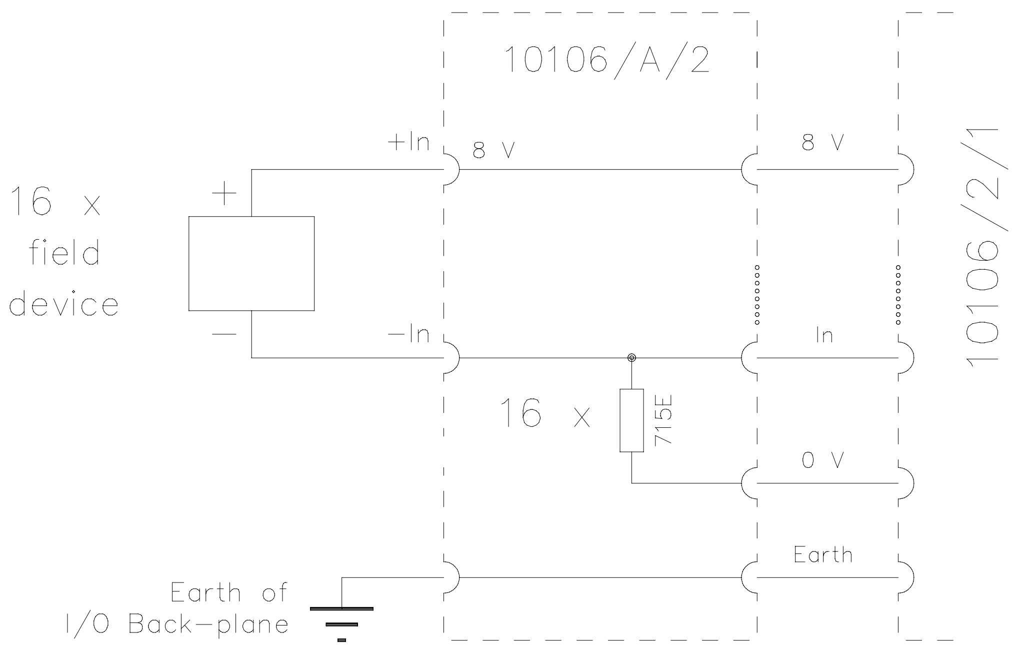


Figure 1 Schematic diagram

Technical data

The 10106/A/2 module has the following specifications:

General	Type number:	10106/A/2
	Approvals:	CE, TÜV, UL
Power	Power requirements:	none
Analog input	Number of input channels:	16
	Input current:	0-11 mA
	Input resistance:	715 Ohm 0.1%
	Absolute maximum input current:	± 25 mA
Physical	Dimensions:	54 x 28 x 9 mm (L x W x H) 2.10 x 1.10 x 0.35 in (L x W x H)
	Rack space requirements:	none (placed on programming connector on I/O back plane)

Fail Safe Control
Hardware Manual

Section 6:
FSC Output Modules

Copyright, Notices and Trademarks

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Section 6: FSC Output Modules

FSC output modules

General information

All the output modules are European standard size (100 x 160 mm) instrument modules. The width of the module front is 4 TE (20.32 mm) (= 4 HP, 0.8 in), which is one position in a standard 19-inch I/O rack.

Each output module is connected to the horizontal bus via a flatcable, which protrudes from the module front. Digital output modules have status LEDs for each channel. The LEDs are placed in the module front, below the flatcable.

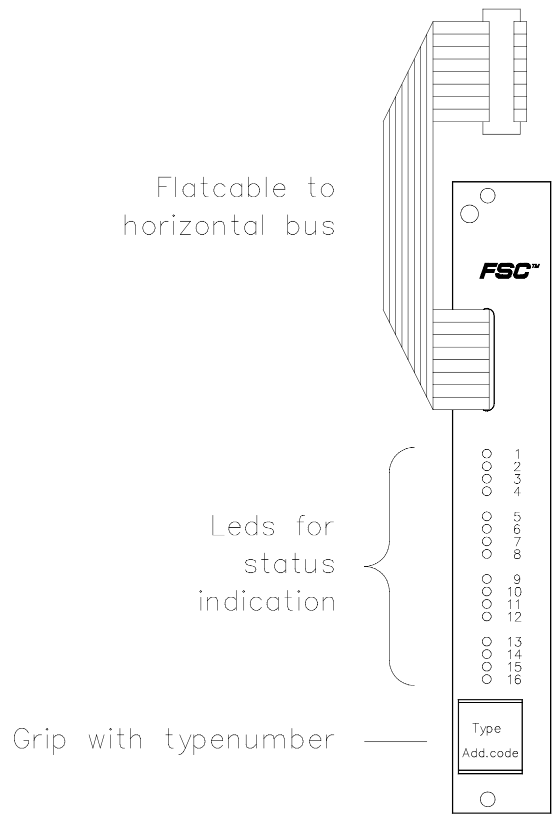


Figure 1 Front of a digital output module

The output modules are fitted with a male connector according to DIN 41612, type F, with the d, (b) and z rows used.

The following items are terminated on the rack connector:

- the internal power supply of 5 Vdc,
- the internal control input(s) for the secondary means of de-energization (WD inputs),
- the internal and external power supply of 24 Vdc or other supply voltages (e.g. 110 Vdc), and
- the wiring for the output signals.

All output modules have galvanic isolation between the 5 Vdc circuitry and the output circuitry for separation between the processor and field section.

If indicated, the output modules are 'fail-to-safe'. This means that in case of a component failure of the output module the outputs can still be switched off. The fail-safe property of output modules is mainly achieved through self-test routines and additional (test) circuits on the module.

The fail-to-safe output modules have a secondary means of de-energization via the watchdog (WD) inputs (5 Vdc level). This makes it possible to de-energize an output irrespective of the horizontal bus control signals. This results in a de-energized output signal to the process, which is the safe condition in a normally energized system. The safety-relevant circuitry of the module is completely covered by the self-test functions of the system.

Supply voltages

The supply voltages to the FSC system must be within the following ranges to ensure correct operation of the FSC output modules:

- 220 Vdc: +10% / –15%
- 110 Vdc: +25% / –15%
- 60 Vdc: +15% / –15%
- 48 Vdc: +15% / –15%
- 24 Vdc: +30% / –15%

If it cannot be guaranteed that the DC power supplied to the FSC system remains within the above ranges, additional voltage monitoring is required.

Addressing

The addressing of an output module is determined by the module's position in the I/O rack. This means that the output modules have no jumpers or switches for setting the address. Each output module can be replaced by any module of the same type.

Replacing an output module

All output modules can be replaced with the power switched on. Depending on the output signal function and the system I/O configuration, process operation may be affected.
When removing an output module, first disconnect the flatcable from the horizontal bus, then carefully pull the module from the rack.
When placing an output module, carefully push the module into the rack until it is flush with the rack, then connect the flatcable to the horizontal bus.

Output load, current limiting and supply voltage

The digital outputs with transistor outputs are provided with an electronic current-limiting circuit. If the output is overloaded or shorted, it goes in current limit for a brief period of time (several milliseconds), supplying ***at least*** the specified maximum output current. If the overload or short-circuit persists, the output switches off.
Safety-related outputs will then generate an FSC system fault, and remain de-energized until a fault reset is given.
Non-safety-related outputs switch on again after a delay of several hundreds of milliseconds (see Figure 2). A system fault is only generated if the output is of a fail-safe type.

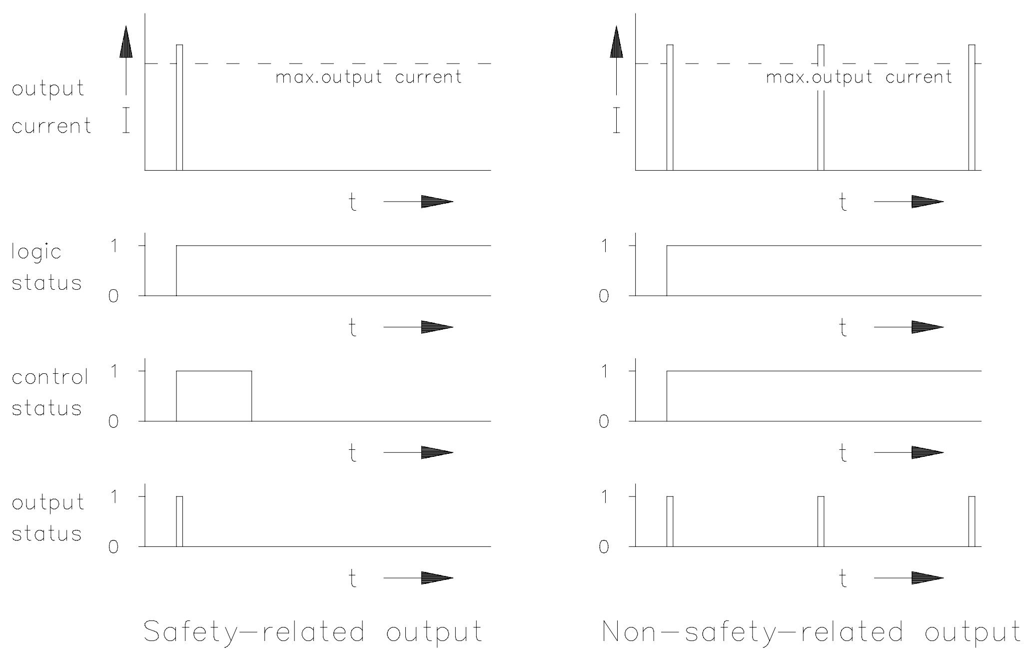


Figure 2 Output overload / short-circuit behavior

The specified maximum output current is independent of the supply voltage. The load current usually changes in a linear fashion with the supply voltage (I = V/R). To calculate the maximum permissible load of a channel, we must take into account the maximum supply voltage we expect.

To do this, we can use the following formula:

$$I_{nl} = I_m * \frac{V_n}{V_m}$$

where:
V_n = nominal supply voltage (usually 24 Vdc)
I_{nl} = nominal load current
V_m = expected maximum supply voltage
I_m = maximum output current (see module specification)

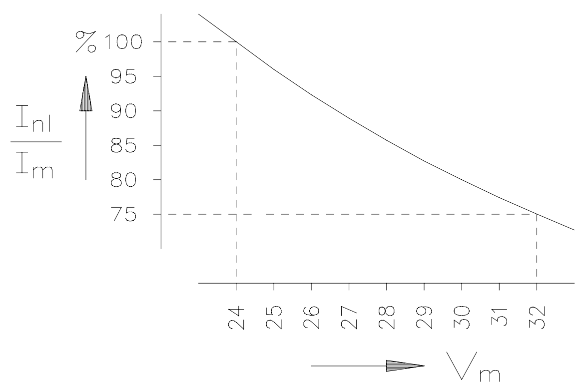


Figure 3 Maximum current derating vs. expected maximum supply voltage

Example:
We have a 10201/2/1 module and we expect a maximum supply voltage of 30 V. The maximum output current of each channel is 550 mA. The current derating factor is 80% (see Figure 3).
The maximum nominal load current will then be 80% ∗ 550 mA = 440 mA (≡ 10.56 W).

10201/2/1 Fail-safe digital output module (24 Vdc, 0.55 A, 8 channels)

Description

The fail-safe digital output module 10201/2/1 has eight 24 Vdc, 550 mA output channels to drive loads up to 13 W.
These loads may be resistive (e.g. lamps) or inductive (e.g. solenoids).
For inductive loads, a suppression diode is included on each output.
The outputs, including the suppression diodes, are fully tested and may therefore be used for fail-safe applications.
Within the configured process safety time, the outputs are tested for:

- ability to de-energize,
- ability to de-energize the group (via secondary means),
- crosstalk between outputs, and
- functioning of the suppression diodes.

The outputs are split into two groups of four outputs each. Each group has its own secondary means of de-energization. This increases the shutdown selectivity in case of a channel failure.
The secondary means of de-energization enables the watchdog and/or the processor to de-energize the outputs, irrespective of the result of the application function.

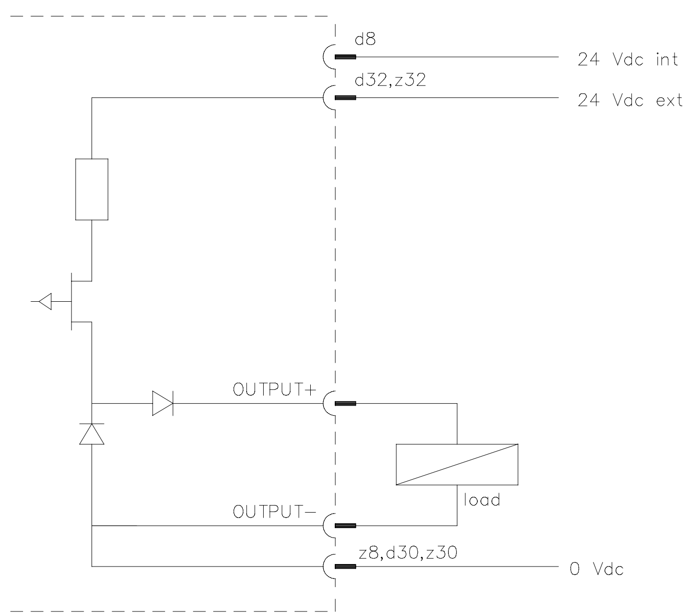
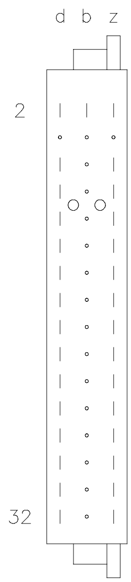


Figure 1 Schematic diagram for connection of one output to the 10201/2/1 module

Pin allocation

The back view and pin allocation of the 10201/2/1 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6				z6	
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10	(0 Vdc)			z10	(0 Vdc)
d12	OUT 1+			z12	OUT 1–
d14	OUT 2+			z14	OUT 2–
d16	OUT 3+			z16	OUT 3–
d18	OUT 4+			z18	OUT 4–
d20	OUT 5+			z20	OUT 5–
d22	OUT 6+			z22	OUT 6–
d24	OUT 7+			z24	OUT 7–
d26	OUT 8+			z26	OUT 8–
d28	(0 Vdc)			z28	(0 Vdc)
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 24 Vdc ext.			z32	Supply 24 Vdc ext.

Connection examples

The figures below show a number of connection examples for the fail-safe digital output module 10201/2/1.

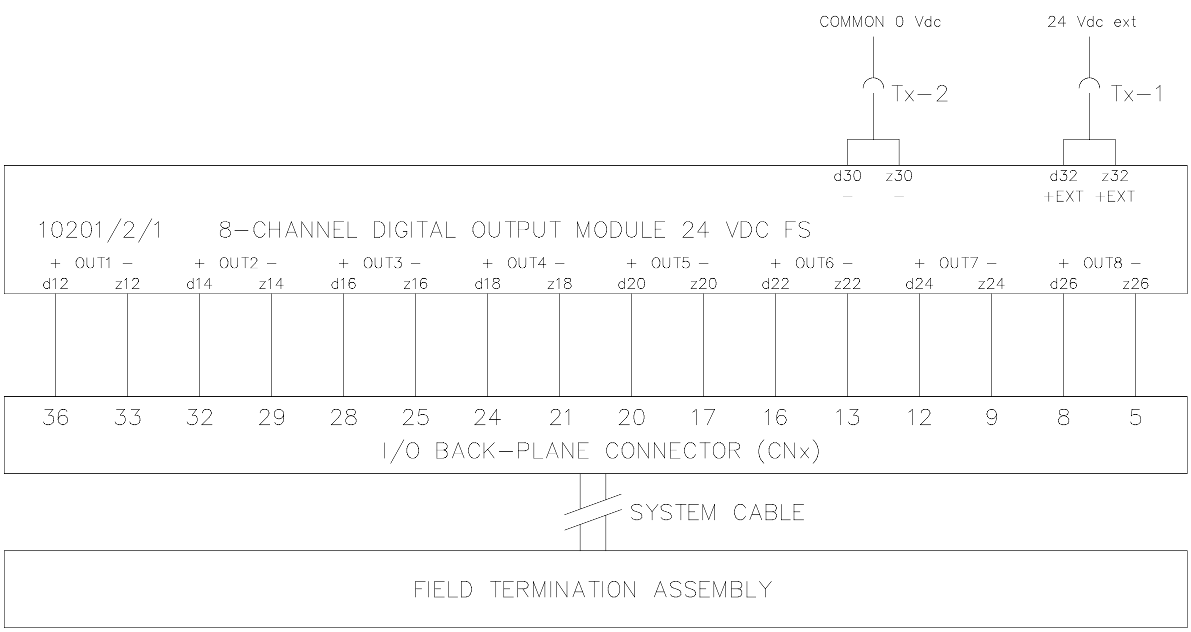


Figure 2 Connection example of 10201/2/1 module to FTA for both non-redundant and redundant I/O configurations

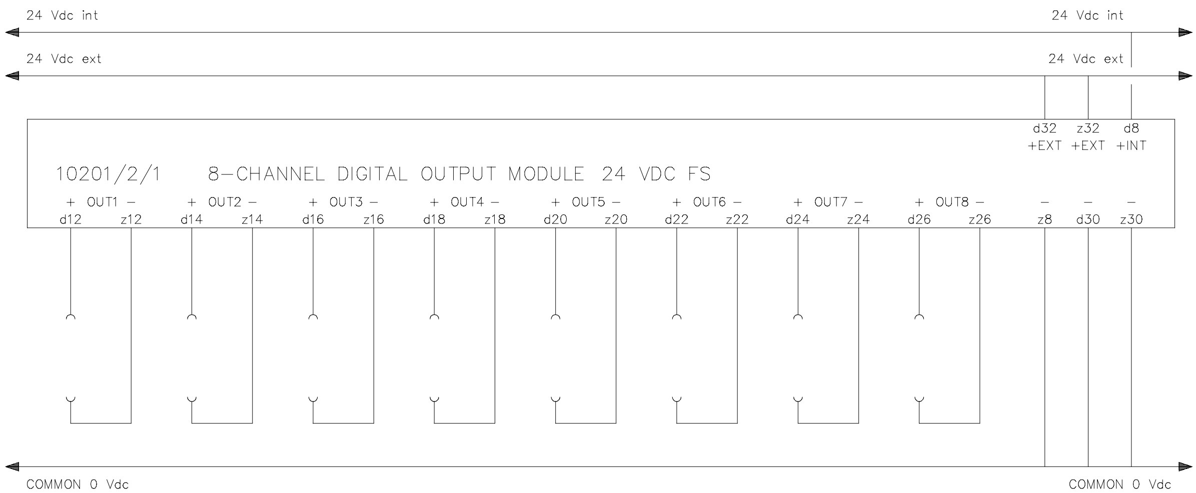


Figure 3 I/O connection example of 10201/2/1 module for non-redundant I/O configurations

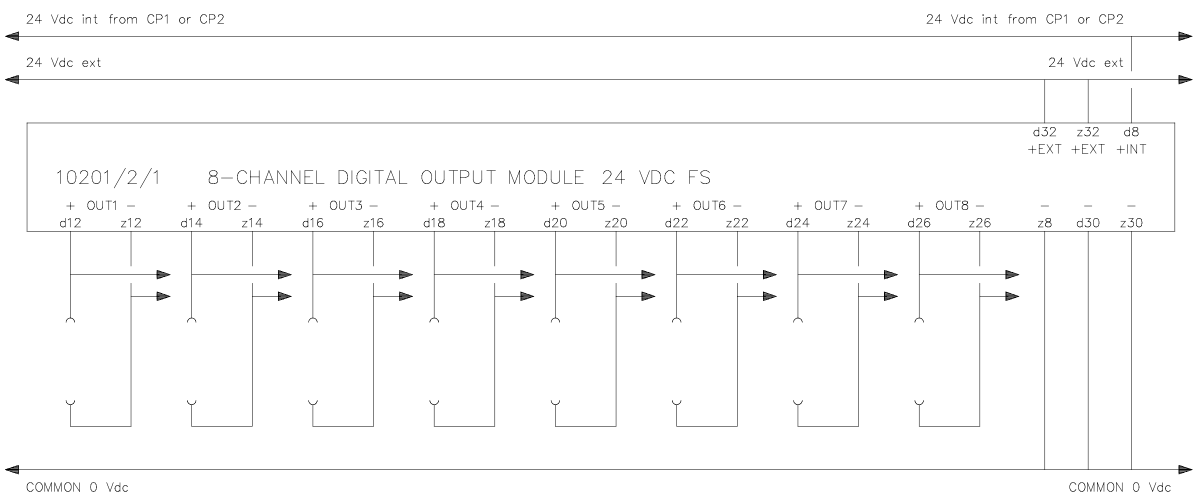


Figure 4 I/O connection example of 10201/2/1 module for redundant I/O configurations

Note:
The 24 Vdc internal and external power supplies must be connected to prevent fault detection during the self-test of the output module (pins d8, z8, d30/z30 and d32/z32).

Technical data

The 10201/2/1 module has the following specifications:

General

Type number:	10201/2/1 11501*
Approvals:	CE, TÜV, UL
Software versions:	≥ 3.00
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 25 mA 24 Vdc internal 25 mA 24 Vdc external 70 mA (without output load)

Output

Number of output channels:	8
Output specification:	24 Vdc solid-state source, short-circuit proof
Maximum current:	550 mA* (see 'FSC output modules' data sheet)
Maximum lamp load:	120 mA (2.9 W)*
Maximum load capacitance:	1 µF
Voltage drop:	< 2.0 Vdc at 500 mA*
Off current:	< 0.1 mA
WDG input current:	8 mA

Key coding

(See 'Key coding' data sheet)

Module code:	
– holes	A9, C9
Rack code:	
– large pins	A9, C9

*** Note:**
10201/2/1 modules with suffix code 11500 have a maximum current of at least 450 mA, a maximum lamp load of 100 mA (2.4 W) and a voltage drop of < 2.0 Vdc at 400 mA..

10205/2/1 Fail-safe analog output module (0(4)-20 mA, 2 channels)

Description

The fail-safe analog output module 10205/2/1 has two 0(4)-20 mA output channels for analog control applications.
The load may only be resistive or capacitive. Inductive loads will cause the analog output module to be reported faulty. The two analog outputs are galvanically isolated from the 24 Vdc and the 5 Vdc.
The 0 V 1 and 0 V 2 pins are interconnected on the module.
Each analog output channel consists of a 12-bit D/A converter for the output value and an A/D converter which reads the output value.
Using the A/D converter it is possible to check the correct functioning of the D/A converter.
Within the configured process safety time, the analog outputs are tested for:

- correct output value (current value ± 5%),
- ability to de-energize, and
- cross talk between analog outputs.

If I/O back planes are used, the analog output module 10205/2/1 requires a 10205/A/. module on each channel.
Each analog output has a secondary means of de-energization, which enables the watchdog and/or the processor to de-energize the outputs, irrespective of the result of the application value.

The analog output module 10205/2/1 can only be used in non-redundant I/O configurations, as it is not possible to put current outputs in parallel (which would be required for redundant I/O configurations).

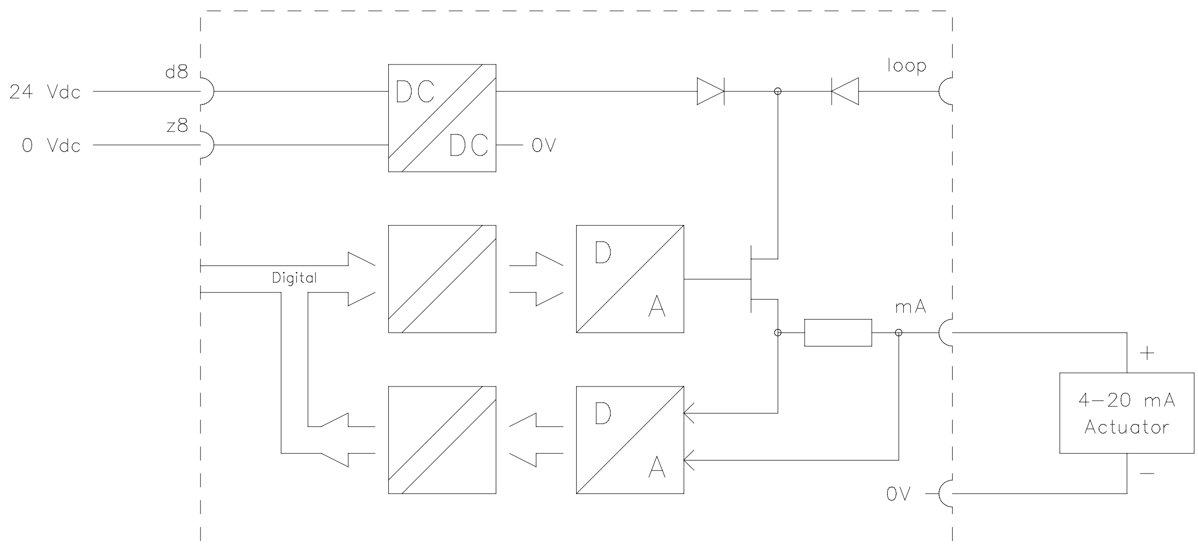


Figure 1 Schematic diagram for connection of the 10205/2/1 module as an active output

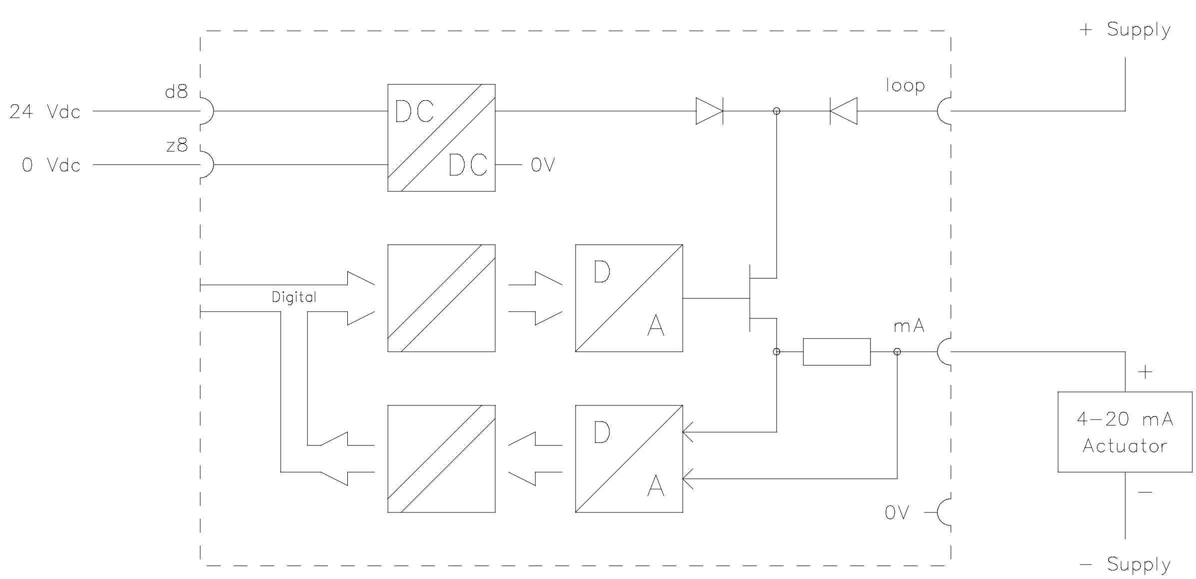
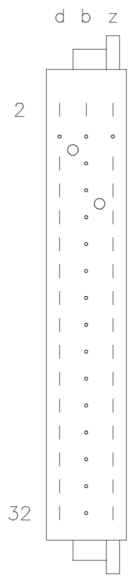


Figure 2 Schematic diagram for connection of the 10205/2/1 module as a passive output

Pin allocation

The back view and pin allocation of the 10205/2/1 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6				z6	
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10				z10	
d12	(F 1+)			z12	(F 1–)
d14	0 V 1			z14	
d16	mA 1			z16	Loop 1
d18	(F 2+)			z18	(F 2–)
d20	0 V 2			z20	
d22	mA 2			z22	Loop 2
d24				z24	
d26				z26	
d28				z28	
d30				z30	
d32				z32	

Connection examples

The figures below show a number of connection examples for the fail-safe analog output module 10205/2/1.

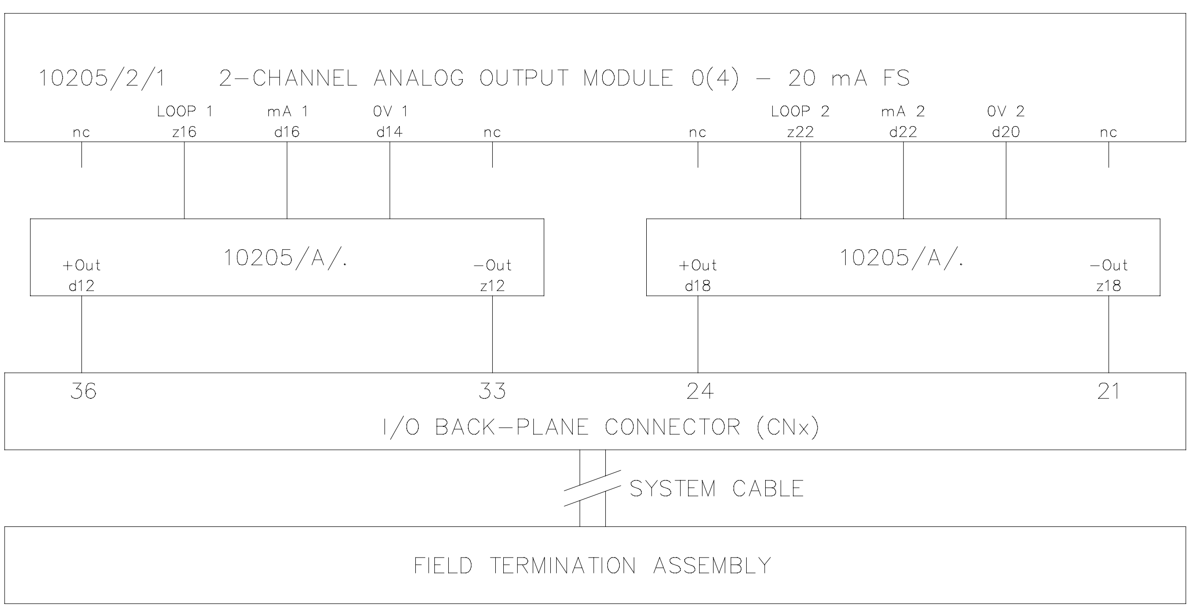


Figure 3 Connection example of 10205/2/1 module to FTA for non-redundant I/O configurations

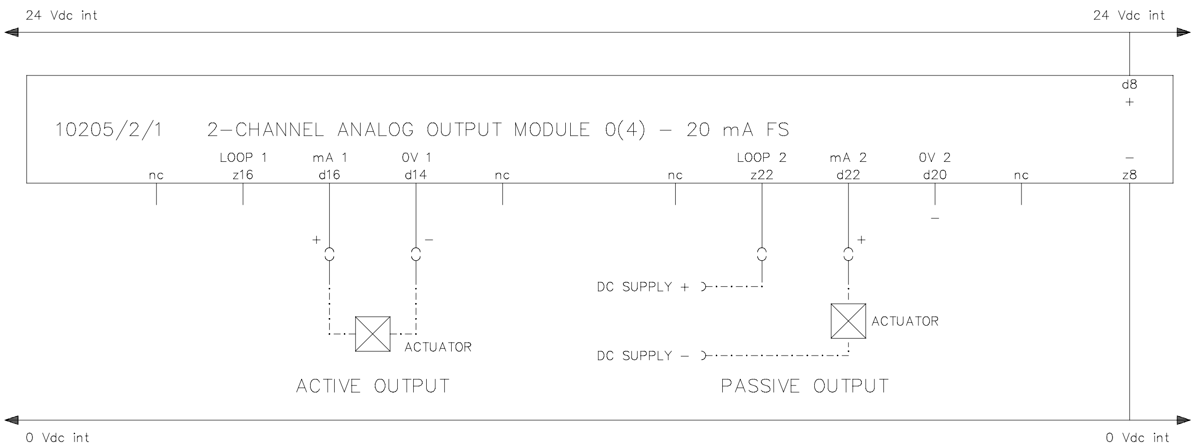
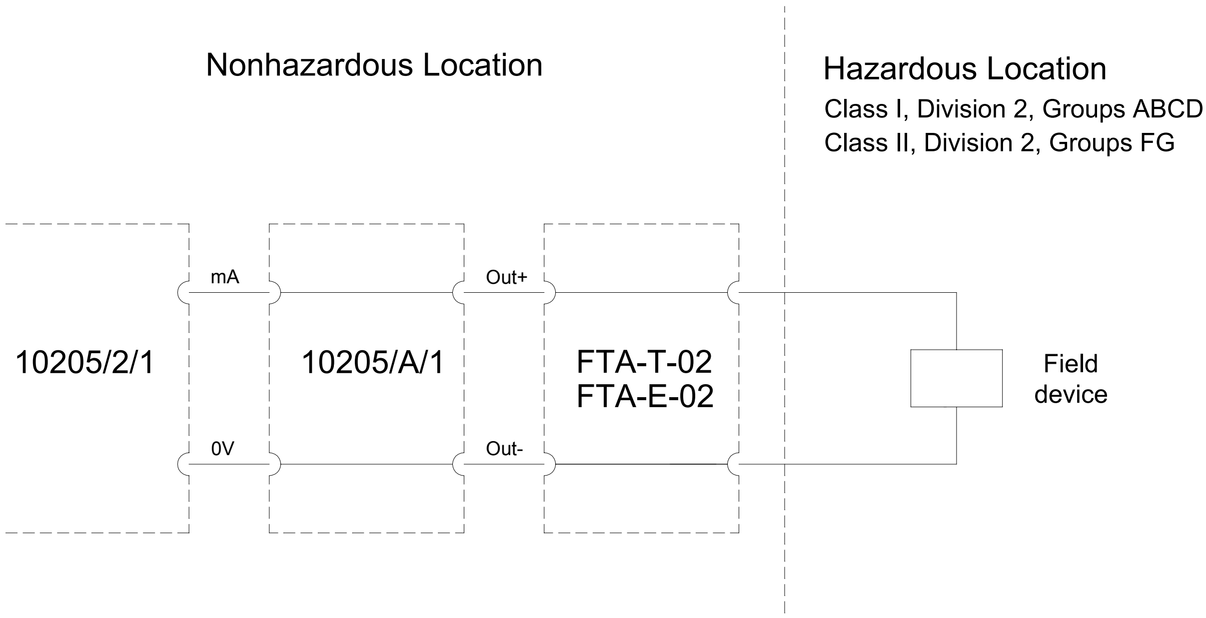


Figure 4 I/O connection example for 10205/2/1 module
for non-redundant I/O configurations
(one channel active, one channel passive)

Note:
The 24 Vdc power supply must be connected (pins z8, d8) and unused outputs must be shorted (10205/A/3 on channel 1, resp. 2, or interconnect pins d16-d14, resp. d22-d20) to prevent fault detection during the self-test of the module.

Hazardous locations (FM 3611)

To use the 10205/2/1 analog output module in non-hazardous areas for non-incendive field circuits to Division 2 locations in compliance with FM 3611 (Class I, Division 2, Groups ABCD; Class II, Division 2, Groups FG), the module must be connected to the passive field device via an FTA-T-02 / FTA-E-02 and a 10205/A/1 analog output mode module as indicated in Figure 5. The field devices, including field wiring, must adhere to the capacitance and inductance levels as given in Figure 5.



Non-Incendive Field Wiring Parameters:

Voc (V)	ISC (mA)	Gas Groups	Ca (µF)	La (mH)
36.0	33.0	A and B	0.16	60.59
		C	0.49	223.6
		D	1.32	498.5

Figure 5 Connection of output in hazardous locations

Considerations for FM approval

Please note the following constraints that are required for FM approval:

1. No revisions to drawings may be carried out without prior FMRC approval.
2. The Non-Incendive Field Wiring Parameter Concept allows interconnection of Non-Incendive Apparatus with Associated Non-Incendive Apparatus not specifically examined in combination as system when: Vmax ≥ Voc; Imax ≥ Isc; Ca ≥ Ci + Ccable; La ≥ Li + Lcable.

3. Modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01.
4. Control equipment connected to modules must not use or generate more than 250 Vrms or Vdc.
5. Installation should be in accordance with the National Electrical Code (ANSI/NFPA 70).
6. Non-Incendive Apparatus manufacturer's installation drawings must be followed when installing this equipment.
7. Non-Incendive Field Device must be FMRC Entity Approved or be simple apparatus (a device which will neither generate nor store more than 1.2 V, 0.1 A, 25 mW, or 20 µJ, ex. switches, thermocouples, LEDs and RTDs)

Calibration

The 10205/2/1 module has potentiometers for calibration purposes (P2 and P3). The module can be calibrated using the calibration option of the 'View FSC system and process status' program, an extender module, an extender flat cable and a multimeter.

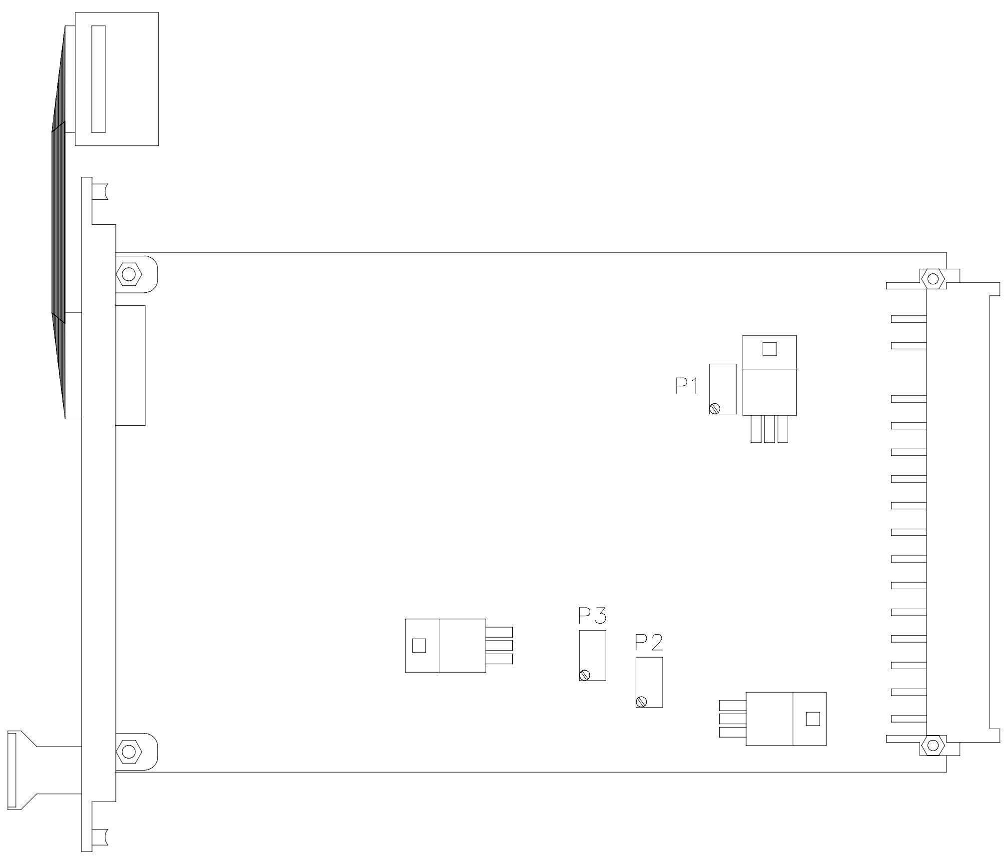


Figure 6 Location of potentiometers on 10205/2/1 module

Technical data

The 10205/2/1 module has the following specifications:

General

Type number:	10205/2/1 11600
Approvals:	CE, TÜV, UL, FM*
Software versions:	≥ 3.00
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 30 mA 24 Vdc 65 mA + 30 mA for each active output

Output

Number of output channels:	2 (galvanically isolated from supply voltage; 0V 1 and 0V 2 interconnected)
Output specification (mA):	active or passive, 0-20 / 4-20 mA
D/A converter:	12-bit
Off current:	< 0.05 mA
Loop powering (active):	maximum loop resistance: 1kOhm maximum output voltage: 30 Vdc
External powering (passive):	maximum: 40 Vdc minimum voltage drop: ≤ 7.5 V
WDG input current:	0.5 mA

Key coding

(See 'Key coding' data sheet)

Module code:	
– holes	A9, C5
Rack code:	
– large pins	A9, C5

*** Note:**
For FM approval please note the considerations on page 6-13.

Left blank intentionally.

10205/A/. Analog output mode modules

Description

If used with I/O back planes, the analog outputs of a 10205/2/1 module require 10205/A/. analog output mode modules.
The 10205/A/. modules are placed on a programming connector (Px) on the back of the I/O back plane in the 19-inch rack. To assist proper placement of these 10205/A/. modules, a 10205 positioning print can be placed on the programming connector.

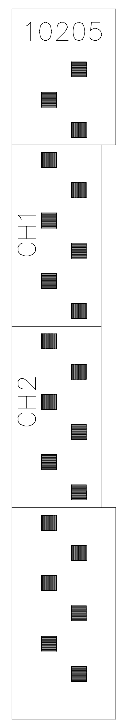


Figure 1 10205 positioning print

The printed circuit board of a 10205/A/. module should be oriented to slide into the cut-out zone of the appropriate channel.

10205/A/1 0(4)-20 mA internal power

Description

The 10205/A/1 analog output mode module links the 0(4)-20 mA as current source to accommodate channels with passive loads (e.g. passive actuators).
The 10205/2/1 module supplies the loop energy.

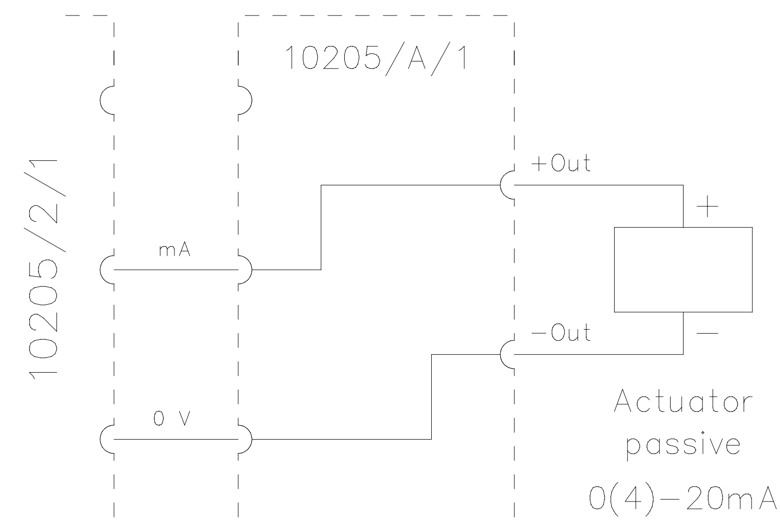


Figure 2 Schematic diagram of a 10205/A/1 module

Technical data

The 10205/A/1 module has the following specifications:

General

Type number:	10205/A/1
Approvals:	CE, TÜV, UL
Number of channels:	1
Dimensions:	23 x 15.3 x 9 mm (0.91 x 0.6 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O back plane)

Power

Power requirements:	none

10205/A/2 0(4)-20 mA external power

Description

The 10205/A/2 analog output mode module links the 0(4)-20 mA as current regulator to accommodate channels with active loads (e.g. active actuators).
The field device supplies the loop energy.

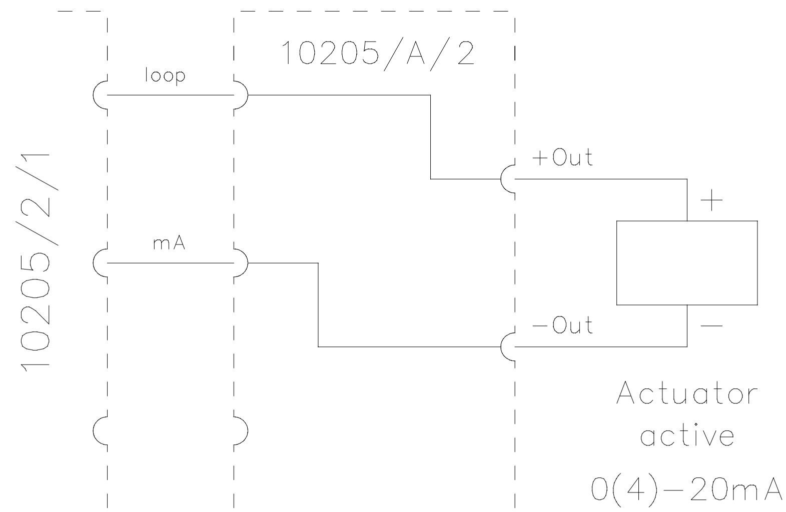


Figure 3 Schematic diagram of a 10205/A/2 module

Technical data

The 10205/A/2 module has the following specifications:

General

Type number:	10205/A/2
Approvals:	CE, TÜV, UL
Number of channels:	1
Dimensions:	23 x 15.3 x 9 mm (0.91 x 0.6 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O back plane)

Power

Power requirements:	none

10205/A/3 Dummy

Description

The 10205/A/3 analog output mode module shorts the 0(4)-20 mA output. No field connection is made.
This module is required for unused analog output channels to prevent fault detection during self-testing of the 10205/2/1 module.

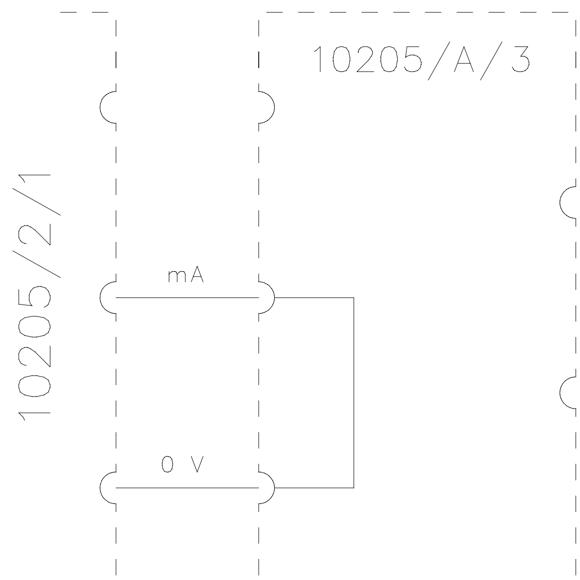


Figure 4 Schematic diagram of a 10205/A/3 module

Technical data

The 10205/A/3 has the following specifications:

General

Type number:	10205/A/3
Approvals:	CE, TÜV, UL
Number of input channels:	1
Dimensions:	23 x 15.3 x 9 mm (0.91 x 0.6 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	none

10206/2/1 Digital output module (24 Vdc, 0.55 A, 12 channels)

Description

The digital output module 10206/2/1 has twelve 24 Vdc, 550 mA output channels to drive loads up to 13 W.
These loads may be resistive (e.g. lamps) or inductive (e.g. solenoids). For inductive loads, a suppression diode is included on each output.
The outputs are not tested and may therefore ***not*** be used for fail-safe applications.

The 24 Vdc circuitry is split into two groups of six outputs each. This enables powering the two outputs groups from two independent power supply groups to support power supply segregation in a process unit and/or subunit structure or to limit circuit-breaker/fuse rating.
The outputs are also controlled by the watchdog. This means that the outputs are de-energized if the system shuts down and the watchdog switches off.

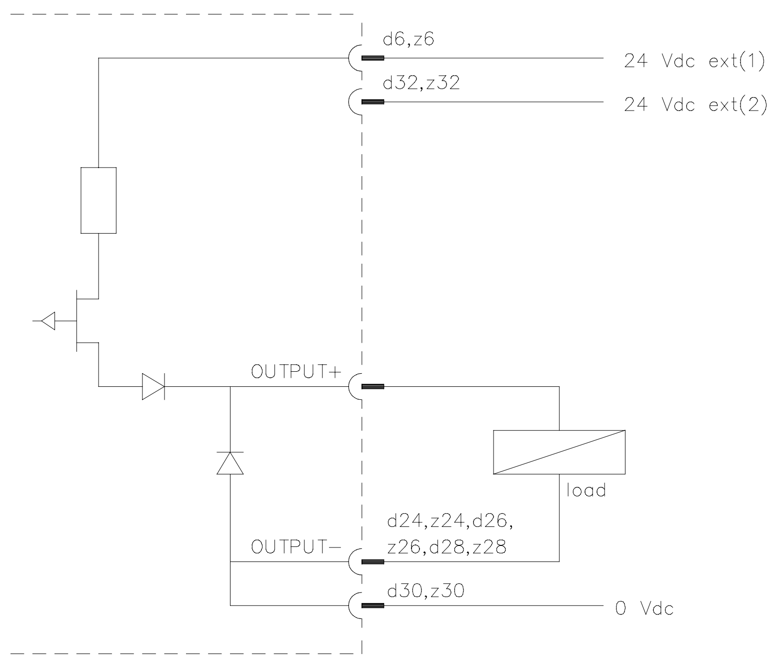
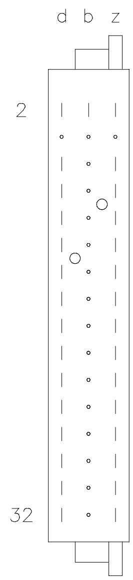


Figure 1 Schematic diagram for connection of one output to the 10206/2/1 module

Pin allocation

The back view and pin allocation of the 10206/2/1 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6	Supply 24 Vdc ext. 1			z6	Supply 24 Vdc ext. 1
d8				z8	
d10				z10	
d12	OUT 1			z12	OUT 2
d14	OUT 3			z14	OUT 4
d16	OUT 5			z16	OUT 6
d18	OUT 7			z18	OUT 8
d20	OUT 9			z20	OUT 10
d22	OUT 11			z22	OUT 12
d24	0 Vdc out			z24	0 Vdc out
d26	0 Vdc out			z26	0 Vdc out
d28	0 Vdc out			z28	0 Vdc out
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 24 Vdc ext. 2			z32	Supply 24 Vdc ext. 2

Connection examples

The figures below show a number of connection examples for the digital output module 10206/2/1.

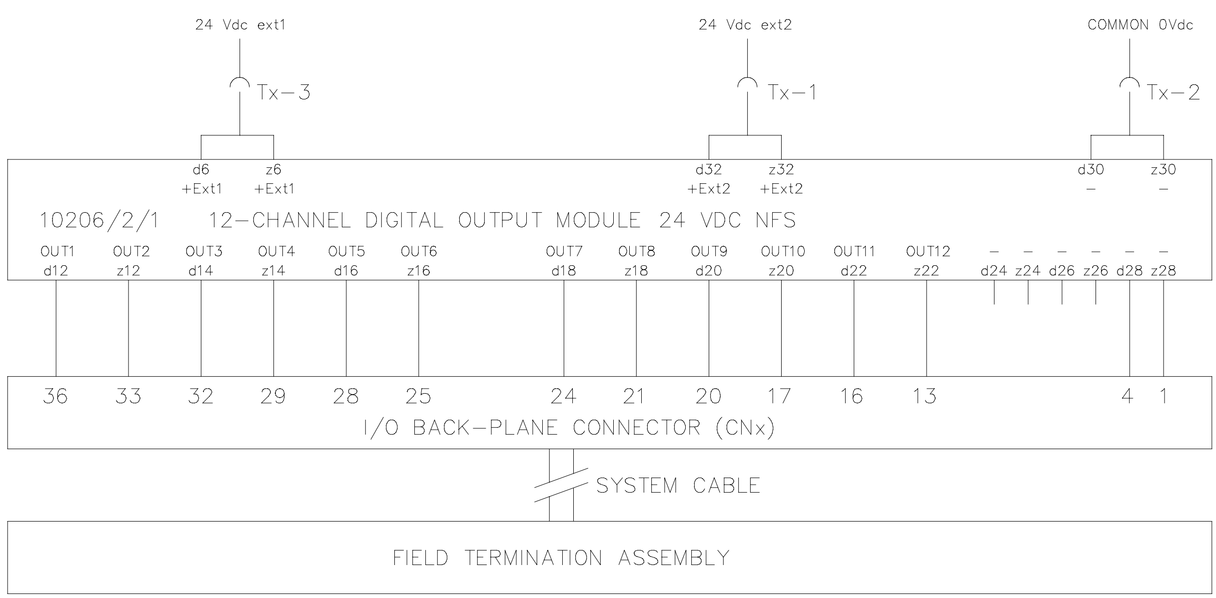


Figure 2 Connection example of 10206/2/1 module to FTA for both non-redundant and redundant I/O configurations

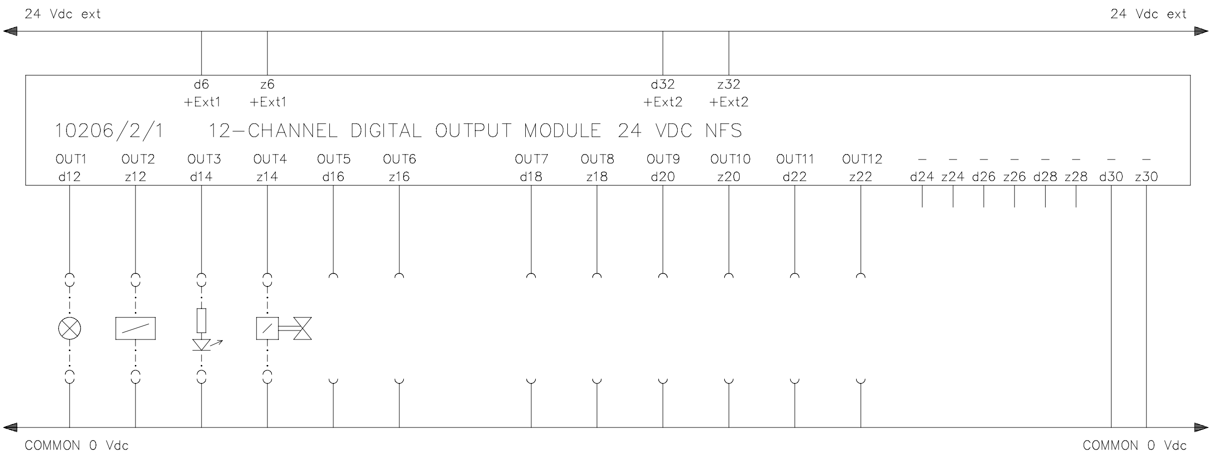


Figure 3 I/O connection example for 10206/2/1 module for non-redundant I/O configurations

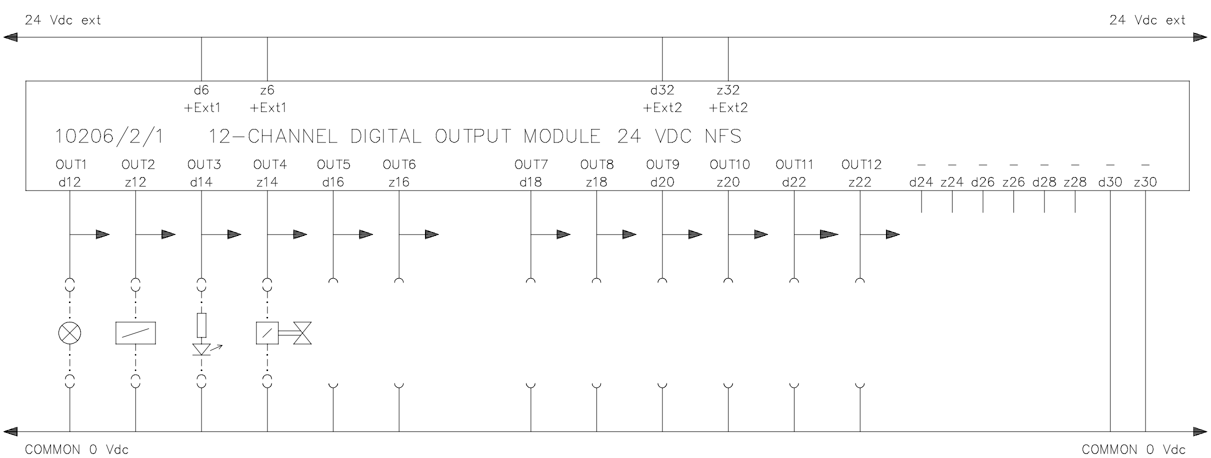


Figure 4 I/O connection example for 10206/2/1 module for redundant I/O configurations

Technical data

The 10206/2/1 module has the following specifications:

General	Type number:	10206/2/1 11702*
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 25 mA 24 Vdc 2∗30 mA (without output load)
Output	Number of output channels:	12 (2 groups of 6)
	Output specification:	24 Vdc solid-state source, short-circuit proof
	Maximum current:	550 mA* (see 'FSC output modules' data sheet)
	Maximum lamp load:	275 mA (6.6 W)*
	Maximum load capacitance:	1 µF
	Voltage drop:	< 1.5 Vdc at 500 mA*
	Off current:	< 0.1 mA
	WDG input current:	0.06 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A9, C13
	Rack code:	
	– large pins	A9, C13

***Notes:**
10206/2/1 modules with suffix code 11700 have a maximum current of at least 450 mA, a maximum lamp load of 225 mA (5.4 W) and a voltage drop of < 1.5 Vdc at 400 mA.

10206/2/1 modules with suffix code 11702 have improved temperature behavior.

10208/2/1 Relay output module (contacts, 10 channels)

Description

The relay output module 10208/2/1 has ten potential-free relay contact output channels to drive loads up to 70 W.
These loads may be resistive (e.g. lamps) or inductive (e.g. solenoids). For inductive loads, a suppression diode **must be mounted externally.** The outputs are not tested and may therefore ***not*** be used for fail-safe applications.
The maximum voltage on the relay contacts may be 36 Vdc to meet IEC 61010-1.

The outputs are also controlled by the watchdog. This means that the relays de-energize if the system shuts down and the watchdog switches off.

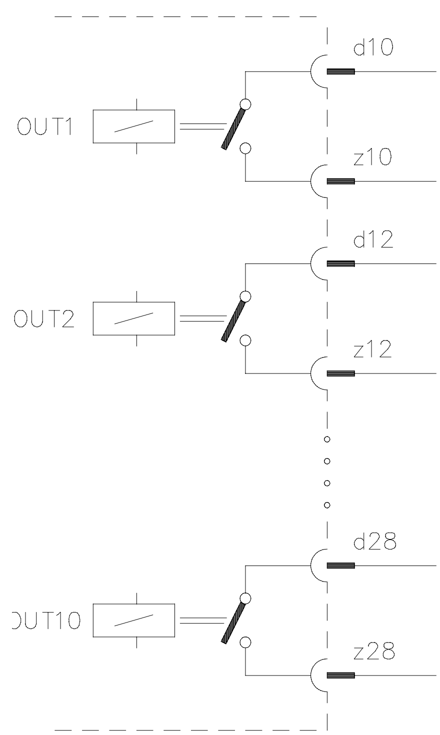
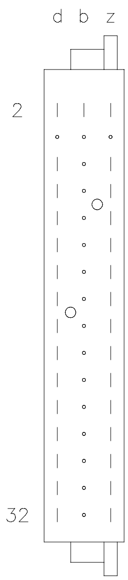


Figure 1 Schematic diagram for 10208/2/1 module

Pin allocation

The back view and pin allocation of the 10208/2/1 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6				z6	
d8	Supply 24 Vdc			z8	Supply 0 Vdc
d10	Common 1			z10	Normally open 1
d12	Common 2			z12	Normally open 2
d14	Common 3			z14	Normally open 3
d16	Common 4			z16	Normally open 4
d18	Common 5			z18	Normally open 5
d20	Common 6			z20	Normally open 6
d22	Common 7			z22	Normally open 7
d24	Common 8			z24	Normally open 8
d26	Common 9			z26	Normally open 9
d28	Common 10			z28	Normally open 10
d30				z30	
d32				z32	

Connection examples

The figures below show a number of connection examples for the relay output module 10208/2/1.

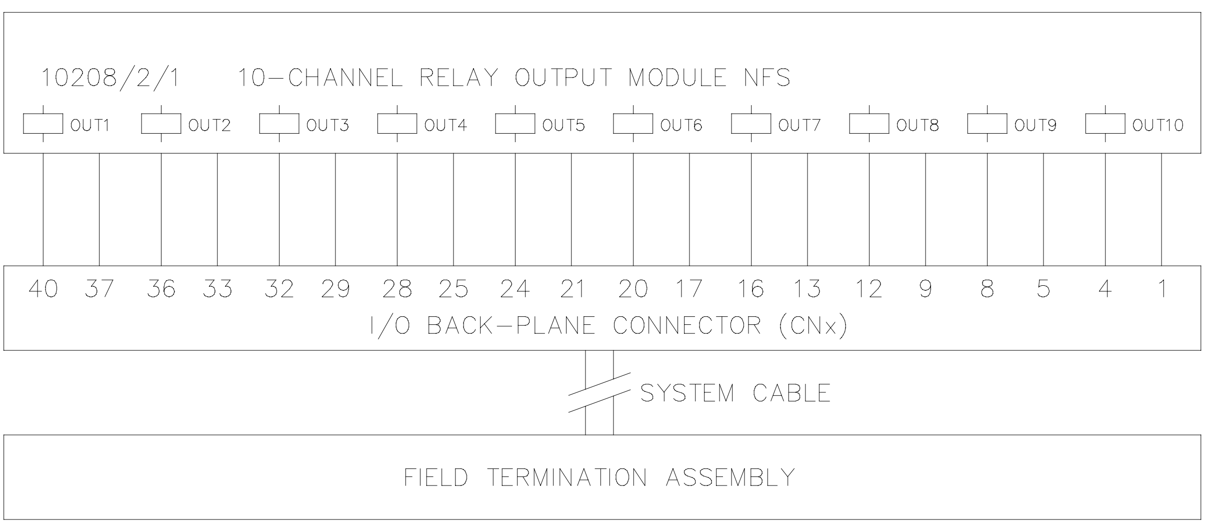


Figure 2 Connection example of 10208/2/1 module to FTA for both non-redundant and redundant I/O configurations

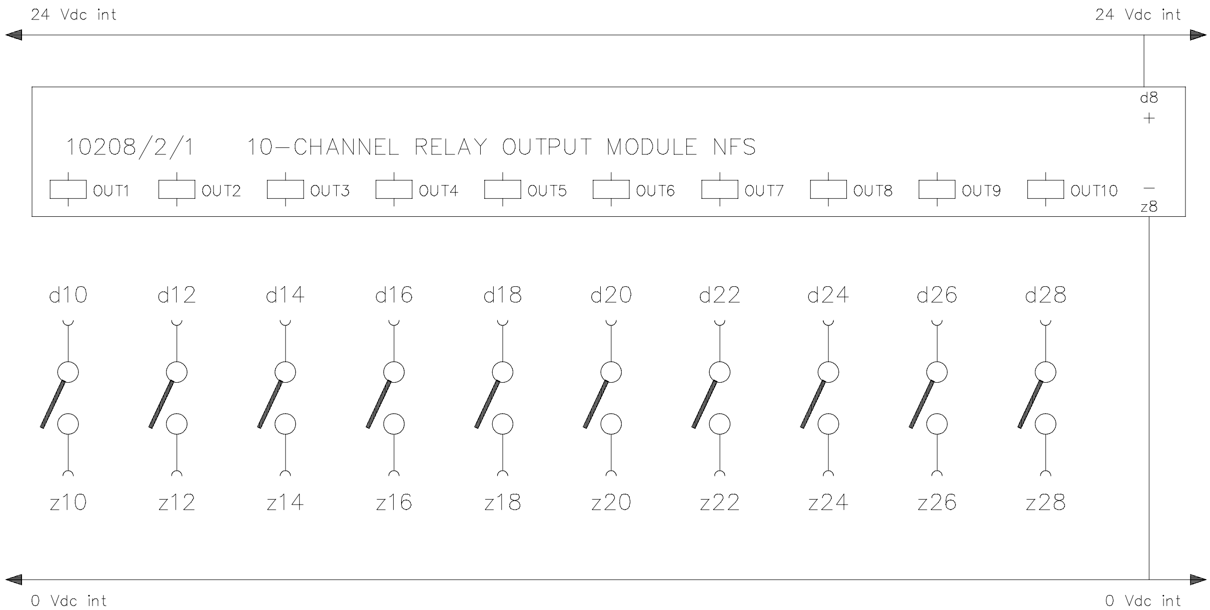


Figure 3 I/O connection example for 10208/2/1 module for non-redundant I/O configurations

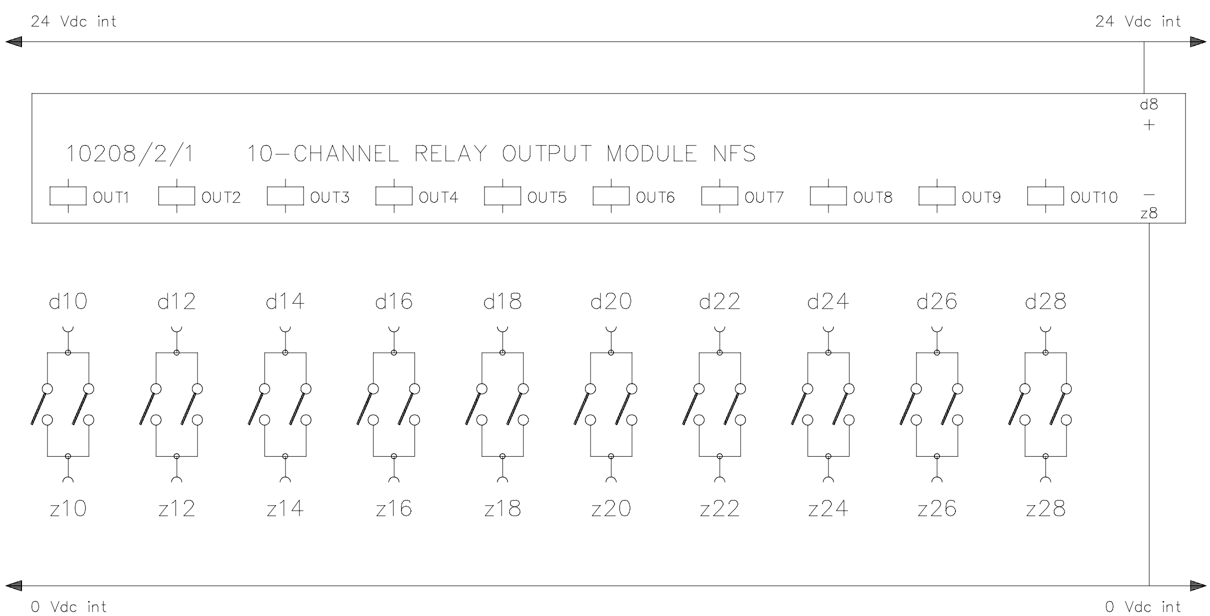


Figure 4 I/O connection example for 10208/2/1 module for redundant I/O configurations

Technical data

The 10208/2/1 module has the following specifications:

General	Type number:	10208/2/1 11800
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 25 mA 24 Vdc 120 mA
Output	Number of output channels:	10
	Output specification:	relay contact
	Maximum current:	2 A
	Maximum voltage:	30 Vac /36 Vdc – IEC 61010-1 (1990), over voltage category 3, Table D.12
	Maximum switched power:	100 W / 1000 VA
	Contact material:	gold flush silver-cadmium oxide
	WDG input current	4 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A9, C17
	Rack code:	
	– large pins	A9, C17

10209/2/1 Digital output module (24 Vdc, 0.1 A, 16 channels)

Description

The digital output module 10209/2/1 has sixteen 24 Vdc, 100 mA output channels to drive loads up to 2.5 W.
These loads may be resistive (e.g. LEDs) or inductive (e.g. relays).
For inductive loads, a suppression diode is included on each output.
The outputs are not tested and may therefore ***not*** be used for fail-safe applications.

The outputs are also controlled by the watchdog. This means that the outputs are de-energized if the system shuts down and the watchdog switches off.

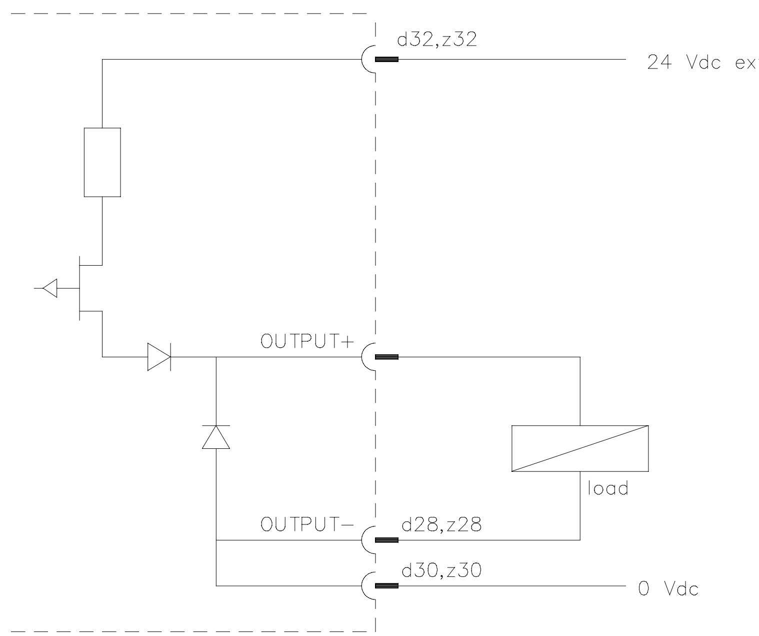
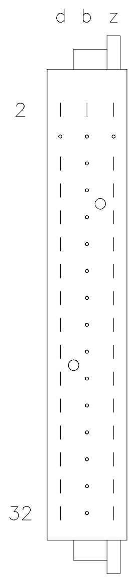


Figure 1 Schematic diagram for connection of one output to the 10209/2/1 module

Pin allocation

The back view and pin allocation of the 10209/2/1 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6				z6	
d8				z8	
d10				z10	
d12	OUT 1			z12	OUT 2
d14	OUT 3			z14	OUT 4
d16	OUT 5			z16	OUT 6
d18	OUT 7			z18	OUT 8
d20	OUT 9			z20	OUT 10
d22	OUT 11			z22	OUT 12
d24	OUT 13			z24	OUT 14
d26	OUT 15			z26	OUT 16
d28	0 Vdc out			z28	0 Vdc out
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 24 Vdc			z32	Supply 24 Vdc

Connections examples

The figures below show a number of connection examples for the digital output module 10209/2/1.

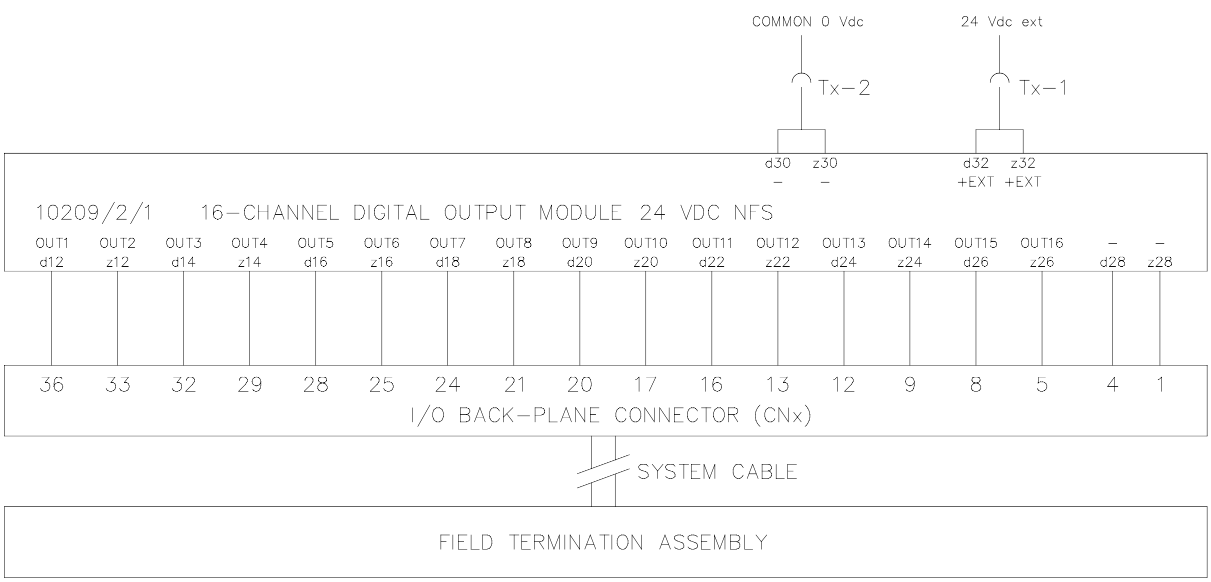


Figure 2 Connection example of 10209/2/1 module to FTA for both non-redundant and redundant I/O configurations

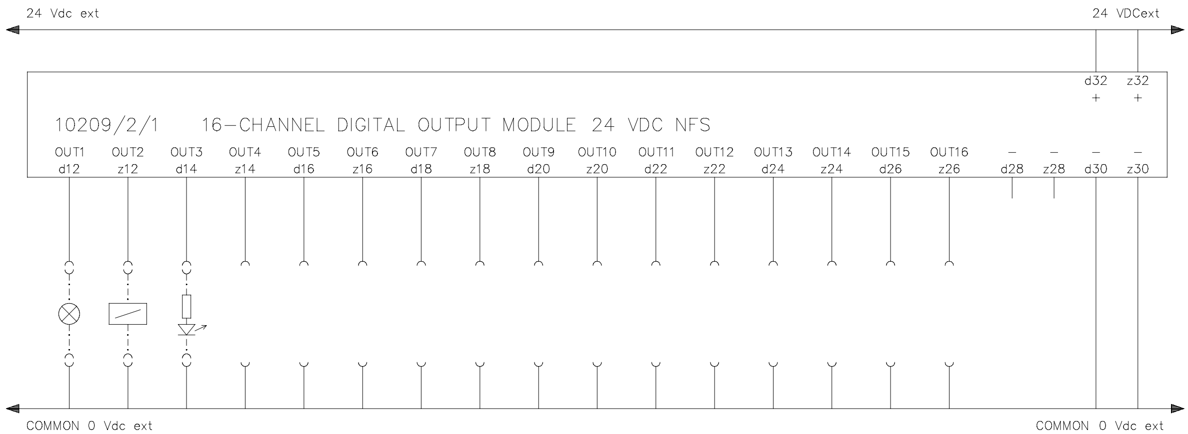


Figure 3 I/O connection example for 10209/2/1 module for non-redundant I/O configurations

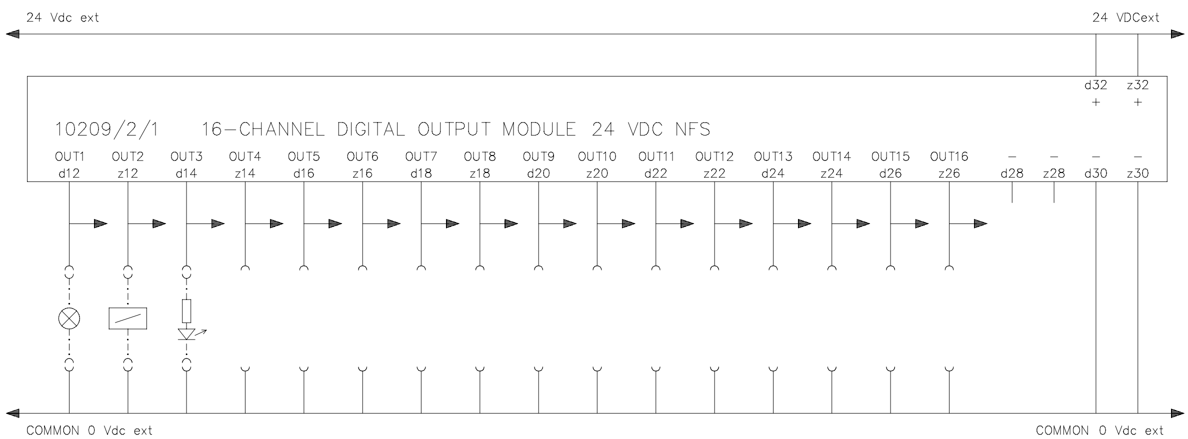


Figure 4 I/O connection example for 10209/2/1 module for redundant I/O configurations

Technical data

The 10209/2/1 module has the following specifications:

General	Type number:	10209/2/1 11900
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 35 mA 24 Vdc 85 mA (without output load)
Output	Number of output channels:	16
	Output specification:	24 Vdc solid-state source, short-circuit proof
	Maximum current:	100 mA (see 'FSC output modules' data sheet)
	Maximum lamp load:	50 mA (1.2 W)
	Maximum load capacitance:	1 µF
	Voltage drop:	< 1.2 Vdc at 100 mA
	Off current:	< 0.1 mA
	WDG input current:	4 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A9, C21
	Rack code:	
	– large pins	A9, C21

10213/2/1 Fail-safe digital output module (110 Vdc, 0.32 A, 4 channels)

Description

The fail-safe digital output module 10213/2/1 has four 110 Vdc, 325 mA output channels to drive loads up to 35 W.
These loads may be resistive or inductive (e.g. solenoids).
For inductive loads, a suppression diode is included on each output.
The outputs, including the suppression diodes, are fully tested and may be therefore used for fail-safe applications.
Within the configured process safety time, the outputs are tested for:

- ability to de-energize,
- ability to de-energize via secondary means,
- crosstalk between outputs, and
- functioning of the suppression diodes.

The outputs have a secondary means of de-energization, which enables the watchdog and/or the processor to de-energize the outputs irrespective of the result of the application function.

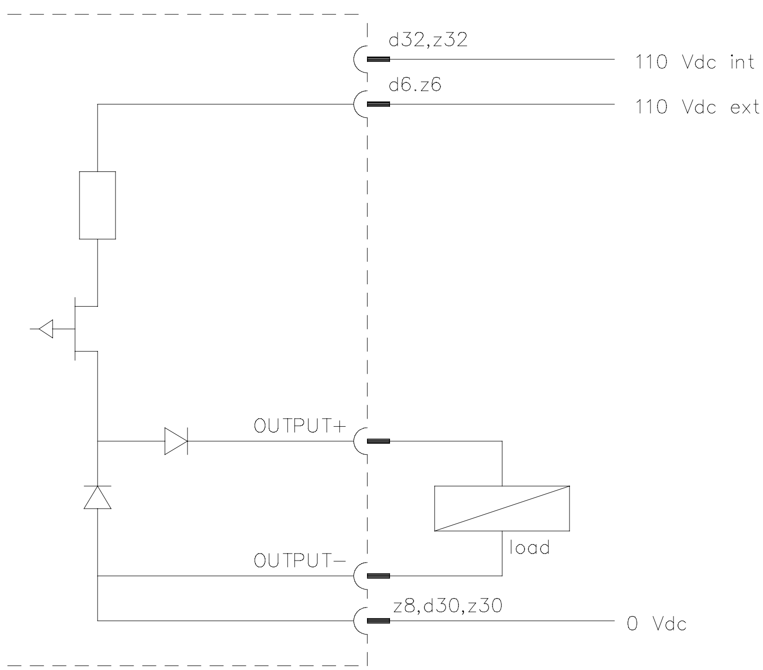
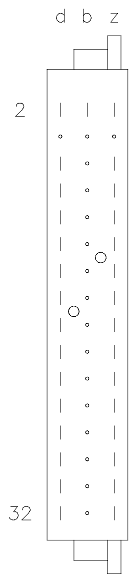


Figure 1 Schematic diagram for connection of one output to the 10213/2/1 module

Pin allocation

The back view and pin allocation of the 10213/2/1 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6	Supply 110 Vdc ext.			z6	Supply 110 Vdc ext.
d8				z8	Supply 0 Vdc
d10				z10	
d12	(0 Vdc)			z12	(0 Vdc)
d14	OUT 1+			z14	OUT 1–
d16	(0 Vdc)			z16	(0 Vdc)
d18	OUT 2+			z18	OUT 2–
d20	(0 Vdc)			z20	(0 Vdc)
d22	OUT 3+			z22	OUT 3–
d24	(0 Vdc)			z24	(0 Vdc)
d26	OUT 4+			z26	OUT 4–
d28	(0 Vdc)			z28	(0 Vdc)
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 110 Vdc int.			z32	Supply 110 Vdc int.

Connection examples

The figures below show a number of connection examples for the fail-safe digital output module 10213/2/1.

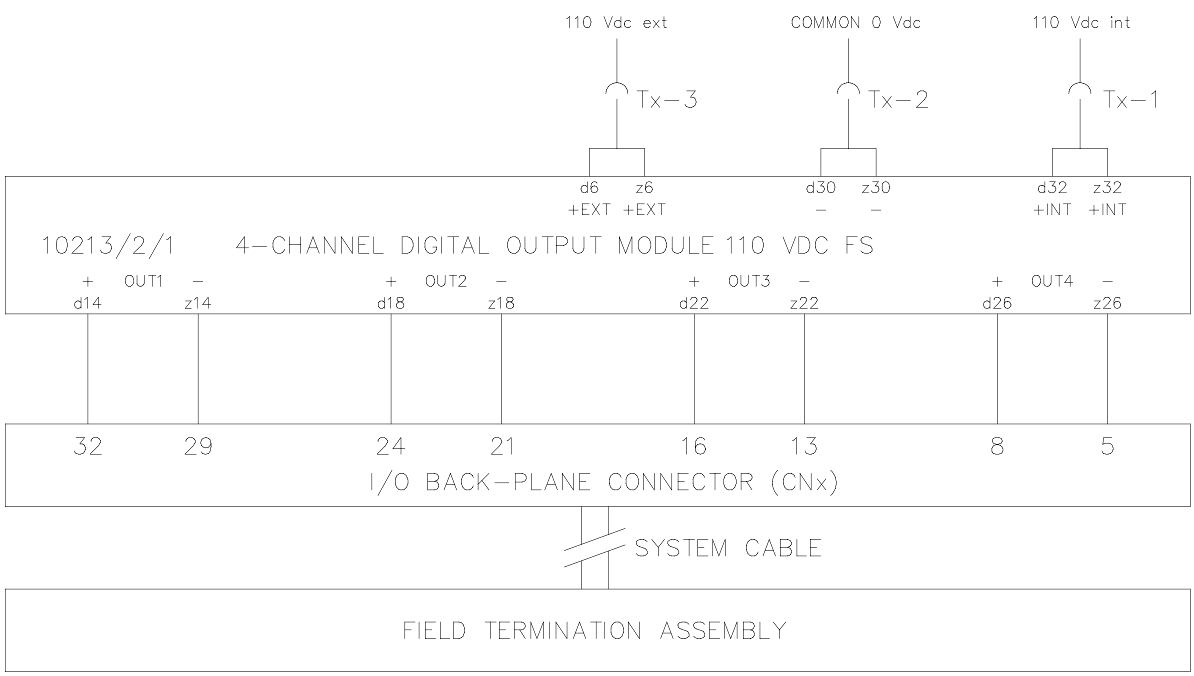


Figure 2 Connection example of 10213/2/1 module to FTA for both non-redundant and redundant I/O configurations

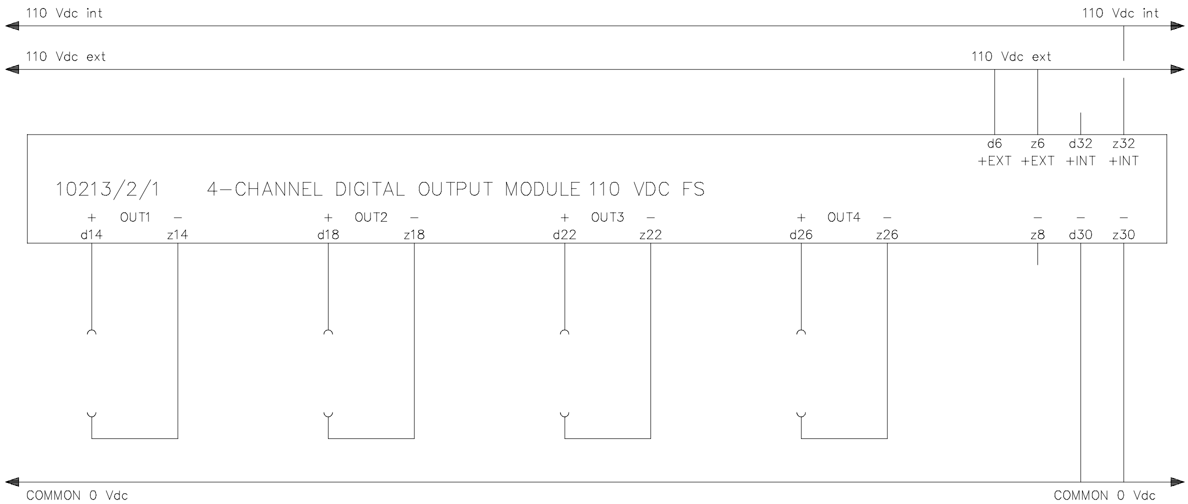


Figure 3 I/O connection example for 10213/2/1 module for non-redundant I/O configurations

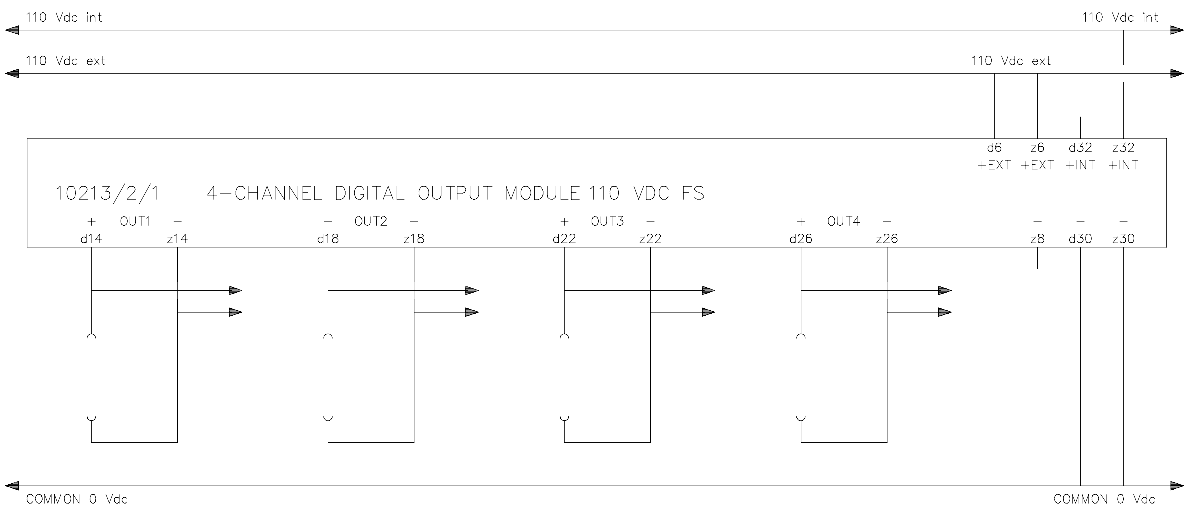


Figure 4 I/O connection example for 10213/2/1 module for redundant I/O configurations

Note:
The 110 Vdc internal and external power supplies must be connected to prevent fault detection during self-test of the output module (pins d6/z6, d30/z30 and z32).

Technical data

The 10213/2/1 module has the following specifications:

General	Type number:	10213/2/1 12002*
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 310
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Supply voltage:	110 Vdc, –15%...+25%
	Power requirements:	5 Vdc 25 mA 110 Vdc internal 10 mA 110 Vdc external 20 mA (without output load)
Fuses	Fuse values:	1x 1.6 A 3x 40 mA
	Fuse type:	Round, TR5-F/19370K
	Fuse dimensions:	∅ 8.2 mm (0.32 in), height 7.7 mm (0.3 in)
Output	Number of output channels:	4
	Output specification:	110 Vdc solid-state source, short-circuit proof
	Maximum current:	325 mA (see 'FSC output modules' data sheet)
	Maximum lamp load:	55 mA (6 W)
	Maximum load capacitance:	1 µF
	Voltage drop:	< 2.5 Vdc at 300 mA
	Off current:	< 0.1 mA
	WDG input current:	5 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A13, C17
	Rack code:	
	– large pins	A13, C17

*** Note:**
10213/2/1 modules with suffix code 12001 or 12002 have improved voltage readback near the minimum supply voltage (110 Vdc –15%).

Left blank intentionally.

10213/2/2 Fail-safe digital output module (60 Vdc, 0.67 A, 4 channels)

Description

The fail-safe digital output module 10213/2/2 has four 60 Vdc, 675 mA output channels to drive loads up to 40 W.
These loads may be resistive or inductive (e.g. solenoids).
For inductive loads, a suppression diode is included on each output.
The outputs, including the suppression diodes, are fully tested and may therefore be used for fail-safe applications.
Within the configured process safety time, the outputs are tested for:

- ability to de-energize,
- ability to de-energize via secondary means,
- crosstalk between outputs, and
- functioning of the suppression diodes.

The outputs have a secondary means of de-energization, which enables the watchdog and/or the processor to de-energize the outputs irrespective of the result of the application function.

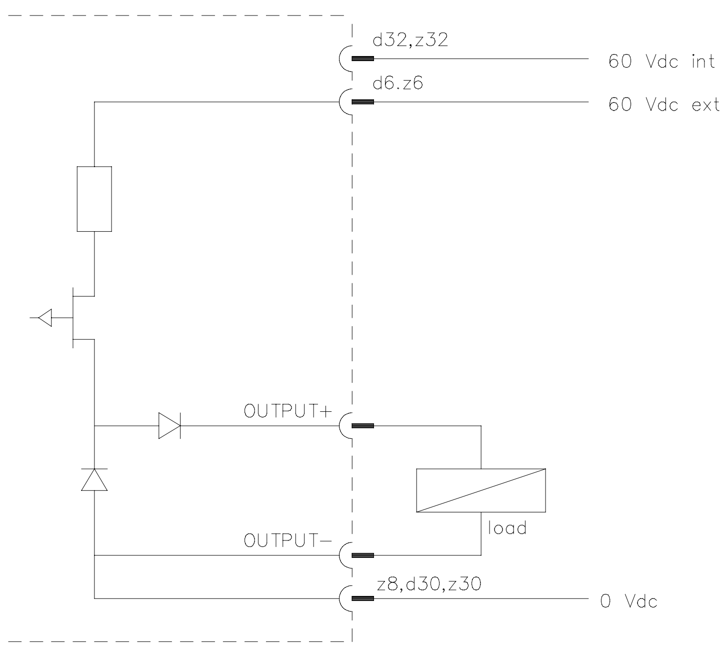
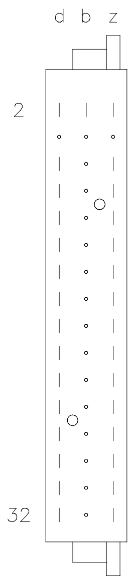


Figure 1 Schematic diagram for connection of one output to the 10213/2/2 module

Pin allocation

The back view and pin allocation of the 10213/2/2 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6	Supply 60 Vdc ext.			z6	Supply 60 Vdc ext.
d8				z8	Supply 0 Vdc
d10				z10	
d12	(0 Vdc)			z12	(0 Vdc)
d14	OUT 1+			z14	OUT 1–
d16	(0 Vdc)			z16	(0 Vdc)
d18	OUT 2+			z18	OUT 2–
d20	(0 Vdc)			z20	(0 Vdc)
d22	OUT 3+			z22	OUT 3–
d24	(0 Vdc)			z24	(0 Vdc)
d26	OUT 4+			z26	OUT 4–
d28	(0 Vdc)			z28	(0 Vdc)
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 60 Vdc int.			z32	Supply 60 Vdc int.

Connection examples

The figures below show a number of connection examples for the fail-safe digital output module 10213/2/2.

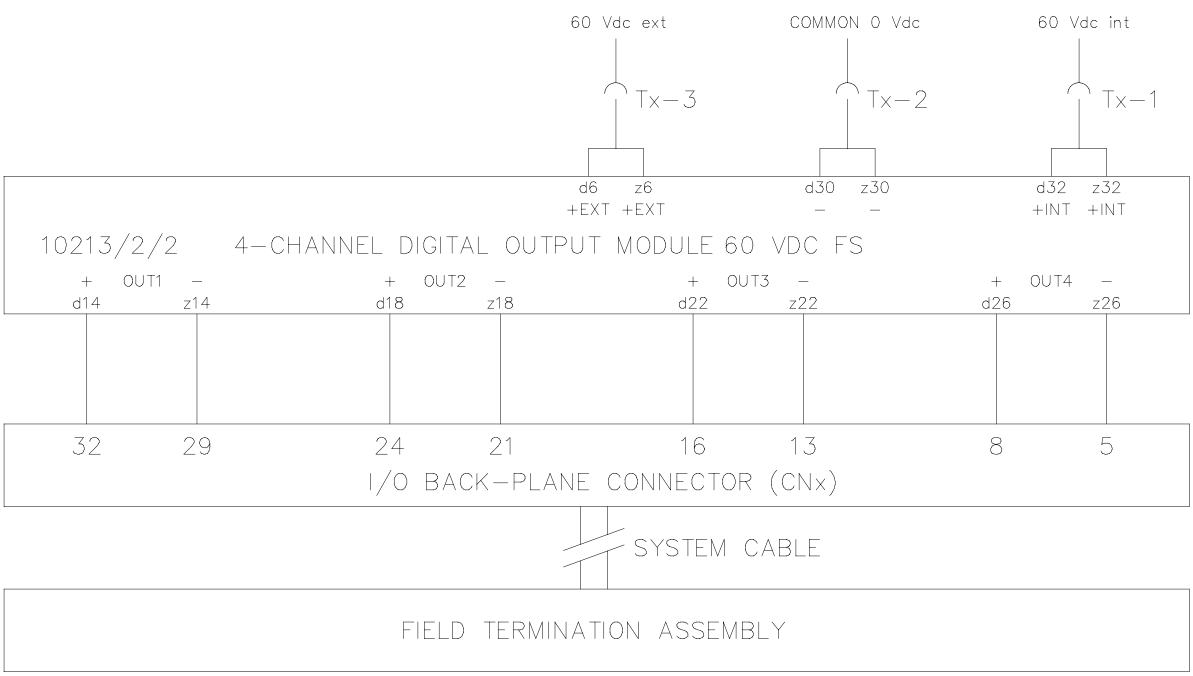


Figure 2 Connection example of 10213/2/2 module to FTA for both non-redundant and redundant I/O configurations

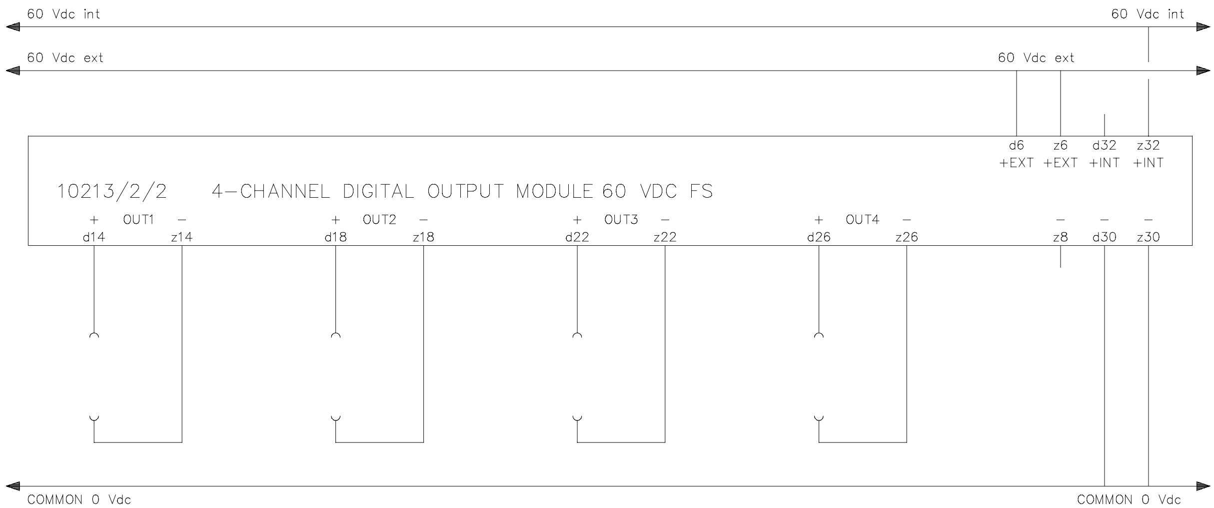


Figure 3 I/O connection example for 10213/2/2 module for non-redundant I/O configurations

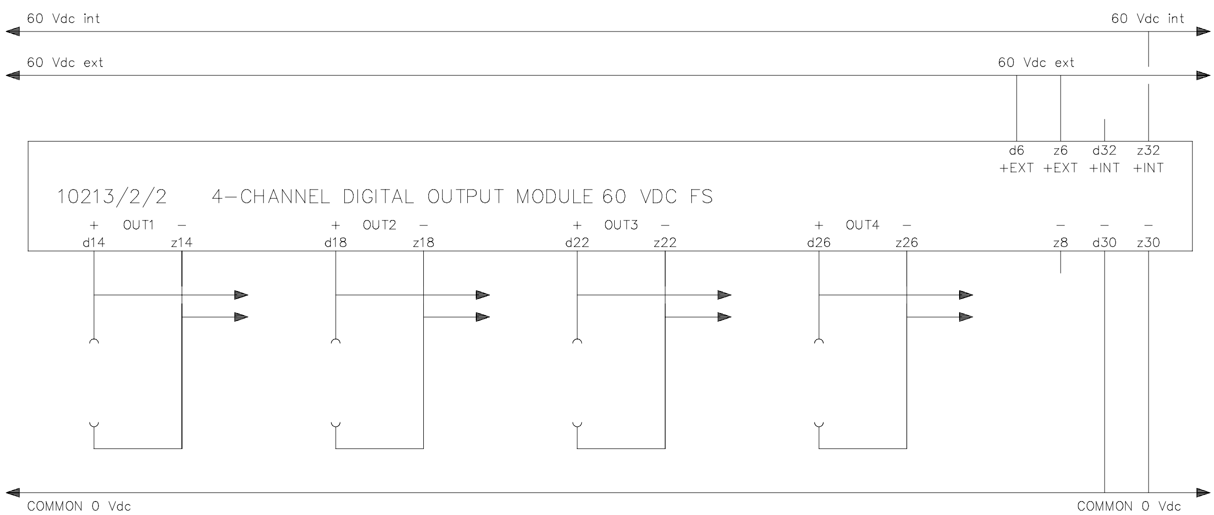


Figure 4 I/O connection example for 10213/2/2 module for redundant I/O configurations

Note:
The 60 Vdc internal and external power supplies must be connected to prevent fault detection during self-test of the output module (pins d6/z6, d30/z30 and z32).

Technical data

The 10213/2/2 module has the following specifications:

General	Type number:	10213/2/2 12101*
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Supply voltage:	60 Vdc ± 15 %
	Power requirements:	5 Vdc 25 mA 60 Vdc internal 20 mA 60 Vdc external 20 mA (without output load)
Fuses	Fuse values:	1x 3.15 A 3x 40 mA
	Fuse type:	Round, TR5-F/19370K
	Fuse dimensions:	∅ 8.2 mm (0.32 in), height 7.7 mm (0.3 in)
Output	Number of output channels:	4
	Output specification:	60 Vdc solid-state source short-circuit proof
	Maximum current:	675 mA (see 'FSC output modules' data sheet)
	Maximum lamp load:	100 mA (6 W)
	Maximum load capacitance:	1 µF
	Voltage drop:	< 2.1 Vdc at 675 mA
	Off current:	< 0.1 mA
	WDG input current:	5 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A9, C25
	Rack code:	
	– large pins	A9, C25

*** Note:**
10213/2/2 modules with suffix code 12101 have improved voltage readback near the minimum supply voltage (60 Vdc –15%).

Left blank intentionally.

10213/2/3 Fail-safe digital output module (48 Vdc, 0.75 A, 4 channels)

Description

The fail-safe digital output module 10213/2/3 has four 48 Vdc, 750 mA output channels to drive loads up to 36 W.
These loads may be resistive or inductive (e.g. solenoids).
For inductive loads, a suppression diode is included on each output.
The outputs, including the suppression diodes, are fully tested and may therefore be used for fail-safe applications.
Within the configured process safety time, the outputs are tested for:

- ability to de-energize,
- ability to de-energize via secondary means,
- crosstalk between outputs, and
- functioning of the suppression diodes.

The outputs have a secondary means of de-energization, which enables the watchdog and/or the processor to de-energize the outputs irrespective of the result of the application function.

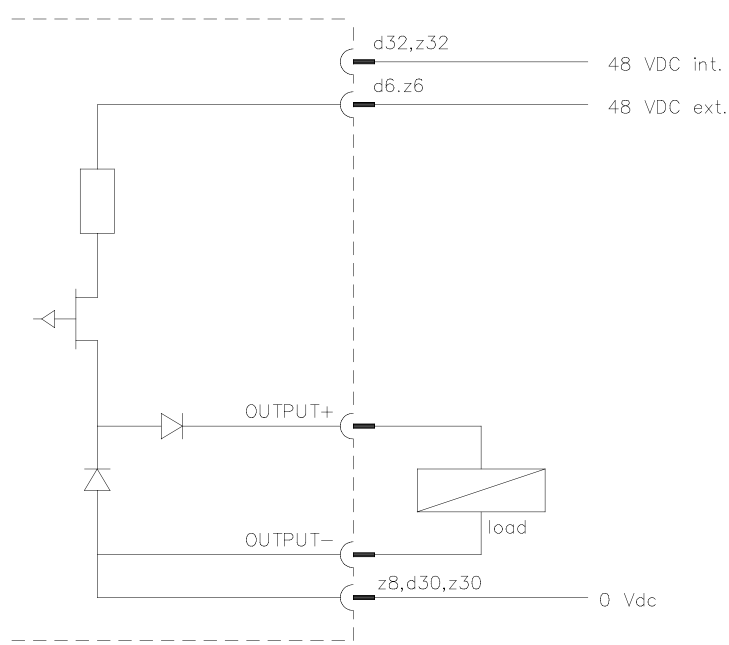
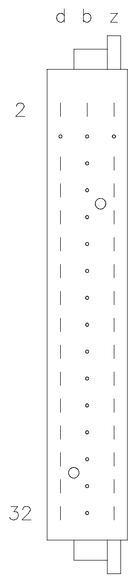


Figure 1 Schematic diagram for connection of one output to the 10213/2/3 module

Pin allocation

The back view and pin allocation of the 10213/2/3 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6	Supply 48 Vdc ext.			z6	Supply 48 Vdc ext.
d8				z8	Supply 0 Vdc
d10				z10	
d12	(0 Vdc)			z12	(0 Vdc)
d14	OUT 1+			z14	OUT 1–
d16	(0 Vdc)			z16	(0 Vdc)
d18	OUT 2+			z18	OUT 2–
d20	(0 Vdc)			z20	(0 Vdc)
d22	OUT 3+			z22	OUT 3–
d24	(0 Vdc)			z24	(0 Vdc)
d26	OUT 4+			z26	OUT 4–
d28	(0 Vdc)			z28	(0 Vdc)
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 48 Vdc int.			z32	Supply 48 Vdc int.

Connection examples

The figures below show a number of connection examples for the fail-safe digital output module 10213/2/3.

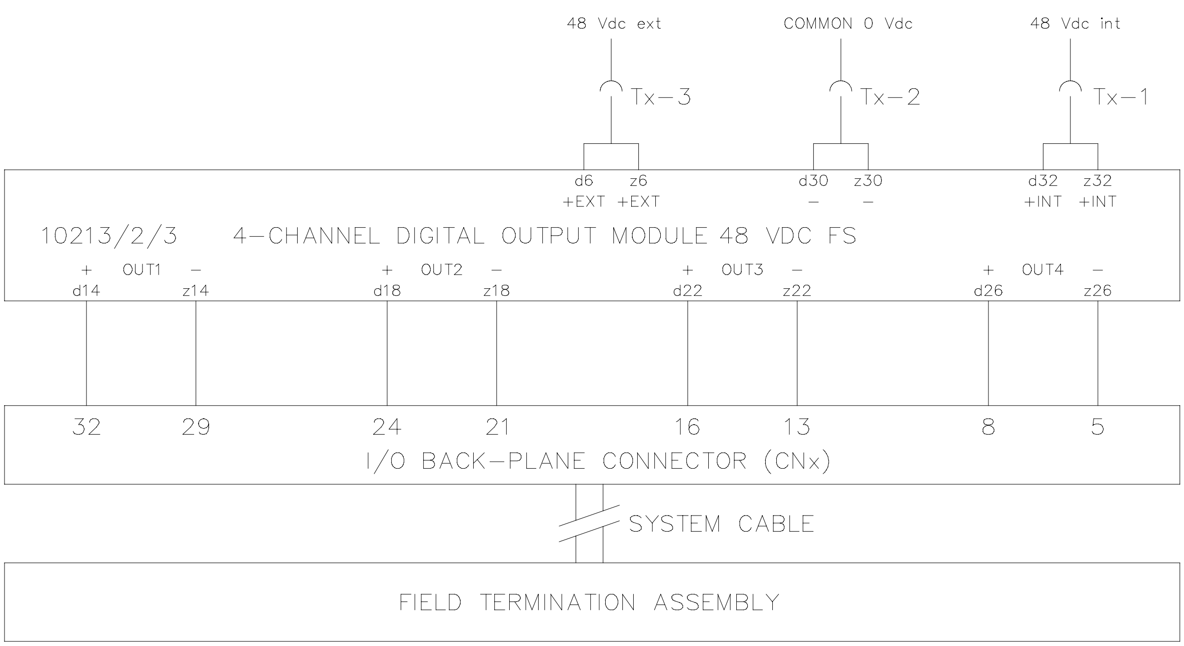


Figure 2 Connection example of 10213/2/3 module to FTA for both non-redundant and redundant I/O configurations

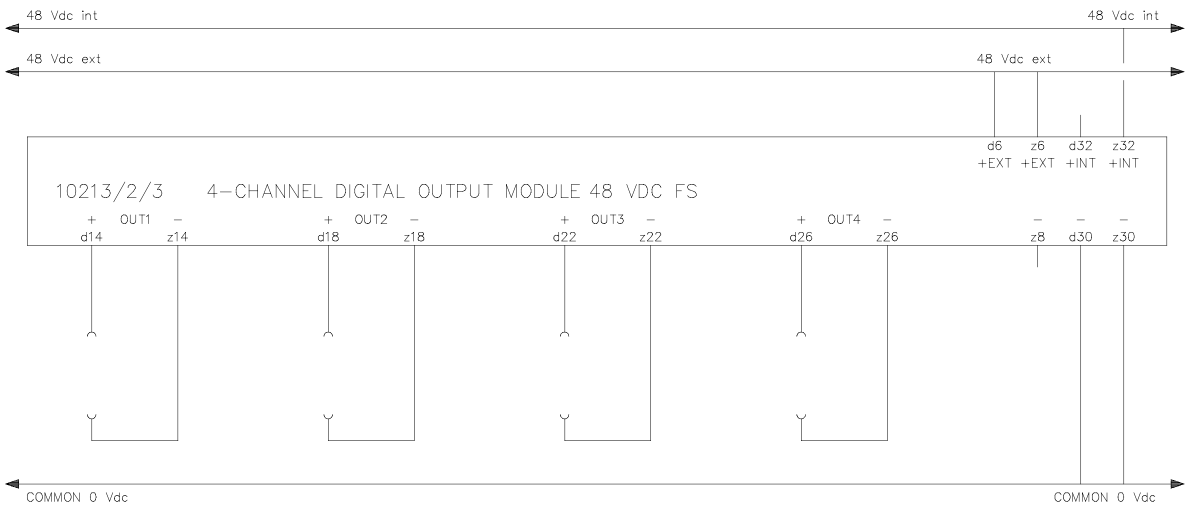


Figure 3 I/O connection example for 10213/2/3 module for non-redundant I/O configurations

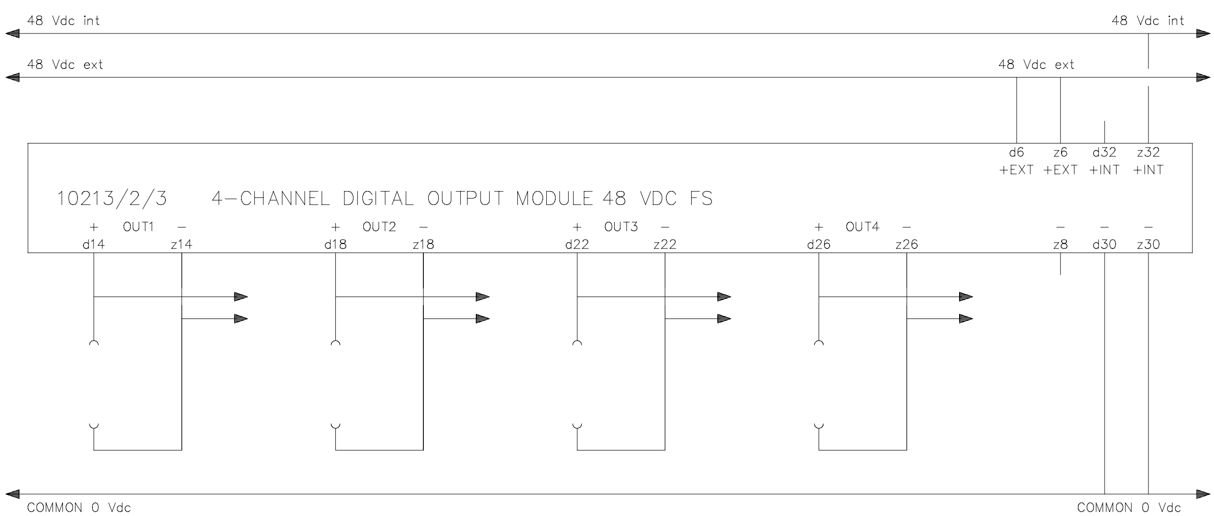


Figure 4 I/O connection example for 10213/2/3 module for redundant I/O configurations

Note:
The 48 Vdc internal and external power supplies must be connected to prevent fault detection during self-test of the output module (pins d6/z6, d30/z30 and z32).

Technical data

The 10213/2/3 module has the following specifications:

General	Type number:	10213/2/3 12201*
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Supply voltage:	48 Vdc ± 15 %
	Power requirements:	5 Vdc 25 mA 48 Vdc internal 20 mA 48 Vdc external 20 mA (without output load)
Output	Number of output channels:	4
	Output specification:	48 Vdc solid-state source, short-circuit proof
	Maximum current:	750 mA (see 'FSC output modules' data sheet)
	Maximum lamp load:	125 mA (6 W)
	Maximum load capacitance:	1 µF
	Voltage drop:	< 2.1 Vdc at 750 mA
	Off current:	< 0.1 mA
	WDG input current:	5 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A9, C29
	Rack code:	
	– large pins	A9, C29

*** Note:**
10213/2/3 modules with suffix code 12201 have improved voltage readback near the minimum supply voltage (48 Vdc –15%).

10214/1/2 Fail-safe loop-monitored digital output module (220 Vdc, 0.25 A, 3 channels)

Description

The fail-safe digital output module 10214/1/2 has three 220 Vdc, 250 mA output channels to drive loads up to 55 W.
These loads may be resistive or inductive. For inductive loads, a suppression diode is included on each output.
All outputs are monitored for lead breakage and short circuit. To get a rough lead breakage current setting, the current sense level must be programmed (see Table 1 on next page). In redundant configurations, the programming link must be placed on both modules.
The outputs, including the suppression diodes and the lead breakage detection, are fully tested and may therefore be used for fail-safe applications.
Within the configured process safety time, the outputs are tested for:

- ability to de-energize,
- ability to de-energize via secondary means,
- cross talk between outputs,
- functioning of the suppression diodes,
- lead breakage in the (external) output wiring, and
- short circuit of the output.

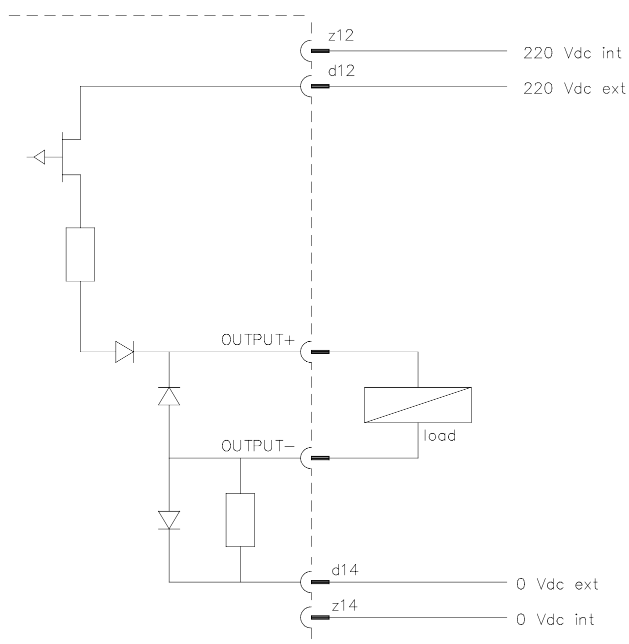


Figure 1 Schematic diagram for connection of one output to the 10214/1/2 module

The internal 220 Vdc supply is galvanically isolated from the external 220 Vdc circuit.
The outputs have a secondary means of de-energization, which enables the watchdog and/or the processor to de-energize the outputs irrespective of the result of the application function.

Table 1 Link Table

LOAD				LINK		
Non-redundant I/O configurations		Redundant I/O configurations		Ch 1	Ch 2	Ch 3
0.5 - 1.4 W	2 - 6 mA	1 - 2.9 W	4 - 13 mA	–	–	–
1.5 - 3.1 W	7 - 14 mA	3 - 6.3 W	14 - 29 mA	d20-d16	d26-d22	d32-d28
3.2 - 8.9 W	15 - 40 mA	6.4 - 17.9 W	30 - 81 mA	d20-z16	d26-z22	d32-z28
9 - 18.9 W	41 - 85 mA	18 - 37.9 W	82 - 171 mA	d20-d18	d26-d24	d32-d30
≥ 19 W	≥ 86 mA	≥ 38 W	≥ 172 mA	d20-z18	d26-z24	d32-z32

To prevent lead breakage detection on spare or unused channels, a dummy load should be placed over these outputs:

- single channels: 100 kOhm (± 10%, 0.5 W),
- redundant channels: 50 kOhm (± 10%, 1 W).

No links with Px.1 to Px.4 may be placed on those channels.

If crimp-on snap-in (COSI) wiring is used, spare channels should be provided with a link from OUT– to a dummy position on the 'b' row (b20, b26 or b32, respectively). This makes it easier to add the spare channel to the system. Just remove the dummy load, connect the output load and replace the link from the dummy position to the required position (see Table 1). This operation sequence may also be used when the system is first installed to enable step-by-step addition of output loads.

Note:
It is recommended that shielded wire pairs are used in order to reduce the interference caused by the self-test of the 10214/1/2 module.

LEDs

The modules have four LEDs, one for each channel.

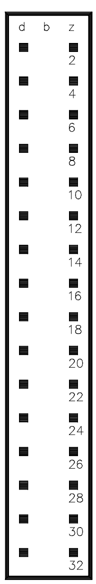
If a channel is **off**, its corresponding LED will be off, with periodic, brief flashes. These are the lead breakage tests.

If a channel is **on** and the configuration is **non-redundant (single)**, its corresponding LED will be on, with periodic, very brief flashes (hardly visible to the naked eye). These are the internal switch-off self-tests.

If a channel is **on** and the configuration is **redundant**, the corresponding LEDs will seem to flash intermittently. What happens is that the module in CP1 will switch off briefly to give the module in CP2 the opportunity to perform its self-test. After the self-test of the module in CP1 has been completed, the module in CP2 will switch on again (there may be some time delay), and the module in CP1 will switch off to give the module in CP2 the opportunity to perform its self-test, etc. This makes it look as if the channel LEDs of both modules flash intermittently. How "fast" the LEDs flash depends on the application cycle time and the configured process safety time.

Pin allocation

The back view and pin allocation of the 10214/1/2 rack connector are as follows:



d2	WDG (5 Vdc)	z2	GND 5 Vdc
d4		z4	Supply 5 Vdc
d6		z6	
d8	Link	z8	Link
d10		z10	
d12	Supply 220 Vdc ext.	z12	Supply 220 Vdc int.
d14	Supply 0 Vdc ext.	z14	Supply 0 Vdc int.
d16	P1.1	z16	P1.2
d18	P1.3	z18	P1.4
d20	OUT 1–	z20	OUT 1+
d22	P2.1	z22	P2.2
d24	P2.3	z24	P2.4
d26	OUT 2–	z26	OUT 2+
d28	P3.1	z28	P3.2
d30	P3.3	z30	P3.4
d32	OUT 3–	z32	OUT 3+

Connection examples

The figures below show a number of connection examples for the fail-safe digital output module 10214/1/2.

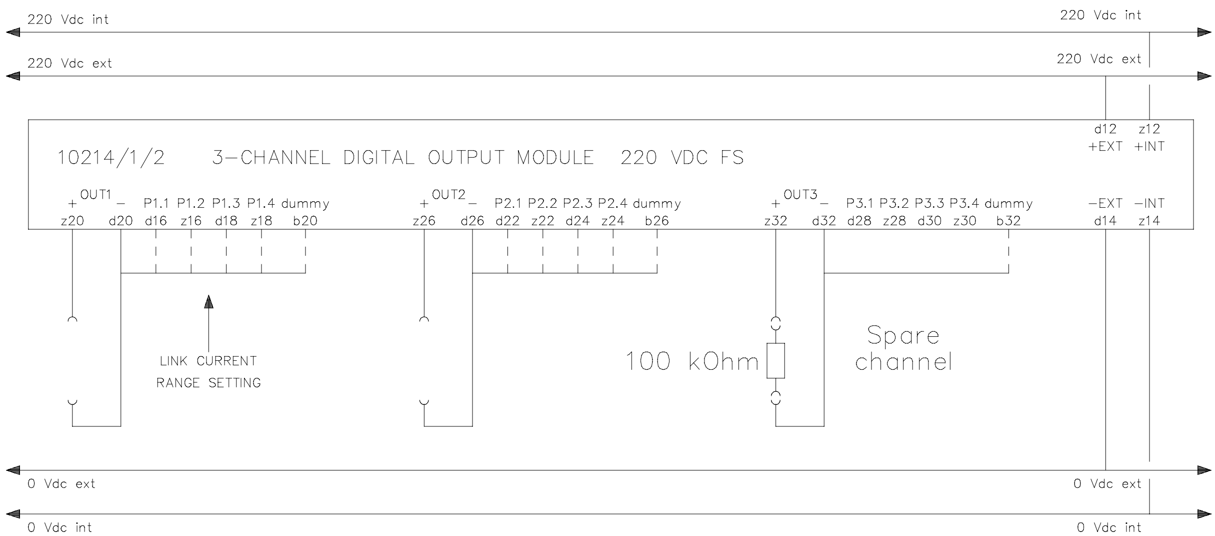


Figure 2 Connection example for non-redundant configurations

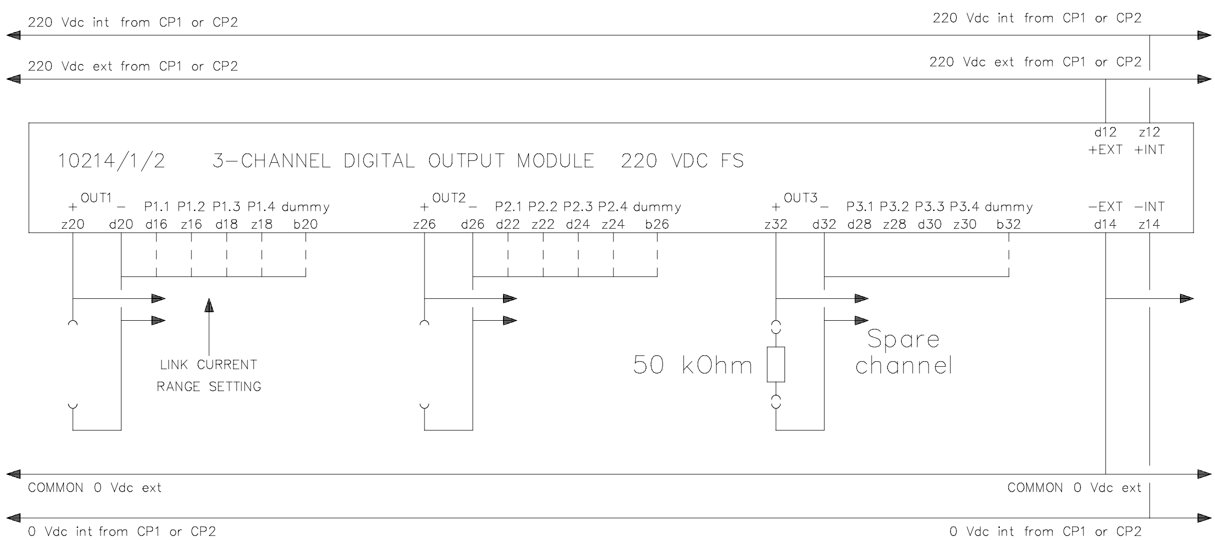


Figure 3 Connection example for redundant I/O configurations

Note:
The 220 Vdc internal and external power supplies must be connected to prevent fault detection during the self-test of the output module (pins d12, z12, d14 and z14). To prevent lead breakage detection, a (dummy) load must be present for all outputs.

Technical data

The 10214/1/2 module has the following specifications:

General	Type number:	10214/1/2 03202*
	Approvals:	CE, TÜV
	Software versions:	≥ 2.78e
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Supply voltage:	220 Vdc, –15%...+10%
	Power requirements:	5 Vdc 30 mA 220 Vdc internal 8 mA 220 Vdc external 12 mA (without output load)
Fuses	Fuse values:	1x 1.0 A 3x 40 mA
	Fuse type:	Round, TR5-F/19370K
	Fuse dimensions:	∅ 8.2 mm (0.32 in), height 7.7 mm (0.3 in)
Output	Number of output channels:	3
	Output specification:	220 Vdc solid-state source, short-circuit proof
	Maximum current:	250 mA* (see 'FSC output modules' data sheet)
	Maximum lamp load:	27 mA (6 W)
	Max. load capacitance:	0.1 μF
	Voltage drop:	< 3.5 Vdc at 250 mA
	Off current:	< 0.1 mA
	Current sense voltage drop:	< 1 Vdc at 250 mA
	WDG input current:	2 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– hole	A23
	– pins	C3, C11, C23
	Rack code:	
	– blind stops	C19, C27, C31
	– large pin	A23

*** Notes:**
10214/1/2 modules without a suffix code have a maximum output current of 175 mA.

10214/1/2 modules with suffix code 03202 have minor board layout modifications to improve production yield and reliability. There are no functional changes.

10215/2/1 Fail-safe digital output module (24 Vdc, 2 A, 4 channels)

Description

The fail-safe digital output module 10215/2/1 has four 24 Vdc, 2 A output channels to drive loads up to 50 W. The maximum module load is 6 A.
These loads may be resistive (e.g. lamps) or inductive (e.g. solenoids). For inductive loads, a suppression diode is included on each output. The outputs, including the suppression diodes, are fully tested and may therefore be used for fail-safe applications.
Within the configured process safety time, the outputs are tested for:

- ability to de-energize the output,
- ability to de-energize the group (via secondary means),
- crosstalk between outputs, and
- functioning of the suppression diodes.

The external 24 Vdc supply is split into two groups of two outputs each to support segregation in a subunit structure or to limit the circuit-breaker / fuse rating. The 0 Vdc is common to both groups.

A secondary means of de-energization has been provided per two outputs. This facility enables the watchdog or the processor to de-energize the outputs irrespective of the result of the application function.

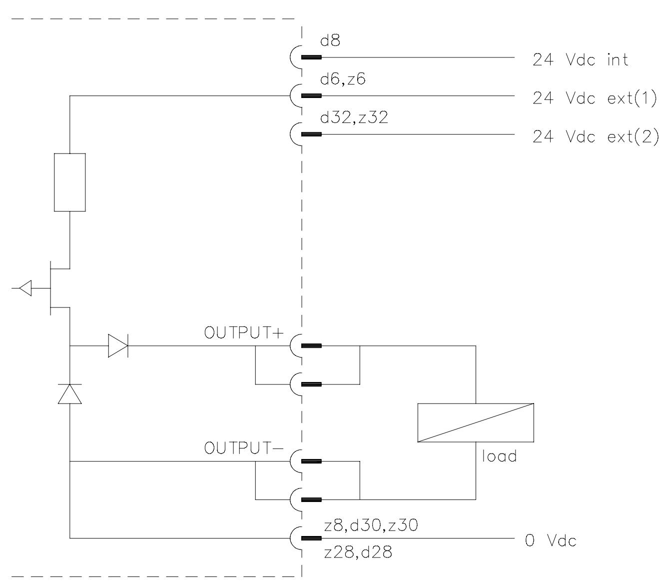
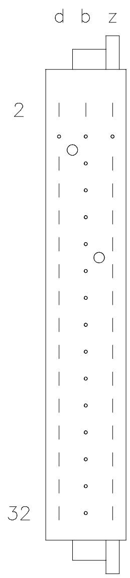


Figure 1 Schematic diagram for connection of one output (output 1-2) to the 10215/2/1 module

Pin allocation

The back view and pin allocation of the 10215/2/1 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6	Supply 24 Vdc ext. 1			z6	Supply 24 Vdc ext. 1
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10				z10	
d12	OUT 1+			z12	OUT 1–
d14	OUT 1+			z14	OUT 1–
d16	OUT 2+			z16	OUT 2–
d18	OUT 2+			z18	OUT 2–
d20	OUT 3+			z20	OUT 3–
d22	OUT 3+			z22	OUT 3–
d24	OUT 4+			z24	OUT 4–
d26	OUT 4+			z26	OUT 4–
d28	(0 Vdc)			z28	(0 Vdc)
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 24 Vdc ext. 2			z32	Supply 24 Vdc ext. 2

Connection examples

The figures below show a number of connection examples for the fail-safe digital output module 10215/2/1.

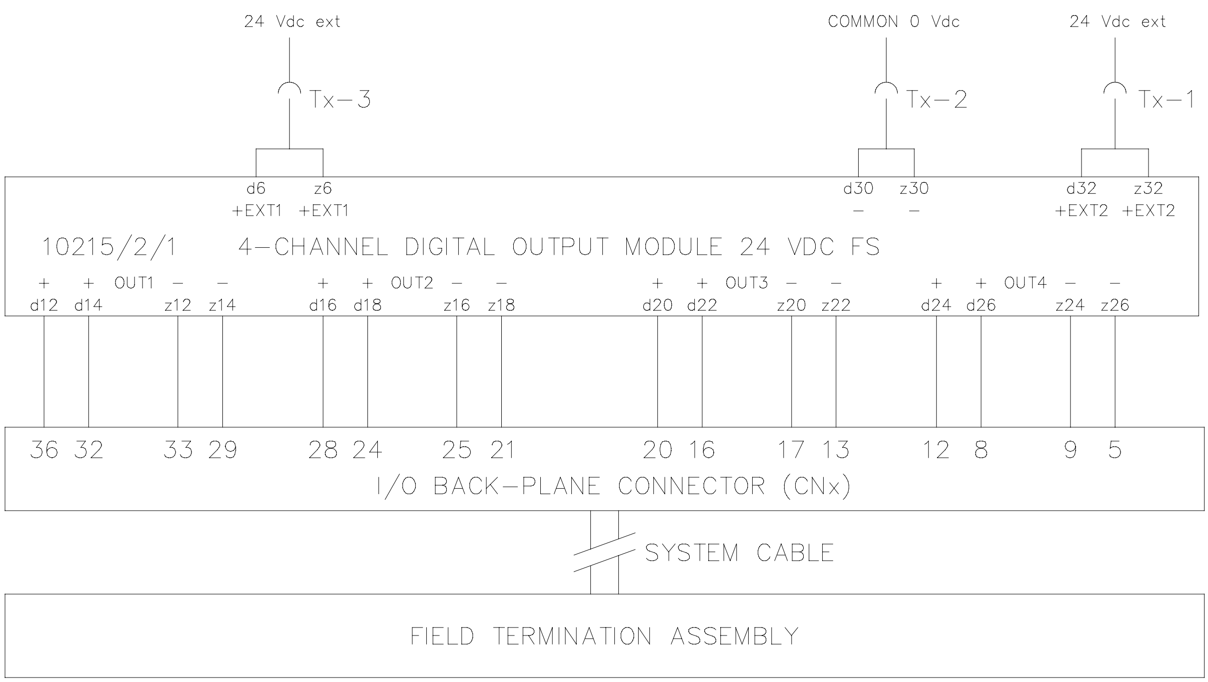


Figure 2 Connection example of 10215/2/1 module to FTA for both non-redundant and redundant I/O configurations

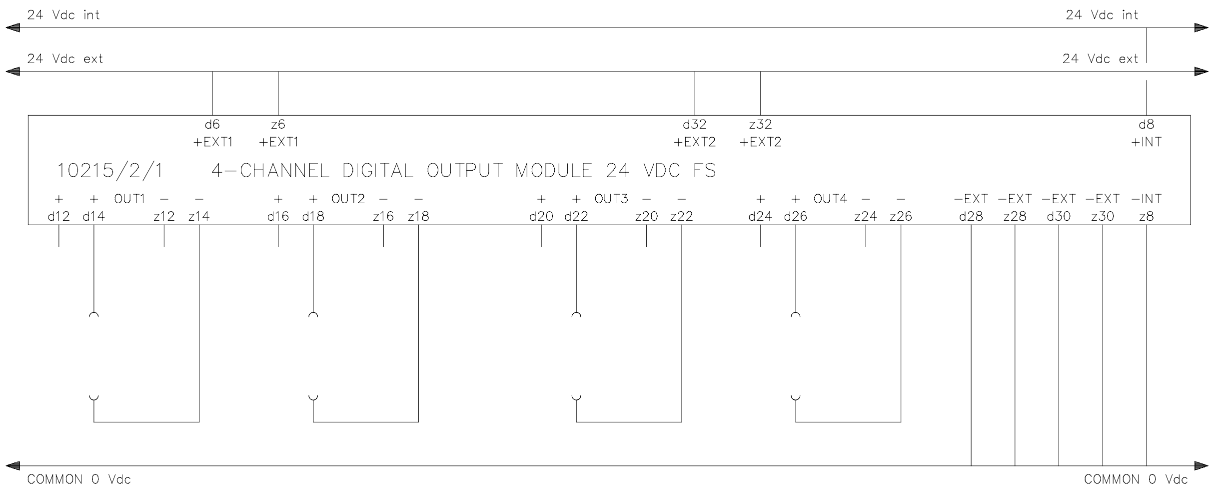


Figure 3 I/O connection example for 10215/2/1 module for non-redundant I/O configurations

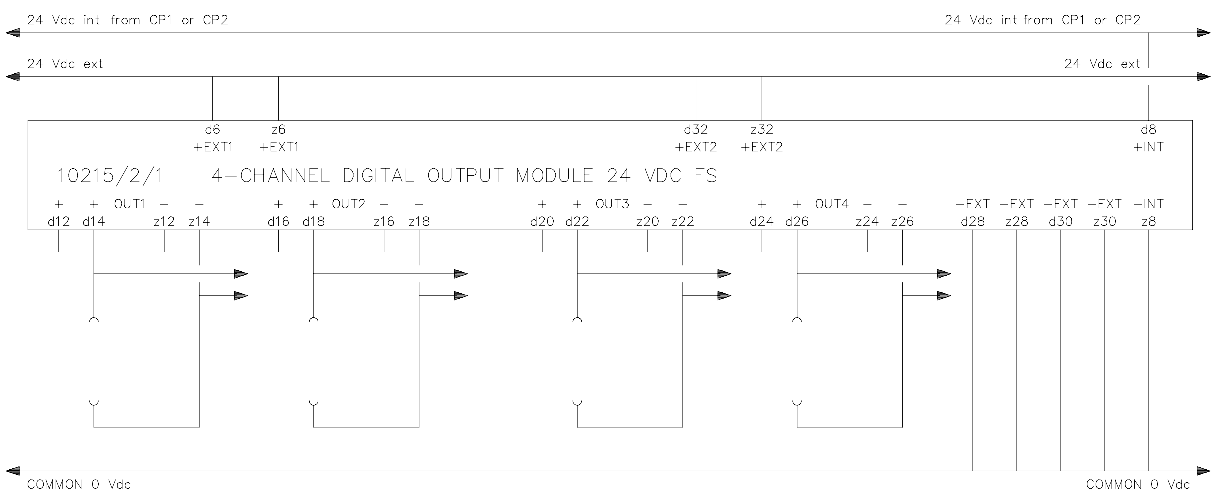


Figure 4 I/O connection example for 10215/2/1 module for redundant I/O configurations

Note:
The 24 Vdc internal and external power supplies must be connected to both output groups to prevent fault detection during the self-test of the output module (pins d6/z6, d8, d30/z30 and d32/z32)

Technical data

The 10215/2/1 module has the following specifications:

General	Type number:	10215/2/1 12303*
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 12 mA 24 Vdc internal 35 mA 24 Vdc external 2 ∗ 25 mA (without output load)
Output	Number of output channels:	4 (2 groups of 2)
	Output specification:	24 Vdc solid-state source short-circuit proof
	Maximum channel current:	2 A (see 'FSC output modules' data sheet)
	Maximum total module load:	6 A (module dissipation limit)
	Maximum lamp load:	417 mA (10 W)
	Maximum load capacitance:	1 µF
	Voltage drop:	< 1.3 Vdc at 2 A
	Off current:	< 0.1 mA
	WDG input current:	8 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A13, C5
	Rack code:	
	– large pins	A13, C5

*** Note:**
10215/2/1 modules with suffix code 12303 have minor board layout modifications to improve production yield and reliability. There are no functional changes.

10216/2/1 Fail-safe loop-monitored digital output module (24 Vdc, 1 A, 4 channels)

Description

The fail-safe digital output module 10216/2/1 has four 24 Vdc, 1 A loop-monitored output channels to drive loads up to 24 W. The maximum module load is 3.6 A.
These loads may be resistive or inductive. For inductive loads, a suppression diode is included on each output.
The outputs, including the suppression diode, the lead breakage detection and short-circuit detection, are fully tested and may therefore be used for fail-safe applications.

The outputs are tested for:

- ability to de-energize,
- ability to de-energize via the secondary means,
- cross talk between outputs,
- function of the suppression diodes,
- lead breakage in the (external) output wiring, and
- short circuit of the outputs.

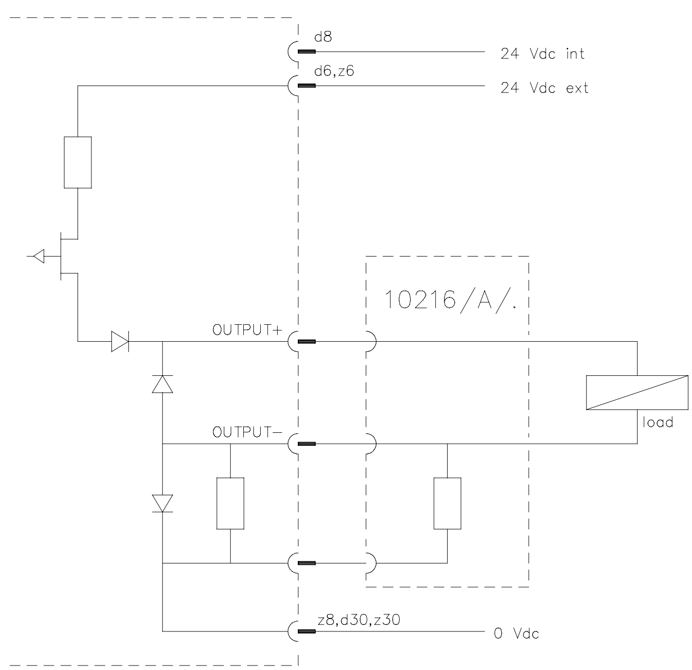


Figure 1 Schematic diagram for connection of one output to the 10216/2/1 module

The outputs have a secondary means of de-energization, which enables the watchdog and/or the processor to de-energize the outputs irrespective of the result of the application function.

Note:
The 10216/2/1 module can only be used in combination with an I/O back plane, since the outputs require a 10216/A/. module.

Loop-monitoring

All outputs are monitored for lead breakage and short circuit. To get a rough lead breakage current setting, the current sense level must be programmed (see Table 1 below).

Table 1 Selection of range-setting module

LOAD		Range-setting module
Spare channel		10216/A/1
0.1 - 0.39 W	4 - 16 mA	none
0.4 - 1.1 W	17 - 47 mA	10216/A/2
1.2 - 4.7 W	48 - 199 mA	10216/A/3
≥ 4.8 W	≥ 200 mA	10216/A/4

LEDs

The modules have four LEDs, one for each channel.

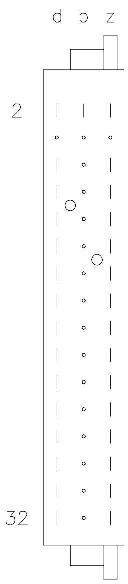
If a channel is **off**, its corresponding LED will be off, with periodic, brief flashes. These are the lead breakage tests.

If a channel is **on** and the configuration is **non-redundant (single)**, its corresponding LED will be on, with periodic, very brief flashes (hardly visible to the naked eye). These are the internal switch-off self-tests.

If a channel is **on** and the configuration is **redundant**, the corresponding LEDs will seem to flash intermittently. What happens is that the module in CP1 will switch off briefly to give the module in CP2 the opportunity to perform its self-test. After the self-test of the module in CP1 has been completed, the module in CP2 will switch on again (there may be some time delay), and the module in CP1 will switch off to give the module in CP2 the opportunity to perform its self-test, etc. This makes it look as if the channel LEDs of both modules flash intermittently. How "fast" the LEDs flash depends on the application cycle time and the configures process safety time.

Pin allocation

The back view and pin allocation of the 10216/2/1 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6	Supply 24 Vdc ext.			z6	Supply 24 Vdc ext.
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10				z10	
d12	(0 Vdc)			z12	(0 Vdc)
d14	OUT 1+			z14	OUT 1–
d16	0 Vdc			z16	0 Vdc
d18	OUT 2+			z18	OUT 2–
d20	0 Vdc			z20	0 Vdc
d22	OUT 3+			z22	OUT 3–
d24	0 Vdc			z24	0 Vdc
d26	OUT 4+			z26	OUT 4–
d28	0 Vdc			z28	0 Vdc
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32				z32	

Connection example

The figure below shows a connection example for the fail-safe digital output module 10216/2/1.

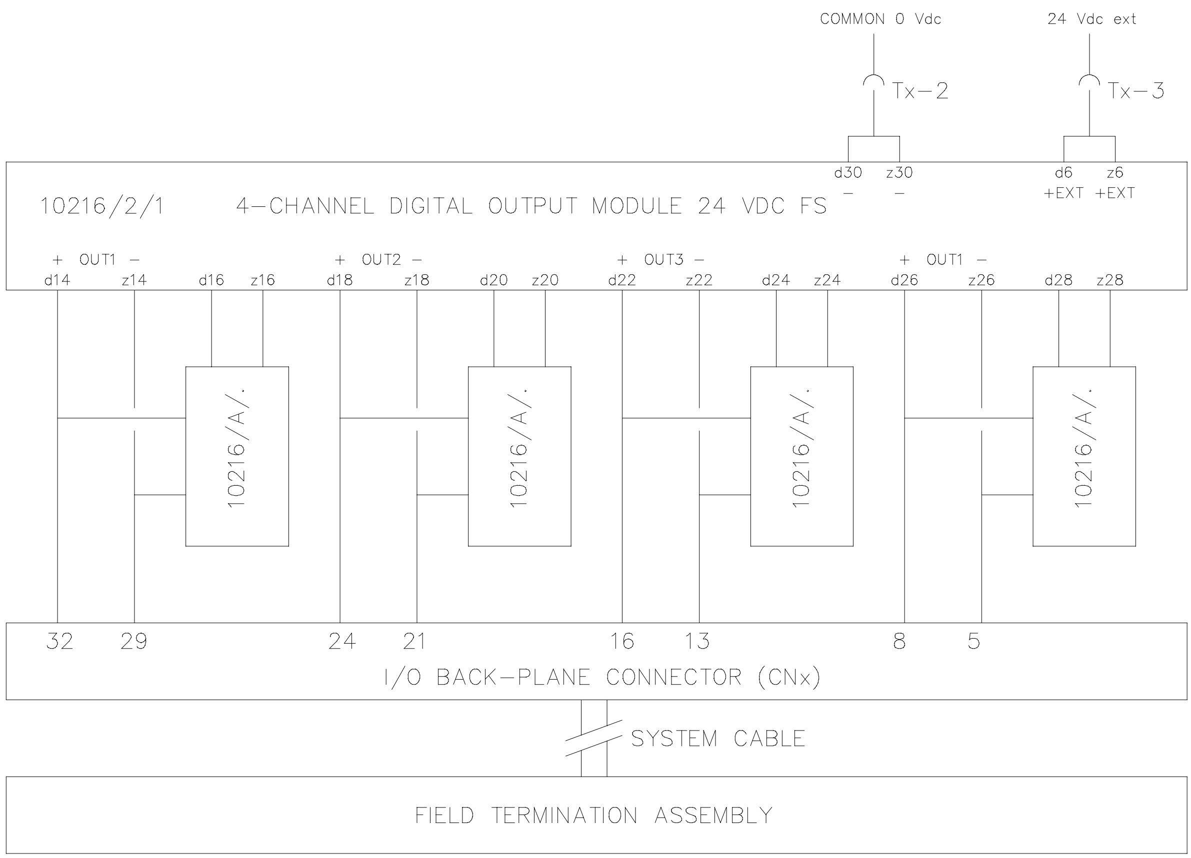


Figure 2 Connection example of 10216/2/1 module to FTA for both non-redundant and redundant I/O configurations

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Note:
The 24 Vdc internal power supply (d8 and z8) must be connected to prevent fault detection during the self-test of the output module. The external power supply (d6/z6 and d30/z30), as well as (dummy) loads on all channels, must be connected to prevent fault detection during the lead breakage test of the output module.

Technical data

The 10216/2/1 module has the following specifications:

General

Type number:	10216/2/1 12401*
Approvals:	CE, TÜV, UL
Software versions	≥ 3.00
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	5 Vdc 15 mA 24 Vdc internal 50 mA 24 Vdc external 15 mA (without output load)

Output

Number of output channels:	4
Output specification:	24 Vdc solid-state source, short circuit proof
Maximum channel current:	1 A (see 'FSC output modules' data sheet)
Maximum total module load:	3.6 A (module dissipation limit)
Maximum load inductance:	0.5 H
Maximum load capacity:	1 µF
Top of overload detection:	> 10 Ohm
Cold resistance lamp:	> 20 Ohm
Voltage drop:	< 1.3 V at 1 A
Off current:	< 0.1 mA
Current sense voltage drop:	< 1 V at 1 A
WDG input current:	4 mA

Key coding

(See 'Key coding' data sheet)

Module code:	
– holes	A13, C9
Rack code:	
– large pins	A13, C9

*** Note:**
10216/2/1 modules with suffix code 12401 have minor board layout modifications to improve production yield and reliability. There are no functional changes.

10216/2/3 Fail-safe loop-monitored digital output module (48 Vdc, 0.5 A, 4 channels)

Description

The fail-safe digital output module 10216/2/3 has four 48 Vdc, 0.5 A loop-monitored output channels to drive loads up to 24 W.
These loads may be resistive or inductive. For inductive loads, a suppression diode is included on each output.
The outputs, including the suppression diode, the lead breakage detection and short-circuit detection, are fully tested and may therefore be used for fail-safe applications.

The outputs are tested for:

- ability to de-energize,
- ability to de-energize via the secondary means,
- cross talk between outputs,
- function of the suppression diodes,
- lead breakage in the (external) output wiring, and
- short circuit of the outputs.

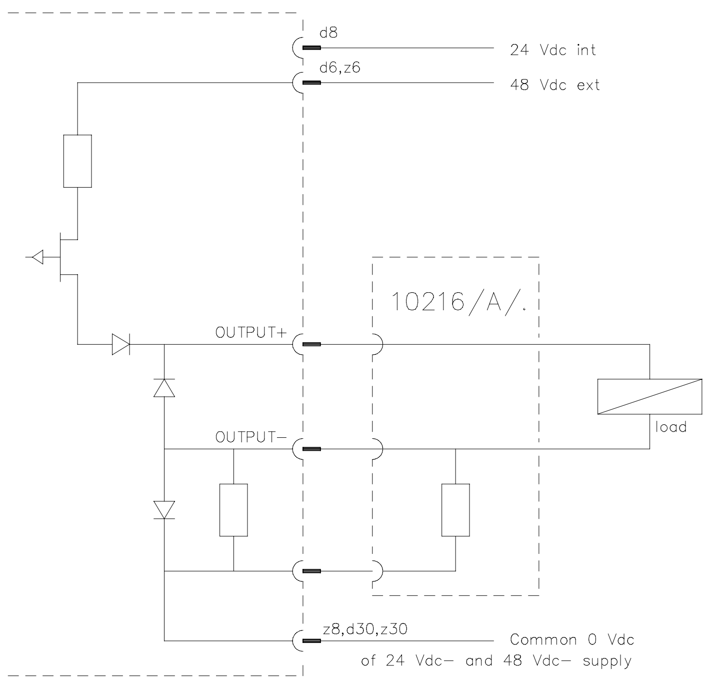


Figure 1 Schematic diagram for connection of one output to the 10216/2/3 module

The outputs have a secondary means of de-energization, which enables the watchdog and/or the processor to de-energize the outputs irrespective of the result of the application function.

Notes:
The 10216/2/3 module can only be used in combination with an I/O back plane, since the outputs require a 10216/A/. module.
The 24 Vdc (internal) and the 48 Vdc (external) must have a common 0 Vdc connection.

Loop-monitoring

All outputs are monitored for lead breakage and short circuit. To get a rough lead breakage current setting, the current sense level must be programmed (see Table 1 below).

Table 1 Selection of range-setting module

LOAD		Range-setting module	Cable limit*	Max. load capacitance
Spare channel		10216/A/1	10 m (32.8 ft)	–
0.1 - 0.79 W	4 - 16 mA	none	10 m (32.8 ft)	0.5 µF
0.8 - 2.3 W	17 - 47 mA	10216/A/2	50 m (164 ft)	0.5 µF
2.4 - 9.5 W	48 - 199 mA	10216/A/3	200 m (656 ft)	0.5 µF
9.6 - 19.2 W	200 - 400 mA	10216/A/4	100 m (328 ft)	10 nF
> 19.2 W	> 400 mA	10216/A/4	50 m (164 ft)	10 nF
> 19.2 W	> 400 mA (< 50 V)	10216/A/4	100 m (328 ft)	10 nF

* Calculation is based on a cable capacitance of 200 pF per meter. Using a cable with a 10% lower cable capacitance will increase the maximum cable length by 10%.

LEDs

The modules have four LEDs, one for each channel.

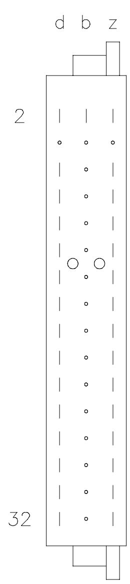
If a channel is **off**, its corresponding LED will be off, with periodic, brief flashes. These are the lead breakage tests.

If a channel is **on** and the configuration is **non-redundant (single)**, its corresponding LED will be on, with periodic, very brief flashes (hardly visible to the naked eye). These are the internal switch-off self-tests.

If a channel is **on** and the configuration is **redundant**, the corresponding LEDs will seem to flash intermittently. What happens is that the module in CP1 will switch off briefly to give the module in CP2 the opportunity to perform its self-test. After the self-test of the module in CP1 has been completed, the module in CP2 will switch on again (there may be some time delay), and the module in CP1 will switch off to give the module in CP2 the opportunity to perform its self-test, etc. This makes it look as if the channel LEDs of both modules flash intermittently. How "fast" the LEDs flash depends on the application cycle time and the configures process safety time.

Pin allocation

The back view and pin allocation of the 10216/2/3 module connector are as follows:



d2	WDG	b2	GND	z2	VCC
d4	–			z4	–
d6	Supply 48 Vdc ext.			z6	Supply 48 Vdc ext.
d8	Supply 24 Vdc int.			z8	Supply 0 Vdc
d10				z10	
d12	(0 Vdc)			z12	(0 Vdc)
d14	OUT 1+			z14	OUT 1–
d16	0 Vdc			z16	0 Vdc
d18	OUT 2+			z18	OUT 2–
d20	0 Vdc			z20	0 Vdc
d22	OUT 3+			z22	OUT 3–
d24	0 Vdc			z24	0 Vdc
d26	OUT 4+			z26	OUT 4–
d28	0 Vdc			z28	0 Vdc
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32				z32	

Connection example

The figure below shows a connection example for the fail-safe digital output module 10216/2/3.

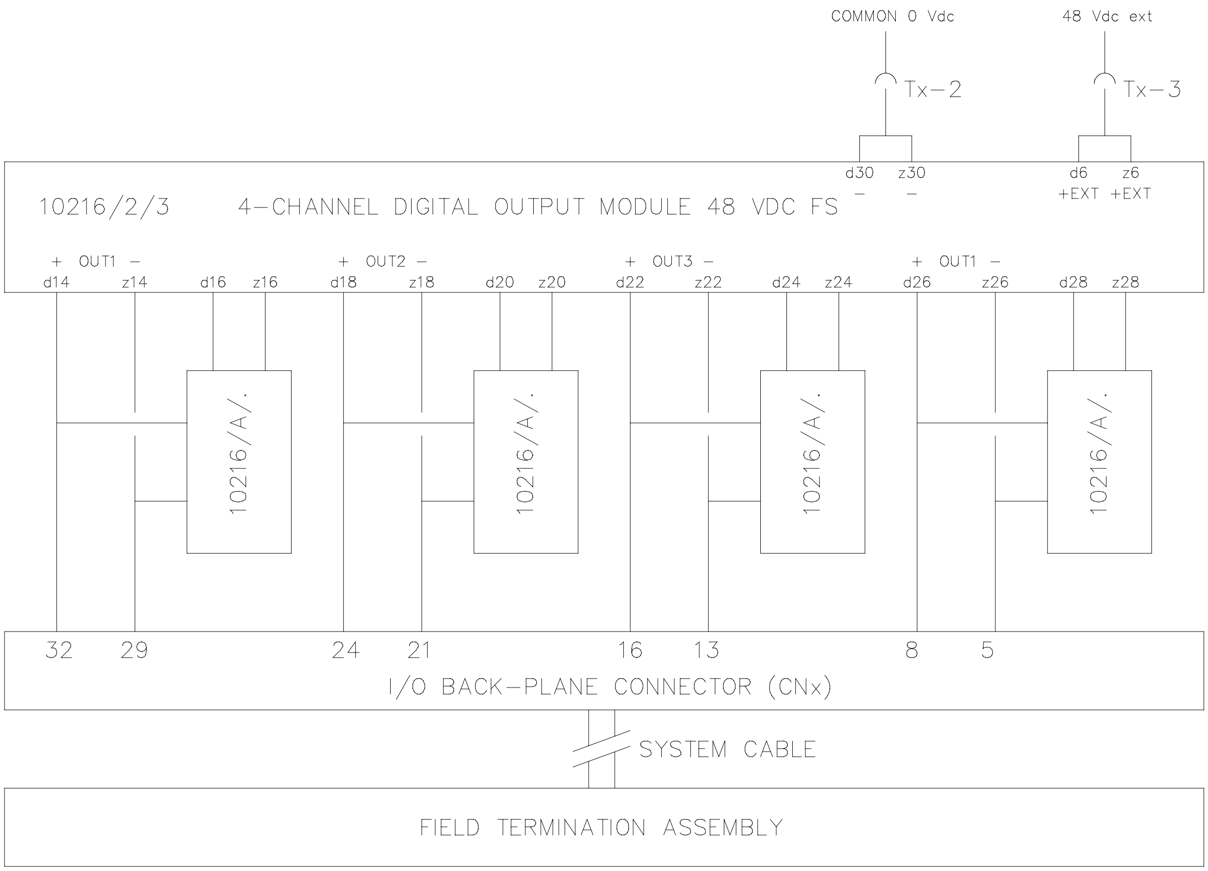


Figure 2 Connection example of 10216/2/3 module to FTA for both non-redundant and redundant I/O configurations

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Note:
The 24 Vdc internal power supply (d8 and z8) must be connected to prevent fault detection during the self-test of the output module. The 48 Vdc external power supply (d6/z6 and d30/z30), as well as (dummy) loads on all channels, must be connected to prevent fault detection during the lead breakage test of the output module.

Technical data

The 10216/2/3 module has the following specifications:

General	Type number:	10216/2/3 13402*
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 310
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 15 mA 24 Vdc internal 50 mA 48 Vdc external 15 mA (without output load)
Output	Number of output channels:	4
	Output specification:	48 Vdc solid-state source, short circuit proof
	Maximum channel current:	0.5 A (see 'FSC output modules' data sheet)
	Maximum load inductance:	1 H
	Maximum load capacitance:	0.5 μF
	Top of overload detection:	> 40 Ohm
	Cold resistance lamp:	> 80 Ohm
	Voltage drop:	< 1.2 V at 0.5 A
	Off current:	< 0.1 mA
	Current sense voltage drop:	< 1 V at 0.5 A
	WDG input current:	4 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A13, C13
	Rack code:	
	– large pins	A13, C13

***Note:**
10216/2/3 modules with suffix codes 13401 or 13402 have minor board layout modifications to improve production yield and reliability. There are no functional changes.

10216/A/. Range-setting modules

Description

The loop-monitored output channels of the 10216/2/. module usually need a range-setting module to put the current sense level in the proper range or to prevent lead breakage detection on spare channels. The 10216/A/. modules are placed on a programming connector (Px) on the back of the I/O backplane in the 19-inch rack. To assist proper placement of these 10216/A/. modules, a 10216 positioning print can be placed on the programming connector.

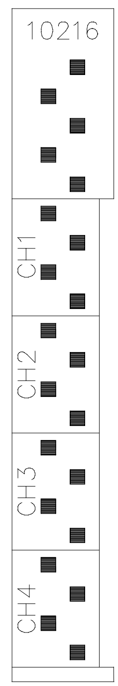

Figure 1 10216 positioning print

The printed circuit board of a 10216/A/. module should be oriented to slide into the cut-out zone of the appropriate channel.
Redundant channels require only one 10216/A/. module.

10216/A/1 Spare channel

Description

The 10216/A/1 range-setting module is used for spare channels of 10216/2/. modules to prevent lead breakage detection on those channels.
The 10216/A/1 module has a 4.7 kOhm (dummy load) resistor.

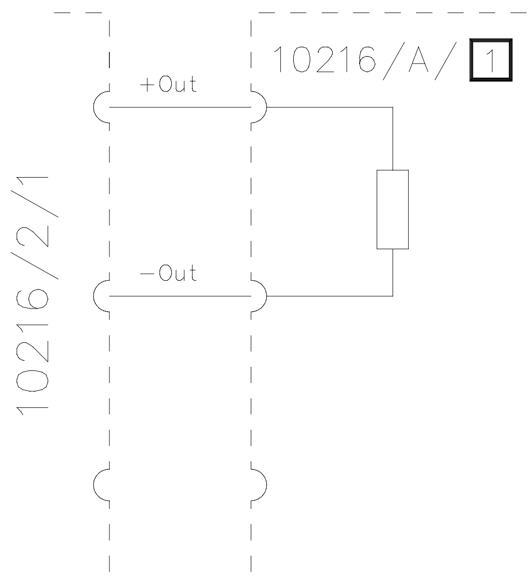

Figure 2 Schematic diagram of a 10216/A/1 module

Technical data

The 10216/A/1 module has the following specifications:

General

Type number:	10216/A/1
Approvals:	CE, TÜV, UL
Number of channels:	1
Dimensions:	23 x 10.2 x 9 mm (0.91 x 0.4 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	5 mA from 24 Vext. of 10216/2/1 10 mA from 48 Vext. of 10216/2/3

10216/A/2 17-47 mA range-setting module

Description

The 10216/A/2 range setting module is used for 10216/2/. channels with loads between 17 and 47 mA.
The 10216/A/2 module has a 33 Ohm resistor to set the current sense level.

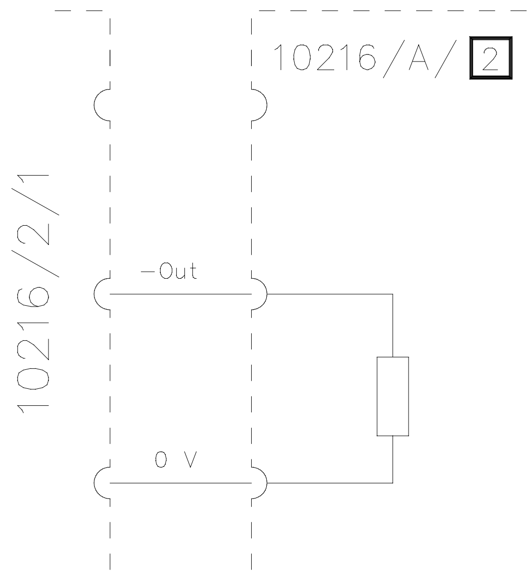

Figure 3 Schematic diagram of a 10216/A/2 module

Technical data

The 10216/A/2 module has the following specifications:

General

Type number:	10216/A/2
Approvals:	CE, TÜV, UL
Number of channels:	1
Dimensions:	23 x 10.2 x 9 mm (0.91 x 0.4 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	none
Load range:	17 to 47 mA 0.4 to 1.1 W at 24 Vdc 0.8 to 2.3 W at 48 Vdc

10216/A/3 48-199 mA range-setting module

Description

The 10216/A/3 range setting module is used for 10216/2/. channels with loads between 48 and 199 mA.
The 10216/A/3 module has a 10 Ohm resistor to set the current sense level.

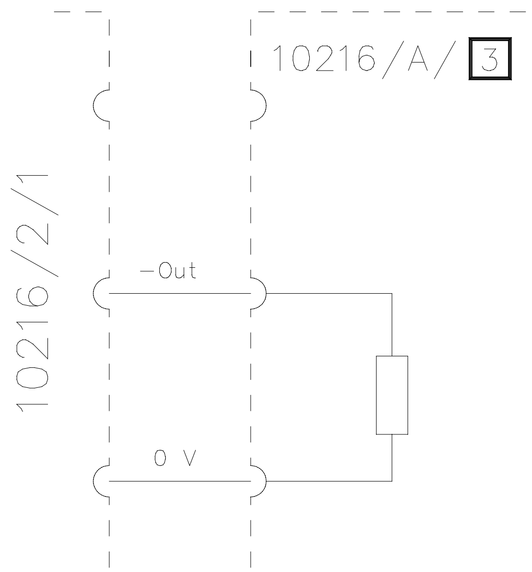

Figure 4 Schematic diagram of a 10216/A/3 module

Technical data

The 10216/A/3 module has the following specifications:

General

Type number:	10216/A/3
Approvals:	CE, TÜV, UL
Number of channels:	1
Dimensions:	23 x 10.2 x 9 mm (0.91 x 0.4 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	none
Load range:	48 to 199 mA 1.2 to 4.7 W at 24 Vdc 2.4 to 9.5 W at 48 Vdc

10216/A/4 ≥ 200 mA range-setting module

Description

The 10216/A/4 range setting module is used for 10216/2/. channels with loads of 200 mA or higher.
The 10216/A/4 module has a 2.2 Ohm resistor to set the current sense level.

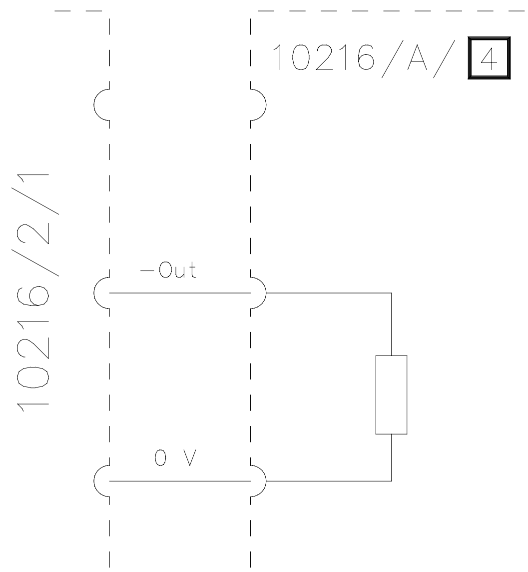

Figure 5 Schematic diagram of a 10216/A/4 module

Technical data

The 10216/A/4 module has the following specifications:

General

Type number:	10216/A/4
Approvals:	CE, TÜV, UL
Number of channels:	1
Dimensions:	23 x 10.2 x 9 mm (0.91 x 0.4 x 0.35 in)
Rack space requirements:	none (placed on programming connector on I/O backplane)

Power

Power requirements:	none
Load range:	≥ 200 mA ≥ 4.8 W at 24 Vdc ≥ 9.6 W at 48 Vdc

Fail Safe Control
Hardware Manual

Section 7:
FSC Modules for Special Functions

Honeywell

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Section 7: FSC Modules for Special Functions

10302/2/1 Watchdog repeater (WDR)

Description

The watchdog repeater 10302/2/1 is a module that monitors the 5 Vdc and 24 Vdc power supplies. The watchdog output of the watchdog repeater is connected to the watchdog input of those output modules whose power supply (5 Vdc and/or 24 Vdc) is monitored.

A watchdog repeater is required in the following cases:

- in multiple-PSU (10300/1/1) configurations, for each subsequent 24 Vdc to 5 Vdc power supply unit, e.g. PSU 2, 3, 4.
- if the 24 Vdc is supplied via an M24-20 HE or M24-12 HE power supply.
- if the 24 Vdc is supplied via an (external) power supply which can provide supply voltages that exceed 31.0 Vdc. (The maximum output voltage of the 24 Vdc supply must be less than 37 Vdc under any single or double fault condition of the 24 Vdc power supply unit.)
- if the required watchdog current exceeds 900 mA.
- in configurations which combine redundant and non-redundant I/O, in order to create the watchdog output for the output modules of the non-redundant I/O part.
- in configurations with redundant Central Parts and non-redundant I/O with safety related output modules.

The watchdog repeater requires a horizontal bus connection. This means that space must be reserved in the I/O racks (positions 1, 2, 11-18).
A watchdog repeater must always be placed in the I/O section whose output modules are monitored by that watchdog repeater. This means that watchdog repeaters in configurations with multiple (redundant) I/O sections may not be installed in such a way that they control the "other" I/O section.

The watchdog repeater may be exchanged with the power supply switched on, but the Central Part will shut down, or both Central Parts will shut down if used in a configuration with redundant Central Parts and non-redundant I/O.

The watchdog repeater is fitted with a male connector according to DIN 41612, type F, with the 'd', 'b' and 'z' rows used.

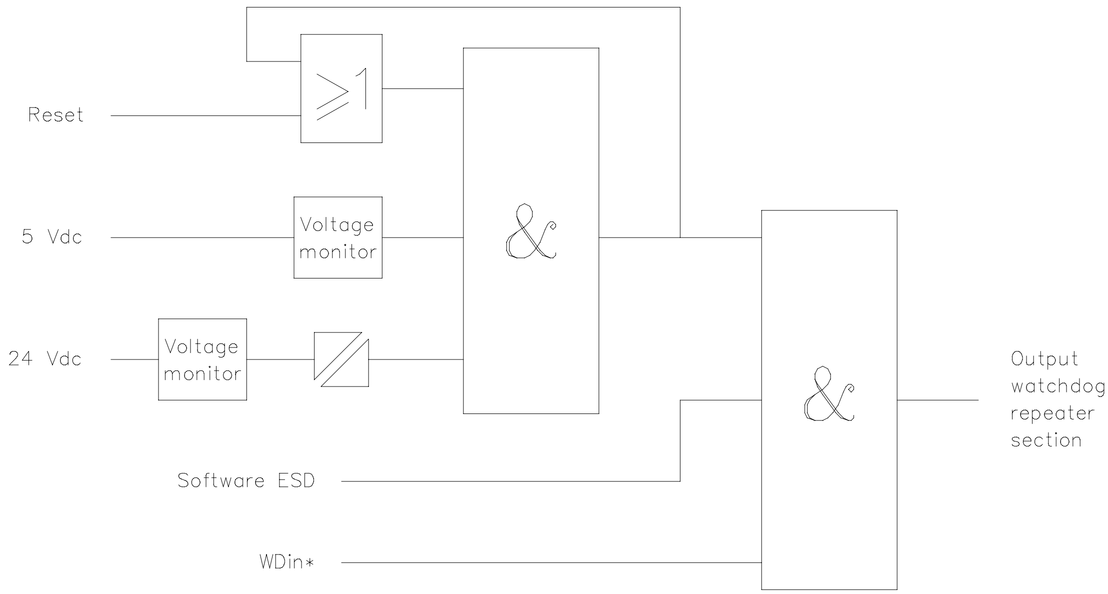


Figure 1 Logic diagram for a watchdog repeater section

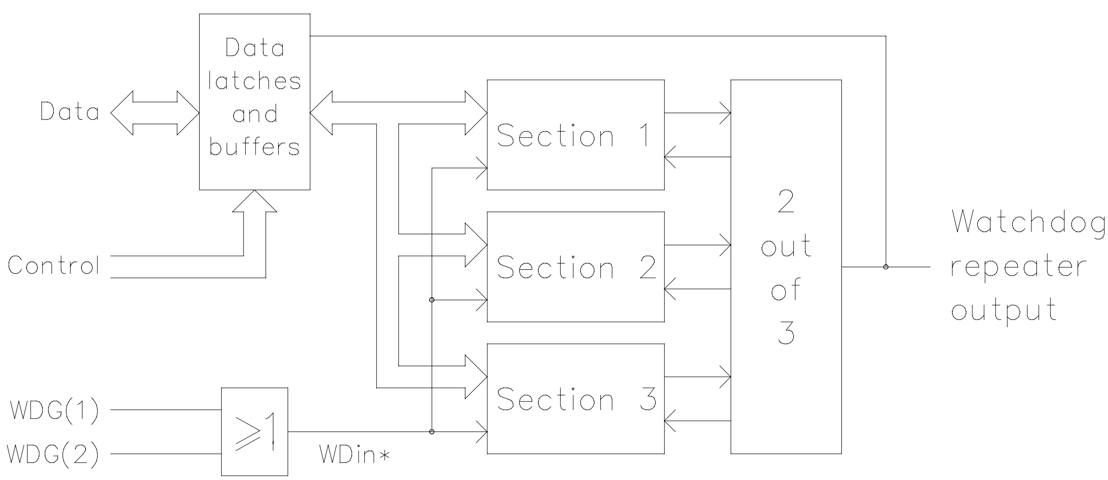
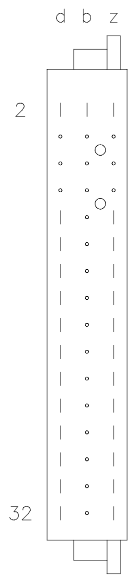


Figure 2 Block diagram for the watchdog repeater module

Pin allocation

The back view and pin allocation of the 10302/2/1 module connector are as follows:



d2		b2	GND 5 Vdc	z2	Supply 5 Vdc
d4	–			z4	–
d6	–			z6	–
d8	–			z8	–
d10	(GND 5 Vdc)			z10	(GND 5 Vdc)
d12	WDG1 IN			z12	WDG2 IN
d14	GND 5 Vdc			z14	(GND 5 Vdc)
d16	WDR OUT			z16	(GND 5 Vdc)
d18	(GND 5 Vdc)			z18	(GND 5 Vdc)
d20				z20	
d22				z22	
d24				z24	
d26				z26	
d28				z28	
d30	Supply 0 Vdc			z30	Supply 0 Vdc
d32	Supply 24 Vdc			z32	Supply 24 Vdc

Technical data

The 10302/2/1 module has the following specifications:

General	Type number:	10302/2/1 12600
	Approvals:	CE, TÜV, UL
	Software versions:	≥ 3.00
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
Power	Power requirements:	5 Vdc 35 mA (without WDROUT output current) 24 Vdc 25 mA
	WDG1 + WDG2 input current:	0.1 mA
WDR OUT	Max. output current:	900 mA
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A5, A9
	Rack code:	
	– large pins	A5, A9

10303/1/1 Power supply distribution module (PSD)

Description

The power supply distribution module (PSD) 10303/1/1 is only used in configurations with redundant Central Parts and non-redundant I/O. It is used to combine the output of the power supply units (PSUs) in the redundant Central Parts into one 5 Vdc supply for the non-redundant I/O part of the system. One power supply distribution module is required per PSU module.
The power supply to the Central Part must also be routed through this module to create an equal voltage drop to the Central Part and I/O section.

As the limits on the 5 Vdc power supply are very tight (± 5%), it is required to place the PSD modules next to the PSU modules to reduce the voltage drop in the wiring. The minimum wire diameter is 2.5 mm² (AWG 14).
The PSD module may only be exchanged with the power supply to its PSU switched off.

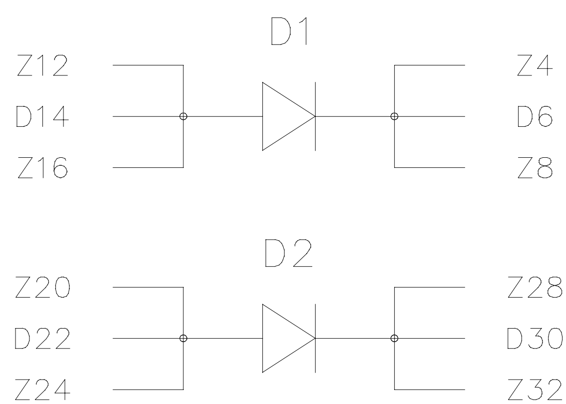


Figure 1 Schematic diagram of 10303/1/1 module

Technical data

The 10303/1/1 module has the following specifications:

General

Type number:	10303/1/1 03501*
Approvals:	CE, TÜV, UL
Software versions:	all
Space requirements:	4 TE, 3 HE (= 4 HP, 3U)

Power

Power requirements:	none
Max. current:	20 A (module dissipation limit)*
Max. forward voltage drop:	0.55 V
Max. reverse voltage:	30 V

Connector

Connector type:	DIN 41612-H 15 P (faston)
Max. connector current:	10 A per pin

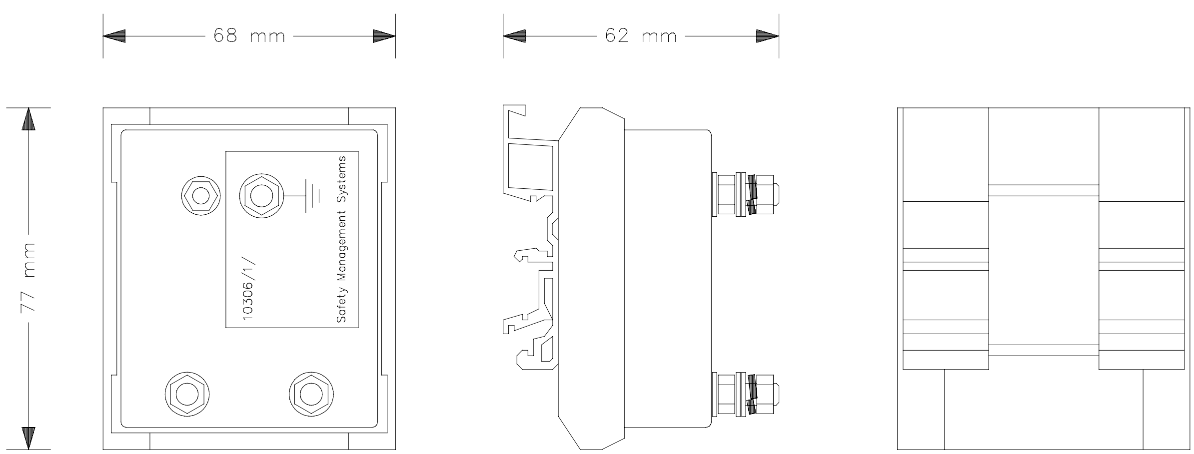
*** Note:**
10303/1/1 modules without a suffix code have a maximum current of 12 A.

10306/1/. Supply input filters

Description

The 10306/1/. modules are used as power supply input filters. The type of 10306/1/. module to be used depends on the voltage level:

- 24 Vdc: 10306/1/1
- 48 Vdc: 10306/1/4
- 60 Vdc: 10306/1/5
- 110 Vdc: 10306/1/2
- 220 Vdc: 10306/1/3



Top view

Side view

Bottom view

Figure 1 10306/1/. mechanical layout

The 10306/1/. modules have a universal snap-in facility for standard DIN EN rails.

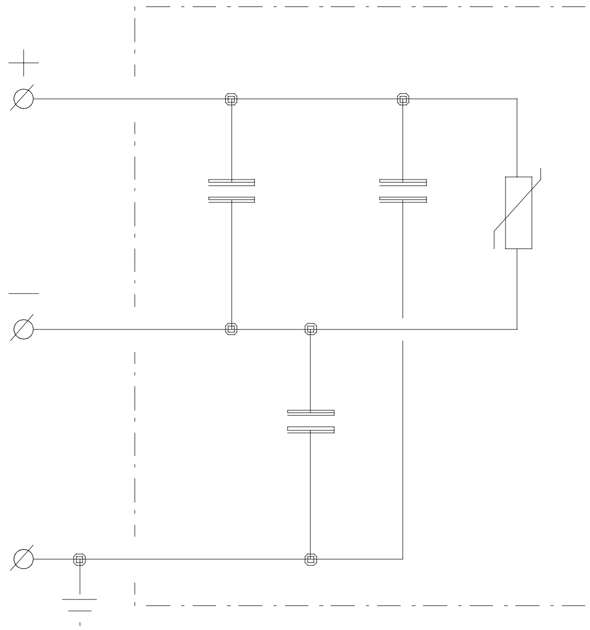


Figure 2 10306/1/. circuit

If the DC power is supplied externally, the input filter must be placed close to the input terminals of the power supply. The plus (+) and minus (–) connections are arbitrary. The ground connection is indicated.

The supply wires must be routed via the filter terminals, or they must be connected to the input filter using wires with a diameter of at least 6 mm² (AWG 10) and a maximum length of 10 cm (4 in).

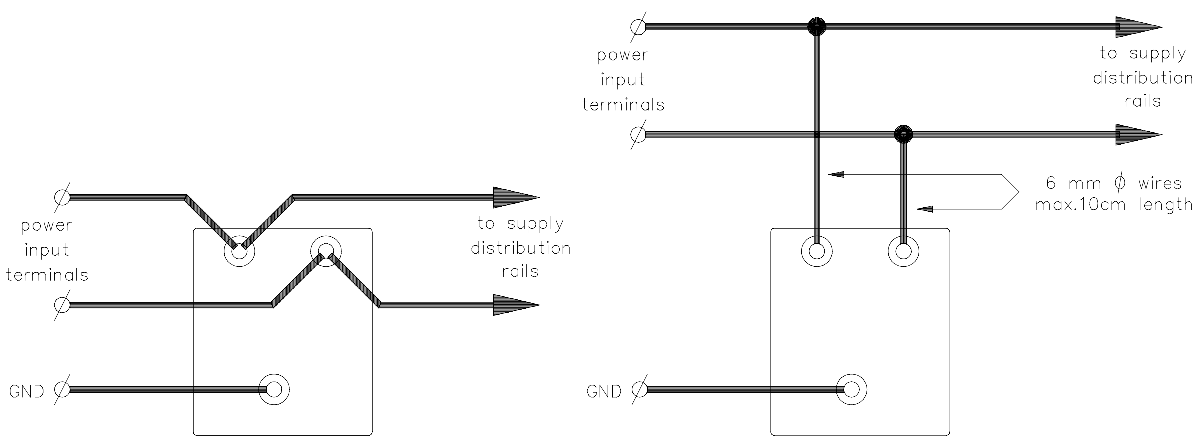


Figure 3 Wiring examples for 10306/1/. modules

Technical data

The 10306/1/. modules have the following specifications:

General	Type number:	10306/1/1 to 10306/1/5
	Approvals:	CE, TÜV, UL
Physical	Dimensions:	77 x 68 x 62 mm (L x W x H) 3.03 x 2.68 x 2.44 in (L x W x H)
	Color:	green
	Weight:	approx. 190 gr (6.70 oz)
Power	Power requirements:	none
	Maximum voltage:	10306/1/1: 36 Vdc
		10306/1/2: 140 Vdc
		10306/1/3: 255 Vdc
		10306/1/4: 62 Vdc
		10306/1/5: 74 Vdc
	Maximum voltage between any input and GND:	500 Vac or 700 Vdc
Terminations	Connection type:	M5

Left blank intentionally.

10307/1/1 Vertical bus terminator

Description

The vertical bus terminator 10307/1/1 provides extra line terminators for the vertical bus. The module gets its own connector on the vertical bus (see 10001/R/1 data sheet).

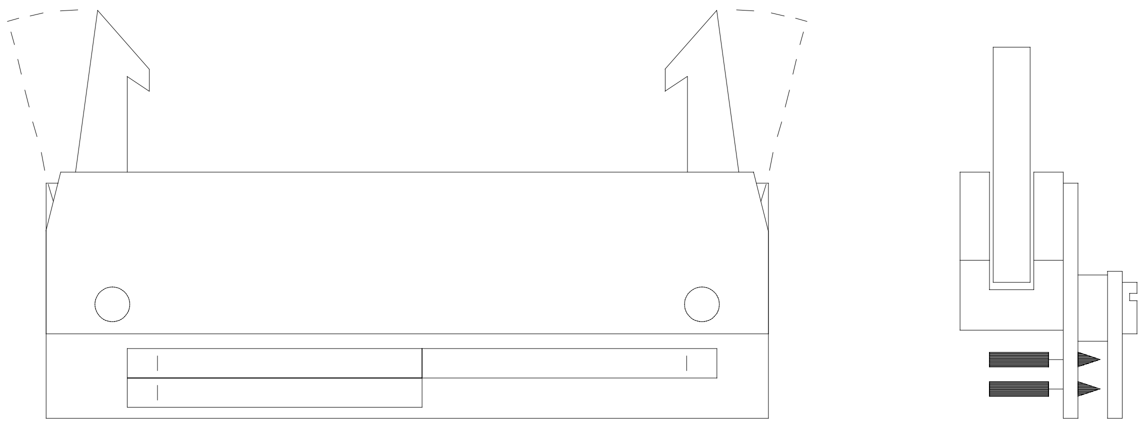


Figure 1 Mechanical layout

Technical data

The 10307/1/1 module has the following specifications:

General	Type number:	10307/1/1
	Approvals:	CE, TÜV, UL
Power	Power requirements:	50 mA (from 5 Vdc of vertical bus driver, VBD)
Physical	Dimensions:	62.5 x 34.5 x 17.5 mm (2.46 x 1.41 x 0.71 in)
	Weight:	approx. 17 g (0.60 oz)

Left blank intentionally.

10310/1/1 Earth leakage detector (ELD)

Description

The 10310/1/1 module is an earth leakage detector (ELD) for 24 Vdc systems. It has a manually operated self-test and earth connection monitor (switch 2 in 'TEST' position).
The system may include 48 Vdc and/or 60 Vdc supplies with a common 0 V rail (see Figure 3).

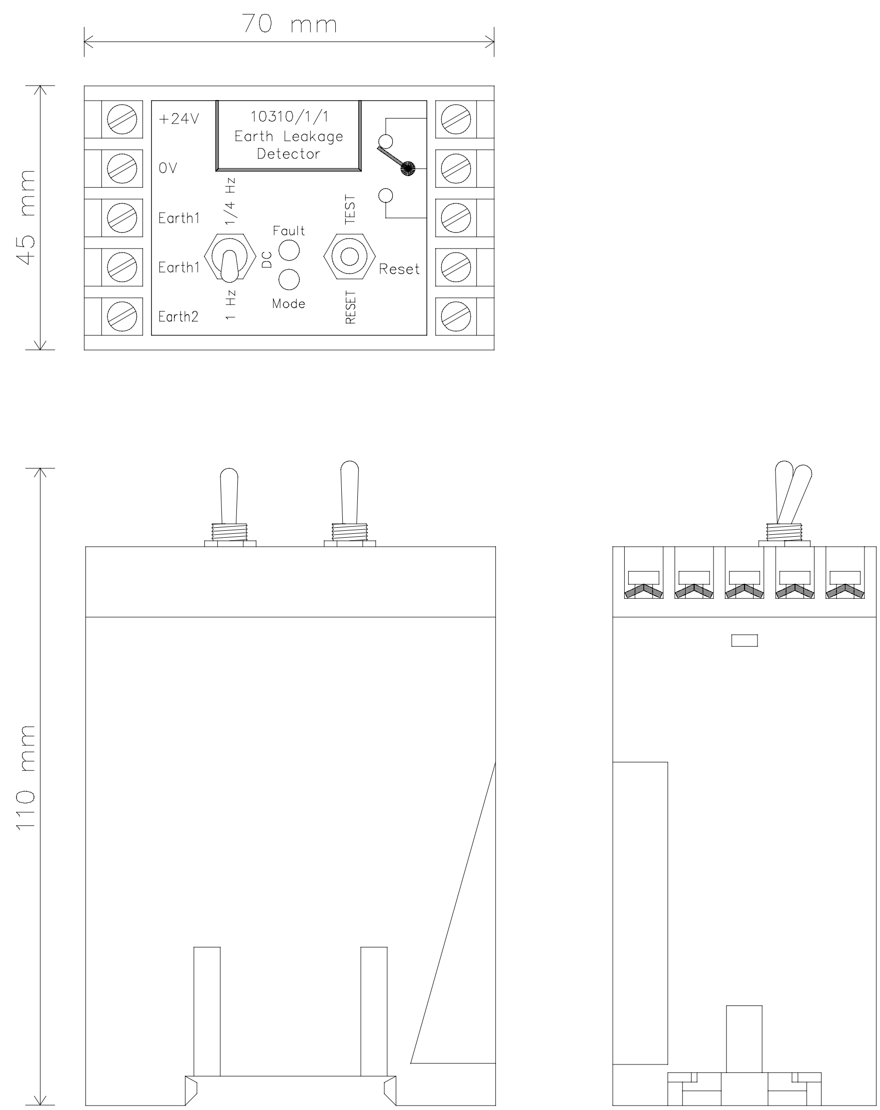


Figure 1 Module layout

The module has a universal snap-in facility for standard 35 mm DIN EN rails.

The ELD module connects earth level with –12 Vdc (referenced to the 0 V connection of the 24 Vdc supply). This connection is:

- continuous (switch 1 in 'DC' position), or
- interrupting at 1 Hz (switch 1 in '1 Hz' position), or
- interrupting at 0.25 Hz (switch 1 in '1/4 Hz' position).

With switch 1 in the '1 Hz' or '1/4 Hz' position, the green 'MODE' LED on the module front flashes at the selected connection frequency.

Switch 1 is normally used in the 'DC' position.
The '1 Hz' position should only be used to accommodate for solenoids or relays that could stay energized by the negative earth voltage.
The '1/4 Hz' position can be used for locating earth faults. Locating earth faults requires a current clamp (e.g. the DCM300E digital clamp from AVO International).

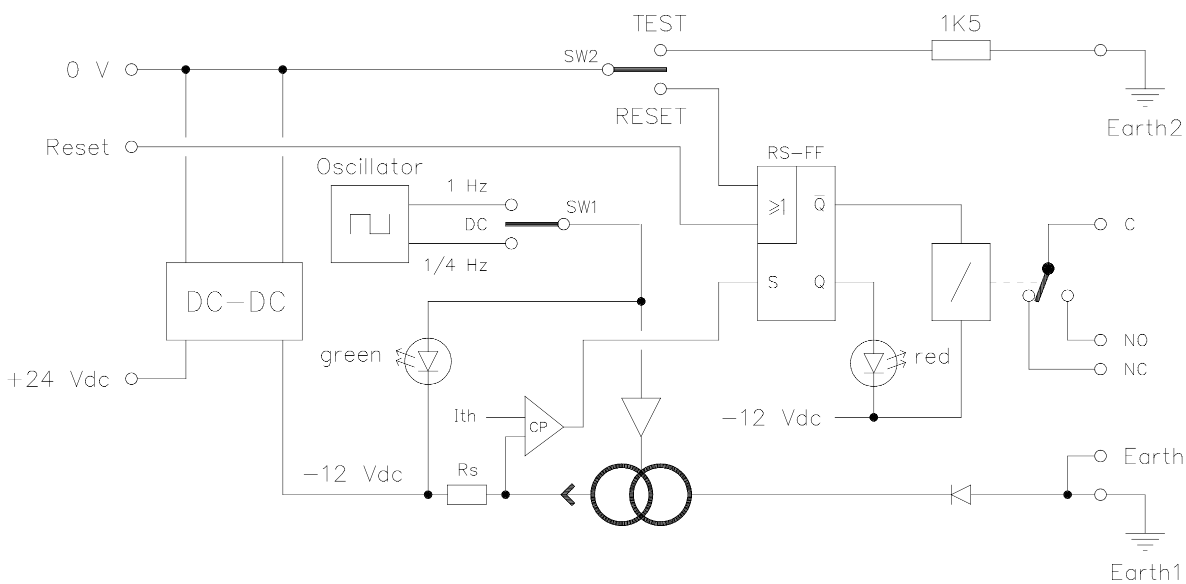


Figure 2 Block diagram of 10310/1/1 ELD

An earth fault sets the flip-flop (FF), and de-energizes the relay (see Figure 2). The flip-flop remains set until a reset is given. This can be done in two ways:

- manually (by setting switch 2 to 'RESET' position), or
- by a high level at the reset input.

The ELD module can be tested by connecting a 1.5 kOhm resistor between 0 V and earth. This should set the flip-flop. A 1.5 kOhm resistor in the ELD with its own connection to earth (on the Earth2 pin) allows testing of the ELD and the earth connection (switch 2 in

'TEST' position). A disconnected Earth1-to-Earth2 link will block the flip-flop set action (because no earth current is flowing).
By placing a link between Earth 1 and Earth 2, only one earth wire is required. However, a fault in this wire will not be detected during test (see Figure 4).

Earth fault for digital inputs

An earth fault to an input wire with an open field contact (10101/2/.) can only be detected if the 10101/A/1 digital input reverse diode module is used. For details refer to this module's data sheet.

Connection examples

The figures below show two connection examples of the 10310/1/1 ELD module.

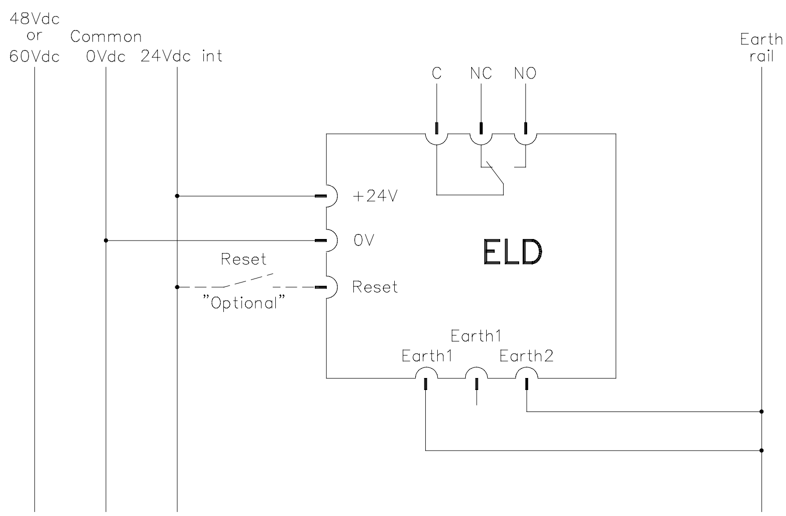


Figure 3 24 Vdc with 48 Vdc or 60 Vdc monitoring

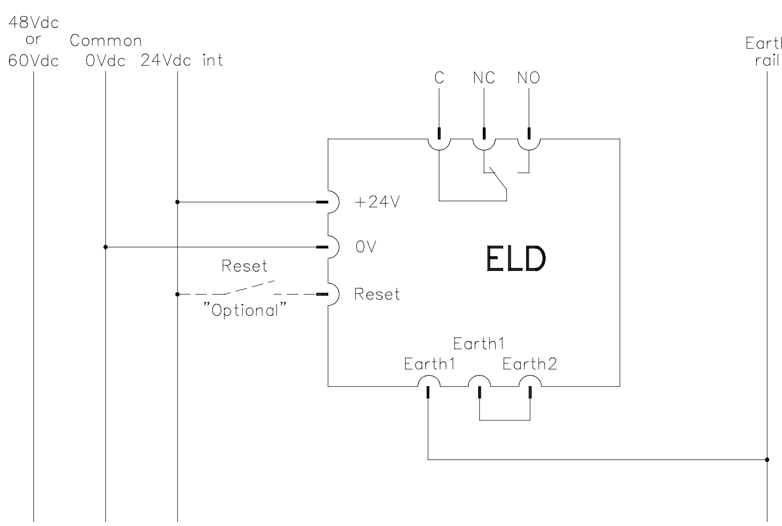


Figure 4 ELD with single earth wire

Technical data

The 10310/1/1 module has the following specifications:

General	Type number:	10310/1/1 09700
	Approvals:	CE
Power	Supply voltage:	24 Vdc (max. 30 Vdc)
	Supply current:	max. 60 mA
	Reset input voltage:	18...70 Vdc
	Reset input current:	1.1 mA at 24 Vdc
Earth	Earth voltage:	–12 Vdc (no earth fault) –30...+70 Vdc (earth fault)
	Earth fault threshold:	5.5 mA (± 1 mA)
	Max. earth current:	25.0 mA (± 5 mA)
	Tightening torque of earth connections:	1 Nm (0.74 ft-lb)
Physical	Dimensions:	70 x 45 x 110 mm (L x W x H) 2.76 x 1.77 x 4.33 in (L x W x H)
	DIN EN rails:	TS35 x 7.5
	Used rail length:	max. 46 mm (1.81 in)
Output contact	Max. output voltage:	115 Vdc
	Max. output current:	2 A
Relay contact	Initial contact resistance:	30 mOhm
	Max. current:	5 A
	Max. switched voltage:	250 Vdc / 250 Vac
	Max. switched load:	100 W / 1000 VA
	Expected life:	
	– electrical	100,000 switch operations
	– mechanical	200,000,000 switch operations
	Ambient temperature:	–55°C to +65°C (–67°F to +149°F)

10310/2/1 Earth leakage detector (ELD)

Description

The 10310/2/1 module is an earth leakage detector (ELD) for 24 Vdc systems. It has a manually operated self-test and earth connection monitor (switch 2 in 'TEST' position).
The ELD can be used to monitor:

- 24 Vdc, 48 Vdc and/or 60 Vdc systems (see Figure 3), or
- 110 Vdc systems (see Figure 4).

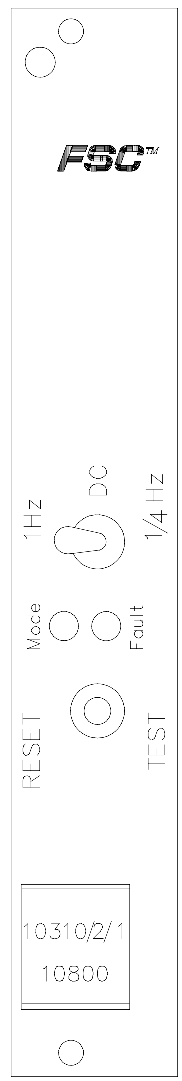


Figure 1 Front view

The ELD module connects earth level with –12 Vdc (referenced to the 0 V connection of the 24, 48, 60 and/or 110 Vdc supply). This connection is:

- continuous (switch 1 in 'DC' position), or
- interrupting at 1 Hz (switch 1 in '1 Hz' position), or
- interrupting at 0.25 Hz (switch 1 in '1/4 Hz' position).

With switch 1 in the '1 Hz' or '1/4 Hz' position, the green 'MODE' LED on the module front flashes at the selected connection frequency.

Switch 1 is normally used in the 'DC' position.
The '1 Hz' position should only be used to accommodate for solenoids or relays that could stay energized by the negative earth voltage.
The '1/4 Hz' position can be used for locating earth faults. Locating earth faults requires a current clamp (e.g. the DCM300E digital clamp from AVO International).

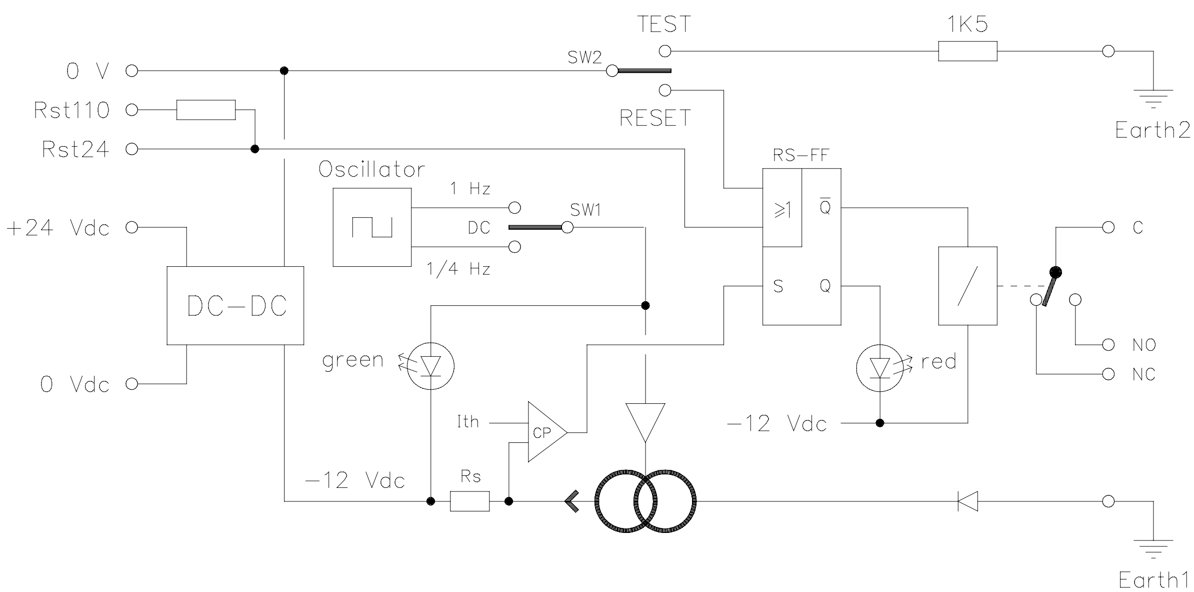


Figure 2   Block diagram of 10310/2/1 ELD

An earth fault sets the flip-flop (FF), and de-energizes the relay (see Figure 2). The flip-flop remains set until a reset is given. This can be done in three ways:

- manually (by setting switch 2 to 'RESET' position), or
- by a high level at the Rst24 input, or
- by a high level at the Rst110 input.

The ELD module can be tested by connecting a 1.5 kOhm resistor between 0 V and earth. This should set the flip-flop. A 1.5 kOhm resistor in the ELD with its own connection to earth (on the Earth2 pin) allows testing of the ELD and the earth connection (switch 2 in 'TEST' position). A disconnected Earth1-to-Earth2 link will block the flip-flop set action (because no earth current is flowing).

Earth fault for digital inputs

An earth fault to an input wire with an open field contact (10101/2/.) can only be detected if the 10101/A/1 digital input reverse diode module is used. For details refer to this module's data sheet.

Connection examples

The figures below show two connection examples of the 10310/2/1 ELD module.

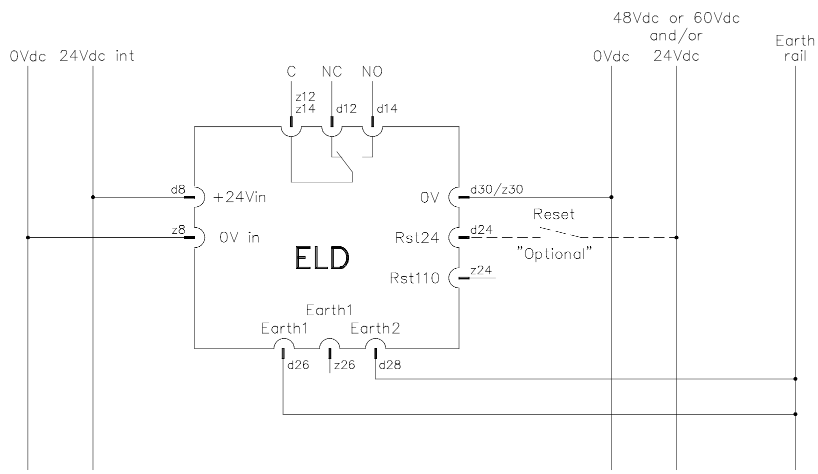


Figure 3 24 Vdc with 48 Vdc and/or 60 Vdc monitoring

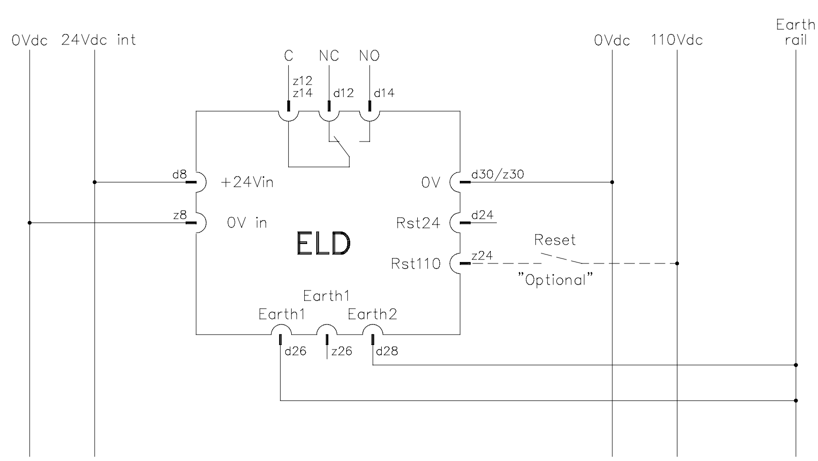
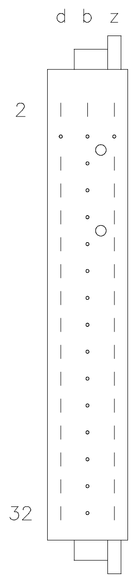


Figure 4 110 Vdc monitoring

Pin allocation

The back view and pin allocation of the 10310/2/1 module connector are as follows:



d2		b2	z2	
d4	–		z4	–
d6			z6	
d8	+24 Vin		z8	0 Vin
d10			z10	
d12	NC		z12	C
d14	NO		z14	C
d16			z16	
d18			z18	
d20			z20	
d22			z22	
d24	Rst24		z24	Rst110
d26	Earth 1		z26	Earth 1
d28	Earth 2		z28	
d30	0 V		z30	0 V
d32			z32	

Technical data

The 10310/2/1 module has the following specifications:

General

Type number:	10310/2/1 10800
Approvals:	CE, UL

Power

Supply voltage:	24 Vdc (max. 30 Vdc)
Supply current:	max. 60 mA
Rst24 input voltage:	18...70 Vdc
Rst110 input voltage:	40...130 Vdc
Rst24 input current:	1.1 mA at 24 Vdc
Rst110 input current:	2.5 mA at 110 Vdc

Earth

Earth voltage:	–12 Vdc (no earth fault) –30...+125 Vdc (earth fault)
Earth fault threshold:	5.5 mA (± 1 mA)
Max. earth current:	25.0 mA (± 5 mA)

Technical data (continued)

Output contact	Max. output voltage:	115 Vdc
	Max. output current:	2 A
Relay contacts	Initial contact resistance:	30 mOhm
	Max. current:	5 A
	Max. switched voltage:	250 Vdc / 250 Vac
	Max. switched load:	100 W / 1000 VA
	Expected life:	
	– electrical	100,000 switch operations
	– mechanical	200,000,000 switch operations
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A5, A11
	Rack code:	
	– large pins	A5, A11

Left blank intentionally.

10311/2/1 Dual key switch module

Description

The 10311/2/1 module provides a Watchdog Reset key switch and a Force Enable key switch. Both key switches require different keys. However, the WD Reset keys and Force Enable keys of different 10311/2/1 modules are identical.

The Watchdog Reset key switch has three make contacts. It can only be removed in the open (i.e. horizontal) position. The switch is used for watchdog reset and fault reset.

The Force Enable key switch has one potential-free make contact. The key can be removed in both the open (i.e. horizontal) position and the closed (i.e. vertical) position. The enabled state of the Force Enable key switch is indicated by a red LED on the module front (underneath the switch). The switch is used to enable or disable forcing of the input and output signals, which is software-controlled.

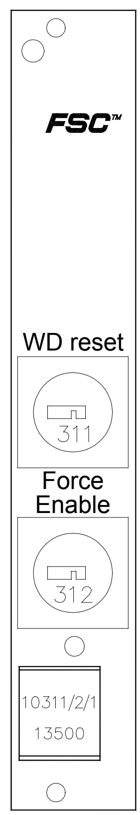


Figure 1 Module front

Block diagram

Figure 2 below shows the block diagram for the 10311/2/1 module:

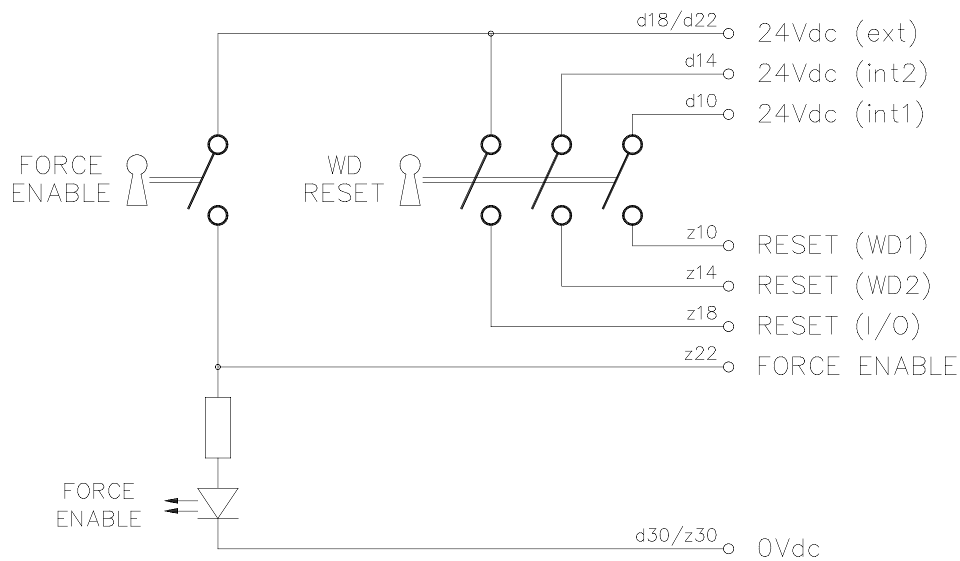


Figure 2 Block diagram

Technical data

The 10311/2/1 module has the following specifications:

General	Type number:	10311/2/1 13500
	Approvals:	CE, UL, TÜV
	Software versions:	not applicable
	Space requirements:	4 TE, 3 HE (= 4 HP, 3U)
LED	Current consumption:	typically 5 mA at 24 Vdc; reverse polarity protected
Key switch contact	Maximum voltage:	36 Vdc
	Maximum current:	2 A
Key coding	(See 'Key coding' data sheet)	
	Module code:	
	– holes	A5, A13
	Rack code:	
	– large pins	A5, A13

Left blank intentionally.

10313/1/1 5 Vdc & watchdog distribution module

Description

The 10313/1/1 module is used for the distribution of 5 Vdc and watchdog (WD) signals in the FSC system.

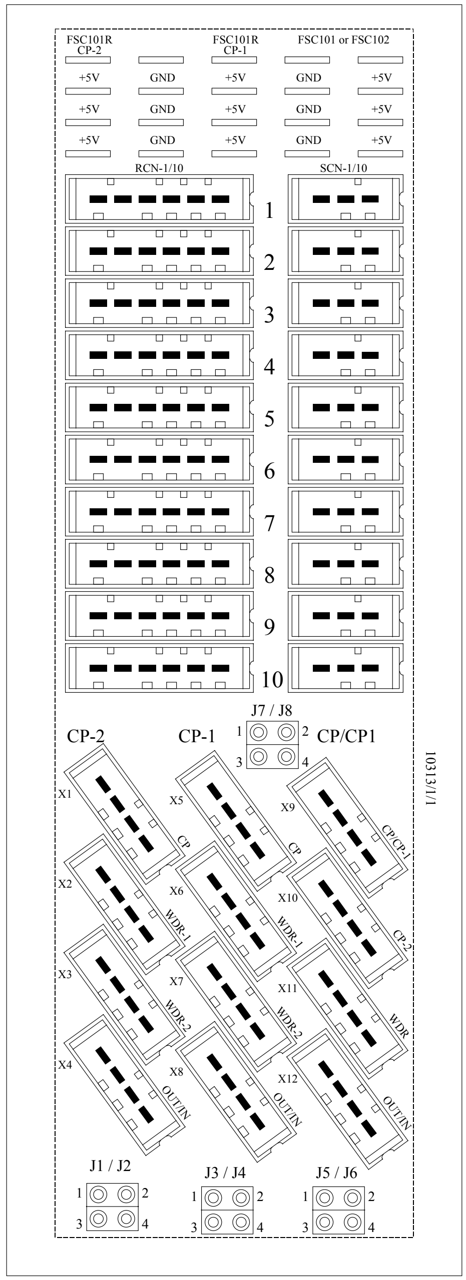


Figure 1 Top view

The module has a universal snap-in facility for standard DIN EN rails.

Connections

The connection diagram of the 10313/1/1 module is as follows:

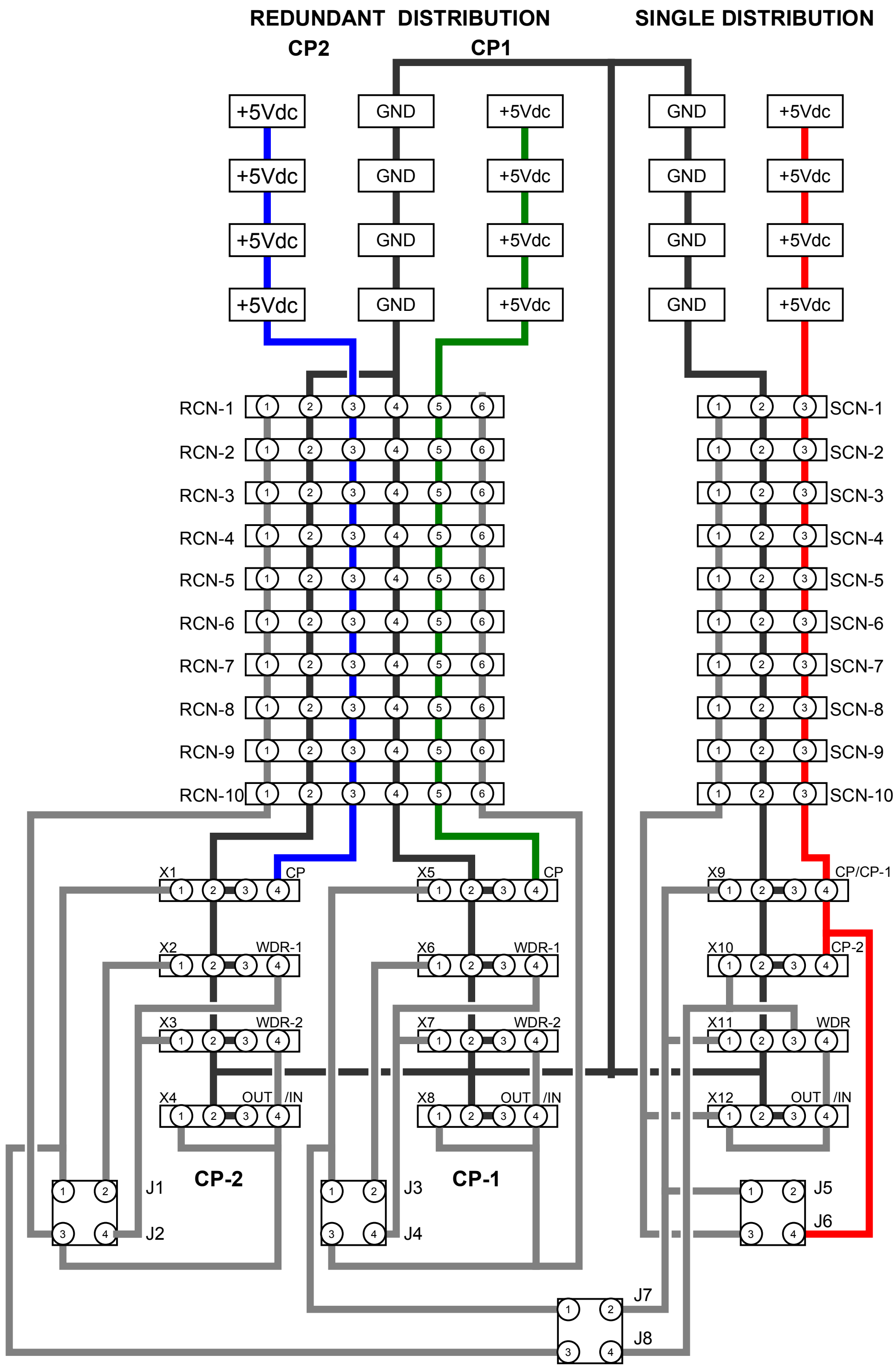


Figure 2 Connection diagram

The 10313/1/1 module has the following connection facilities (see Figure 1 and Figure 2):

- ten connectors (RCN-1 to RCN-10) for connecting redundant I/O backplanes (10315/1/1) (see Figure 3),
- ten connectors (SCN-1 to SCN-10) for connecting non-redundant I/O backplanes (10314/1/1) (see Figure 4),
- 'FSC101 or FSC102' fastons for the incoming 5 Vdc power (for non-redundant I/O backplanes),
- 'FSC101R CP-1' and 'FSC101R CP-2' fastons for the incoming 5 Vdc power (for redundant I/O backplanes),
- connectors for directly connecting the watchdog repeaters (WDRs),
- connectors for directly connecting the 10005/O/2 WD horizontal buses, and
- connectors for linking an additional 10313/1/1 module in a separate cabinet (next 'section').

Pin connections

RCN-x

Figure 3 below shows the pin connections of the RCN-x connectors, which are used to connect redundant I/O backplanes.

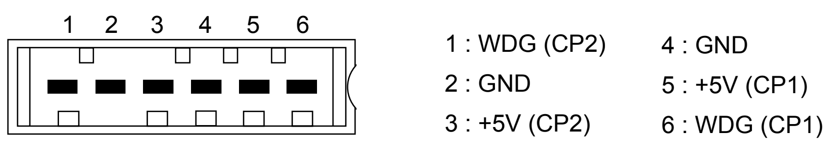


Figure 3 Pin connections of RCN-x

SCN-x

Figure 4 below shows the pin connections of the SCN-x connectors, which are used to connect non-redundant I/O backplanes.

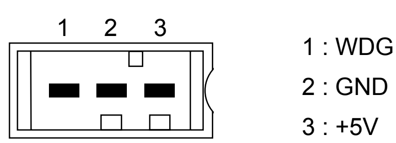


Figure 4 Pin connections of SCN-x

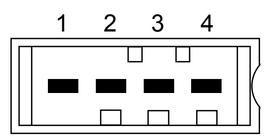
10005/O/2
WD horizontal bus

Table 1 below shows the connectors that are used to connect 10005/O/2 WD horizontal bus, depending on the system configuration.

Table 1 Connectors used to connect 10005/O/2 WD horizontal bus

System configuration		Connectors used on 10313/1/1 module
Central Part(s)	**I/O**	
Non-redundant	Non-redundant	'CP/CP-1' connector (X9)
Redundant	Non-redundant	'CP/CP-1' and 'CP-2' connectors (X9 and X10)
Redundant	Redundant	'CP' connectors of CP-1 and CP-2 (X1 and X5)
Redundant	Redundant & Non-redundant	'CP' connectors of CP-1 and CP-2 (X1 and X5)

Figure 5 below shows the pin connections of these connectors.



1 : WDG
2 : GND
3 : GND
4 : +5V

Figure 5 Pin connections of 'CP' and 'CP/CP-1' connector

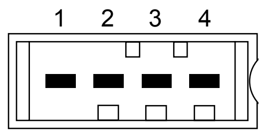
Watchdog repeaters

Table 2 below shows the connectors that are used to connect watchdog repeaters, depending on the system configuration.

Table 2 Connectors used to connect watchdog repeaters

System configuration		Connectors used on 10313/1/1 module
I/O	**Watchdog**	
Redundant	1st watchdog repeater	'WDR-1' connectors (X2 and X6)
	2nd watchdog repeater	'WDR-2' connectors (X3 and X7)
Non-redundant	one watchdog repeater	'WDR' connector (X11)

Figure 6 on the next page shows the pin connections of these connectors.

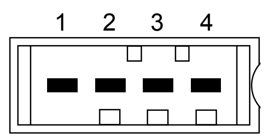


1 : WDG (1)
2 : GND
3 : WDG (2)
4 : WDROUT

Figure 6 Pin connections of 'WDR', 'WDR-1' and 'WDR-2' connectors

Additional 10313/1/1 modules

The 'OUT/IN' connectors (X4, X8 and X12) are used to link an additional 10313/1/1 module in a separate cabinet (next 'section'). Figure 7 shows the pin connections of these connectors.



1 :
2 : GND
3 : GND
4 : WDG

Figure 7 Pin connections of 'OUT/IN' connectors

Connectors used for various configurations

Table 3 below provides an overview of the connectors that may be used for the various FSC configurations:

Table 3 Use of connectors on 10313/1/1 module

System configuration		Connectors on 10313/1/1 module		
Central Part(s)	I/O	'RCN'	'SCN'	'X'
Non-redundant	Non-redundant	–	1-10	X9, X11, X12
Redundant	Non-redundant	–	1-10	X9-X12
Redundant	Redundant	1-10	–	X1-X8
Redundant	Redundant & Non-redundant	1-10	1-10	X1-X8, X12

Application

Figure 8 shows an example of how to use the 10313/1/1 module for the 5 Vdc and watchdog distribution by using the system power interconnection cables:

- WD-01 cable, which connects the 10313/1/1 module to the non-redundant backplane 10314/1/1.
- WD-02 cable, which connects the 10313/1/1 module to the redundant backplane 10315/1/1.
- WDG-C cable, which connects the 10313/1/1 module to the 10005/O/2 watchdog horizontal bus.
- WD-WD cable, which connects the 10313/1/1 module to the 10313/1/1 module in the next section.
- WDR cable, which connects the 10313/1/1 module to the watchdog repeater 10302/2/1.

The concept diagram below shows the connections of a redundant configuration.

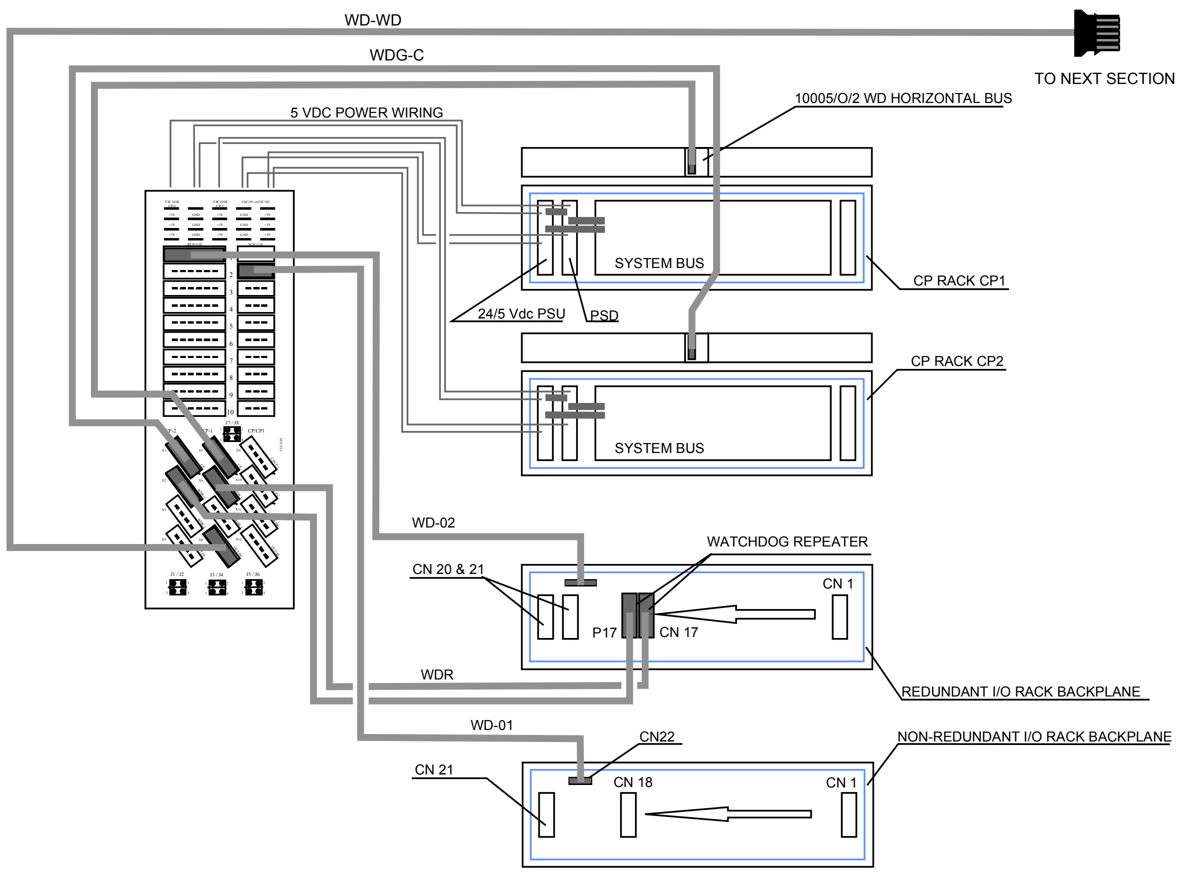


Figure 8 Concept diagram of 5 Vdc & watchdog distribution

Distribution examples

The following pages contain a number of distribution examples for the various FSC configurations. Each example has been subdivided into configurations that consist of one, two or three cabinets ('sections'). Each of the examples assumes that the Central Part racks are located in section 1.

Examples of the following configurations are given:

- Non-redundant Central Part and non-redundant I/O,
- Redundant Central Parts and non-redundant I/O,
- Redundant Central Parts and redundant I/O,
- Redundant Central Parts and redundant/non-redundant I/O,
- Redundant Central Parts, with redundant I/O in section 1 and non-redundant I/O in sections 2/3, and
- Redundant Central Parts, with redundant I/O in sections 1/2 and non-redundant I/O in section 3.

Example 1

Non-redundant Central Part and non-redundant I/O

The Central Part racks are located in section 1. Depending on the number of watchdog repeaters (WDRs) and the number of sections per FSC system, the following jumper settings must be made:

Error! Not a valid link.

	Section 1				
	Section 1				**Section 2**
	Section 1			**Section 2**	**Section 3**
Jumper:	**1x WDR**	**No WDR**	**with only +5V**	**No WDR**	**No WDR**
J1/J2	not placed	not placed	not placed	not placed	not placed
J3/J4	not placed	not placed	not placed	not placed	not placed
J5/J6	not placed	1 - 3	3 - 4	1 - 3	not placed
J7/J8	not placed	not placed	not placed	not placed	not placed

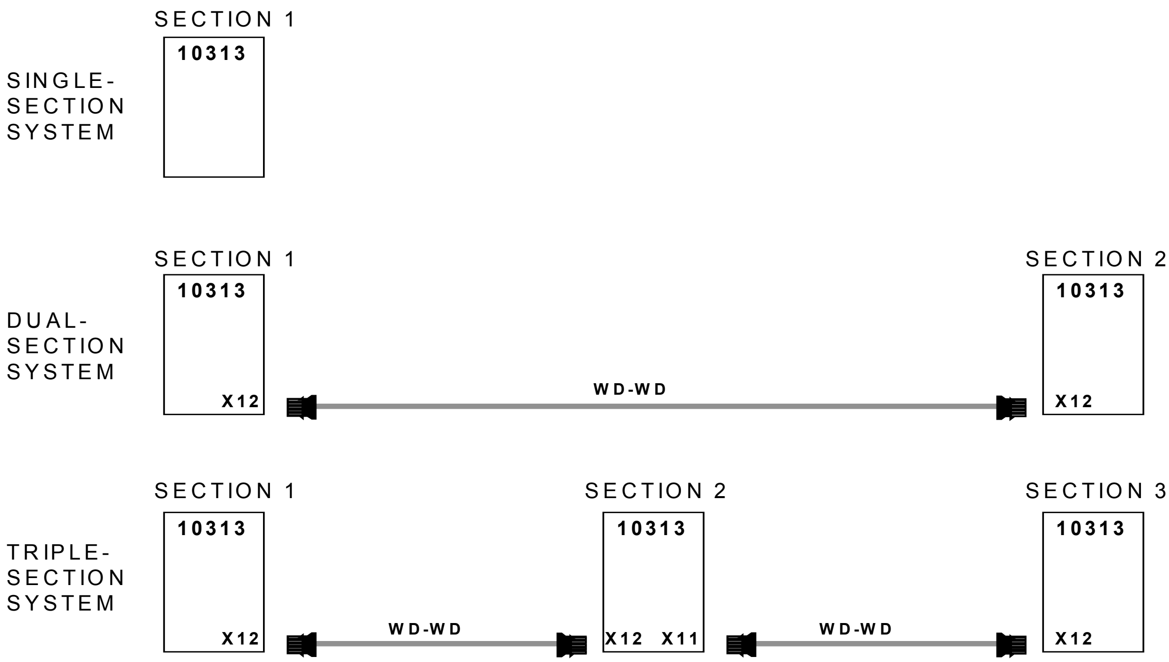
Function of jumper settings:

J5/J6 in section 1, setting 1-3:	to connect the WDG line to the I/O racks via the SCN connectors.
J5/J6 in section 1, setting 3-4:	to connect the 5 Vdc to the WDG lines of the I/O racks via the SCN connectors.
J5/J6 in section 2, setting 1-3:	to link the WDG line to section 3.

Example 2

Redundant Central Parts and non-redundant I/O

The Central Part racks are located in section 1. Depending on the number of watchdog repeaters (WDRs) and the number of sections per FSC system, the following jumper settings must be made:



	Section 1			
	Section 1			**Section 2**
	Section 1		**Section 2**	**Section 3**
Jumper:	**1x WDR**	**No WDR**	**No WDR**	**No WDR**
J1/J2	not placed	not placed	not placed	not placed
J3/J4	not placed	not placed	not placed	not placed
J5/J6	not placed	3 - 4	1 - 3	not placed
J7/J8	not placed	not placed	not placed	not placed

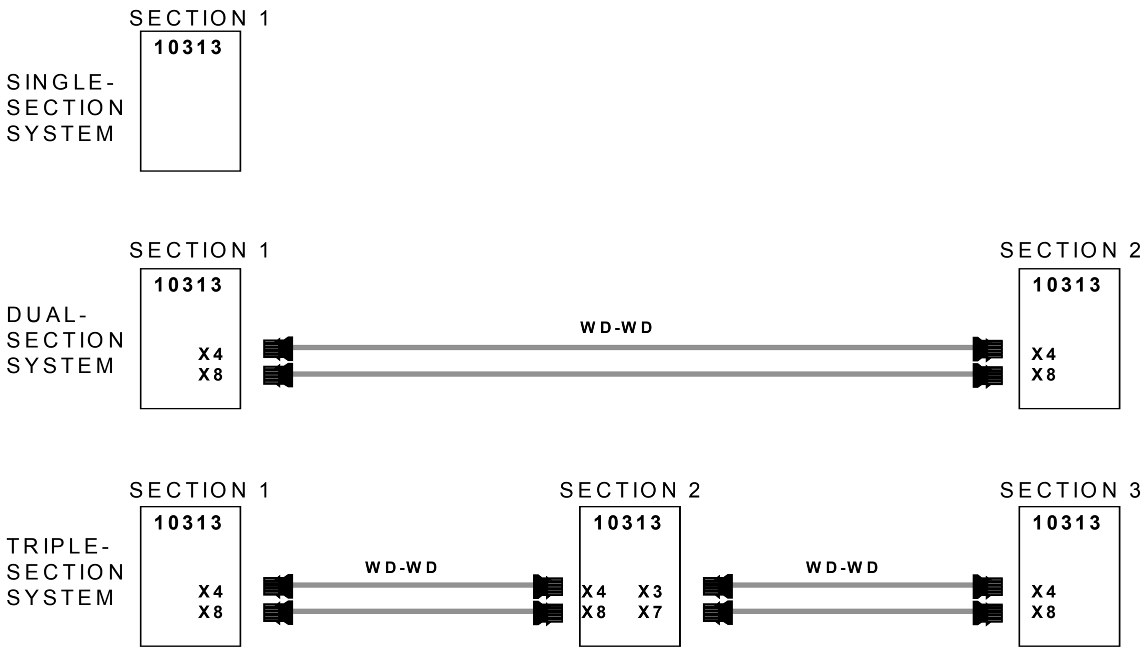
Function of jumper settings:

J5/J6 in section 1, setting 3-4:	to connect the 5 Vdc to the WDG lines of the I/O racks via the SCN connectors.
J5/J6 in section 2, setting 1-3:	to link the WDG line to section 3.

Example 3

Redundant Central Parts and redundant I/O

The Central Part racks are located in section 1. Depending on the number of watchdog repeaters (WDRs) and the number of sections per FSC system, the following jumper settings must be made:



	Section 1				
	Section 1				Section 2
	Section 1			Section 2	Section 3
Jumper:	**2x WDR**	**1x WDR**	**No WDR**	**No WDR**	**No WDR**
J1/J2	1 - 2	1 - 2 3 - 4	1 - 3	3 - 4	not placed
J3/J4	1 - 2	1 – 2 3 - 4	1 - 3	3 - 4	not placed
J5/J6	not placed	not placed	not placed	not placed	not placed
J7/J8	not placed	not placed	not placed	not placed	not placed

Note: 2 x WDR = 2 x redundant WDR pairs in the redundant I/O part.

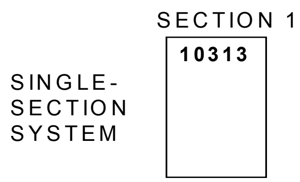
Function of jumper settings:

J1/J2 and J3/J4 in section 1, setting 1-2:	to connect the WDs from the central parts to the WDG inputs of the watchdog repeater module.
J1/J2 and J3/J4 in section 1, setting 3-4:	to connect the WDG outputs of the watchdog repeater module (if only one watchdog repeater module is used) to the WDG lines of the I/O racks via the RCN connectors.
J1/J2 and J3/J4 in section 1, setting 1-3:	to connect the WDG lines to the I/O racks via the RCN connectors.
J1/J2 and J3/J4 in section 2, setting 3-4:	to link the WDG lines to section 3.

Example 4

Redundant Central Parts and hybrid I/O, with redundant/non-redundant I/O in one section.

Depending on the number of watchdog repeaters (WDRs) and the number of sections per FSC system, the following jumper settings must be made:



Section 1

Section 1

Section 1

Jumper:	(2 + 1) x WDR	(1 + 1) x WDR	(0 + 1) x WDR	(0 + 0) x WDR
J1/J2	1 - 2	1 - 2 3 - 4	1 - 3	1 - 3
J3/J4	1 - 2	1 - 2 3 - 4	1 - 3	1 - 3
J5/J6	not placed	not placed	not placed	3 - 4
J7/J8	1 - 2 3 - 4	1 - 2 3 - 4	1 - 2 3 - 4	not placed

Note: (2 + 1) x WDR = 2 x redundant WDR pairs in the redundant I/O part and one WDR in non-redundant part.

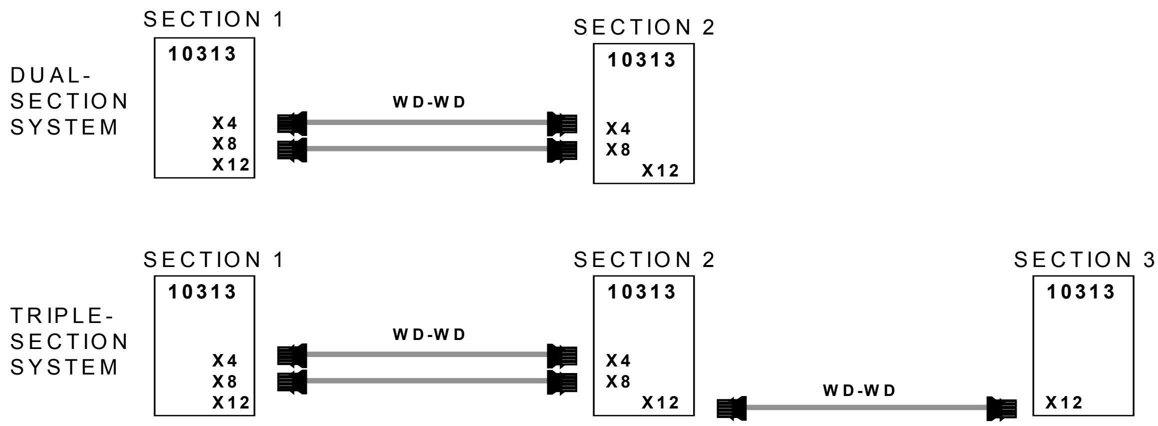
Function of jumper settings:

J1/J2 and J3/J4, setting 1-2:	to connect the WDs from the central parts to the WDG inputs of the watchdog repeater module.
J1/J2 and J3/J4, setting 3-4:	to connect the WDG outputs of the watchdog repeater module (if only one watchdog repeater module is used) to the WDG lines of the I/O racks via the RCN connectors.
J1/J2 and J3/J4 setting 1-3:	to connect the WDG lines to the I/O racks via the RCN connectors.
J5/J6, setting 3-4:	to link the WDG lines to the 5 Vdc.
J7/J8, setting 1-2/3-4	To connect the WDs from the central parts to the WDG input of the watchdog repeater module in the non-redundant I/O part.

Example 5

Redundant Central Parts and hybrid I/O, with redundant I/O in section 1, redundant/non-redundant I/O in section 2, and non-redundant I/O in section 3.

The Central Part racks are located in section 1. Depending on the number of watchdog repeaters (WDRs) and the number of sections per FSC system, the following jumper settings must be made:



	Section 1			Section 2		
	Section 1			**Section 2**		**Section 3**
Jumper:	**(2 +0) x WDR**	**(1 + 0) x WDR**	**(0 + 0) x WDR**	**(0 + 1) x WDR**	**(0 + 0) x WDR**	**(0 + 0) x WDR**
J1/J2	1 - 2	1 - 2 3 - 4	1 - 3	1 - 3	not placed	not placed
J3/J4	1 - 2	1 - 2 3 - 4	1 - 3	1 - 3	not placed	not placed
J5/J6	not placed	not placed	not placed	not placed	3 - 4	not placed
J7/J8	not placed	not placed	not placed	1 - 2 3 - 4	not placed	not placed

Note: (2 + 0) x WDR = 2 redundant WDR pairs in redundant I/O part and no WDR in non-redundant part.

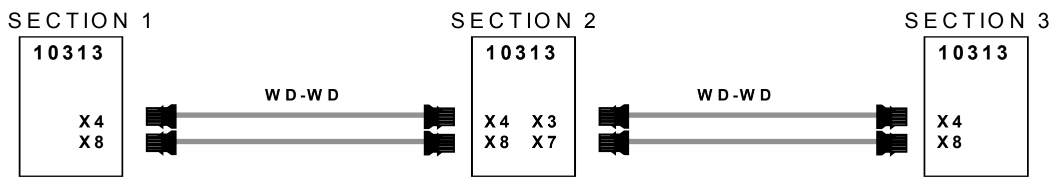
Function of jumper settings:

J1/J2 and J3/J4 in section 1, setting 1-2:	to connect the WDs from the central parts to the WDG inputs of the watchdog repeater module.
J1/J2 and J3/J4 in section 1, setting 3-4:	to connect the WDG outputs of the watchdog repeater module (if only one watchdog repeater module is used) to the WDG lines of the I/O racks via the RCN connectors.
J1/J2 and J3/J4 in section 1, setting 1-3:	to connect the WDG lines to the I/O racks via the RCN connectors.
J1/J2 and J3/J4 in section 2, setting 1-3:	to connect the WDs from the central parts to the WDG input of the watchdog repeater module in the non-redundant I/O part.
J5/J6 in section 2, setting 3-4:	to connect the WDG line to the 5 Vdc.
J7/J8 in section 2, setting 1-2/3-4:	to connect the WDs from the central parts to the WDG input of the watchdog repeater module in the non-redundant I/O part.

Example 6

Redundant Central Parts and hybrid I/O, with redundant I/O in sections 1/2 and redundant/non-redundant I/O in section 3.

The Central Part racks are located in section 1. Depending on the number of watchdog repeaters (WDRs) and the number of sections per FSC system, the following jumper settings must be made:



	Section 1			Section 2	Section 3	
Jumper:	**(2 +0) x WDR**	**(1 + 0) x WDR**	**(0 + 0) x WDR**	**(0 + 0) x WDR**	**(0 + 1) x WDR**	**(0 + 0) x WDR**
J1/J2	1 - 2	1 - 2 3 - 4	1 - 3	3 - 4	1 - 3	not placed
J3/J4	1 - 2	1 - 2 3 - 4	1 - 3	3 - 4	1 - 3	not placed
J5/J6	not placed	not placed	not placed	not placed	not placed	3 - 4
J7/J8	not placed	not placed	not placed	not placed	1 - 2 3 - 4	not placed

Note: (2 + 0) x WDR = 2 redundant WDR pairs in redundant I/O part and no WDR in non-redundant I/O part.

Function of jumper settings:

J1/J2 and J3/J4 in section 1, setting 1-2:	to connect the WDs from the central parts to the WDG inputs of the watchdog repeater module.
J1/J2 and J3/J4 in section 1, setting 3-4:	to connect the WDG outputs of the watchdog repeater module (if only one watchdog repeater module is used) to the WDG lines of the I/O racks via the RCN connectors.
J1/J2 and J3/J4 in section 1, setting 1-3:	to connect the WDG lines to the I/O racks via the RCN connectors.
J1/J2 and J3/J4 in section 2, setting 3-4:	to link WDG lines to section 3.
J1/J2 and J3/J4 in section 3, setting 1-3:	to connect the WDs from the central parts to the WDG input of the watchdog repeater module in the non-redundant I/O part.
J5/J6 in section 3, setting 3-4:	to connect the WDG line to the 5 Vdc.
J7/J8 in section 3, setting 1-2/3-4:	to connect the WDs from the central parts to the WDG input of the watchdog repeater module in the non-redundant I/O part.

Connectors

The connectors on the 10313/1/1 module are of make AMP.
The table below lists the items that should be used when handling the connectors:

Item	AMP description	AMP part no.
Receptacle housing:	3 POS. RECEPTACLE HOUSING	1-178288-3
	4 POS. RECEPTACLE HOUSING	1-178288-4
	6 POS. RECEPTACLE HOUSING	1-178288-6
Crimp pin type:	RECEPTACLE CONTACTS (on reel)	0-175195-2
	RECEPTACLE CONTACTS (loose pieces)	0-175217-2
Crimp tool for these pins:	HANDTOOL	0-914595-2
Extraction tool:	EXTRACTION TOOL	0-914677-1

Wire types

The following wire types can be used:
- 0.25 mm^2 (AWG 24), or
- 0.5 mm^2 (AWG 20).

Technical data

The 10313/1/1 module has the following specifications:

General	Type number:	10313/1/1 20701*
	Approvals:	CE, TÜV; UL approval pending
Power	Current consumption:	none (included in I/O module data sheets)
	Max. current on faston pin:	4 A
	Max. current on I/O connector pin:	2 A
Physical	Dimensions:	240 x 87 x 60 mm (L x W x H) 9.45 x 3.43 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	241 mm (9.49 in)

*** Note:**
10313/1/1 modules with suffix code 20700 have a different connector layout.

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07191/1/1 RS485 Communication Board

Description

The 07191/1/1 module is used for the distribution of RS485 Communication cabling inside FSC systems and communication networks.

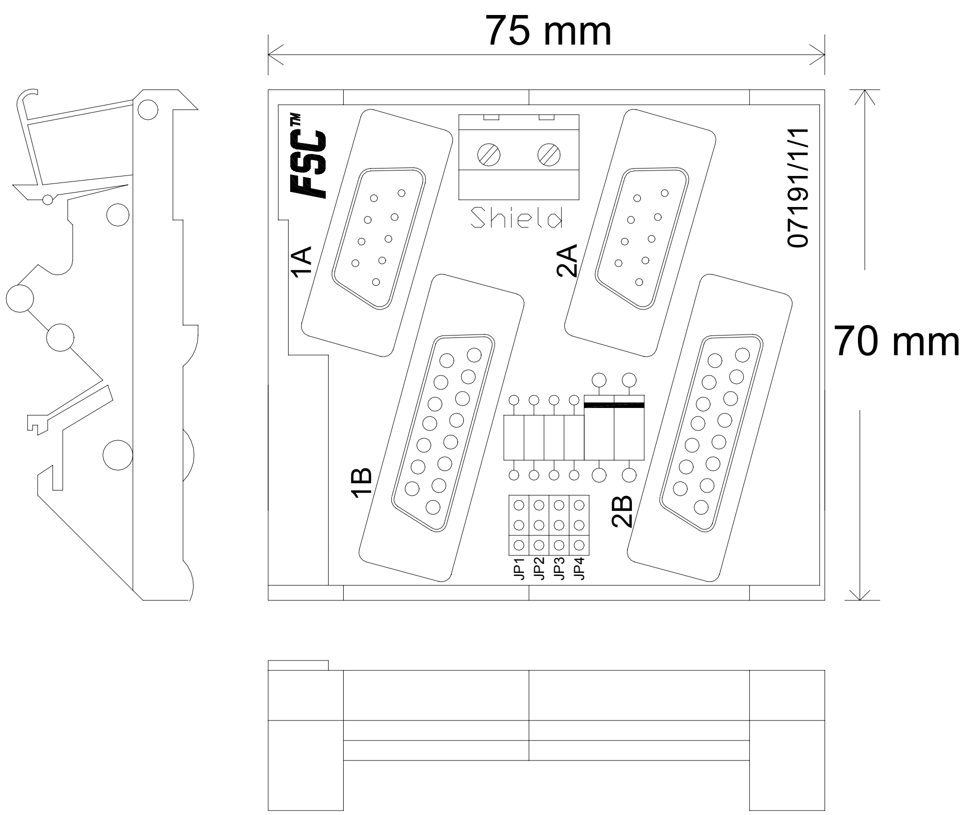

Figure 1 Top view

The module has a universal snap-in facility for standard DIN EN rails.

Connections

The connection diagram of the 07191/1/1 module is as follows:

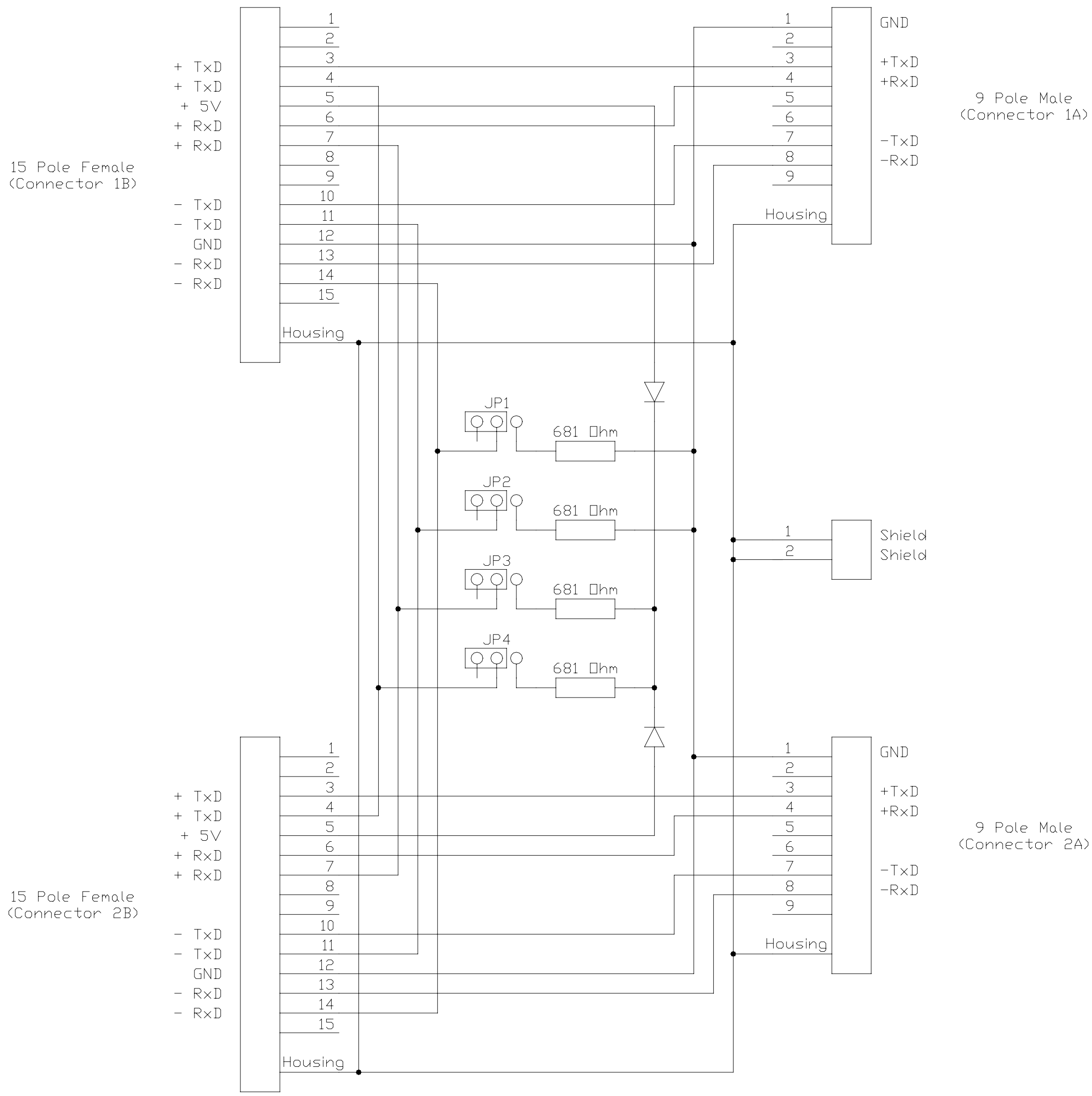

Figure 2 Connection diagram

Connectors

The 07191/1/1 module contains a number of connectors for connection of communication cables, By-pass connectors or End-of-Line Termination connectors.

Connector	Type	For connection of:
1A	9 pole Male	External RS 485 cable (IN), types **FS-CCE-485-xx/Lx** or **FS-CCE-485-FO-xx/Lx**, or End-of-Line Terminator type **FS-EOL-485-01**
2A	9 pole Male	External RS 485 cable (OUT), types **FS-CCE-485-xx/Lx** or **FS-CCE-485-FO-xx/Lx**, or End-of-Line Terminator type **FS-EOL-485-01**
1B	15 pole Female	Internal RS 485 cable to the Central part, type **FS-CCI-485-01**
2B	15 pole Female	Internal RS 485 cable to the Central part, type **FS-CCI-485-01**, or By-pass connector type **FS-BYP-485-01**

Jumpers

On the 07191/1/1 module four jumpers are installed. Jumper JP1, JP2, JP3 and JP4.

These jumpers shall be set in position ‘1’ if Pull-up and pull down resistors are required.

Ground connection

The chassis or safety ground shall be connected to the screw terminals (marked ‘Shield’ on the 07191/1/1 module) to comply with the EMC requirements.

The shields of the internal and external communication cables are connected to this ground connection.

Technical data

The 07191/1/1 module has the following specifications:

General	Type number:	07191/1/1 15000
Connectors	Connector type:	
	– 1A, 2A	male, 9 pins SUB-D
	– 1B, 2B	female, 15 pins SUB-D
Physical	Dimensions:	75 x 70 x 43 mm (L x W x H) 2.95 x 2.76 x 1.69 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	76 mm (2.99 in)

07192/1/1 RS232 Communication Board

Description

The 07192/1/1 module is used for the distribution of RS232 Communication cabling inside FSC systems and to external device.

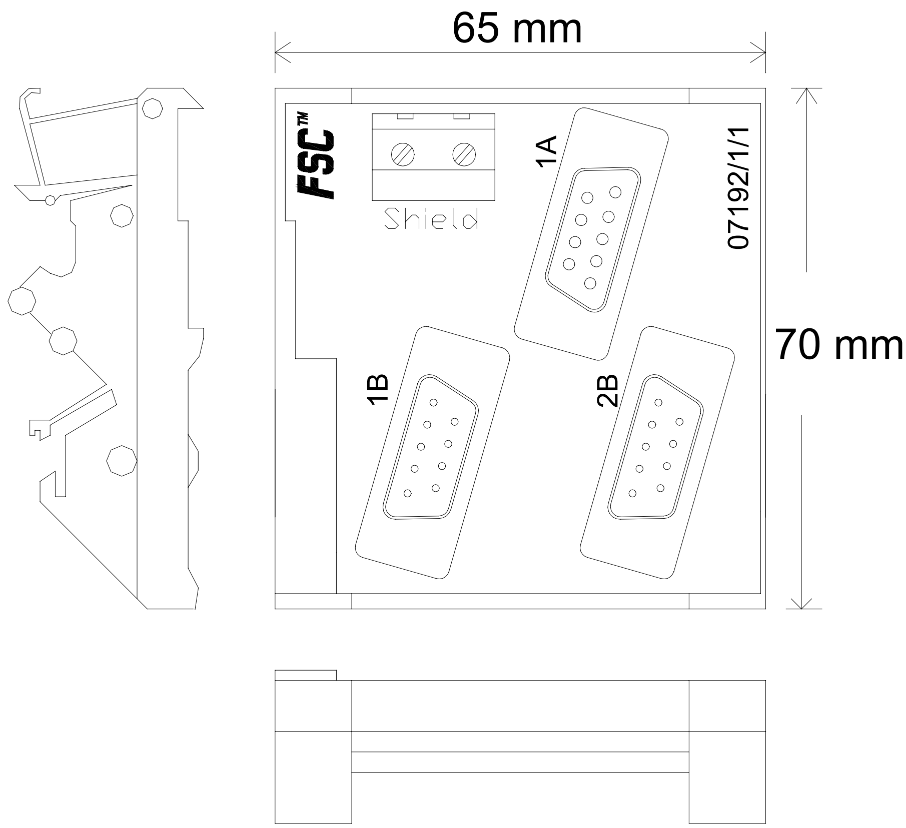

Figure 1 Top view

The module has a universal snap-in facility for standard DIN EN rails.

Connections

The connection diagram of the 07192/1/1 module is as follows:

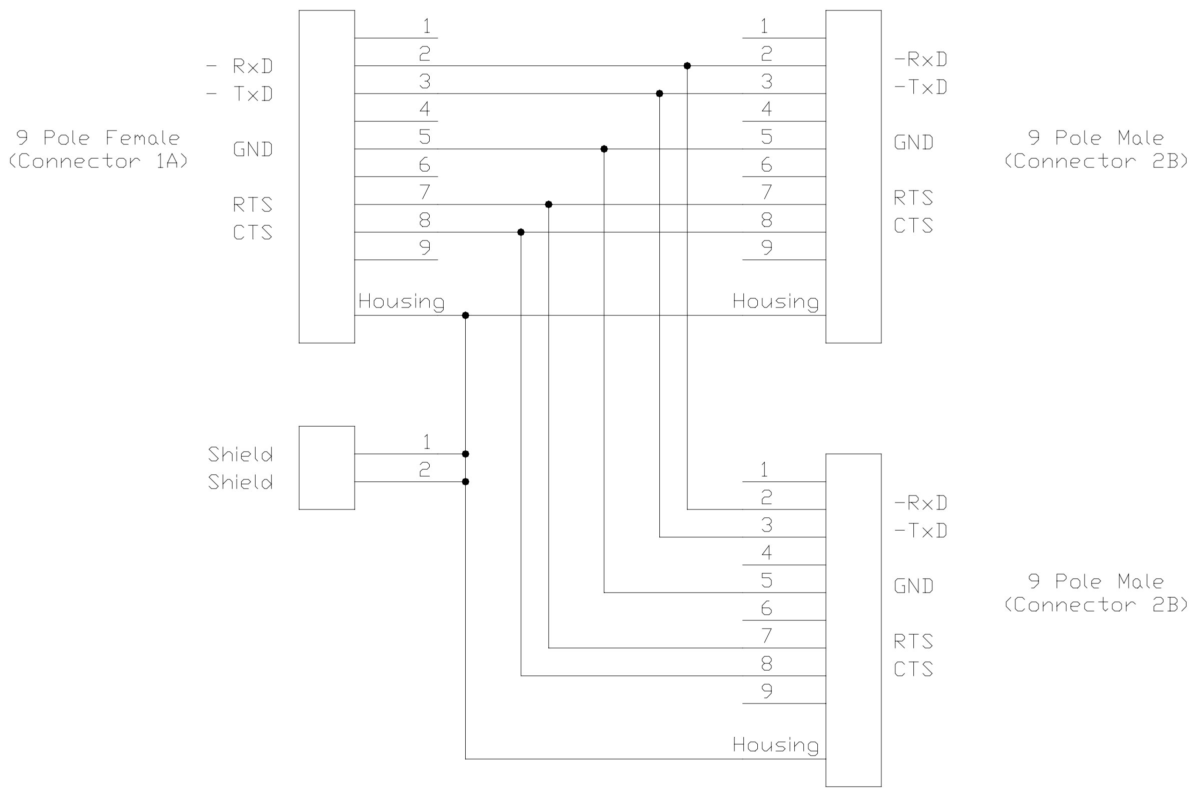

Figure 2 Connection diagram

Connectors

The 07192/1/1 module contains a number of connectors for connection of communication cables.

Connector	**Type**	**For connection of:**
1A	9 pole Female	External RS 232 cable, types **FS-CCE-232-xx/Lx**
1B	9 pole Male	Internal RS 232 cable to Central part 1, type **FS-CCI-232-01**
2B	9 pole Male	Internal RS 232 cable to Central part 2, type **FS-CCI-232-01**, or not connected.

Ground connection

The chassis or safety ground shall be connected to the screw terminals (marked ‘Shield’ on the 07192/1/1 module) to comply with the EMC requirements.

The shields of the internal and external communication cables are connected to this ground connection.

Technical data

The 07192/1/1 module has the following specifications:

General	Type number:	07192/1/1 15100
Connectors	Connector type:	
	– 1A	female, 9 pins SUB-D
	– 1B, 2B	male, 9 pins SUB-D
Physical	Dimensions:	65 x 70 x 43 mm (L x W x H) 2.56 x 2.76 x 1.69 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	66 mm (2.60 in)

Honeywell

Fail Safe Control
Hardware Manual

Section 8:
System Interconnection Cables

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Section 8: System Interconnection Cables

System interconnection cables (SICs)

Description

FSC I/O backplanes in FSC system cabinets need cabinet wiring to interface boards or terminals (e.g. FTAs). These interface boards or terminals may be located in the FSC cabinet or in cross-wiring cabinets next to the FSC cabinet.

There are three I/O signal wiring methods that can be used:

- **SIC-C:** I/O signal wiring using system interconnection cables (SIC) to field termination assembly (FTA) boards.
  For details on SIC-C cables refer to the 'System interconnection cables terminating on FTAs' data sheet.
- **SIC-P:** I/O signal wiring using system interconnection cables (SIC) to screw terminals.
  For details on SIC-P cables refer to the 'System interconnection cables terminating on crimp pins' data sheet.
- **Single wires:** I/O signal wiring using individual wires for each channel.
  For details on this method refer to the 'Single-wire connection method' data sheet.

Cable lengths

Table 1 below lists the standard lengths of the SIC cables. Other cable lengths are available on request.

Table 1 Standard lengths of SIC cables

meters	feet		meters	feet
2.5	8.2		12	39.4
3.25	10.7		15	49.2
4	13.1		20	65.6
5	16.4		25	82.0
6	19.7		30	98.4
8	26.2		40	131.2
10	32.8			

SIC-C

The wiring method that uses SIC cables terminating on FTAs (SIC-C) is shown in Figure 1. The SIC cables used in this method are fitted with connectors on both ends and are called SIC-C cables.

For details on SIC-C cables refer to the 'System interconnection cables terminating on FTAs' data sheet.

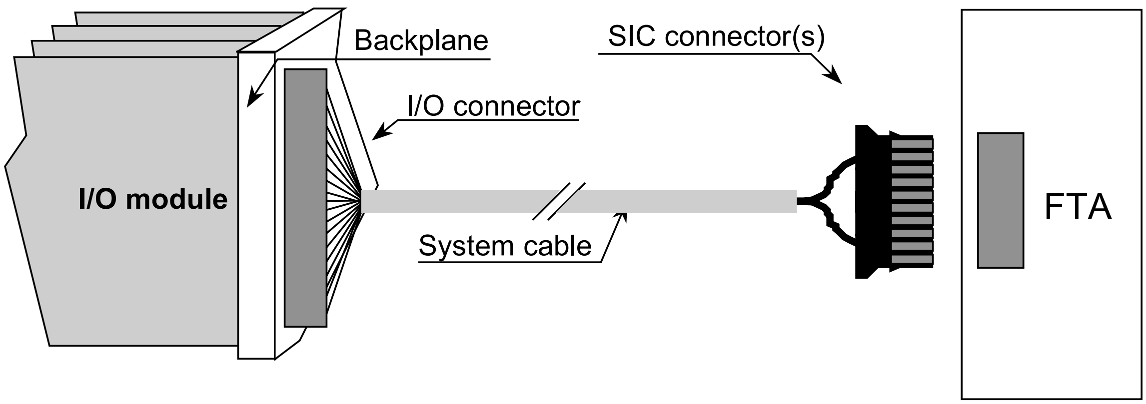

Figure 1 Principle of SIC-C connection method

SIC-P

The wiring method that uses SIC cables terminating on crimp pins is shown in Figure 2. The SIC cables used in this method are fitted with connector(s) on the I/O backplane side and with crimp pins on the other side. These cables are called SIC-P cables.

For details on SIC-P cables refer to the 'System interconnection cables terminating on crimp pins' data sheet.

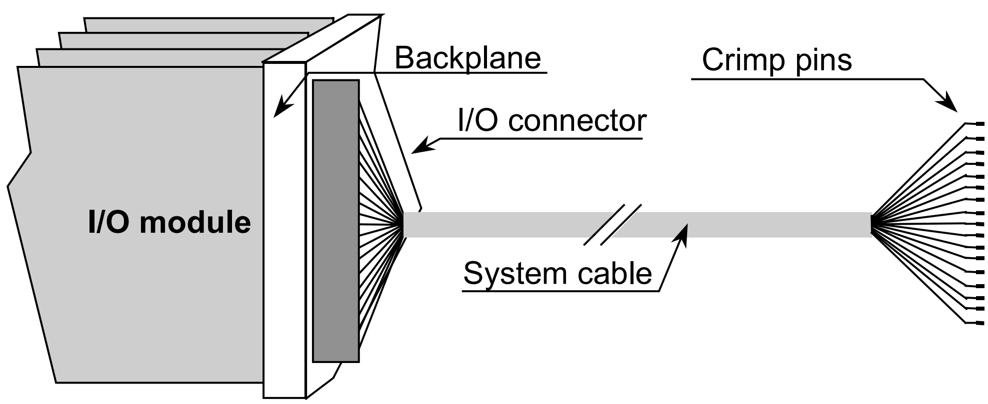

Figure 2 Principle of SIC-P connection method

Single wires

The single-wire connection method is shown in Figure 3.
This method involves separate production and assembly of each wire that is connected to the I/O connectors (CNx).

For details on the single-wire method refer to the 'Single-wire connection method' data sheet.

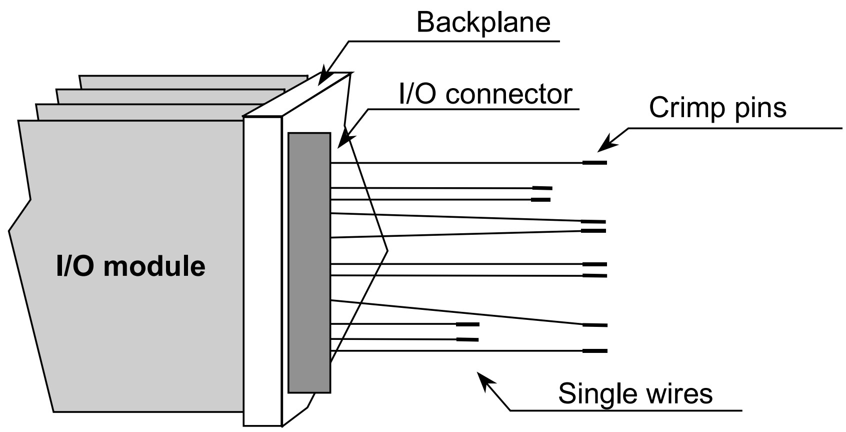

Figure 3 Principle of single-wire connection method

Applications

For application details for SIC-C cables refer to the 'SIC to FTA applications' data sheet.
For application details for SIC-P cables refer to the 'SIC to pin applications' data sheet.

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System interconnection cables terminating on FTAs (SIC-C)

Description

System interconnection cables with termination to field termination assemblies (SIC-C) are used to connect FSC I/O modules via an I/O backplane to FTAs (see Figures 2 to 6). These cables are called SIC-C cables and have one or more connectors at both ends.

This data sheet provides detailed information on the connections of the SIC-C cables.

Note:
For details on FSC input modules refer to section 5 of the FSC Hardware Manual ("FSC Input Modules").
For details on FSC output modules refer to section 6 of the FSC Hardware Manual ("FSC Output Modules").

Connection principle

The wiring method that uses SIC cables terminating on FTAs (SIC-C) is shown in Figure 1.

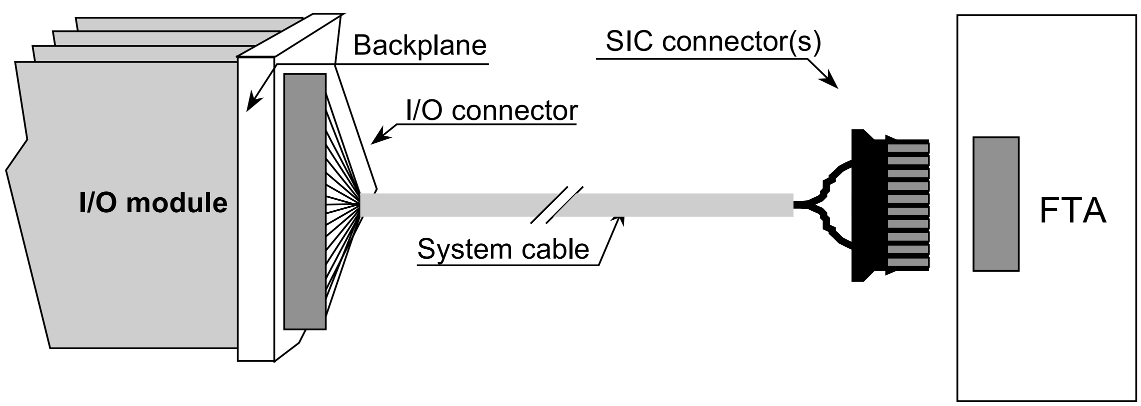

Figure 1 Principle of SIC-C connection method

Applications

For application details for SIC-C cables refer to the 'SIC to FTA applications' data sheet.

SIC-C cable types

SIC-C cables (i.e. SIC cables terminating in one or more connectors) are available in five layout types:

1) SIC-C cable with one I/O connector and one 20-pin FTA connector:

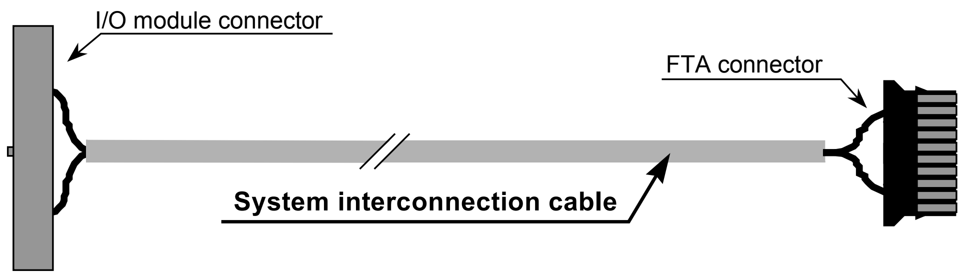

Figure 2 SIC-C cable, layout type 1

2) SIC-C cable with one I/O connector and one 10-pin FTA connector:

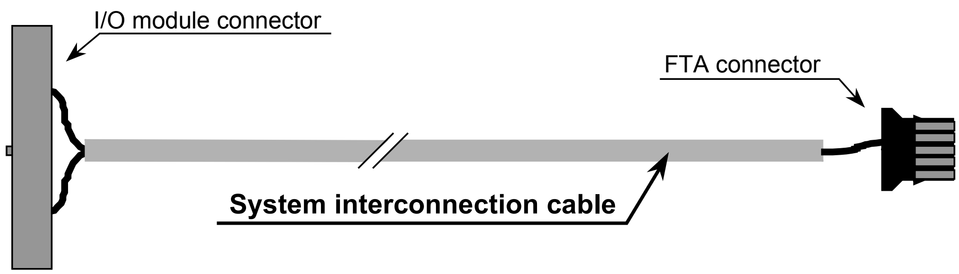

Figure 3 SIC-C cable, layout type 2

3) SIC-C cable with one I/O connector, one 10-pin FTA connector and two ferrites:

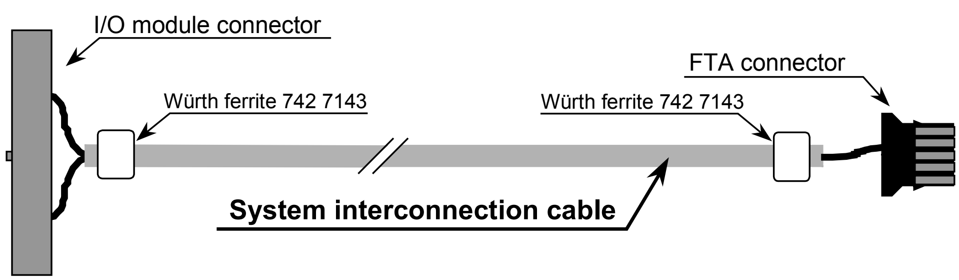

Figure 4 SIC-C cable, layout type 3

4) SIC-C cable with one I/O connector and two 10-pin FTA connectors (marked 'a' and 'b'):

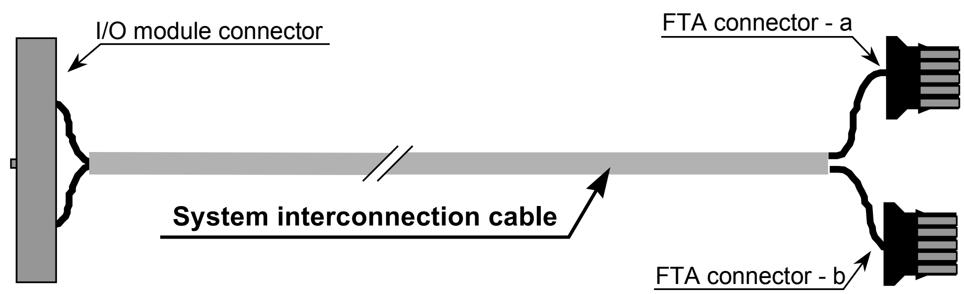

Figure 5 SIC-C cable, layout type 4

5) SIC-C cable with two I/O connectors (marked 'a' and 'b') and one 10-pin FTA connector:

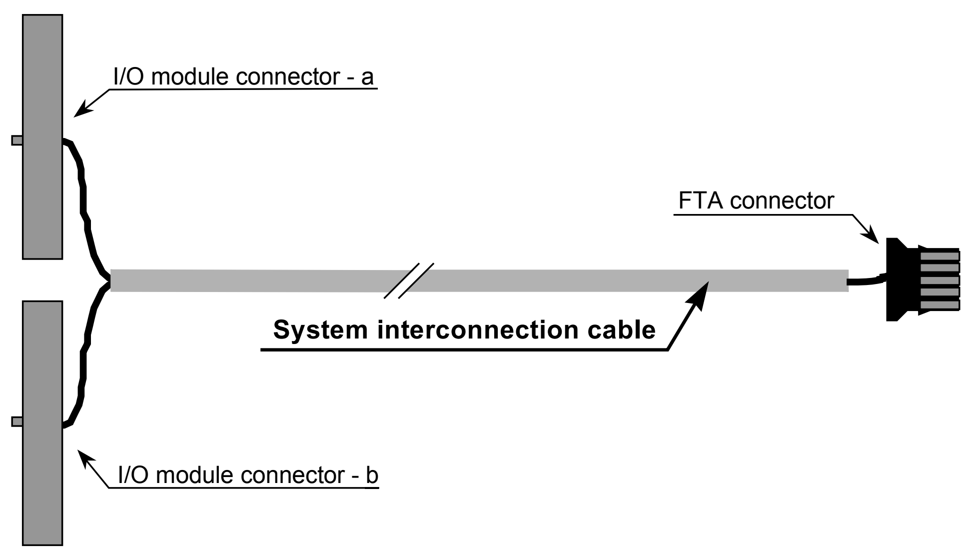

Figure 6 SIC-C cable, layout type 5

SIC-C cable characteristics

Table 1 below shows the available SIC-C cables with their main characteristics:

Table 1 Standard SIC-C cables

Cable model	Cable type	Outer diameter (nominal)	Cable layout (see fig. 2 to 6)
SIC-C-02/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	4
SIC-C-03/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	5
SIC-C-04/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	4
SIC-C-05/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	2
SIC-C-06/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	3
SIC-C-07/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	4
SIC-C-08/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	4
SIC-C-10/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	2
SIC-C-11/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	2
SIC-C-12/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	1

Usable wire types:
AWG 20 = 0.5 mm²

Explanation of cable type codes:
SIC-C-../Lx = Standard SIC-C cable with a standard length of x meters.
x = 2.5 m, 3.25 m, 4 m, 5 m, 6 m, 8 m, 10 m, 12 m, 15 m, 20 m, 25 m, 30 m, or 40 m.

SIC-C cable connections

The tables below list the available SIC-C cables with their connections:

Table 2 Standard SIC-C-02 cable

SIC-C-02/Lx	**Cable type : Outer diameter: Cable layout :**	**20 x AWG20 double shielded cable 9.93 mm / 0.39 inch Nominal Figure 5 SIC-C cable, layout type 4**	
10201/2/1 signal	10215/2/1 signal	I/O module connector pin	FTA connectors a and b pin
CH1+	CH1+	36	a-A5
CH1–	CH1–	33	a-B5
CH2+	CH1+	32	a-A4
CH2–	CH1–	29	a-B4
CH3+	CH2+	28	a-A3
CH3–	CH2–	25	a-B3
CH4+	CH2+	24	a-A2
CH4–	CH2–	21	a-B2
CH5+	CH3+	20	b-A5
CH5–	CH3–	17	b-B5
CH6+	CH3+	16	b-A4
CH6–	CH3–	13	b-B4
CH7+	CH4+	12	b-A3
CH7–	CH4–	9	b-B3
CH8+	CH4+	8	b-A2
CH8–	CH4–	5	b-B2

Table 3 Standard SIC-C-03 cable

SIC-C-03/Lx	**Cable type : Outer diameter: Cable layout :**	**10 x AWG20 double shielded cable 7.90 mm / 0.31 inch Nominal Figure 6 SIC-C cable, layout type 5**	
	10205/2/1 modules 1 and 2 signal	I/O module connectors a and b pin	FTA connector pin
	shield	41 a	B1
	1 CH1+	36 a	A5
	1 CH1–	33 a	B5
	1 CH2+	24 a	A4
	1 CH2–	21 a	B4
	2 CH1+	36 b	A3
	2 CH1–	33 b	B3
	2 CH2+	24 b	A2
	2 CH2–	21 b	B2

Table 4 Standard SIC-C-04 cable

SIC-C-04/Lx	Cable type : Outer diameter: Cable layout :	20 x AWG20 double shielded cable 9.93 mm / 0.39 inch Nominal Figure 5 SIC-C cable, layout type 4	
	10208/2/1 signal	I/O module connector pin	FTA connectors a and b pin
	CH1 c	40	a-A5
	CH1 no	37	a-B5
	CH2 c	36	a-A4
	CH2 no	33	a-B4
	CH3 c	32	a-A3
	CH3 no	29	a-B3
	CH4 c	28	a-A2
	CH4 no	25	a-B2
	CH5 c	24	a-A1
	CH5 no	21	a-B1
	CH6 c	20	b-A5
	CH6 no	17	b-B5
	CH7 c	16	b-A4
	CH7 no	13	b-B4
	CH8 c	12	b-A3
	CH8 no	9	b-B3
	CH9 c	8	b-A2
	CH9 no	5	b-B2
	CH10 c	4	b-A1
	CH10 no	1	b-B1
c = common	no = normally open		

Table 5 Standard SIC-C-05 cable

SIC-C-05/Lx	Cable type : Outer diameter: Cable layout :	10 x AWG20 double shielded cable 7.90 mm / 0.31 inch Nominal Figure 3 SIC-C cable, layout type 2	
10213/2/2 10213/2/3 signal	10216/2/1 10216/2/3 signal	I/O module connector pin	FTA connector pin
shield	shield	41	B1
CH1+	CH1+	32	A5
CH1–	CH1–	29	B5
CH2+	CH2+	24	A4
CH2–	CH2–	21	B4
CH3+	CH3+	16	A3
CH3–	CH3–	13	B3
CH4+	CH4+	8	A2
CH4–	CH4–	5	B2

Table 6 Standard SIC-C-06 cable

SIC-C-06/Lx	Cable type : 10 x AWG20 double shielded cable Outer diameter: 7.90 mm / 0.31 inch Nominal Cable layout : Figure 4 SIC-C cable, layout type 3		
	10102/2/1 signal	I/O module connector pin	FTA connector pin
	shield	41	B1
	CH1–	40	B5
	CH1+	37	A5
	CH2+	24	A4
	CH2–	21	B4
	CH3–	20	B3
	CH3+	17	A3
	CH4+	4	A2
	CH4–	1	B2

Table 7 Standard SIC-C-07 cable

SIC-C-07/Lx	Cable type : 20 x AWG20 double shielded cable Outer diameter: 9.93 mm / 0.39 inch Nominal Cable layout : Figure 5 SIC-C cable, layout type 4			
10101/2/. signal	10209/2/1 signal	10206/2/1 signal	I/O module connector pin	FTA connectors a and b pin
CH1	CH1	CH1	36	a-A5
CH2	CH2	CH2	33	a-B5
CH3	CH3	CH3	32	a-A4
CH4	CH4	CH4	29	a-B4
CH5	CH5	CH5	28	a-A3
CH6	CH6	CH6	25	a-B3
CH7	CH7	CH7	24	a-A2
CH8	CH8	CH8	21	a-A1
CH9	CH9	CH9	20	b-A5
CH10	CH10	CH10	17	b-B5
CH11	CH11	CH11	16	b-A4
CH12	CH12	CH12	13	b-B4
CH13	CH13	– Vext	12	b-A3
CH14	CH14	– Vext	9	b-B3
CH15	CH15	– Vext	8	b-A2
CH16	CH16	– Vext	5	b-A1
+ Vext	– Vext	– Vext	4	a-B1
+ Vext	– Vext	– Vext	1	b-B1

Table 8 Standard SIC-C-08 cable

SIC-C-08/Lx	**Cable type :** **Outer diameter:** **Cable layout :**	**20 x AWG20 double shielded cable** **9.93 mm / 0.39 inch Nominal** **Figure 5 SIC-C cable, layout type 4**
10101/2/. signal	I/O module connector pin	FTA connectors a and b pin
– Vext	40	a-B2
– Vext	37	b-B2
CH1	36	a-A5
CH2	33	a-B5
CH3	32	a-A4
CH4	29	a-B4
CH5	28	a-A3
CH6	25	a-B3
CH7	24	a-A2
CH8	21	a-A1
CH9	20	b-A5
CH10	17	b-B5
CH11	16	b-A4
CH12	13	b-B4
CH13	12	b-A3
CH14	9	b-B3
CH15	8	b-A2
CH16	5	b-A1

Table 9 Standard SIC-C-10 cable

SIC-C-10/Lx	**Cable type :** **Outer diameter:** **Cable layout :**	**10 x AWG20 double shielded cable** **7.90 mm / 0.31 inch Nominal** **Figure 3 SIC-C cable, layout type 2**	
	10201/2/1 signal	I/O module connector pin	FTA connector pin
	CH1+	36	A5
	CH2+	32	B5
	CH3+	28	A4
	CH4+	24	B4
	CH5+	20	A3
	CH6+	16	B3
	CH7+	12	A2
	CH8+	8	A1
	– Vext	4	B2
	– Vext	1	B1

Table 10 Standard SIC-C-11 cable

SIC-C-11/Lx	**Cable type : 10 x AWG20 double shielded cable** **Outer diameter: 7.90 mm / 0.31 inch Nominal** **Cable layout : Figure 3 SIC-C cable, layout type 2**		
	10213/2/1 signal	I/O module connector pin	FTA connector pin
	CH1+	32	B5
	CH1-	29	A5
	CH2+	24	A4
	CH2–	21	B4
	CH3+	16	B3
	CH3–	13	A3
	CH4+	8	A2
	CH4–	5	B2

Table 11 Standard SIC-C-12 cable

SIC-C-12/Lx	**Cable type : 20 x AWG20 double shielded cable** **Outer diameter: 9.93 mm / 0.39 inch Nominal** **Cable layout : Figure 2 SIC-C cable, layout type 1**			
10101/2/. signal	10105/2/1 signal	10106/2/1 signal	I/O module connector pin	FTA connector pin
	Shield		41	–
– Vext	0 Vdc	– Vext	40	A10
– Vext	0 Vdc	– Vext	37	B10
CH1	CH1	CH1	36	A9
CH2	CH2	CH2	33	B9
CH3	CH3	CH3	32	A8
CH4	CH4	CH4	29	B8
CH5	CH5	CH5	28	A7
CH6	CH6	CH6	25	B7
CH7	CH7	CH7	24	A6
CH8	CH8	CH8	21	B6
CH9	CH9	CH9	20	A5
CH10	CH10	CH10	17	B5
CH11	CH11	CH11	16	A4
CH12	CH12	CH12	13	B4
CH13	CH13	CH13	12	A3
CH14	CH14	CH14	9	B3
CH15	CH15	CH15	8	A2
CH16	CH16	CH16	5	B2
+ Vext	0 Vdc	+ Vext (8 Vdc)	4	A1
+ Vext	+ Vext/8	Earth	1	B1

System interconnection cables terminating on crimp pins (SIC-P)

Description

System interconnection cables with termination to crimp pins (SIC-P) are suitable for connection to screw terminals (see Figure 1). The SIC cables used in this method are fitted with one or more connectors on the I/O backplane side and crimp pins on the other side.
These cables are called SIC-P cables.

This data sheet provides detailed information on the connections of the SIC-P cables.

Note:
For details on FSC input modules refer to section 5 of the FSC Hardware Manual ("FSC Input Modules").
For details on FSC output modules refer to section 6 of the FSC Hardware Manual ("FSC Output Modules").

Connection principle

The wiring method that uses SIC cables terminating on crimp pins (SIC-P) is shown in Figure 1.

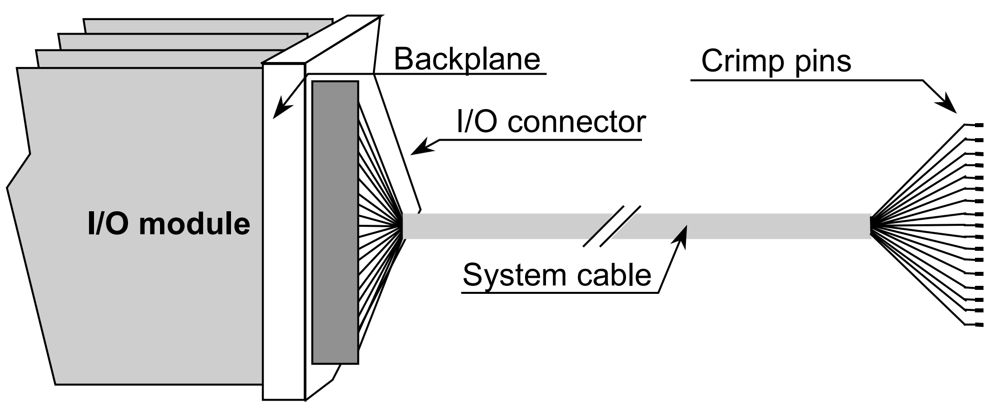

Figure 1 Principle of SIC-P connection method

Applications

For application details for SIC-P cables refer to the 'SIC to pin applications' data sheet.

SIC-P cable types

SIC-P cables (i.e. SIC cables terminating on individual crimp pins) are available in three layout types:

1) SIC-P cable with one I/O connector:

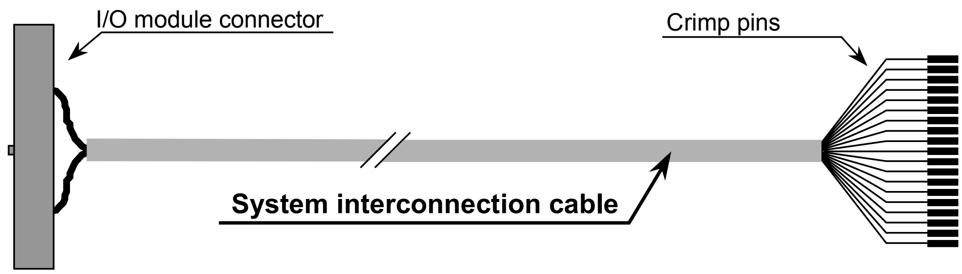

Figure 2 SIC-P cable, layout type 1

2) SIC-P cable with one I/O connector and two ferrites:

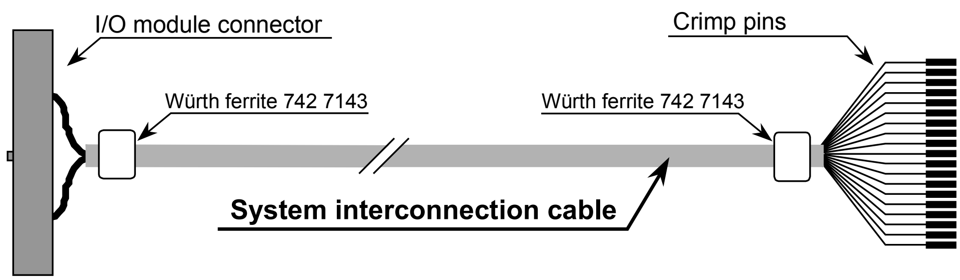

Figure 3 SIC-P cable, layout type 2

3) SIC-P cable with two I/O connectors (marked 'a' and 'b'):

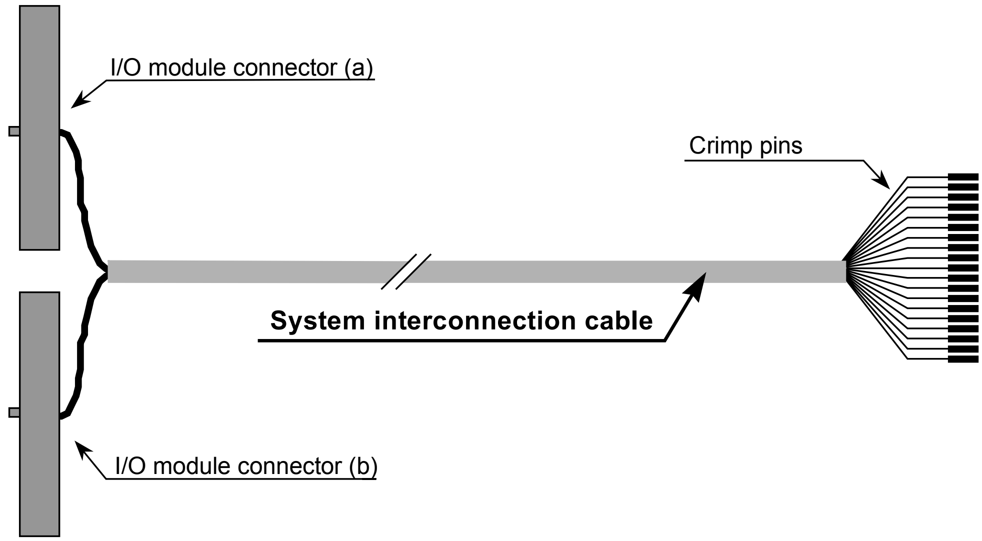

Figure 4 SIC-P cable, layout type 3

SIC-P cable characteristics

Table 1 below shows the available SIC-P cables with their main characteristics:

Table 1 Standard SIC-P cables

Cable model	Cable type	Outer diameter (nominal)	Cable layout (see fig. 2 to 4)
SIC-P-03/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	3
SIC-P-06/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	2
SIC-P-12/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	1

Usable wire types:
AWG 20 = 0.5 mm²

Explanation of cable type codes:
SIC-P-../Lx = Standard SIC-C cable with a standard length of x meters.
x = 2.5 m, 3.25 m, 4 m, 5 m, 6 m, 8 m, 10 m, 12 m, 15 m, 20 m, 25 m, 30 m, or 40 m.

SIC-P cable connections

The tables below list the available SIC-P cables with their connections:

Table 2 Standard SIC-P-03 cable

SIC-P-03/Lx	**Cable type : 10 x AWG20 double shielded cable** **Outer diameter: 7.90 mm / 0.31 inch Nominal** **Cable layout : Figure 4 SIC-P cable, layout type 3**		
	10205/2/1 modules 1 and 2 signal	I/O module connectors a and b pin	Color code crimp pin
	shield	41 a	Yellow / Green
	1 CH1+	36 a	White
	1 CH1–	33 a	Brown
	1 CH2+	24 a	Green
	1 CH2–	21 a	Yellow
	2 CH1+	36 b	Gray
	2 CH1–	33 b	Pink
	2 CH2+	24 b	Blue
	2 CH2–	21 b	Red

Table 3 Standard SIC-P-06 cable

SIC-P-06/Lx	**Cable type : 10 x AWG20 double shielded cable** **Outer diameter: 7.90 mm / 0.31 inch Nominal** **Cable layout : Figure 3 SIC-P cable, layout type 2**		
	10102/2/1 signal	I/O module connector pin	Color code crimp pin
	shield	41	Yellow / Green
	CH1–	40	Brown
	CH1+	37	White
	CH2+	24	Green
	CH2–	21	Yellow
	CH3–	20	Pink
	CH3+	17	Gray
	CH4+	4	Blue
	CH4–	1	Red

Table 4 Standard SIC-P-12 cable

SIC-P-12/Lx	**Cable type :**	**20 x 0.25 mm^2 (AWG 24), screened and shielded**									
	Outer diameter:	**9.90 (± 0.20) mm, 0.390 (± 0.008) in**									
	Cable layout :	**Figure 2 SIC-P cable, layout type 1**									
10101/2/. signal	10105/2/1 signal	10106/2/1 signal	10201/2/1 signal	10206/2/ signal	10208/2/1 signal	10209/2/1 signal	10215/2/1 signal	10213/2/. signal	10216/2/. signal	I/O module connector pin	Color code crimp pin
	Shield							Shield	Shield	41	Yellow / Green
– Vext	0 Vdc	– Vext			CH1 c					40	White
– Vext	0 Vdc	– Vext			CH1 no					37	Brown
CH1	CH1	CH1	CH1+	CH1	CH2 c	CH1	CH1+			36	Green
CH2	CH2	CH2	CH1-	CH2	CH2 no	CH2	CH1-			33	Yellow
CH3	CH3	CH3	CH2+	CH3	CH3 c	CH3	CH1+	CH1+	CH1+	32	Gray
CH4	CH4	CH4	CH2–	CH4	CH3 no	CH4	CH1–	CH1–	CH1–	29	Pink
CH5	CH5	CH5	CH3+	CH5	CH4 c	CH5	CH2+			28	Blue
CH6	CH6	CH6	CH3-	CH6	CH4 no	CH6	CH2-			25	Red
CH7	CH7	CH7	CH4+	CH7	CH5 c	CH7	CH2+	CH2+	CH2+	24	Black
CH8	CH8	CH8	CH4–	CH8	CH5 no	CH8	CH2-	CH2–	CH2–	21	Violet
CH9	CH9	CH9	CH5+	CH9	CH6 c	CH9	CH3+			20	Gray / Pink
CH10	CH10	CH10	CH5-	CH10	CH6 no	CH10	CH3–			17	Red / Blue
CH11	CH11	CH11	CH6+	CH11	CH7 c	CH11	CH3+	CH3+	CH3+	16	White / Green
CH12	CH12	CH12	CH6–	CH12	CH7 no	CH12	CH3–	CH3–	CH3–	13	Brown / Green
CH13	CH13	CH13	CH7+	– Vext	CH8 c	CH13	CH4+			12	White / Yellow
CH14	CH14	CH14	CH7-	– Vext	CH8 no	CH14	CH4–			9	Yellow / Brown
CH15	CH15	CH15	CH8+	– Vext	CH9 c	CH15	CH4+	CH4+	CH4+	8	White / Gray
CH16	CH16	CH16	CH8–	– Vext	CH9 no	CH16	CH4–	CH4–	CH4–	5	Gray / Brown
+ Vext	0 Vdc	+Vext (8Vdc)		– Vext	CH10 c	– Vext				4	White / Pink
+ Vext	+ Vext/8	Earth		– Vext	CH10 no	– Vext				1	Pink / Brown
c = common			no = normally open								

Single-wire connection method

Description

FSC I/O back planes in FSC system cabinets need cabinet wiring to interface boards or terminals (e.g. FTAs). If these interface boards or terminals are located in the FSC cabinet, then the single-wire connection method can be used.

This data sheet provides detailed information on the single-wire method.

Note:
For details on FSC input modules refer to section 5 ("FSC Input Modules") of the FSC Hardware Manual.
For details on FSC output modules refer to section 6 ("FSC Output Modules") of the FSC Hardware Manual.

Connection principle

The single-wire connection method is shown in Figure 1.
This method involves separate production and assembly of each wire that is connected to the I/O connectors (CNx).

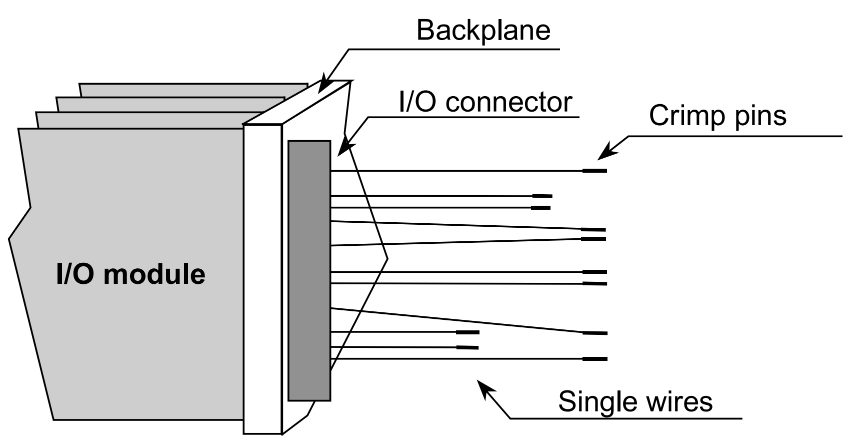

Figure 1 Principle of single-wire connection method

Connections

The pin allocation of the I/O back plane connector is shown in Figure 2. The pin codes refer to the connected pins of the I/O module in the rack.

Programming

	41 / earth
40 / d10	
	37 / z10
36 / d12	
	33 / z12
32 / d14	
	29 / z14
28 / d16	
	25 / z16
24 / d18	
	21 / z18
20 / d20	
	17 / z20
16 / d22	
	13 / z22
12 / d24	
	9 / z24
8 / d26	
	5 / z26
4 / d28	
	1 / z28

I/O module

d	b	z
2	2	2
–		–
6		6
8		8
10		10
12		12
14		14
16		16
18		18
20		20
22		22
24		24
26		26
28		28
30		30
32		32

I/O back plane

–	–
–	41 / earth
40 / d10	–
–	37 / z10
36 / d12	–
–	33 / z12
32 / d14	–
–	29 / z14
28 / d16	–
–	25 / z16
24 / d18	–
–	21 / z18
20 / d20	–
–	17 / z20
16 / d22	–
–	13 / z22
12 / d24	–
–	9 / z24
8 / d26	–
–	5 / z26
4 / d28	–
–	1 / z28

Figure 2 Back view of programming connector (P), I/O module connector and I/O backplane connector (CN)

Table 1 below shows the connections of the I/O modules to the I/O backplane connector.

Table 1 Connections to I/O backplane connector

10101/2/. signal	10102/2/1 + 10102/A/. signal	10105/2/1 signal	10201/2/1 signal	10205/2/1 + 10205/A/. signal	I/O backplane connector pin	I/O module connector pin
	shield	shield		shield	41	earth
– Vext	CH1–	0 Vdc	(0 Vdc)	nc	40	d10
– Vext	CH1+	0 Vdc	(0 Vdc)	nc	37	z10
CH1	(26V 1)	CH1	CH1+	CH1+	36	d12
CH2	(IN 1)	CH2	CH1–	CH1–	33	z12
CH3	(0V 1)	CH3	CH2+	(0V 1)	32	d14
CH4	(0V 2)	CH4	CH2–	nc	29	z14
CH5	(IN 2)	CH5	CH3+	(mA 1)	28	d16
CH6	(26V 2)	CH6	CH3–	(loop 1)	25	z16
CH7	CH2+	CH7	CH4+	CH2+	24	d18
CH8	CH2–	CH8	CH4–	CH2–	21	z18
CH9	CH3–	CH9	CH5+	(0V 2)	20	d20
CH10	CH3+	CH10	CH5–	nc	17	z20
CH11	(26V 3)	CH11	CH6+	(mA 2)	16	d22
CH12	(IN 3)	CH12	CH6–	(loop 2)	13	z22
CH13	(0V 3)	CH13	CH7	nc	12	d24
CH14	(0V 4)	CH14	CH7–	nc	9	z24
CH15	(IN 4)	CH15	CH8+	nc	8	d26
CH16	(26V 4)	CH16	CH8–	nc	5	z26
+ Vext	IN 4+	0 Vdc	(0 Vdc)	nc	4	d28
+ Vext	IN 4–	+ Vext/8	(0 Vdc)	nc	1	z28

Table 1 Connections to I/O backplane connector (continued)

10206/2/1 signal	10208/2/1 signal	10209/2/1 signal	10213/2/. signal	10215/2/1 signal	10216/2/. + 10216/A/1 signal	I/O backplane connector pin	I/O module connector pin
					shield	41	earth
nc	CH1 c	nc	nc	nc	nc	40	d10
nc	CH1 no	nc	nc	nc	nc	37	z10
CH1	CH2 c	CH1	(– Vext)	CH1+	(– Vext)	36	d12
CH2	CH2 no	CH2	(– Vext)	CH1–	(– Vext)	33	z12
CH3	CH3 c	CH3	CH1+	CH1+	CH1+	32	d14
CH4	CH3 no	CH4	CH1–	CH1–	CH1–	29	z14
CH5	CH4 c	CH5	(– Vext)	CH2+	(– Vext)	28	d16
CH6	CH4 no	CH6	(– Vext)	CH2–	(– Vext)	25	z16
CH7	CH5 c	CH7	CH2+	CH2+	CH2+	24	d18
CH8	CH5 no	CH8	CH2–	CH2–	CH2–	21	z18
CH9	CH6 c	CH9	(– Vext)	CH3+	(– Vext)	20	d20
CH10	CH6 no	CH10	(– Vext)	CH3–	(– Vext)	17	z20
CH11	CH7 c	CH11	CH3+	CH3+	CH3+	16	d22
CH12	CH7 no	CH12	CH3–	CH3–	CH3–	13	z22
– Vext	CH8 c	CH13	(– Vext)	CH4+	(– Vext)	12	d24
– Vext	CH8 no	CH14	(– Vext)	CH4–	(– Vext)	9	z24
– Vext	CH9 c	CH15	CH4+	CH4+	CH4+	8	d26
– Vext	CH9 no	CH16	CH4–	CH4–	CH4–	5	z26
– Vext	CH10 c	– Vext	(– Vext)	(– Vext)	(– Vext)	4	d28
– Vext	CH10 no	– Vext	(– Vext)	(– Vext)	(– Vext)	1	z28
nc = not connected	c = common	no = normally open					

Requirements

The single-wire connection method has the following requirements:

Connector

I/O backplane connector:	
– housing	44 pos. MODU MOD IV Housing. (AMP Part No. 1-102387-3)
– crimp pin on reel	MODU MOD IV RECEPTACLE (AMP Part No. 0-167301-4)
– crimp pin loose pieces	MODU MOD IV RECEPTACLE (AMP Part No. 0-141708-1)
Connector pin:	
– max. current	2 A
– usable wire types	0.25 mm² (AWG 24) 0.34 mm² (AWG 22) 0.5 mm² (AWG 20)

Tools

Crimp tool:	AMP Part No. 0-169481-1
Extraction tool:	AMP Part No. 0-843473-1

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SIC to FTA applications

Introduction

This data sheet provides detailed information on the selection of SIC-C cables and FTAs based on I/O signal specifications.

Table 1 gives an overview of the standard SIC-C cables.
Table 2 to Table 4 list the available FTA modules.
Table 5 to Table 8 are selection tables that will help you determine which combinations of FSC I/O modules, FTAs and SIC cables are possible.

Note:
For details on field termination assemblies (FTAs) refer to section 9 of the FSC Hardware Manual ("Field Termination Assembly Modules").
For details on FSC input modules refer to section 5 of the FSC Hardware Manual ("FSC Input Modules").
For details on FSC output modules refer to section 6 of the FSC Hardware Manual ("FSC Output Modules").

SIC-C cable types

SIC-C cables (i.e. SIC cables terminating in one or more connectors) are available in five layout types:

1. SIC-C cable with one I/O connector and one 20-pin FTA connector,
2. SIC-C cable with one I/O connector and one 10-pin FTA connector,
3. SIC-C cable with one I/O connector, one 10-pin FTA connector and two ferrites,
4. SIC-C cable with one I/O connector and two 10-pin FTA connectors (marked 'a' and 'b'), and
5. SIC-C cable with two I/O connectors (marked 'a' and 'b') and one 10-pin FTA connector.

Note:
For details on SIC-C cables refer to the 'System interconnection cables terminating on FTAs' data sheet (SIC-C).

SIC-C cable characteristics

Table 1 below shows the available SIC-C cables with their main characteristics:

Table 1 Standard SIC-C cables

Cable model	Cable type	Outer diameter (nominal)	Cable layout (see SIC-C data sheet)
SIC-C-02/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	4
SIC-C-03/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	5
SIC-C-04/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	4
SIC-C-05/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	2
SIC-C-06/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	3
SIC-C-07/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	4
SIC-C-08/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	4
SIC-C-10/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	2
SIC-C-11/Lx	10 x AWG 20 double shielded cable	7.90 mm / 0.31 in	2
SIC-C-12/Lx	20 x AWG 20 double shielded cable	9.93 mm / 0.39 in	1

Usable wire types:
AWG 20 = 0.5 mm²

Explanation of cable type codes:
SIC-C-../Lx = Standard SIC-C cable with a standard length of x meters.
X = 2.5 m, 3.25 m, 4 m, 5 m, 6 m, 8 m, 10 m, 12 m, 15 m, 20 m, 25 m, 30 m, or 40 m.

Note:
For details on the connections of SIC-C cables refer to the 'System interconnection cables terminating on FTAs' data sheet (SIC-C).

FTA types

Field termination assemblies (FTAs) are the interface between the SIC cables and the external field wiring. They are available in two versions:

1. fitted with a standard Elco E-56 connector to connect E-56 system cables (FTA-E), and
2. fitted with screw terminals to connect field wires directly (FTA-T).

Note:
For details on FTAs refer to section 9 of the FSC Hardware Manual ("Field Termination Assembly Modules").

FTA-E characteristics

FTA-E modules are field termination assemblies (FTAs) that are fitted with a standard Elco E-56 connector. They are the interface between system interconnection cables (SICs) and the external field wiring. Table 2 below lists the available FTA-E modules with their main characteristics:

Table 2 Available FTA-E modules

FTA type	Description	FTA connector x channels	Termination type
FTA-E-01	24-channel FTA with E-56	3F x 8	E56
FTA-E-02	24-channel FTA with E-56	6 x 4	E56
FTA-E-03	24-channel FTA with E-56	3 x 8	E56
FTA-E-04	25-channel FTA with E-56	5 x 5	E56
FTA-E-05	25-channel FTA with E-56	5F x 5	E56/T

Total number of signals per FTA, specified by FTA connector. F=fused
Examples: 2 x 4 = 2 connectors, 4 signals each
3F x 8 = 3 connectors, 8 signals each and common fuse per 8 signals

Termination types:
E56 = ELCO connector E56/54
E56/T = E56 with 5 groups of 2 screw terminals for external power

FTA-T characteristics for field inputs

FTA-T modules are field termination assemblies (FTAs) fitted with screw terminals to connect field wires directly. They are the interface between system interconnection cables (SICs) and the external field wiring. Table 3 below lists the available FTA-T modules for field inputs with their main characteristics:

Table 3 Available FTA-T modules for field inputs

FTA type	Description	FTA connector x channels	Termination type
FTA-T-02	FTA with screw terminals (24 channels)	6 x 4	T48
FTA-T-12	Passive isolated digital input FTA (8 channels)	1 x 8	T16
FTA-T-14	Fail-safe 0(4)-20 mA analog input FTA (16 channels)	1FF x 16	T64/T2
FTA-T-15	24 Vdc to 30 Vdc/1 A converter	–	–
FTA-T-16	Fail-safe active digital input FTA with line-monitoring (16 channels)	1 x 16	T32/T2
FTA-T-18	Fail-safe Gas-Flame detector input FTA (0-20 mA, 16 ch.)	1 x 16F	T64/T
FTA-T-19	Fail-safe fire detector input FTA with line monitoring (24 Vdc, 16 channels)	1 x 16	T48/T/R
FTA-T-21	Fail-safe digital input FTA (24/48/60 Vdc, NAMUR, 16 ch.)	1FF x 16	T32
FTA-T-23	Current-limited digital input FTA (24 Vdc, 16 channels)	1FF x 16	T32
FTA-T-29	Fail-safe active/passive digital input FTA (115 Vac/dc, 16 ch.)	1 x 16	T64/T

Total number of signals per FTA, specified by FTA connector. F=fused
Examples: 6 x 4 = 6 connectors, 4 signals each
2F x 8 = 2 connectors, 8 signals each and common fuse per 8 signals
1FF x 16 = 1 connector of 16 signals, with one fuse per 8 signals
1 x 16F = 1 connector of 16 signals with one fuse per signal.

Termination types:

T16	=	8 groups of 2 screw terminals
T32	=	16 groups of 2 screw terminals
T32/T2	=	16 groups of 2 screw terminals with 2 groups of 2 screw terminals for external power
T48	=	24 groups of 2 screw terminals plus 2 earth screw terminals
T48/T/R	=	16 groups of 3 screw terminals with one group of 2 screw terminals for external power and one group of 2 screw terminals for relay reset signal plus one earth screw terminal
T64/T	=	16 groups of 4 screw terminals with 2 screw terminals for external power
T64/T2	=	16 groups of 4 screw terminals with 2 groups of 2 screw terminals for external power plus 2 earth screw terminals

FTA-T characteristics for field outputs

FTA-T modules are field termination assemblies (FTAs) fitted with screw terminals to connect field wires directly. They are the interface between system interconnection cables (SICs) and the external field wiring. Table 4 below lists the available FTA-T modules for field outputs with their main characteristics:

Table 4 Available FTA-T modules for field outputs

FTA type	Description	FTA connector x channels	Termination type
FTA-T-02	FTA with screw terminals (24 channels)	6 x 4	T48
FTA-T-03	FTA with screw terminals (24 channels)	3 x 8	T48
FTA-T-04	FTA with screw terminals (25 channels)	5 x 5	T50
FTA-T-05	FTA with screw terminals (12 channels)	6 x 2	T24
FTA-T-08	Fail-safe digital output (relay) FTA (4 channels)	1 x 4F	T10
FTA-T-11	FTA with screw terminals (8 channels)	2 x 4	T16
FTA-T-17	Digital output (relay) FTA for AK 5/6 applications (4 channels)	1 x 4F	T8
FTA-T-20	Digital output (relay contact) FTA (8 channels, NO/NC)	1 x 8F	T24/T
FTA-T-35	Fail-safe digital output FTA, current limited (24 Vdc, 8 channels)	1 x 8	T16
FTA-T-36	Fail-safe digital output FTA, current limited (24 Vdc, 4 channels)	1 x 4	T8

Total number of signals per FTA, specified by FTA connector. F=fused
Examples: 2 x 4 = 2 connectors, 4 signals each
1 x 4F = 1 connector of 4 signals, with one fuse per signal
1 x 8F = 1 connector of 8 signals, with one fuse per signal

Termination types:
T8 = 4 groups of 2 screw terminals
T10 = 4 groups of 2 screw terminals plus 2 screw terminals for read back
T16 = 8 groups of 2 screw terminals
T24 = 12 groups of 2 screw terminals plus 1 earth screw terminal
T24/T = 8 groups of 3 screw terminals
T48 = 24 groups of 2 screw terminals plus 2 earth screw terminals
T50 = 25 groups of 2 screw terminals

Selection table for digital field inputs

Table 5 is an aid in determining which combinations of FSC input modules, FTAs and SIC cables can be used depending on the characteristics of the digital field input signal. Modules, SIC cables and FTAs support different numbers of channels, depending on the field signal characteristics.

Table 5 Selection table for digital field inputs

Digital input signal characteristic	Module		SIC cable	A	B	Terminal FTA (FTA-T)	
Digital Input, 24 Vdc, int. power, FS/NFS	10101/2/1	16	SIC-C-12	16		FTA-T-21	1FFx16
Digital Input, 24 Vdc, ext. power, NFS	10101/2/1	16	SIC-C-07	8	8	FTA-T-12	1x8
Digital Input, 24 Vdc, int. power, FS/NFS, current-limited	10101/2/1	16	SIC-C-12	16		FTA-T-23	1FFx16
Digital Input with LM, int. power, FS/NFS	10106/2/1**	16	SIC-C-12	16		FTA-T-21	1FFx16
NAMUR Digital Input with LM, 24 Vdc, int. power, FS/NFS	10106/2/1**	16	SIC-C-12	16		FTA-T-21	1FFx16
Digital Input, 48 Vdc, int. power, FS/NFS	10101/2/3	16	SIC-C-12	16		FTA-T-21	1FFx16
Digital Input, 60 Vdc, int. power, FS/NFS	10101/2/2	16	SIC-C-12	16		FTA-T-21	1FFx16
Digital Input, 115 Vac/dc, int./ext. power, FS/NFS*	10101/2/1	16	SIC-C-12	16		FTA-T-29	1x16

* Length limitations apply (see applicable FTA data sheets).

** requires signal converter 10106/A/. (see 10106/2/1 data sheet)

Number of signals per module

Number of signals per SIC cable, specified by connector (where appropriate):
8 / 8 = 2 connectors, 8 signals each
16 = 1 connector, 16 signals

Number of signals per FTA, specified by FTA connector: F=fused
Examples: 1 x 8 = 1 connector, 8 signals
1FFx16 = 1 connector, 16 signals and common fuse per 8 signals

Selection table for analog field inputs

Table 6 is an aid in determining which combinations of FSC input modules, FTAs and SIC cables can be used depending on the characteristics of the analog field input signal. Modules, SIC cables and FTAs support different numbers of channels, depending on the field signal characteristics.

Table 6 Selection table for analog field inputs

Analog input signal characteristic	Module		SIC cable		ELCO FTA		Terminal FTA	
				A B	(FTA-E)		(FTA-T)	
Analog Input, 0(4)-20 mA, ext. power, FS	10105/2/1 10102/2/1*	16 4	SIC-C-12 SIC-C-06	16 4	--- FTA-E-02	--- 6x4	FTA-T-14 FTA-T-02	1FFx16 6X4
Analog Input, 0(4)-20 mA, int. power, FS	10105/2/1 10102/2/1*	16 4	SIC-C-12 SIC-C-06	16 4	--- FTA-E-02	--- 6x4	FTA-T-14** FTA-T-02	1FFx16 6X4
Analog Input, 0(1)-5 V, FS	10102/2/1*	4	SIC-C-06	4	FTA-E-02	6x4	FTA-T-02	6x4
Analog Input, 0(2)-10V, FS	10102/2/1*	4	SIC-C-06	4	FTA-E-02	6x4	FTA-T-02	6x4

* requires analog input converter:

0(4)-20 mA internal power	10102/A/1
0(4)-20 mA external power	10102/A/2
0(1)-5 Vdc external power	10102/A/3
0(2)-10 Vdc external power	10102/A/4

Number of signals per module

** requires DC/DC converter FTA-T-15

Number of signals per SIC cable, specified by connector (where appropriate):
8 / 8 = 2 connectors, 8 signals each
4 = 1 connector, 4 signals

Number of signals per FTA, specified by FTA connector: F=fused
Examples: 6 x 4 = 6 connectors, 4 signals each
1FF x 16 = 1 connector of 16 signals, with one fuse per 8 signals

Selection table for Fire & Gas detector inputs

Table 7 is an aid in determining which combinations of FSC input modules, FTAs and SIC cables can be used depending on the characteristics of the fire and gas detector input signals. Modules, SIC cables and FTAs support different numbers of channels, depending on the field signal characteristics.

Table 7 Selection table for fire & gas detector inputs

Fire & Gas detector signal characteristic	**Module**		**SIC cable**			**Terminal FTA**	
				A	**B**	**(FTA-T)**	
Gas detector input, 0-20 mA, int. power, FS	10105/2/1	16	SIC-C-12	16		FTA-T-18	1 x 16F
Fire detector input, 24 V, LM, int. power, FS	10105/2/1	16	SIC-C-12	16		FTA-T-19	1 x 16

Number of signals per module

Number of signals per SIC cable, specified by connector (where appropriate):
8 / 8 = 2 connectors, 8 signals each
4 = 1 connector, 4 signals

Number of signals per FTA, specified by FTA connector: F=fused
Examples: 1 x 16 = 1 connector, 16 signals
1 x 16F = 1 connector, 16 signals with one fuse per signal

Selection table for field outputs

Table 8 is an aid in determining which combinations of FSC I/O modules, FTAs and SIC cables can be used depending on the characteristics of the field output signal. Modules, SIC cables and FTAs support different numbers of channels, depending on the field signal characteristics.

Table 8 Selection table for field outputs

Output signal characteristics	Module		SIC cable	A	B	ELCO FTA (FTA-E)		Terminal FTA (FTA-T)	
Digital Output, 24 Vdc, FS	10201/2/1	8	SIC-C-02	4	4	FTA-E-02	6x4	FTA-T-02	6x4
Digital Output, 24 Vdc – 2 A, FS	10215/2/1	4	SIC-C-02	(4÷2)	(4÷2)	FTA-E-02	6x(4÷2)	FTA-T-05	6x(4÷2)
Digital Output, 24 Vdc, FS line-monitored	10216/2/1	4	SIC-C-05	4		FTA-E-02	6x4	FTA-T-02	6x4
Digital Output, 24 Vdc, 550 mA, NFS	10206/2/1	12	SIC-C-07	8	4	FTA-E-03	3x8	FTA-T-03	3x8
Digital Output, 24 Vdc, 100 mA, NFS	10209/2/1	16	SIC-C-07	8	8	FTA-E-03	3x8	FTA-T-03	3x8
Digital Output, 24 Vdc, FS, current limited, 110 mA	10201/2/1	8	SIC-C-12	8		-	-	FTA-T-35	1x8
Digital Output, 24 Vdc, FS, line monitored, current limited, 110 mA	10216/2/1	4	SIC-C12	4		-	-	FTA-T-36	1x4
Digital Output, 48 Vdc, FS	10213/2/3	4	SIC-C-05	4		FTA-E-02	6x4	FTA-T-02	6x4
Digital Output, 48 Vdc, FS line-monitored	10216/2/3	4	SIC-C-05	4		FTA-E-02	6x4	FTA-T-02	6x4
Digital Output, 60 Vdc, FS	10213/2/2	4	SIC-C-05	4		FTA-E-02	6x4	FTA-T-02	6x4
Digital Output, 110 Vdc, FS	10213/2/1	4	SIC-C-11	4		---	---	FTA-T-11	2x4
Digital Output, potential-free contacts	10208/2/1	10	SIC-C-04	5	5	FTA-E-04	5x5	FTA-T-04	5x5
Digital Output, powered contacts	10208/2/1	10	SIC-C-04	5	5	FTA-E-05	5Fx5	---	---
Digital Output, relay, FS, AK1-4, 250 Vac / 110 Vdc	10201/2/1	8	SIC-C-02	4	4	---	---	FTA-T-08	1x4F
Digital Output, relay, FS, AK1-6, 250 Vac / 250 Vdc	10201/2/1	8	SIC-C-02	4	4	---	---	FTA-T-17	1x4F
Digital Output, relay, FS lin-mon, AK1-6, 250 Vac / 250 Vdc	10216/2/1	4	SIC-C-05	4		---	---	FTA-T-17	1x4F
Digital Output, relay, NFS, 250 Vac / 110 Vdc	10209/2/1	16	SIC-C-07	8	8	---	---	FTA-T-20	1x8F
(NO/NC contact)	10201/2/1	8	SIC-C-10	8		---	---	FTA-T-20	1x8F
Digital Output, relay, NFS, 250 Vac / 110 Vdc	10209/2/1	16	SIC-C-07	8	8	---	---	FTA-T-10	1x8F
(NO contact)	10201/2/1	8	SIC-C-10	8		---	---	FTA-T-10	1x8F
Analog Output, 0(4)-20 mA ext. power, FS	10205/2/1**	2	SIC-C-03	2*	2*	FTA-E-02	6x4	FTA-T-02	6x4
Analog Output, 0(4)-20 mA int. power, FS	10205/2/1**	2	SIC-C-03	2*	2*	FTA-E-02	6x4	FTA-T-02	6x4

** requires analog output converter:
0(4)-20 mA internal power 10205/A1
0(4)-20 mA external power 10205/A2
Dummy 10205/A3

Number of signals per module

Number of signals per SIC cable, specified by connector (where appropriate).
Examples:
8 / 8 = 2 FTA connectors, 8 signals each.
8 / 4 = 2 FTA connectors, 1st connector 8 signals, 2nd connector 4 signals used.
4 = 1 FTA connector, 4 signals.
2* / 2* = 2 I/O module connectors, 2 signals each

(4÷2) = 2 signals, since two wire pairs must be used per signal

Number of signals per FTA and per FTA connector F=fused
Examples: 6 x 4 = 6 connectors, 4 signals each
5Fx5 = 5 connectors, 5 signals each and common fuse per 5 signals
1x4F = 1 connector of 4 signals, with one fuse per signal
1x8F = 1 connector of 8 signals, with one fuse per signal

Relationship between FTA-T-14 and FTA-T-15

Figure 1 below shows the relation between the field termination assembly module FTA-T-14 and the DC/DC converter FTA-T-15. The FTA-T-15 module can power a maximum of two FTA-T-14 modules.
Figure 1(a) shows how to connect a mix of active and/or passive sensors using two FTA-T-15 modules in redundant operation powering two FTA-T-14 modules.
Figure 1(b) shows how to connect an active sensor using the FTA-T-14 module. In that case the FTA-T-15 module is not required.

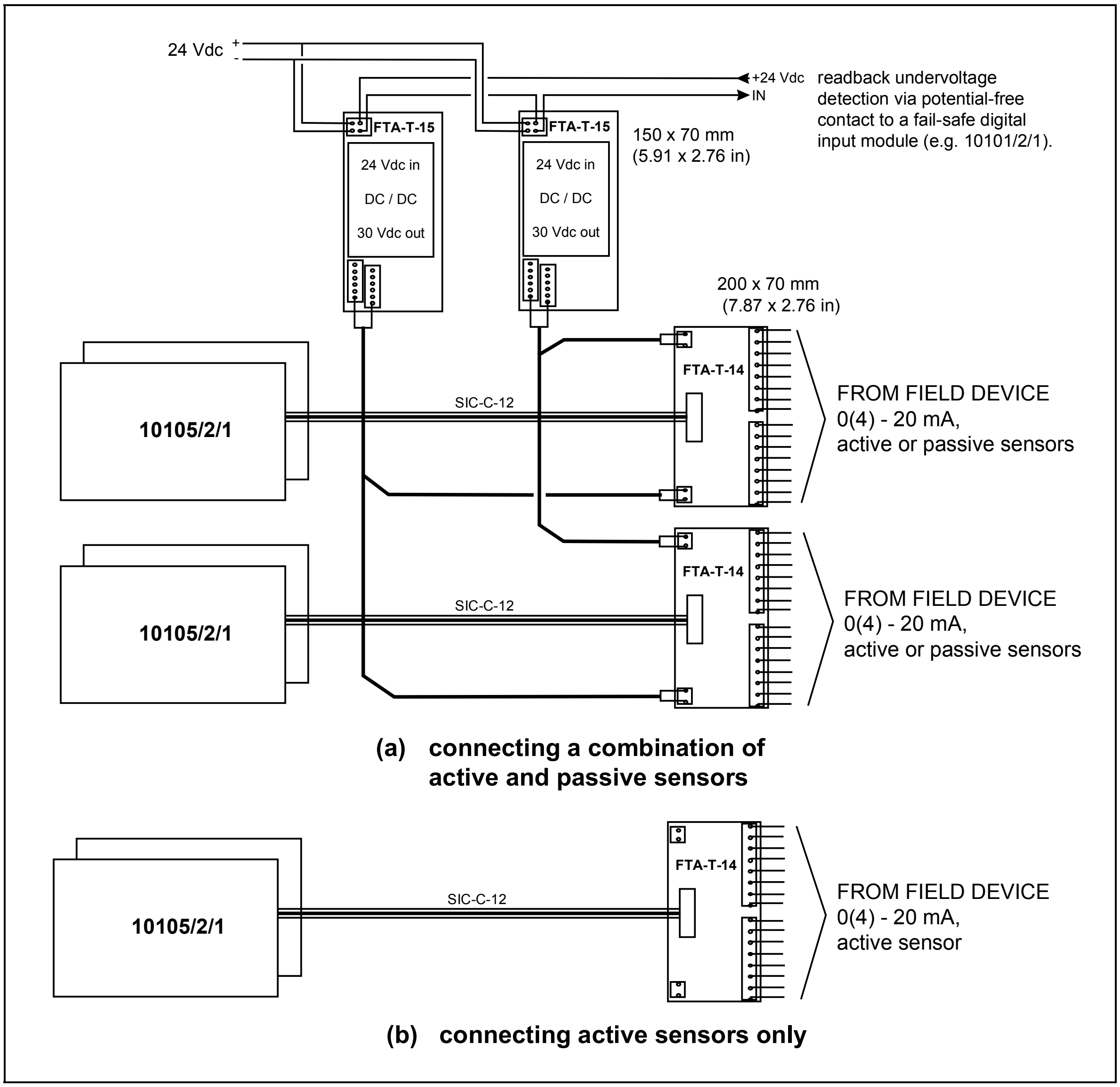

Figure 1 Relationship between FTA-T-14 and FTA-T-15

SIC to pin applications

Introduction

This data sheet provides detailed information on the selection of SIC-P cables based on I/O signal specifications.

Table 1 gives an overview of the standard SIC-P cables
Table 2 to Table 4 are selection tables that will help you determine which combinations of FSC I/O modules and SIC cables are possible.

Note:
For details on FSC input modules refer to section 5 of the FSC Hardware Manual ("FSC Input Modules").
For details on FSC output modules refer to section 6 of the FSC Hardware Manual ("FSC Output Modules").

SIC-P cable types

SIC-P cables (i.e. SIC cables terminating in individual crimp pins) are available in three layout types:

1. SIC-P cable with one I/O connector,
2. SIC-P cable with one I/O connector and two ferrites,
3. SIC-P cable with two I/O connectors (marked 'a' and 'b).

Note:
For details on SIC-P cables refer to the 'System interconnection cables terminating on crimp pins' data sheet (SIC-P).

SIC-P cable characteristics

Table 1 below shows the available SIC-P cables with their main characteristics:

Table 1 Standard SIC-P cables

Cable model	Cable type	Outer Diameter Nominal	Cable layout (see SIC-P datasheet)
SIC-P-03/Lx	10 x AWG20 double shielded cable	7.90 mm / 0.31 inch	3
SIC-P-06/Lx	10 x AWG20 double shielded cable	7.90 mm / 0.31 inch	2
SIC-P-12/Lx	20 x AWG20 double shielded cable	9.93 mm / 0.39 inch	1

Usable wire types:
AWG 20 = 0.5 mm²

Explanation of cable type codes:
SIC-P-../Lx = Standard SIC-C cable with a standard length of x meters.
x = 2.5 m, 3.25 m, 4 m, 5 m, 6 m, 8 m, 10 m, 12 m, 15 m, 20 m, 25 m, 30 m or 40 m.

Note:
For details on the connections of SIC-P cables refer to the 'System interconnection cables terminating on crimp pins' data sheet (SIC-P).

Selection table for digital field inputs

Table 2 is an aid in determining which combinations of FSC input modules and SIC cables can be used depending on the characteristics of the digital field input signal. Modules and SIC cables support different numbers of channels, depending on the field signal characteristics.

Table 2 Selection table for digital field inputs

Digital input signal characteristic	Module		SIC cable	
Digital Input, 24 Vdc, int. power, FS/NFS	10101/2/1	16	SIC-P-12	16
Digital Input, 24 Vdc, ext. power, FS/NFS	10101/2/1	16	SIC-P-12	16
Digital Input, 24 Vdc, int. power, FS/NFS, current-limited	10101/2/1	16	SIC-P-12	16
Digital Input with LM, int. power, FS	10106/2/1*	16	SIC-P-12	16
NAMUR Digital Input with LM, 24 Vdc, int. power, FS	10106/2/1*	16	SIC-P-12	16
Digital Input, 48 Vdc, int. power, FS	10101/2/3	16	SIC-P-12	16
Digital Input, 60 Vdc, int. power, FS	10101/2/2	16	SIC-P-12	16

* requires signal converter 10106/A/.
(see 10106/2/1 data sheet)

Number of signals per module

Selection table for analog field inputs

Table 3 is an aid in determining which combinations of FSC input modules and SIC cables can be used depending on the characteristics of the analog field input signal. Modules and SIC cables support different numbers of channels, depending on the field signal characteristics.

Table 3 Selection table for analog field inputs

Analog input signal characteristic	Module		SIC cable	
Analog Input, 0(4)-20 mA, ext. power, FS	10105/2/1*	16	SIC-P-12	16
Analog Input, 0(4)-20 mA, int. power, FS	10102/2/1**	4	SIC-P-06	4
Analog Input, 0(1)-5 V, power, FS	10102/2/1**	4	SIC-P-06	4
Analog Input, 0(2)-10 V, FS	10102/2/1**	4	SIC-P-06	4

* requires converter:
0-25 mA to 0-4.1 V 10105/A/1

** requires converter:
0(4)-20 mA internal power 10102/A/1
0(4)-20 mA external power 10102/A/2
0(1)-5 Vdc external power 10102/A/3
0(2)-10 Vdc external power 10102/A/4

Number of signals per module

Selection table for field outputs

Table 4 is an aid in determining which combinations of FSC I/O modules and SIC cables can be used depending on the characteristics of the field output signal. Modules and SIC cables support different numbers of channels, depending on the field signal characteristics.

Table 4 Selection table for field outputs

Digital input signal characteristic	Module		SIC cable		
Digital Output, 24 Vdc, FS	10201/2/1	8	SIC-P-12	16	
Digital Output, 24 Vdc, 2 A, FS	10215/2/1	4	SIC-P-12	16	
Digital Output, 24 Vdc, FS, line-monitored	10216/2/1	4	SIC-P-12	16	
Digital Output, 24 Vdc, 550 mA, NFS	10206/2/1	12	SIC-P-12	16	
Digital Output, 24 Vdc, 100 mA, NFS	10209/2/1	16	SIC-P-12	16	
Digital Output, 48 Vdc, FS	10213/2/3	4	SIC-P-12	16	
Digital Output, 48 Vdc, FS, line-monitored	10216/2/3	4	SIC-P-12	16	
Digital Output, 60 Vdc, FS	10213/2/2	4	SIC-P-12	16	
Digital Output, 110 Vdc, FS	10213/2/1	4	SIC-P-12	16	
Digital Output, potential-free contacts	10208/2/1	10	SIC-P-12	16	
Analog Output. 0(4)-20 mA, ext. power, FS	10205/2/1**	2	SIC-P-03	2*	2*
Analog Output. 0(4)-20 mA, int. power, FS	10205/2/1**	2	SIC-P-03	2*	2*

** requires analog output converter:
0(4)-20 mA internal power 10205/A/1
0(4)-20 mA external power 10205/A/2
Dummy 10205/A/3

Number of signals per module

Number of signals per SIC cable, specified by connector (where appropriate).
Examples:
2* / 2* = 2 I/O module connectors, 2 signals each.
(8÷2) = 4 signals, since two wire pairs must be used per signal.

Fail Safe Control

Hardware Manual

Section 9:

Field Termination Assembly Modules

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Section 9: Field Termination Assembly Modules

FS-TSDI-16UNI Fail-safe digital input FTA (24/48 Vdc, NAMUR, 16 channels)

Description

The field termination assembly module FS-TSDI-16UNI is the interface between a system interconnection cable (SIC) and the external field wiring (screw terminals).

Sixteen channels (separated into two groups of eight channels with a 250 mA fuse in the common +) can be connected to the FS-TSDI-16UNI module via a system interconnection cable (SIC). This cable is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

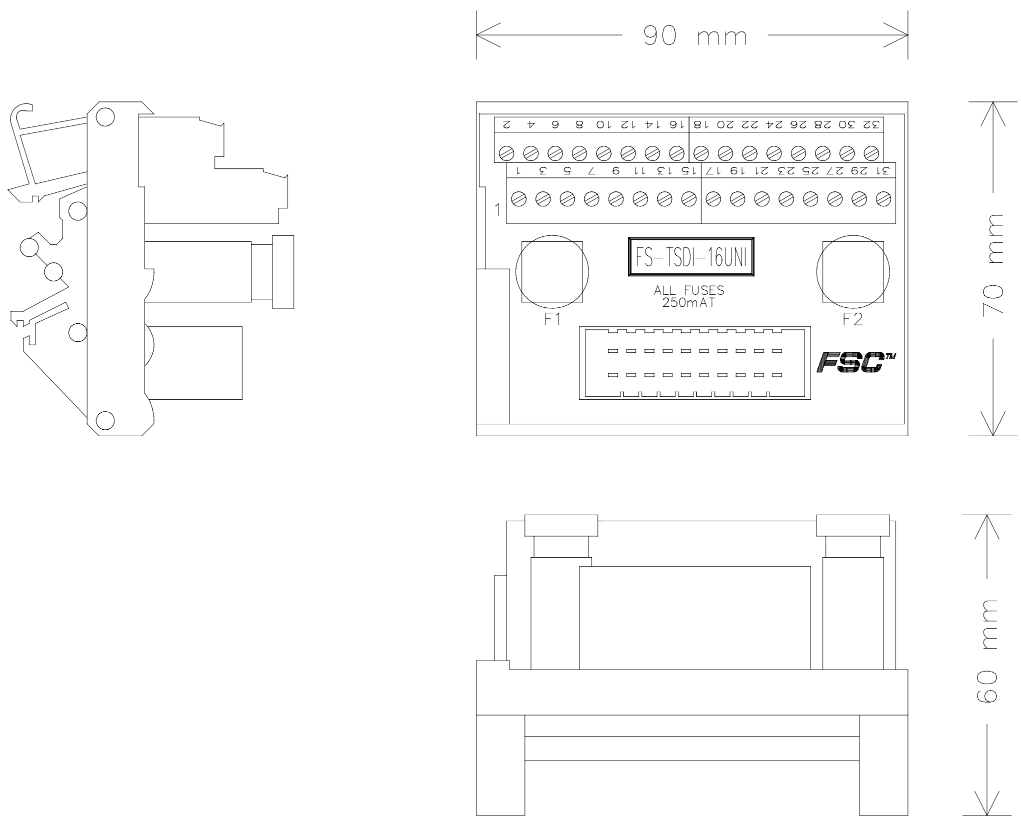

Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TSDI-16UNI module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TSDI-16UNI module is as follows:

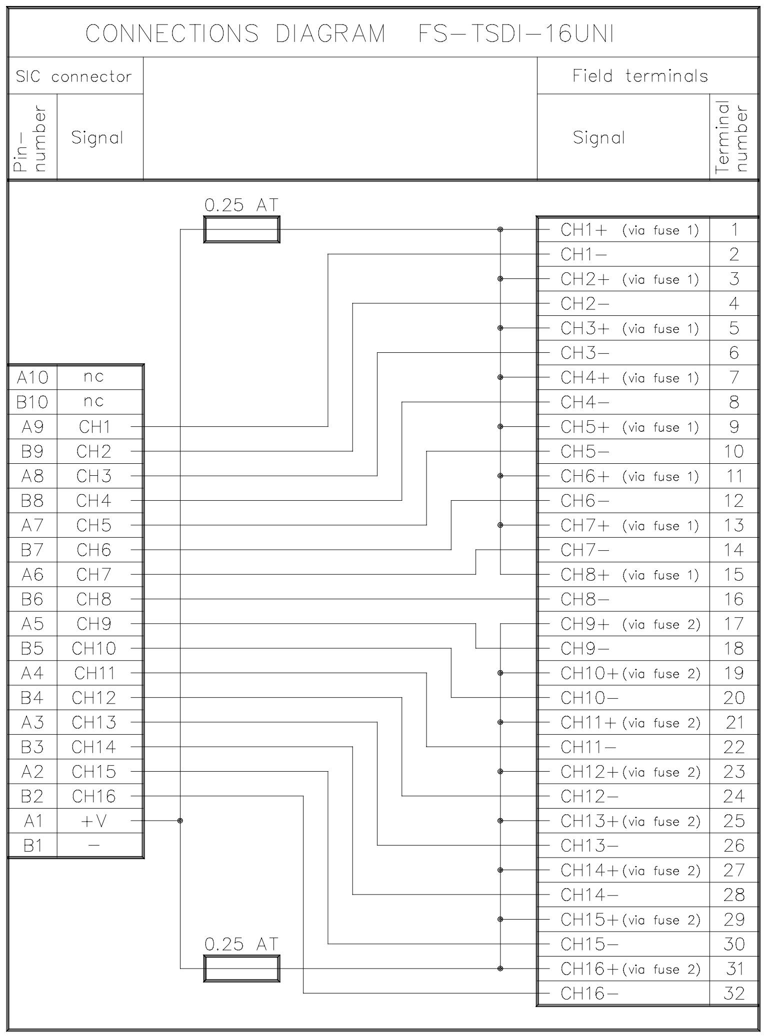

Figure 2 Connections diagram

Technical data

The FS-TSDI-16UNI module has the following specifications:

General	Type number:	FS-TSDI-16UNI
	Approvals:	CE, UL, TÜV
Power	Number of channels:	16 (2 groups of 8)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
Physical	Module dimensions:	90 x 70 x 60 mm (L x W x H) 3.54 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	91 mm (3.58 in)
Fuse	Rating:	250 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.79 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

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FS-TSDI-1624C Current-limited digital input FTA (24 Vdc, 16 channels)

(FTA-T-23)

Description

The field termination assembly module FS-TSDI-1624C is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals). It can be used for interfacing digital input signals from Class I, Division 2 Hazardous Locations.

Sixteen channels (separated into two groups of eight channels with a 250 mA fuse in the common +) can be connected to the FS-TSDI-1624C module via a system interconnection cable (SIC). This cable is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

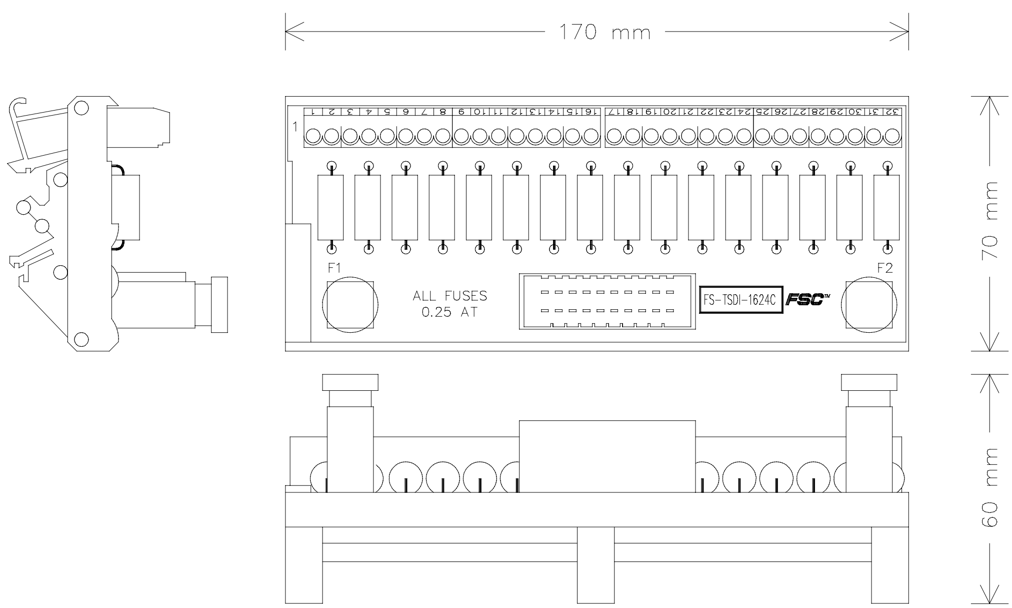


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TSDI-1624C module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TSDI-1624C module is as follows:

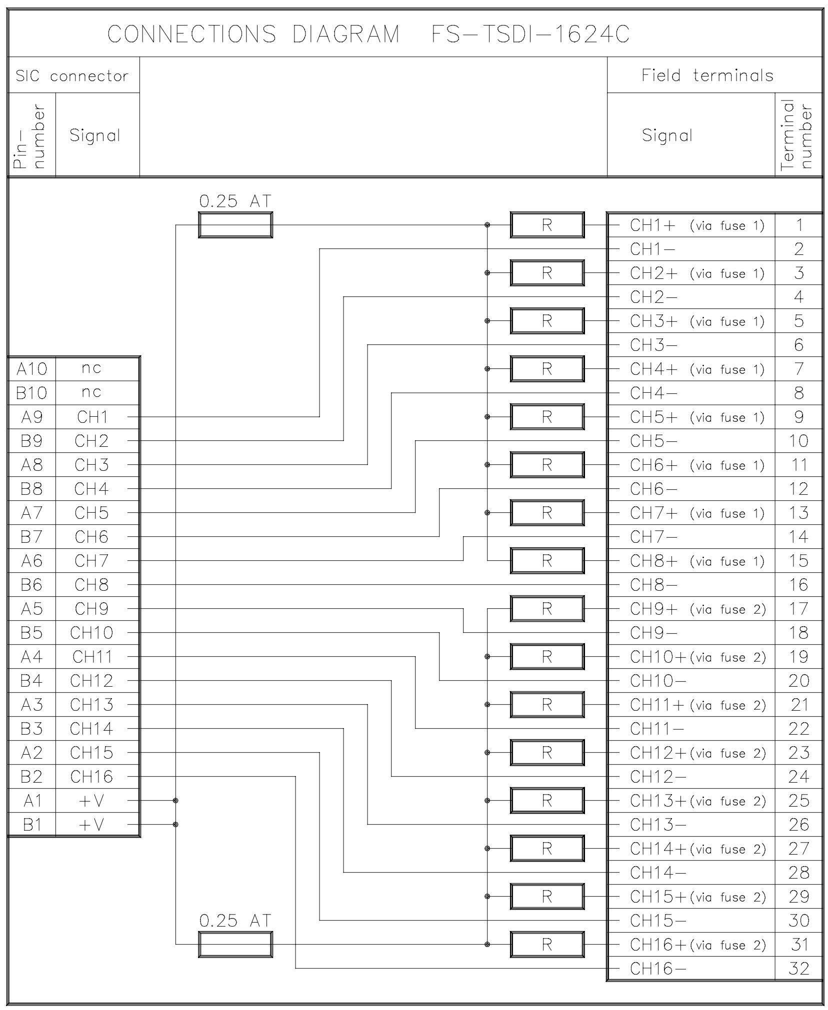


Figure 2 Connections diagram

Technical data

The FS-TSDI-1624C module has the following specifications:

General	Type number:	FS-TSDI-1624C
	Approvals:	CE, UL, TÜV, FM
Input	Number of input channels:	16 (2 groups of 8)
	Input voltage:	24 Vdc, –15% … +30%
	Input current:	≤ 15 mA at 24 Vdc (with a redundant pair of fail-safe digital input modules 10101/2/1 as load)
	Igniting current per channel:	< 100 mA at 24 Vdc +30%
Physical	Module dimensions:	170 x 70 x 60 mm (L x W x H) 6.69 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	171 mm
Fuse	Rating:	250 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.79 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	Max. closed loop resistance:	250 Ohm
	Min. open loop resistance:	15 kOhm
for non-incendive field circuits to Class 1 Division 2	HYDROGEN (Group A & B):	
	– max. loop inductance	8 mH
	– max. loop capacitance	0.3 µF
	NON-HYDROGEN (Group C & D):	
	– max. loop inductance	22 mH
	– max. loop capacitance	7 µF

FS-TSDI-16115 Fail-safe active/passive digital input FTA (115 Vac/dc, 16 channels)

(FTA-T-29)

Description

The field termination assembly module FS-TSDI-16115 is a 16-channel fail-safe input converter module, universal for both 115 Vac and/or 115 Vdc. All inputs are galvanically isolated.
Each channel converts an externally supplied 115 V input signal to a 24 Vdc input signal which can be connected to the 24 Vdc fail-safe input module 10101/2/1, thus creating a fail-safe 115 V input for the FSC system.

Sixteen channels can be connected to the FS-TSDI-16115 module via the system interconnection cable SIC-C-12. This cable is plugged into the SIC connector on the FTA module, and connects to a (redundant pair of) 10101/2/1 module(s).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

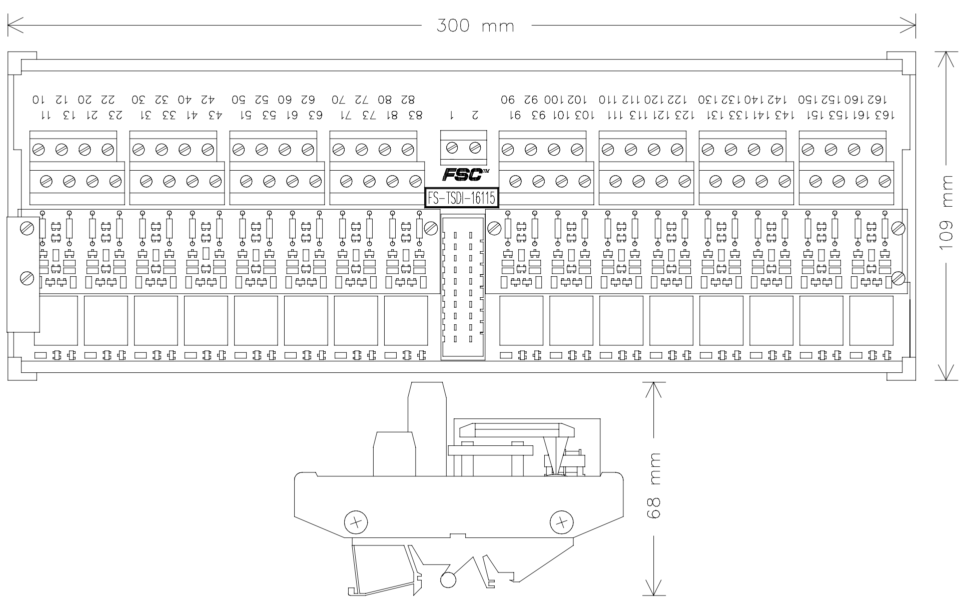


Figure 1 Mechanical layout

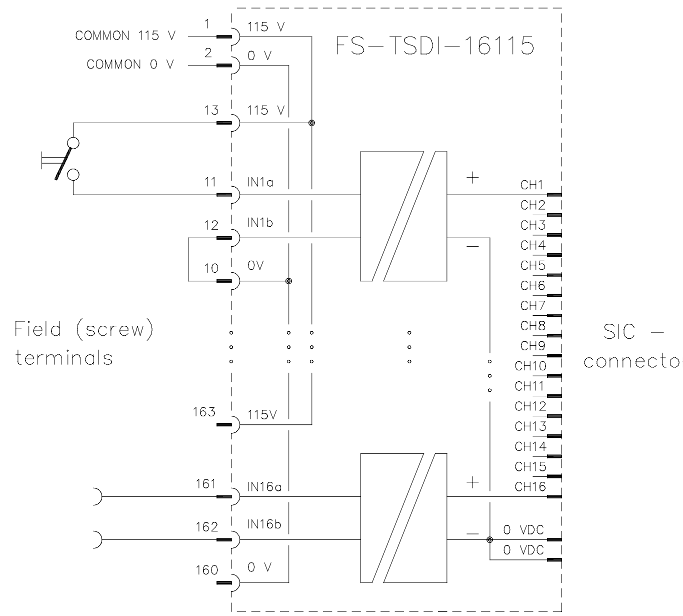


Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FS-TSDI-16115 module refer to the 'SIC to FTA applications' data sheet.

Field cable lengths

High-impedance AC inputs – like the inputs on this FTA – have a limited capability of handling the wire capacitance of standard multicore field cables. The wire capacitance of the field cable acts as a shunt impedance over the field contact (see Figure 3).

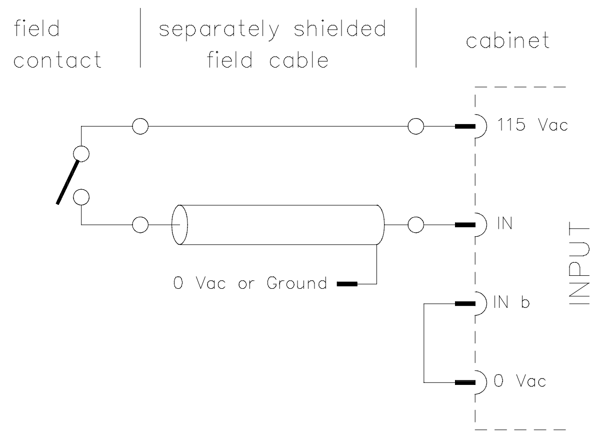


Figure 3 Standard (multicore) field cable

When the current through this shunt impedance exceeds the maximum 'LOW' current, the input may be activated by this shunt impedance, thus disabling the input function (by keeping the input activated continuously, i.e. ON). Every AC input will have a maximum 'LOW' current that it can handle.

The maximum allowable cable length depends on the maximum 'LOW' current (e.g. 1.2 mA), the typical cable capacitance (e.g. 120 pF/m), the maximum supply voltage (e.g. 130 Vac) and the supply frequency (e.g. 60 Hz).
The maximum length (in meters) can be calculated using the following formula:

$$L_{max} = \frac{I_{low}}{V_{max} * 2 * \pi * f * C_{typ}}$$

where:
L_{max} = maximum allowable cable length
I_{low} = maximum 'LOW' current
V_{max} = maximum supply voltage
f = supply frequency
C_{typ} = typical cable capacitance

As an example, we will calculate the maximum field cable length (in meters) using the values mentioned above:

$$L_{max} = \frac{(1.2*10^{-3})}{130 * 2 * \pi * 60 * (120*10^{-12})} = 204 \text{ m}$$

In this example, the maximum allowable field cable length is 204 meters (223 yards).

Solutions:

The field cable length limit can be eliminated by using field cables with wires that are shielded separately (see Figure 4).
The only (relevant) capacitance of the input wire is to the shield (0 Vac or earth) and this will not activate a 'LOW' input.
However, this type of cable is rather unusual. Field cables with shielded wire pairs are more commonly used. This allows for two connections methods:

1. Use the method of Figure 4 and leave the second wire of each pair unconnected, or
2. Connect the second wire of each pair to 0 Vac (see Figure 5). The 115 Vac / 0 Vac supply pair can be used for more than one input.

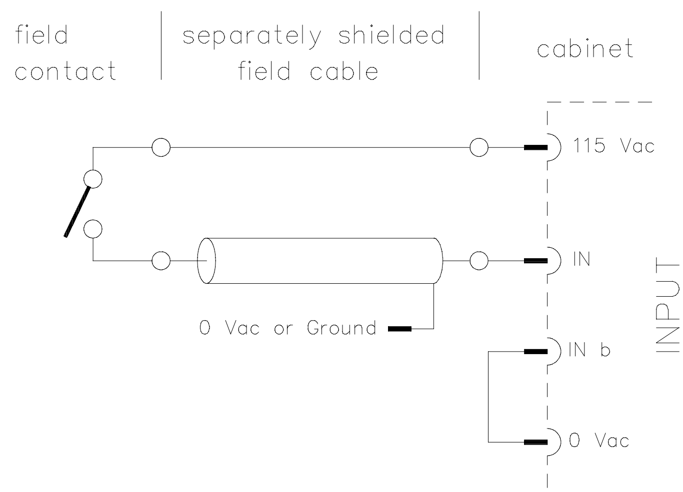


Figure 4 Field cable with separately shielded wires

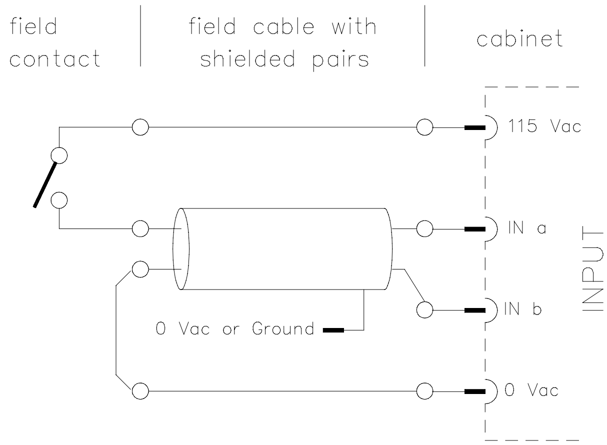


Figure 5 Field cable with shielded pairs

In practice, a mix of wiring methods may be used. For example, use a cable with shielded pairs between the control cabinet and a distribution box close to the process. This cable may be long, e.g. 3 km (1.8 mi). Then use a standard (multicore) cable for the connection between the distribution box and the field contact. This cable length is limited to the value calculated using the formula mentioned above.

Connecting active/ passive inputs

The FS-TSDI-16115 module supports inputs for both active and passive signals. Figure 6 below shows the schematic diagram for connecting active inputs. Figure 7 shows the diagram for connecting passive inputs.

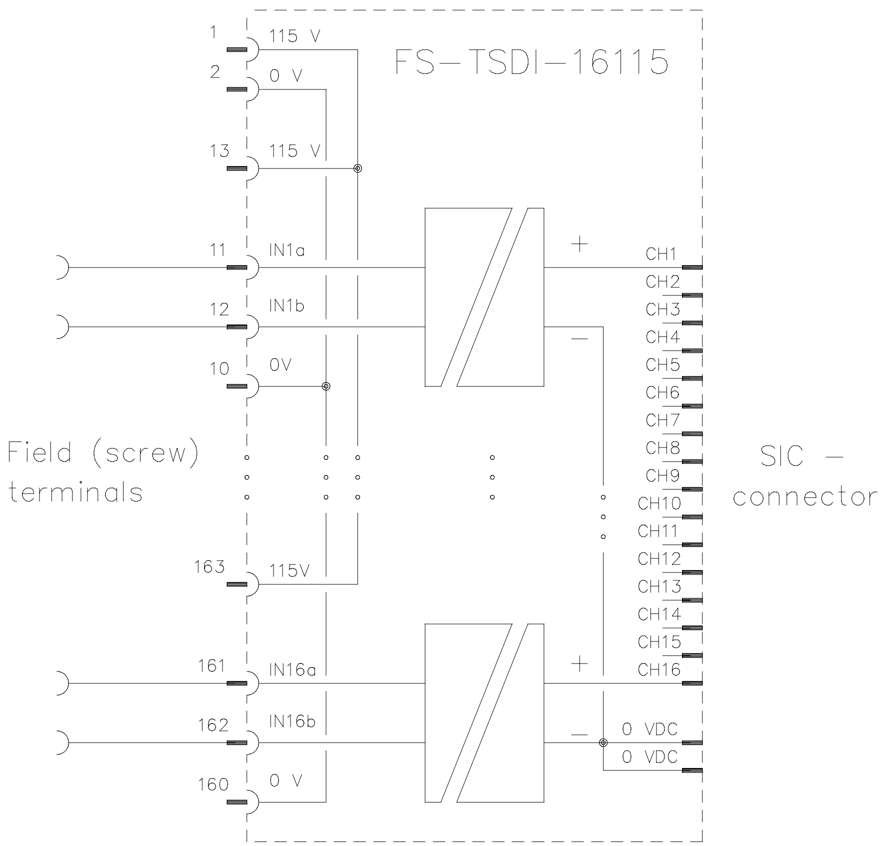


Figure 6 Schematic diagram for connecting active inputs.

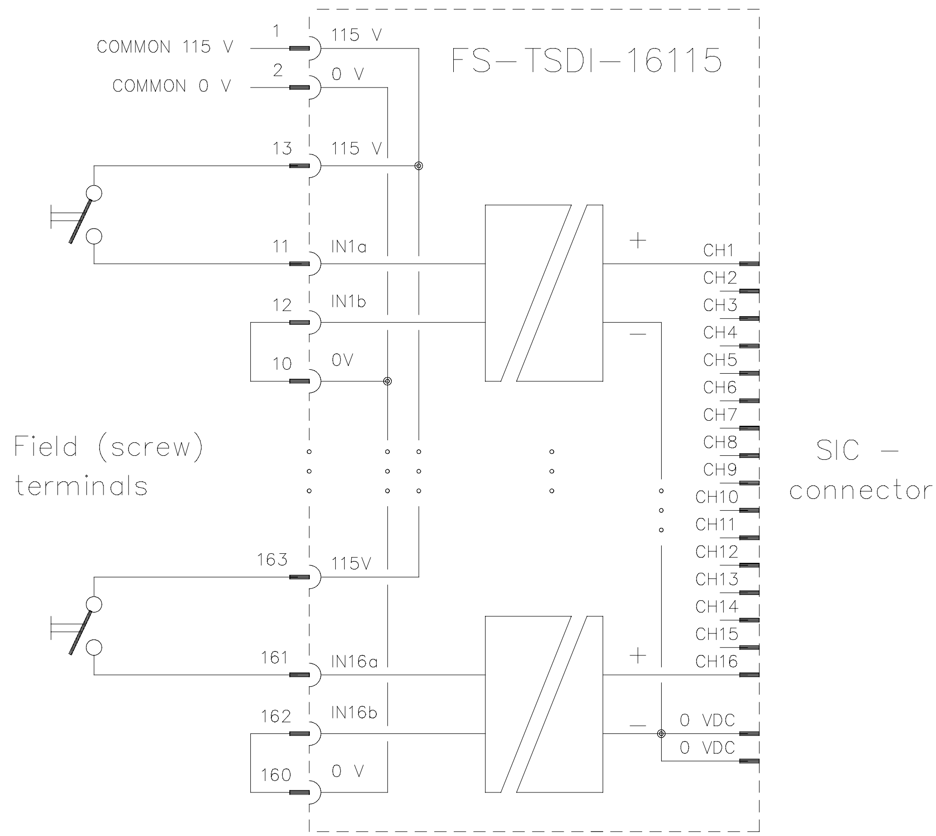


Figure 7 Schematic diagram for connecting passive inputs.

Connections

The connections diagram of the FS-TSDI-16115 module is as follows:

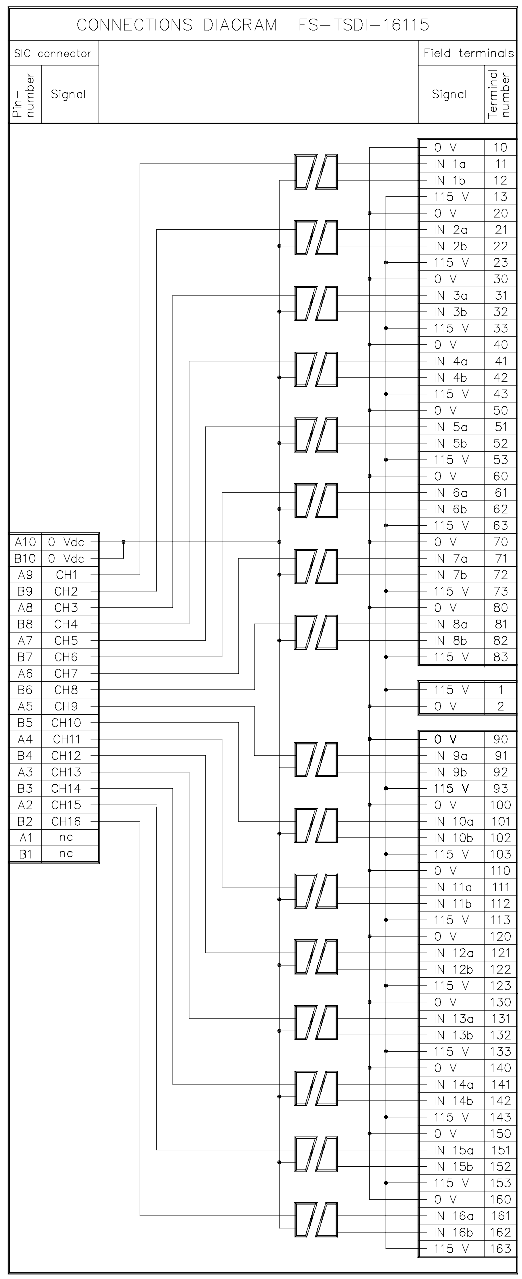


Figure 8 Connections diagram

Technical data

The FS-TSDI-16115 module has the following specifications:

General	Type number:	FS-TSDI-16115
	Approvals:	UL, CE, TÜV
Input	Number of input channels:	16
	Input voltage:	115 V, –15% ... + 30%
	Input frequency:	DC or 40...300 Hz
	Input current:	7.5 mA (± 1 mA) at 115 V
	Input impedance:	non-inductive, > 9 kOhm
	Input LOW:	U ≤ 15 V or I ≤ 1.2 mA *(see 'Field cable length' section in this data sheet)*
Physical	Module dimensions:	300 x 109 x 68 mm (L x W x H) 11.81 x 4.29 x 2.68 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	301 mm (11.85 in)
Isolation	Isolation input to output:	2 kV
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FS-TIDI-1624 Isolated passive digital input FTA (16 channels)

Description

The field termination assembly module FS-TIDI-1624 is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals). It has sixteen non-fail-safe isolated 24 Vdc input channels.

Sixteen channels can be connected to the FS-TIDI-1624 module via the system interconnection cable SIC-C-12. This cable is plugged into the SIC connector on the FTA module, and connects to a (redundant pair of) 10101/2/1 module(s).
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

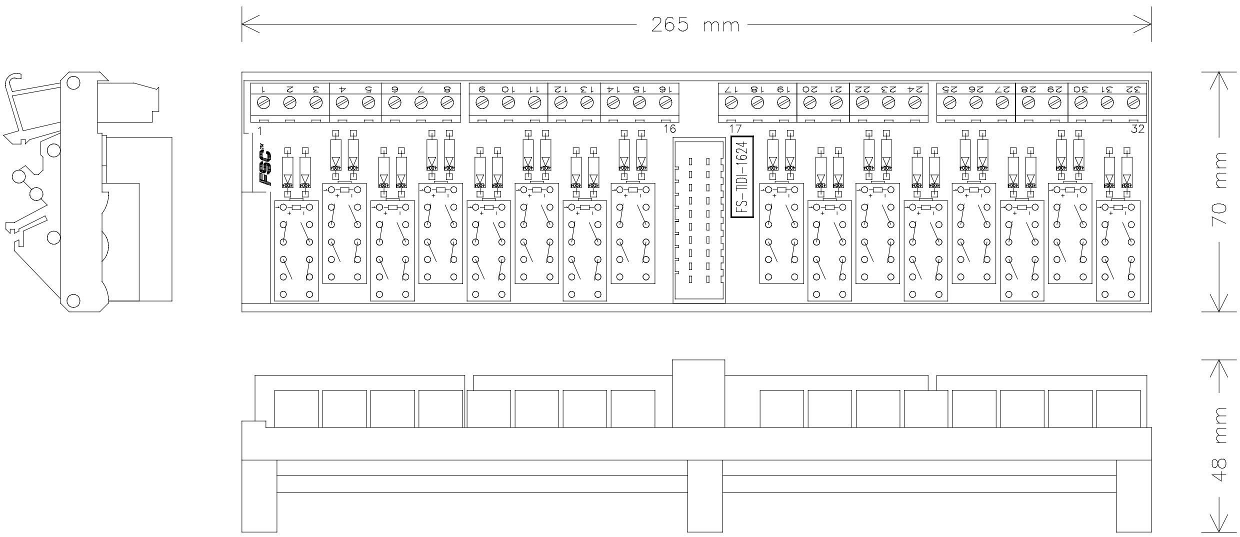


Figure 1 Mechanical layout

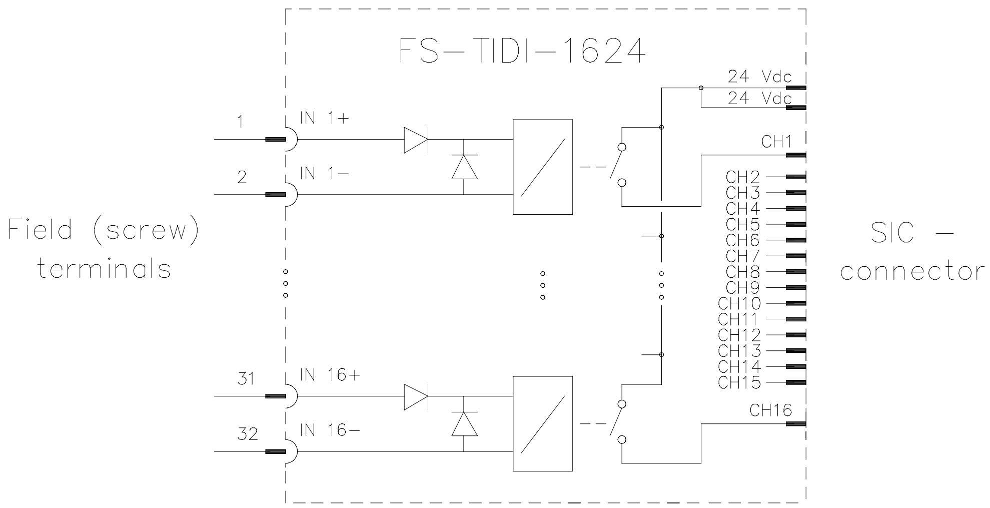


Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FS-TIDI-1624 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TIDI-1624 module is as follows:

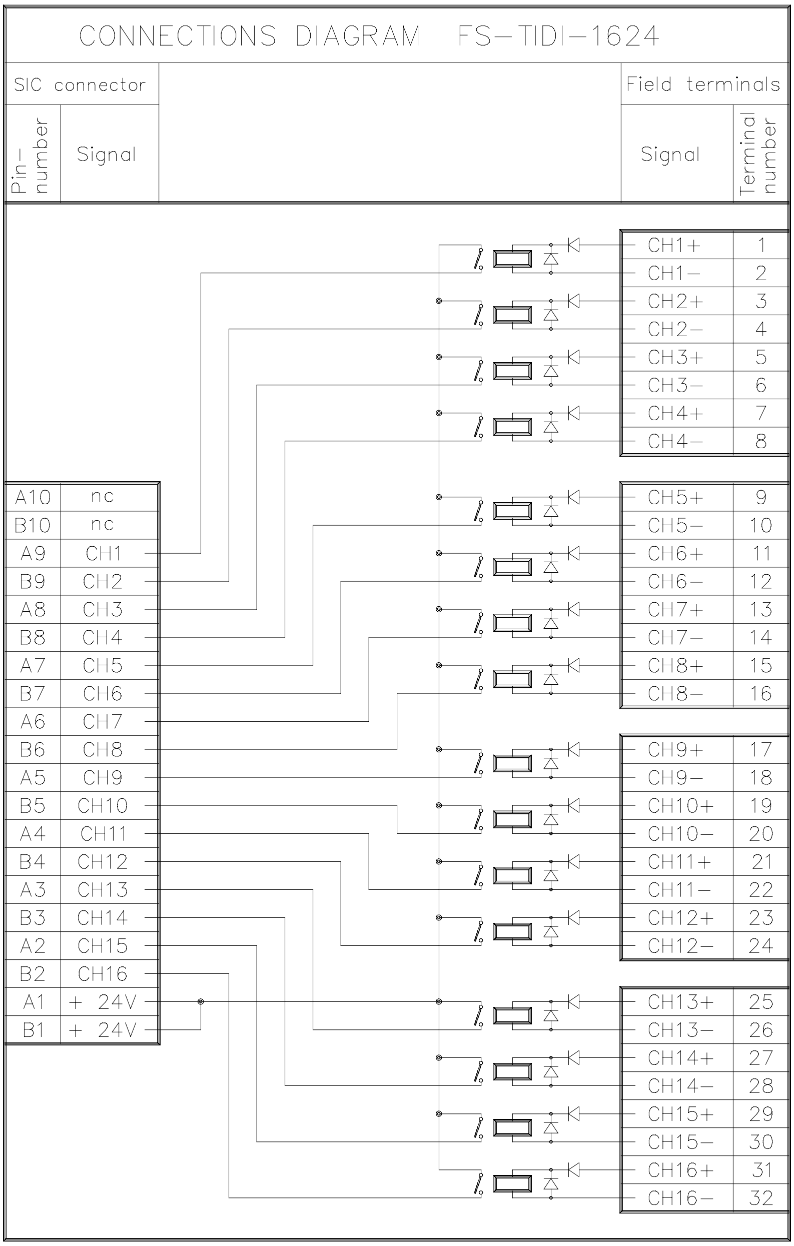


Figure 3 Connections diagram

Technical data

The FS-TIDI-1624 module has the following specifications:

General	Type number:	FS-TIDI-1624
	Approvals:	CE, TÜV, UL approvals pending
Input	Number of input channels:	16
	Nominal input voltage:	24 Vdc
	Drop-out voltage:	2.8 Vdc
	Pick-up voltage:	17.5 Vdc
	Max. input voltage:	47.5 Vdc
	Reverse polarity protection:	series diode
	Max. reverse voltage:	300 V
	Input current:	typically 9 mA at 24 Vdc
	Max. switching frequency:	20 Hz
Physical	Module dimensions:	265 x 70 x 48 mm (L x W x H) 10.43 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	266 mm (10.47 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Isolation	Galvanic isolation:	
	– input to output	1000 Vac
	– input to input	1000 Vac

FS-TSAI-0410 Fail-safe analog input FTA (4 channels)

Description

The field termination assembly module FS-TSAI-0410 is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals).

The four channels of a (redundant pair of) 10102/2/1 module(s) can be connected to the FS-TSAI-0410 module via the system interconnection cable SIC-C-12. Range selection (active, passive, volts/current) is still set using 10102/A/*x* boards.
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

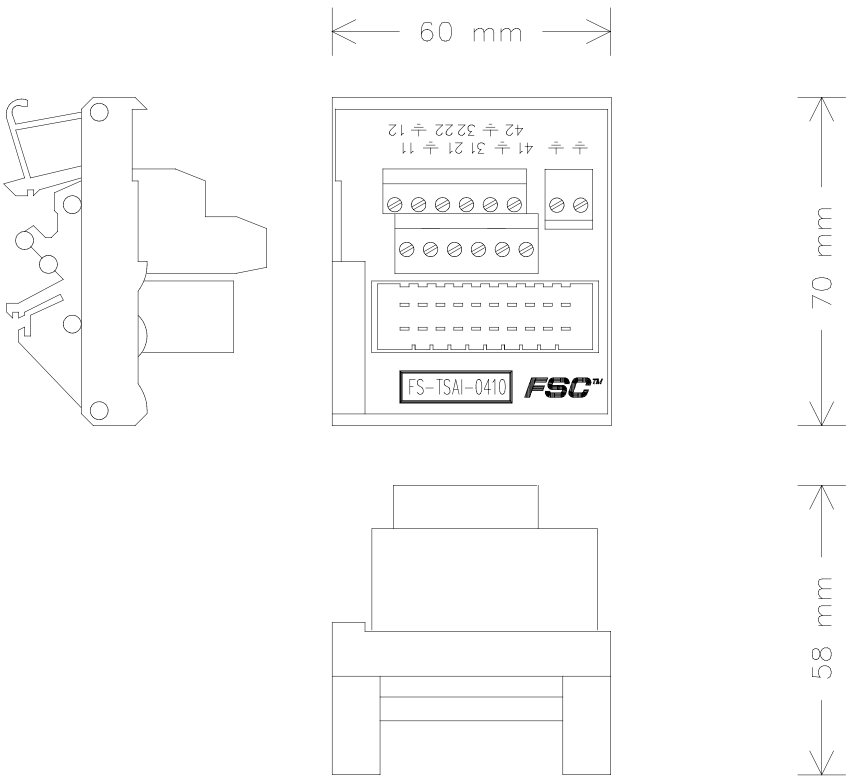


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TSAI-0410 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TSAI-0410 module is as follows:

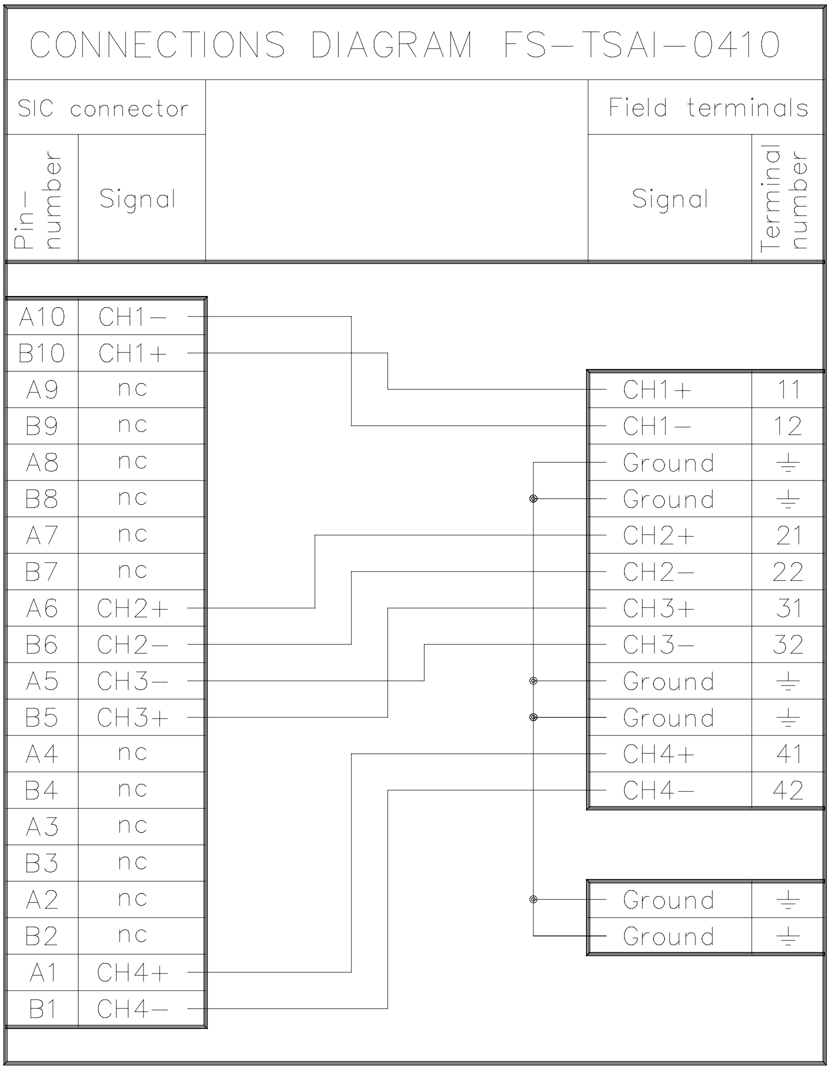


Figure 2 Connections diagram

Technical data

The FS-TSAI-0410 module has the following specifications:

General	Type number:	FS-TSAI-0410
	Approvals:	CE, UL approvals pending
Power	Number of channels:	4
	Maximum voltage:	36 Vac / 50 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12)
	Maximum continuous current/voltage per channel:	50 mA (0(4)-20mA setting) 10 V (0(2)-10V setting)
Physical	Module dimensions:	60 x 70 x 58 mm (L x W x H) 2.36 x 2.76 x 2.28 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	61 mm (2.40 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FS-TSAI-1620m Fail-safe 0(4)-20 mA analog input FTA (16 channels)

Description

The field termination assembly module FS-TSAI-1620m is the interface between field components (sensors, etc.) and the fail-safe high-density analog input module 10105/2/1 in the FSC system. It can be used for interfacing signals from Class I, Division 2 Hazardous Locations.

The FS-TSAI-1620m module has sixteen analog input channels, which may be used for both safety-related and non-safety-related applications. These sixteen channels (separated into two groups of eight channels with common 0 V) are connected via a system interconnection cable (SIC), which is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connection of power supply, ground and field wiring.

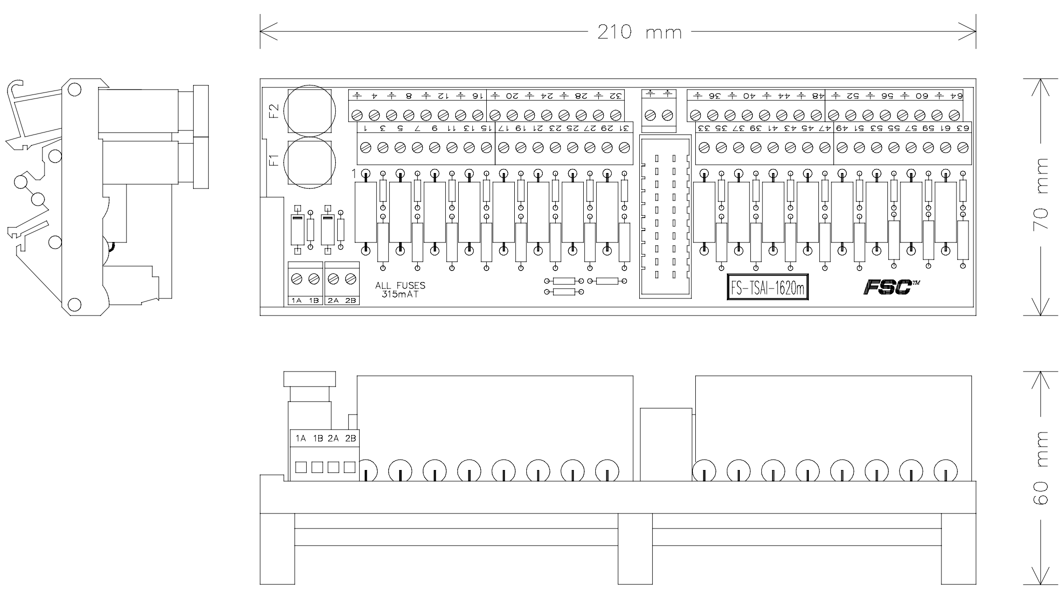


Figure 1 Mechanical layout

Main functions

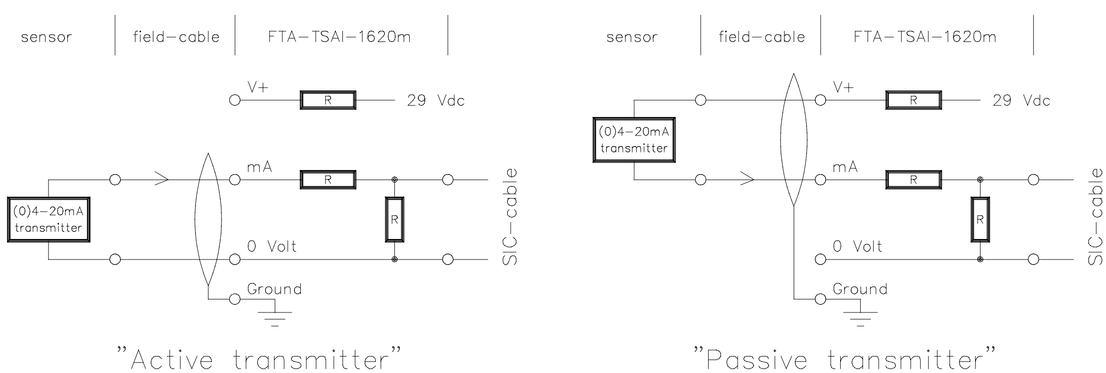
The FS-TSAI-1620m module has three main functions:

- linear direct conversion of 0(4)-20 mA DC field signals to the signal levels of the fail-safe high-density analog input module 10105/2/1,
- power supply distribution to each transmitter with voltage-current limitation in compliance with Hazardous Area Class I Division 2, and
- enable monitoring of the external power connected to the FS-TSAI-1620m module.

Linear direct conversion

The input circuit of each channel consists of a high-precision resistor, which converts the input current (0 to 20 mA) to the input voltage for the high-density analog input module 10105/2/1. The power to the analog transmitter is supplied via a series resistor. Each analog signal has its own terminal for the field cable shield.

Figure 2 below shows the schematic diagram for connecting a



transmitter (active and passive).

Figure 2 Schematic diagram for connecting a transmitter

Class I Division 2

The FS-TSAI-1620m module may be used in for non-incendive field circuits to Class I, Division 2 applications. The external output voltage (V+) is current-limited by means of a series resistor.

Transmitter voltage

Figure 3 below shows the available transmitter voltage for passive transmitters.

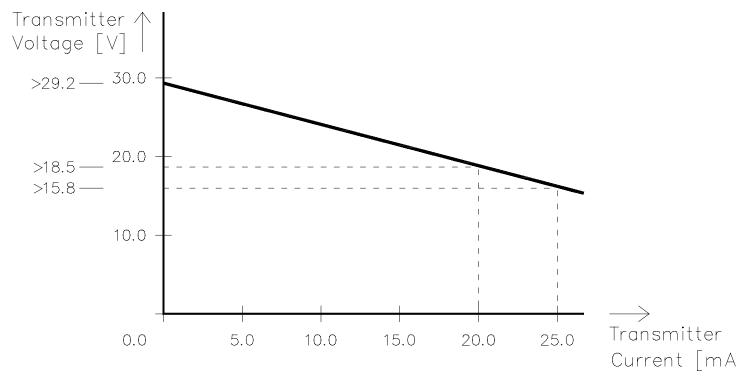


Figure 3 Transmitter voltage for passive transmitters

External power

If all inputs are active, no external power is required.

For loops, which contain passive transmitters, analog process data is only available if the supply voltage to the electronics is guaranteed. The high-density analog input concept (using FS-TSAI-1620m / FS-TPSU-2430 modules) offers full monitoring of power that is provided externally. If DC/DC converter modules FS-TPSU-2430 are used, even redundant power supplies are covered.

Redundant external power can be connected to the FS-TSAI-1620m module via two screw terminal pairs marked '1A', '1B', '2A' and '2B'. The external power supplies are de-coupled via diodes (see figure 4). The sixteen channels on the FTA module are divided into two groups of eight channels, with each group being protected by a 315 mA fuse. Single-channel errors (shorts from V+ to 0 V) cannot blow the group fuse.

Note:
The 0 V connection of the external power is directly connected to the common 0 V of all sixteen analog inputs.

The FSC application software must monitor the external power voltage via the fail-safe high-density analog input module 10105/2/1 when safety-related analog input signals are connected to the FS-TSAI-1620m.

Figure 4 below shows the schematic diagram for power distribution with monitoring.

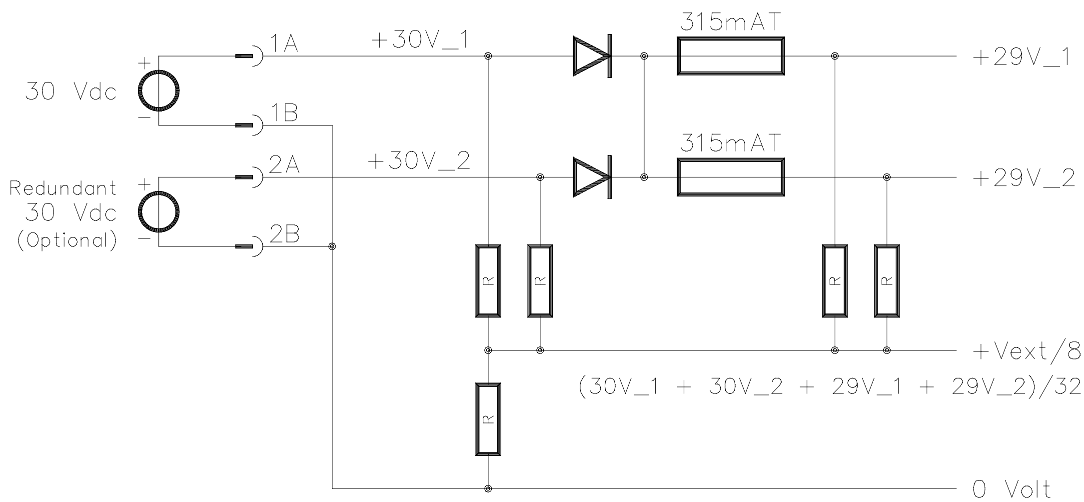


Figure 4 Schematic diagram for power distribution with monitoring

Applications

For details on applications and connection options for the FS-TSAI-1620m module refer to the 'SIC to FTA applications' data sheet.

Connections

External power and ground

The redundant external supply voltage (Vext) and ground are connected to the following screw terminals (marked '1A', '1B', '2A', '2B' and '⏚' on the FTA):

Screw terminal	Function
1A	30 Vdc Vext feeder 1
1B	0 Vdc Vext feeder 1
2A	30 Vdc Vext feeder 2
2B	0 Vdc Vext feeder 2
⏚	Ground connection
⏚	Ground connection

Connections diagram

The FS-TSAI-1620m module has sixteen groups (= sixteen channels) of four screw terminals to provide optimum connection of field wiring, with a ground terminal per channel for screening of analog input cables. The screw terminals are numbered 1 to 64. The connections diagram of the FS-TSAI-1620m module is as follows:

Connections diagram

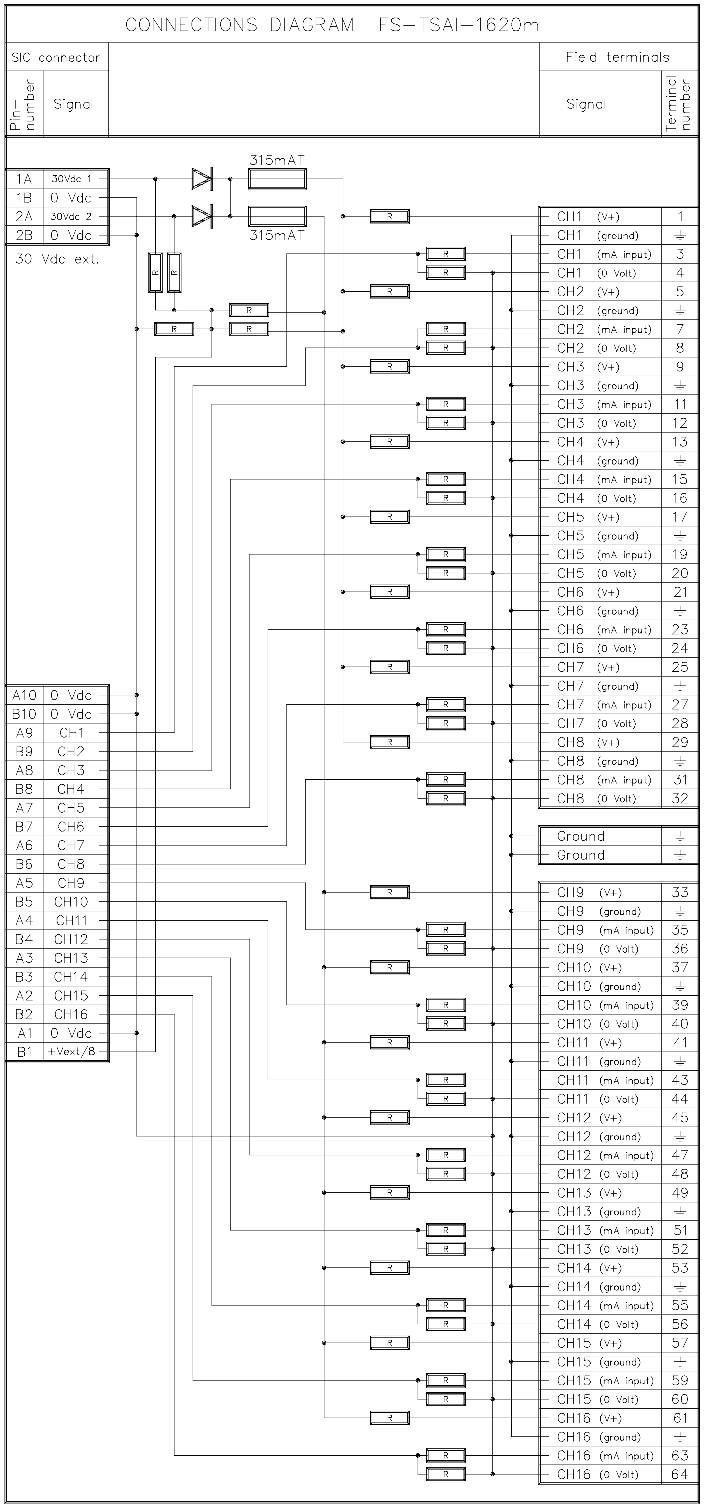


Figure 5 Connections diagram

Technical data

The FS-TSAI-1620m module has the following specifications:

General	Type number:	FS-TSAI-1620m
	Approvals:	CE, TÜV, UL, FM**
Input	Number of input channels:	16 (2 groups of 8 with common 0 V)
	Power requirements:	30 Vdc external 3 mA (without input loop loads)
	Input current:	0 to 25 mA
	Input resistance:	250 Ohm (± 1%)
Output	To passive transmitters (Vext):	
	– output resistance:	270 Ohm (± 5%)
	– igniting current per channel:	< 120 mA at 30 Vdc
	To 10105/2/1 module:	
	– output voltage	0 to 4 Vdc
	– accuracy	0.1%
Fuses	Rating:	315 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.20 x 0.79 in)
Physical	Module dimensions:	210 x 70 x 60 mm (L x W x H) 8.26 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	211 mm (8.30 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications **For non-incendive** **Field circuits, Class1 Division 2**	HYDROGEN (Group A & B):	
	– max. loop inductance	6 mH
	– max. loop capacitance	0.25 µF
	NON-HYDROGEN (Group C & D):	
	– max. loop inductance	20 mH
	– max. loop capacitance	5 µF

** See datasheet 10105/2/1

Left blank intentionally.

FS-TSHART-1620m Fail-safe 0(4)-20 mA analog input FTA with HART interface (16 channels)

Description

The field termination assembly module FS-TSHART-1620m is the interface between field components (sensors, etc.) and the fail-safe high-density analog input module 10105/2/1 in the FSC system. The FTA provides HART interface. It can be used for interfacing signals from Class I, Division 2 Hazardous Locations.

The FS-TSHART-1620m module has sixteen analog input channels, which may be used for both safety-related and non-safety-related applications. These sixteen channels (separated into two groups of eight channels with common 0 V) are connected via a system interconnection cable (SIC), which is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connection of power supply, ground and field wiring.

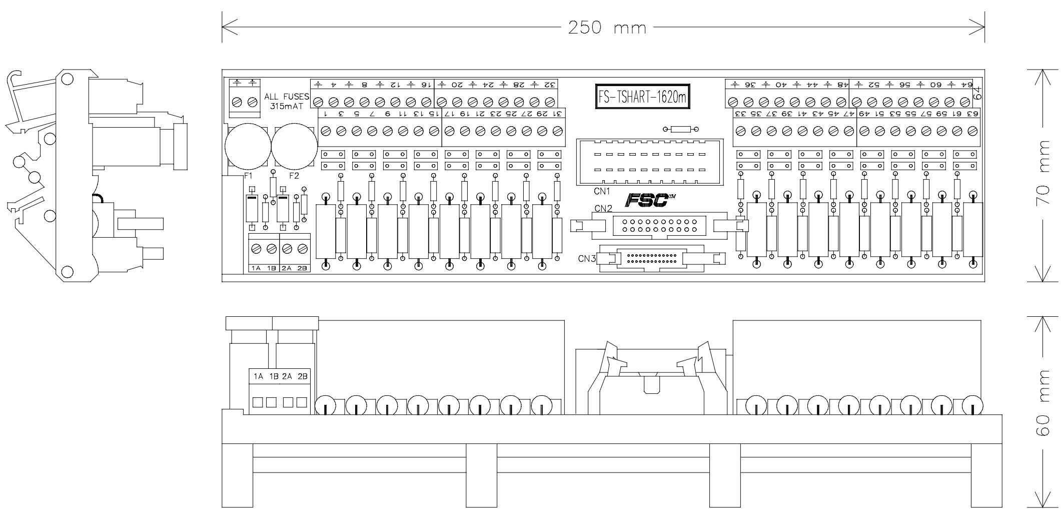


Figure 1 Mechanical layout

Main functions

The FS-TSHART-1620m module has four main functions:

- linear direct conversion of 0(4)-20 mA DC field signals to the signal levels of the fail-safe high-density analog input module 10105/2/1,
- enable connection to HART multiplex units of MTL or Pepperl+Fuchs (P+F),
- power supply distribution to each transmitter with voltage-current limitation in compliance with Hazardous Area Class I Division 2, and
- enable monitoring of the external power connected to the FS-TSAI-1620m module.

Linear direct conversion

The input circuit of each channel consists of a high-precision resistor, which converts the input current (0 to 20 mA) to the input voltage for the high-density analog input module 10105/2/1. The power to the analog transmitter is supplied via a series resistor. Each analog signal has its own terminal for the field cable shield.

Figure 2 below shows the schematic diagram for connecting a transmitter (active and passive).

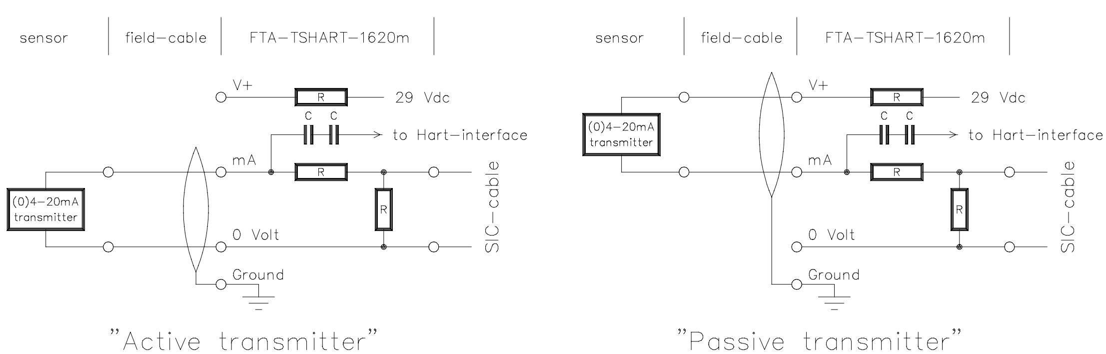


Figure 2 Schematic diagram for connecting a transmitter

HART interface

The FS-TSHART-1620m module provides an interface to HART multiplex units from MTL and P+F. On the FTA special connectors are installed for connection of the standard cables from these suppliers.

The following connections and equipment can be used:

MTL solution:
- Multiplex unit MTL4842
- Cable: MTL FLAT20-2.2
- Connector on FTA: CN2 (see figure 1)

P+F solution:
- Multiplex unit KFD0-HMS-16 or KFD2-HMM-16
- Cable : K-HM26
- Connector on FTA: CN3 (see figure 1)

Class I Division 2

The FS-TSHART-1620m module may be used in for non-incendive field circuits to Class I, Division 2 applications. The external output voltage (V+) is current-limited by means of a series resistor.

Transmitter voltage

Figure 3 below shows the available transmitter voltage for passive transmitters.

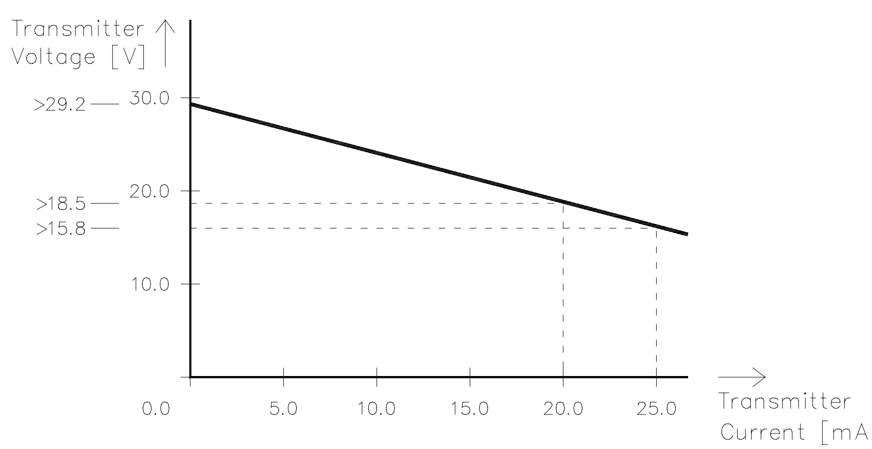


Figure 3 Transmitter voltage for passive transmitters

External power

If all inputs are active, no external power is required.

For loops, which contain passive transmitters, analog process data is only available if the supply voltage to the electronics is guaranteed. The high-density analog input concept (using FS-TSHART-1620m / FS-TPSU-2430 modules) offers full monitoring of power that is provided externally. If DC/DC converter modules FS-TPSU-2430 are used, even redundant power supplies are covered.

Redundant external power can be connected to the FS-TSAI-1620m module via two screw terminal pairs marked '1A', '1B', '2A' and '2B'. The screw terminal pairs are interconnected on the FTA module but de-coupled via diodes. The sixteen channels on the FTA module are divided into two groups of eight channels, with each group being protected by a 315 mA fuse. Single-channel errors (shorts from V+ to 0 V) cannot blow the group fuse.

Note:
The 0 V connection of the external power is directly connected to the common 0 V of all sixteen analog inputs.

The FSC application software must monitor the external power voltage via the fail-safe high-density analog input module 10105/2/1 when safety-related analog input signals are connected to the FS-TSHART-1620m.

Figure 4 below shows the schematic diagram for power distribution with monitoring.

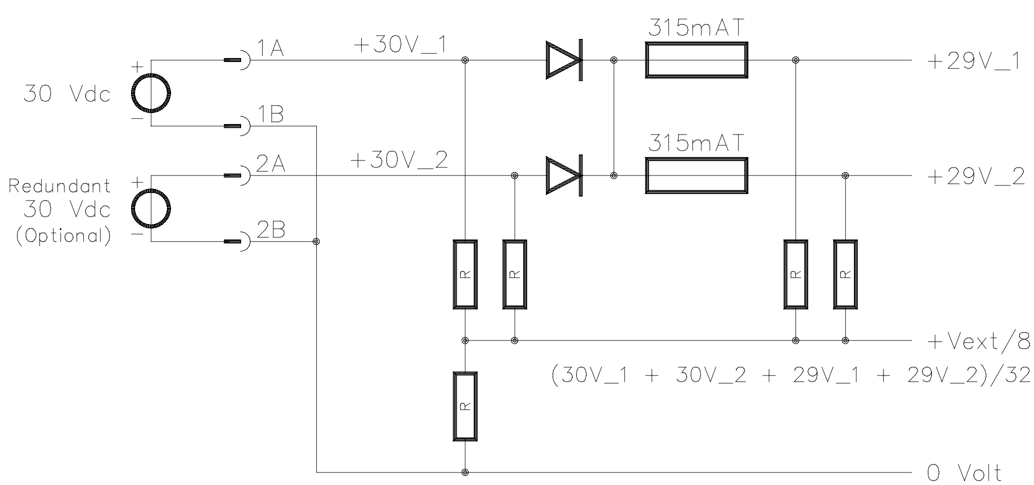


Figure 4 Schematic diagram for power distribution with monitoring

Applications

For details on applications and connection options for the FS-TSHART-1620m module refer to the 'SIC to FTA applications' data sheet.

Connections

External power and ground

The redundant external supply voltage (Vext) and ground are connected to the following screw terminals (marked '1A', '1B', '2A', '2B' and '⏚' on the FTA):

Screw terminal	Function
1A	30 Vdc Vext feeder 1
1B	0 Vdc Vext feeder 1
2A	30 Vdc Vext feeder 2
2B	0 Vdc Vext feeder 2
⏚	Ground connection
⏚	Ground connection

Connections diagram

The FS-TSHART-1620m module has sixteen groups (= sixteen channels) of four screw terminals to provide optimum connection of field wiring, with a ground terminal per channel for screening of analog input cables. The screw terminals are numbered 1 to 64. The connections diagram of the FS-TSHART-1620m module is as follows:

Connections diagram

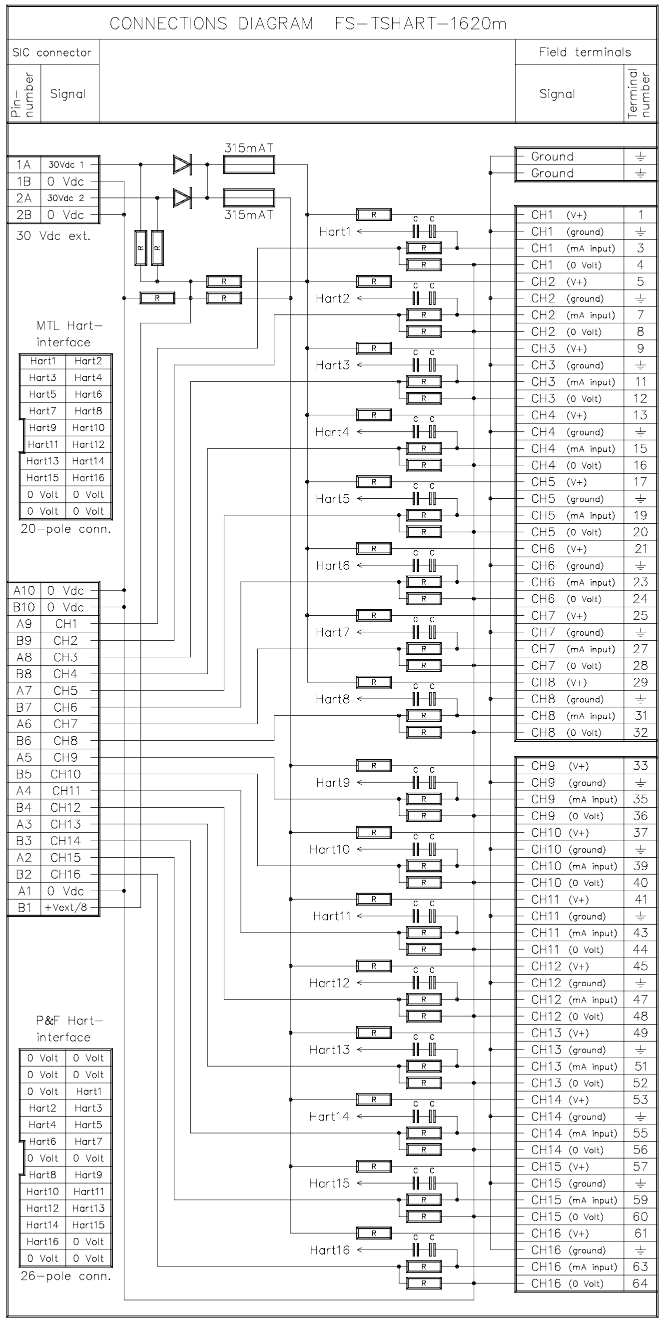


Figure 5 Connections diagram

Technical data

The FS-TSHART-1620m module has the following specifications:

General	Type number:	FS-TSHART-1620m
	Approvals:	CE, TÜV, UL, FM** Pending
Input	Number of input channels:	16 (2 groups of 8 with common 0 V)
	Power requirements:	30 Vdc external 3 mA (without input loop loads)
	Input current:	0 to 25 mA
	Input resistance:	250 Ohm (± 1%)
Output	To passive transmitters (Vext):	
	– output resistance:	270 Ohm (± 5%)
	– igniting current per channel:	< 120 mA at 30 Vdc
	To 10105/2/1 module:	
	– output voltage	0 to 4 Vdc
	– accuracy	0.1%
	To HART multiplex unit:	
	– output voltage	Max. 5 V peak-peak
	– series impedance	> 100 nF
Fuses	Rating:	315 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.20 x 0.79 in)
Physical	Module dimensions:	250 x 70 x 60 mm (L x W x H) 9.84 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	251 mm (9.87 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	HYDROGEN (Group A & B):	
	– max. loop inductance	6 mH
For non-incendive	– max. loop capacitance	0.25 µF

Technical data (continued)

Field circuits, Class1 Division 2	NON-HYDROGEN (Group C & D): – max. loop inductance 20 mH – max. loop capacitance 5 µF

** See datasheet 10105/2/1

.

FS-TSGAS-1624 Fail-safe Gas -Flame detector input FTA (0 - 20 mA, 16 channels)

(FTA-T-18)

Description

The field termination assembly module FS-TSGAS-1624 is the interface between gas/ flame detectors in the field and the fail-safe high-density analog input module 10105/2/1 in the FSC system.

The FS-TSGAS-1624 module has sixteen analog input channels which may be used for both safety-related and non-safety-related applications. The FS-TSGAS-1624 module uses a SIC-C-12 system interconnection cable to transfer the 16 input signals to a (redundant pair of) 10105/2/1 module(s).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connection of power supply, ground and field wiring.

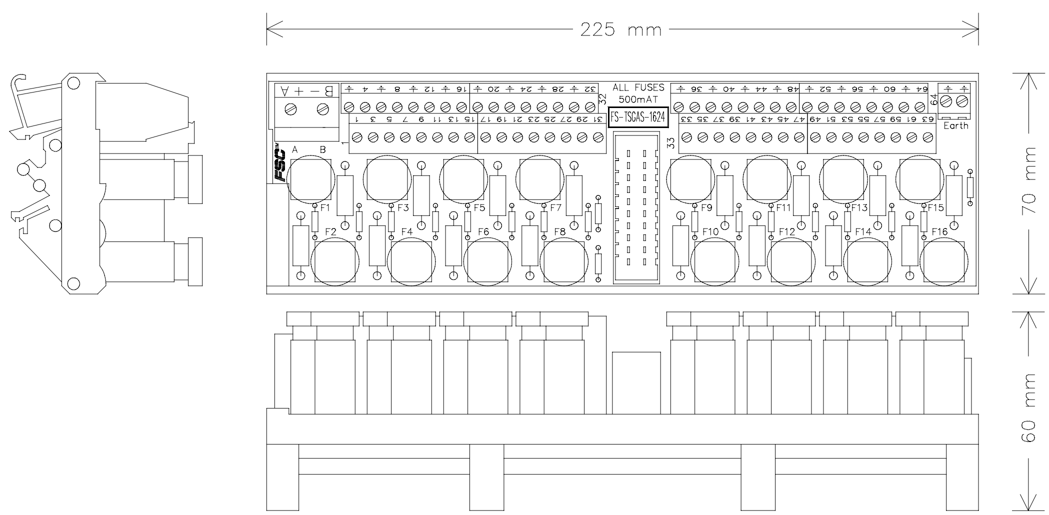


Figure 1 Mechanical layout

Main functions

The FS-TSGAS-1624 module has three main functions:

- linear direct conversion of 0(4)-20 mA DC field signals to the signal levels of the fail-safe high-density analog input module 10105/2/1,
- power supply distribution to each transmitter (500 mAT fused),
- enable monitoring of the external power connected to the FS-TSGAS-1624 module.

Linear direct conversion

The input circuit of each channel consists of a high-precision resistor which converts the input current (0 to 20 mAT) to the input voltage for the high-density analog input module 10105/2/1. The power to the analog transmitter is fused (500 mAT) per channel. Each analog input has its own terminal for the field cable shield.

Figure 2 below shows the schematic diagram for connecting a transmitter (active and passive).

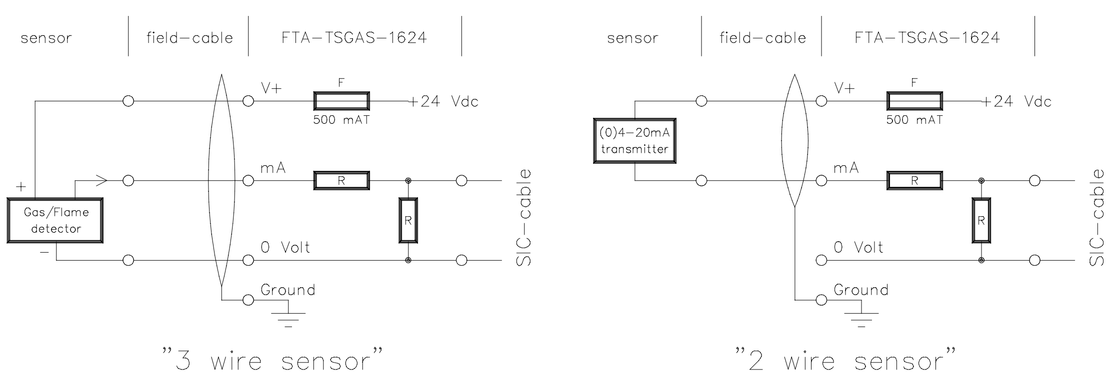


Figure 2 Schematic diagram for connecting a transmitter

External power

External power can be connected to the FS-TSGAS-1624 module via the power screw terminal pair marked 'A' and 'B'.

Note:
The 0 V connection of the external power is directly connected to the common 0 V of all sixteen analog inputs.

The FSC software can monitor the external power voltage via the fail-safe high-density analog input module 10105/2/1.

Applications

For details on applications and connection options for the FS-TSGAS-1624 module refer to the 'SIC to FTA applications' data sheet.

Connections

External power and ground

The external supply voltage (Vext) and ground are connected to the following screw terminals (marked 'A' and 'B' and '⏚' on the FTA):

Screw terminal	Function
A	24 Vdc Vext
B	0 Vdc Vext
⏚	Ground connection
⏚	Ground connection (1 ground wire is enough)

Connections diagram

The FS-TSGAS-1624 module has sixteen groups (= sixteen channels) of four screw terminals to provide optimum connection of field wiring, with a earth terminal per channel for screening of analog input cables. The screw terminals are numbered 1 to 64. The connections diagram of the FS-TSGAS-1624 module is as follows:

Connections diagram

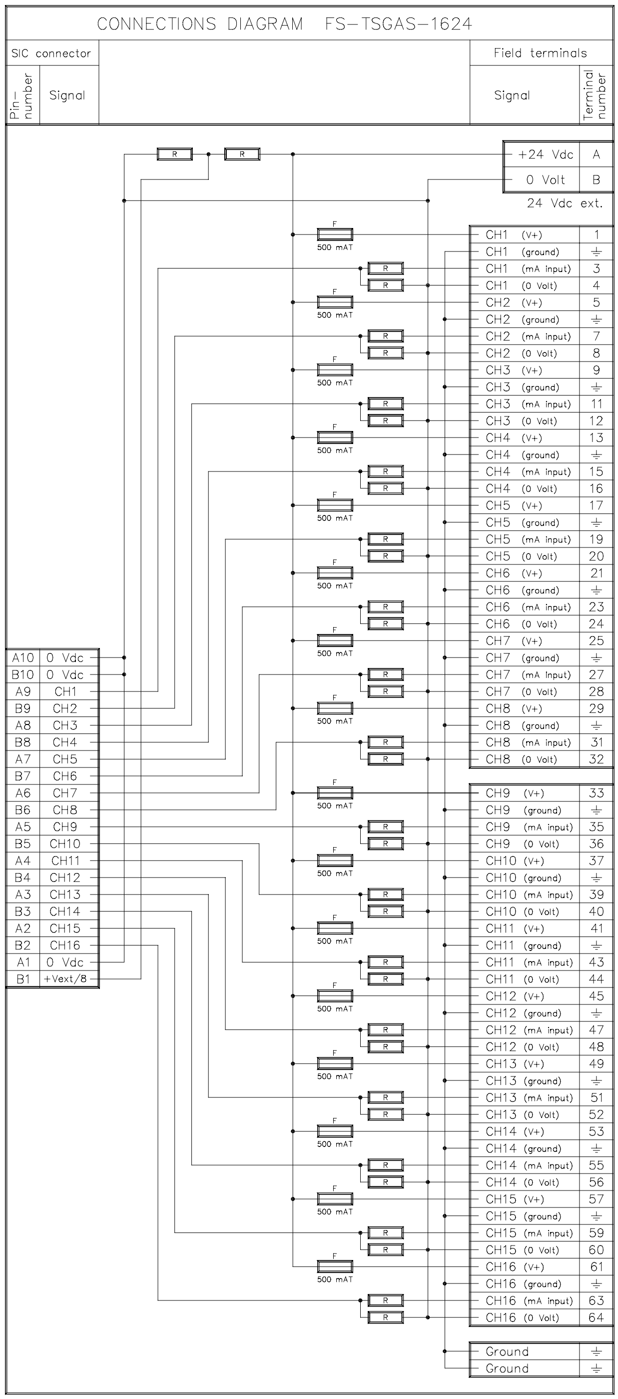


Figure 3 Connections diagram

Technical data

The FS-TSGAS-1624 module has the following specifications:

General	Type number:	FS-TSGAS-1624
	Approvals:	CE; TÜV, UL approvals pending
Input	Number of input channels:	16 (with common 0 V)
	Power requirements:	24 Vdc external 3 mA (without field loads)
	Input current:	0 to 25 mA
	Input resistance:	500 Ohm (± 5%)
Output	To 10105/2/1 module:	
	– output voltage	0 to 4 Vdc
	– accuracy	0.1%
Fuses	Rating:	500 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.20 x 0.79 in)
Physical	Module dimensions:	225 x 70 x 60 mm (L x W x H) 8.86 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	226 mm (8.90 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
	Power screw terminals (A, B):	
	– max. wire diameter	16 mm² (AWG 8)
	– strip length	7 mm (0.28 in)
	– tightening torque	1.2 Nm (0.88 ft-lb)

Left blank intentionally.

FS-TSFIRE-1624 Fail-safe Fire detector input FTA with line monitoring (24 Vdc, 16 channels)

(FTA-T-19)

Description

The field termination assembly module FS-TSFIRE-1624 is the interface between (digital) fire detectors and the fail-safe high-density analog input module 10105/2/1 in the FSC system. It may be used for installations in, and interfacing signals to Class I, Division 2 Hazardous Locations.

The FS-TSFIRE-1624 module has sixteen digital detector input channels which may be used for both safety-related and non-safety-related applications. The FS-TSFIRE-1624 module uses a SIC-C-12 system interconnection cable to transfer the 16 input signals to a (redundant pair of) 10105/2/1 module(s).
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connection of power supply and field wiring.

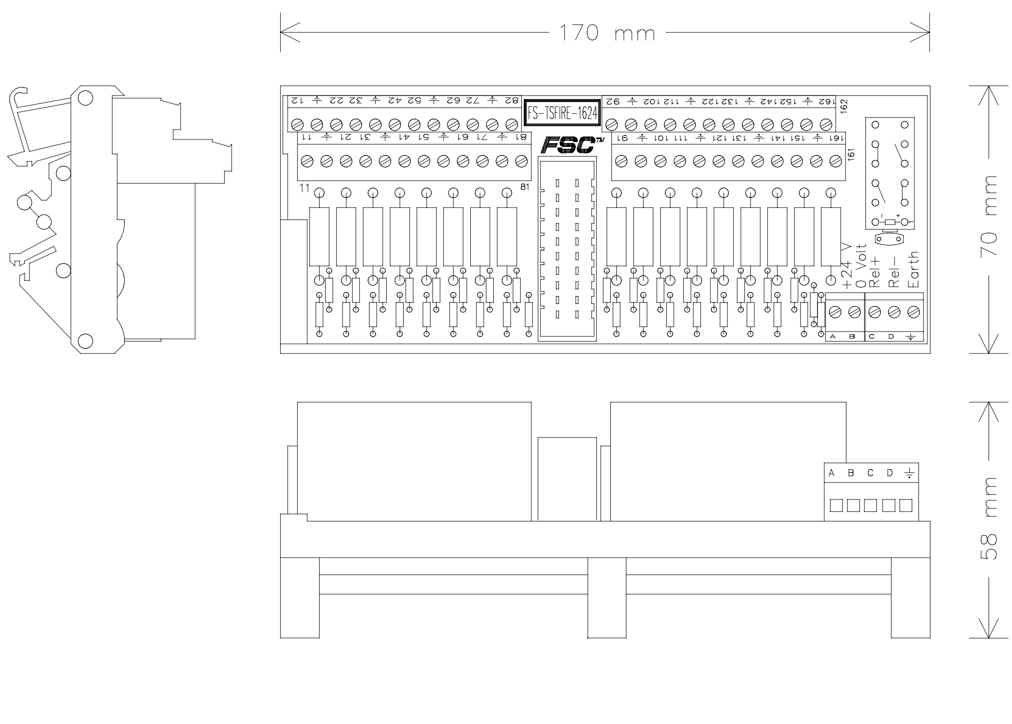


Figure 1 Mechanical layout

Main functions

The FS-TSFIRE-1624 module has three main functions:

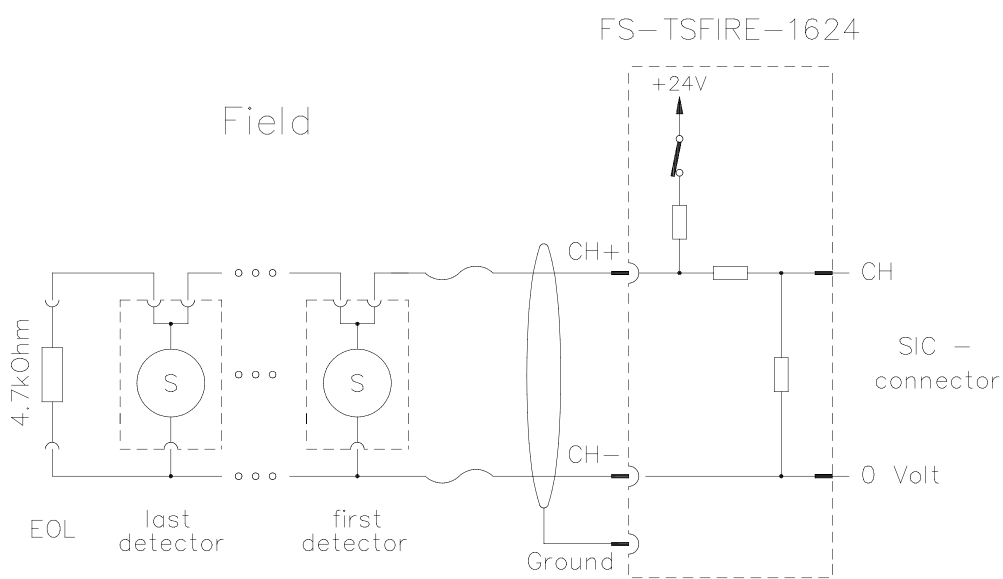
- power supply to each detector with voltage-current limitation in compliance with Hazardous Area Class I Division 2,
- fire detection input function, and
- global reset of the connected sensors.

Detector power supply

The FS-TSFIRE-1624 module requires an external 24 Vdc power supply.
This provides a field signal with open voltage of approx. 24 Vdc and a short-circuit current of approx. 35 mA. The normal operating voltage (with a 4.7 kOhm EOL resistor) is approx. 20.5 Volt.

Fire detector input

The FS-TSFIRE-1624 module converts an input for 24 V fire detectors to levels suitable for the 10105/2/1 module.
Figure 2 below shows the schematic diagram for the connection of fire



detectors or manual call points.

Figure 2 Typical schematic diagram for FS-TSFIRE-1624 input

Global reset

The relay on the FS-TSFIRE-1624 module enables a reset of all connected detectors by removing the supply voltage to the field. The relay is normally de-energized (energized = reset detectors). The Global Reset function is non-safety related .

Applications

For details on applications and connection options for the FS-TSFIRE-1624 module refer to the 'SIC to FTA applications' data sheet.

Connections

Common signals

The connections for common signals are as follows:

Screw terminal	Function
A	+ 24 Vdc Vext
B	0 Vdc Vext
C	Rel+
D	Rel–
E	Ground

Connections diagram

The FS-TSFIRE-1624 module has 48 screw terminals for connection of field wiring. The connections diagram of the FS-TSFIRE-1624 module is as follows:

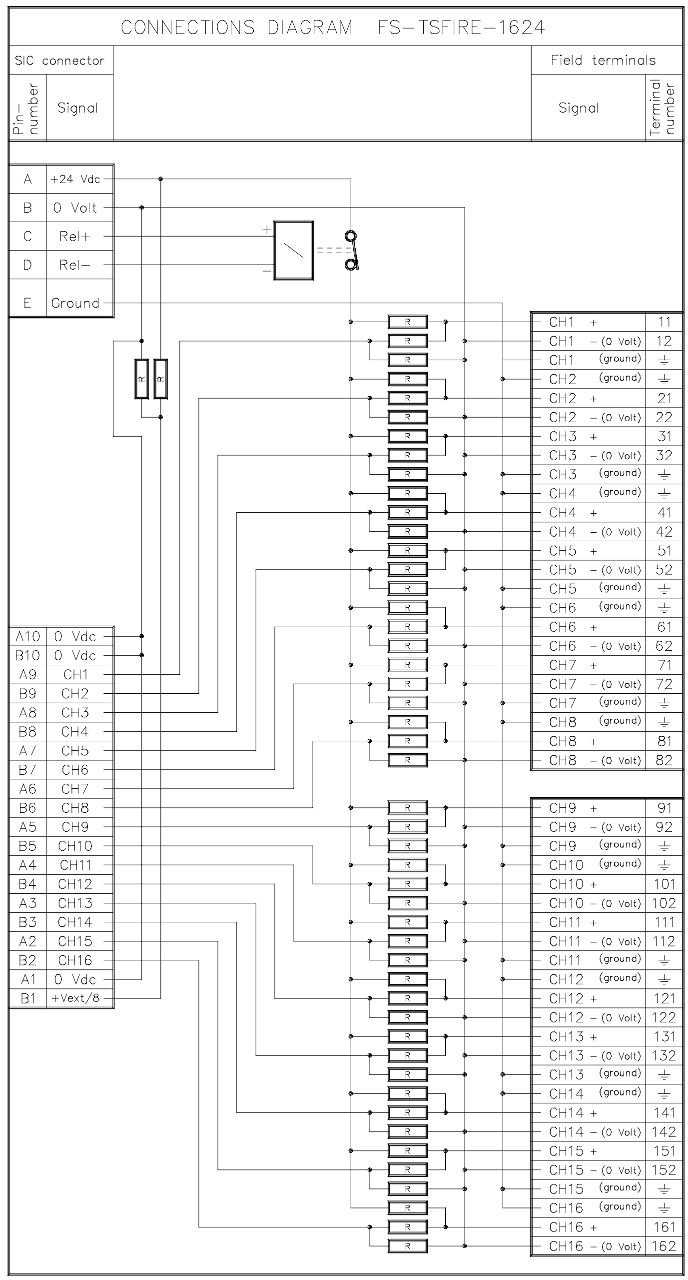


Figure 3 Connections diagram

Technical data

The FS-TSFIRE-1624 module has the following specifications:

General	Type number:	FS-TSFIRE-1624
	Approvals:	CE; TÜV, UL, FM approvals pending
Input	Number of input channels:	16
	Power requirements:	24 Vdc external max. 570 mA
	Max. current per channel:	35 mA at 24 Vdc
Output	Open voltage:	typically 23.5 Vdc (at 24 Vdc ext.)
	With EOL resistor:	typically 20.5 Vdc (at 24 Vdc ext.)
Physical	Module dimensions:	170 x 70 x 58 mm (L x W x H) 6.72 x 2.76 x 2.28 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	171 mm (6.73 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	Field wire resistance:	< 100 Ohm
	End-of-line (EOL) resistor:	e.g. 4k7, ± 5% (≥ 0.25 W) (see F&G Application Manual)
	HYDROGEN (Group A & B):	
	– max. loop inductance	60 mH
	– max. loop capacitance	0.3 µF
	NON-HYDROGEN (Group C & D):	
	– max. loop inductance	230 mH
	– max. loop capacitance	7 µF

Left blank intentionally.

FS-TSDO-0824 Fail-safe digital output FTA (24 Vdc, 8 channels)

Description

The field termination assembly module FS-TSDO-0824 is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals).

The eight channels of a (redundant pair of) 10201/2/1 module(s) can be connected to the FS-TSDO-0824 module via the system interconnection cable SIC-C-12.
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

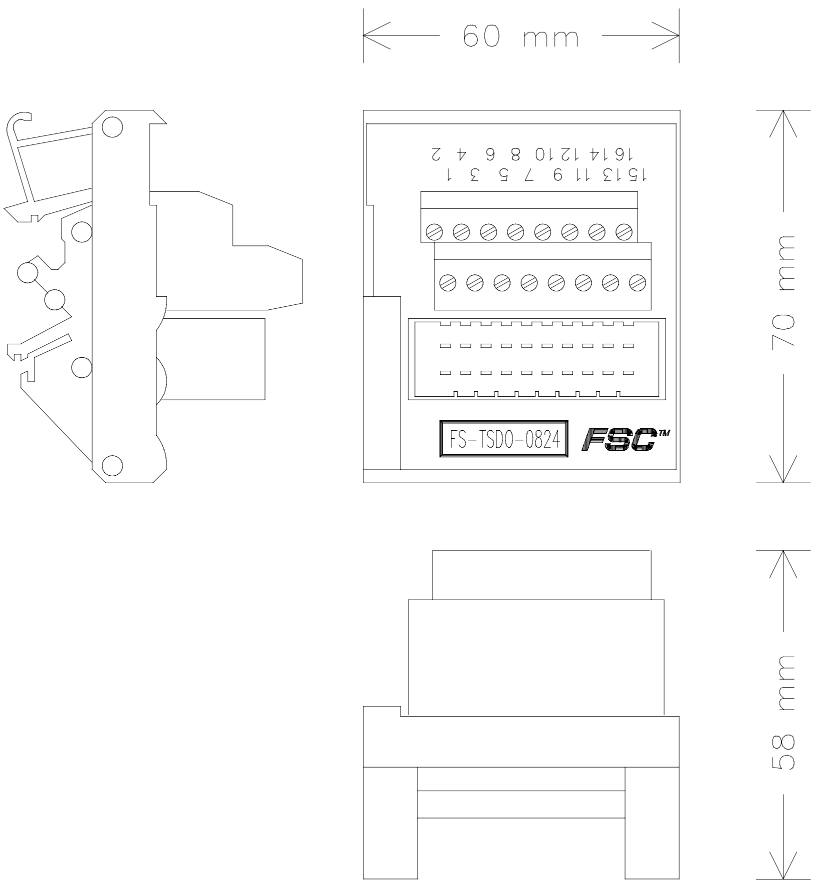


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TSDO-0824 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TSDO-0824 module is as follows:

CONNECTIONS DIAGRAM FS–TSDO–0824

SIC connector: Pin–number	SIC connector: Signal	Field terminals: Signal	Field terminals: Terminal number
A10	nc		
B10	nc		
A9	OUT1+	OUT1+	1
B9	OUT1–	OUT1– (0 Volt)	2
A8	OUT2+	OUT2+	3
B8	OUT2–	OUT2– (0 Volt)	4
A7	OUT3+	OUT3+	5
B7	OUT3–	OUT3– (0 Volt)	6
A6	OUT4+	OUT4+	7
B6	OUT4–	OUT4– (0 Volt)	8
A5	OUT5+	OUT5+	9
B5	OUT5–	OUT5– (0 Volt)	10
A4	OUT6+	OUT6+	11
B4	OUT6–	OUT6– (0 Volt)	12
A3	OUT7+	OUT7+	13
B3	OUT7–	OUT7– (0 Volt)	14
A2	OUT8+	OUT8+	15
B2	OUT8–	OUT8– (0 Volt)	16
A1	nc		
B1	nc		

Figure 2 Connections diagram

Technical data

The FS-TSDO-0824 module has the following specifications:

General	Type number:	FS-TSDO-0824
	Approvals:	CE, UL approvals pending
Power	Number of channels:	8
	Maximum voltage:	36 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12)
	Maximum continuous current per channel:	1.5 A
	Actual maximum current defined by connected output module	
Physical	Module dimensions:	60 x 70 x 58 mm (L x W x H) 2.36 x 2.76 x 2.28 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	61 mm (2.40 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FS-TSDO-0424 Fail-safe digital output FTA (24 Vdc, 4 channels)

Description

The field termination assembly module FS-TSDO-0424 is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals).

The four channels of a (redundant pair of) 10215/2/1 module(s) can be connected to the FS-TSDO-0424 module via the system interconnection cable SIC-C-12.
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

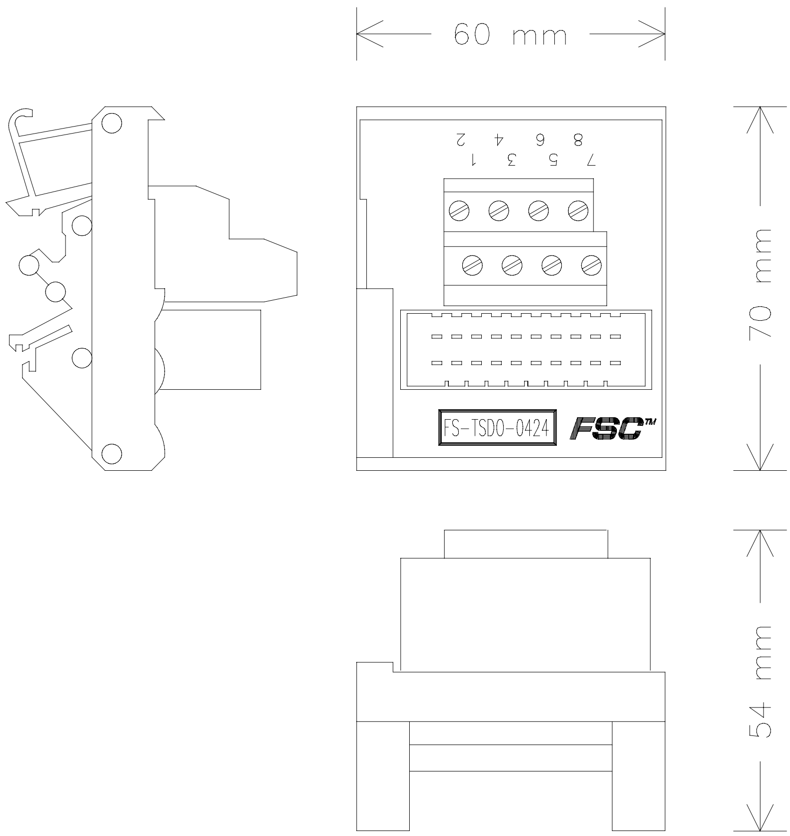


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TSDO-0424 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TSDO-0424 module is as follows:

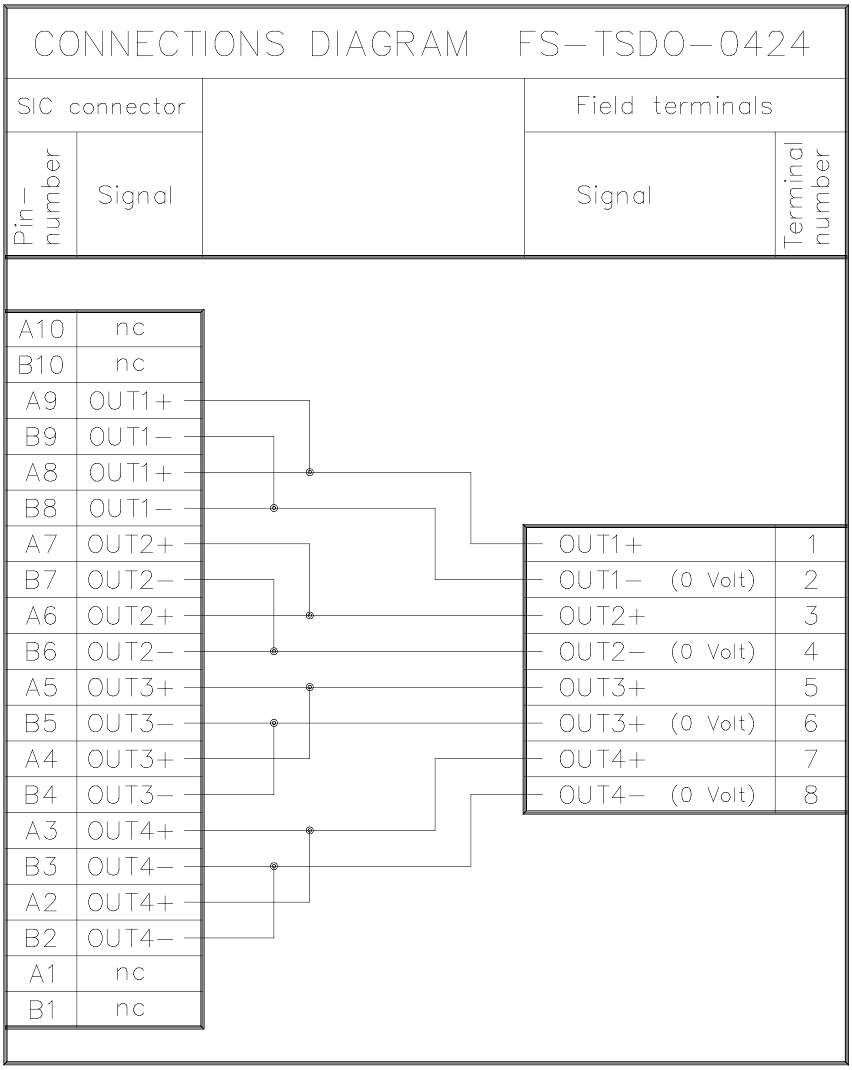


Figure 2 Connections diagram

Technical data

The FS-TSDO-0424 module has the following specifications:

General	Type number:	FS-TSDO-0424
	Approvals:	CE, UL approvals pending
Power	Number of channels:	4
	Maximum voltage:	36 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12)
	Maximum continuous current per channel:	4 A
	Actual maximum current defined by connected output module	
Physical	Module dimensions:	60 x 70 x 54 mm (L x W x H) 2.36 x 2.76 x 2.13 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	61 mm (2.40 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FS-TSDO-04UNI Fail-safe digital output FTA (24/48/60/110 Vdc, 4 channels)

Description

The field termination assembly module FS-TSDO-04UNI is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals).

The four channels of a (redundant pair of) 10213/2/*x* module(s) or 10216/2/x module(s) can be connected to the FS-TSDO-04UNI module via the system interconnection cable SIC-C-12.
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

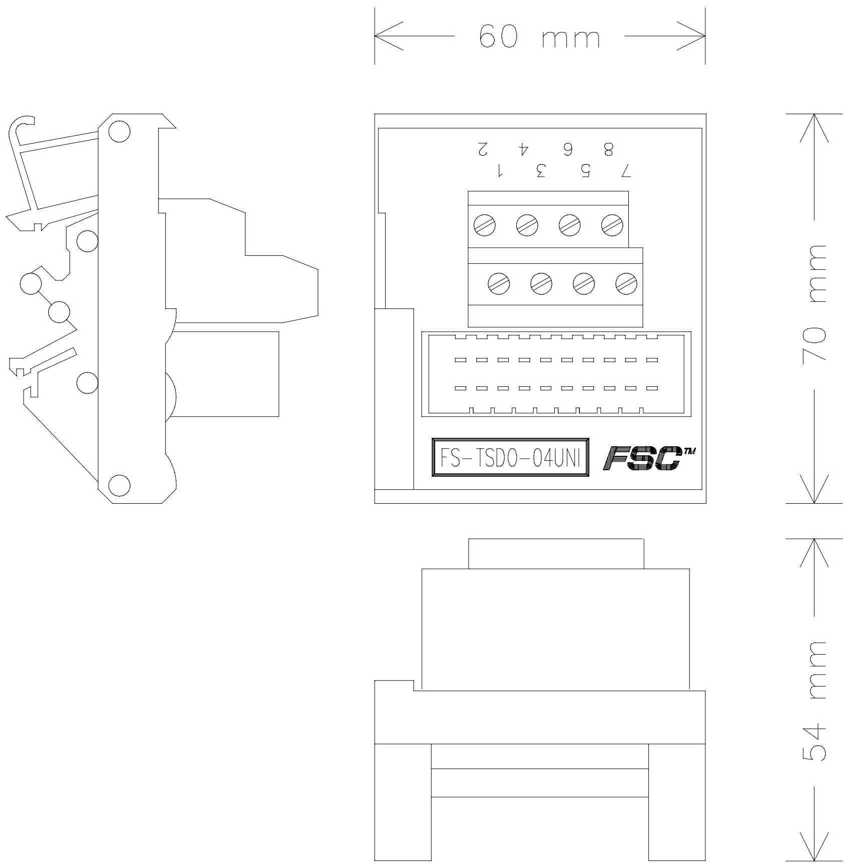


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TSDO-04UNI module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TSDO-04UNI module is as follows:

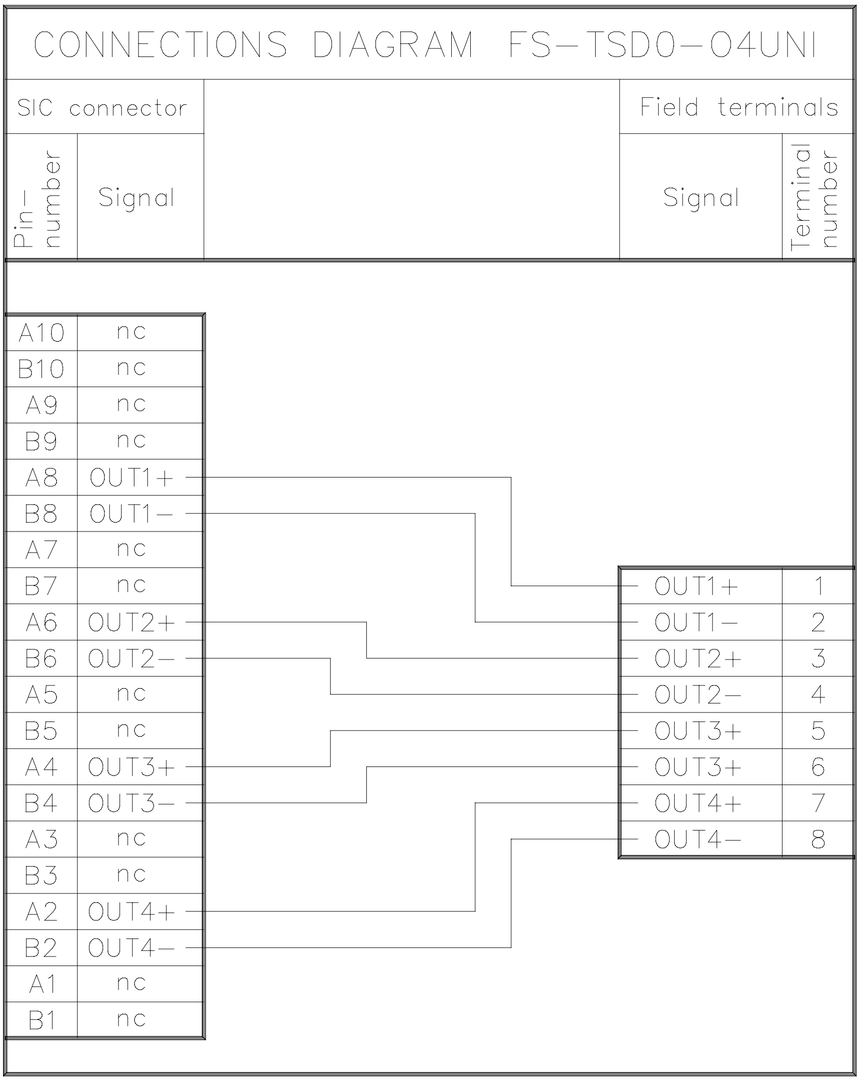


Figure 2 Connections diagram

Technical data

The FS-TSDO-04UNI module has the following specifications:

General	Type number:	FS-TSDO-04UNI
	Approvals:	CE, UL approvals pending
Power	Number of channels:	4
	Maximum voltage:	50 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12) 150 Vdc – IEC 1010 (1990), overvoltage category 2 (Table D.10)
	Maximum continuous current per channel:	2 A
	Actual maximum current defined by connected output module	
Physical	Module dimensions:	60 x 70 x 54 mm (L x W x H) 2.36 x 2.76 x 2.13 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	61 mm (2.40 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FS-TDO-1624 Digital output FTA (24 Vdc, 16 channels)

Description

The field termination assembly module FS-TDO-1624 is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals).

The sixteen channels of a (redundant pair of) 10209/2/1 module(s) or the twelve channels of a (redundant pair of) 10206/2/1 module(s) can be connected to the FS-TDO-1624 module via the system interconnection cable SIC-C-12.
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

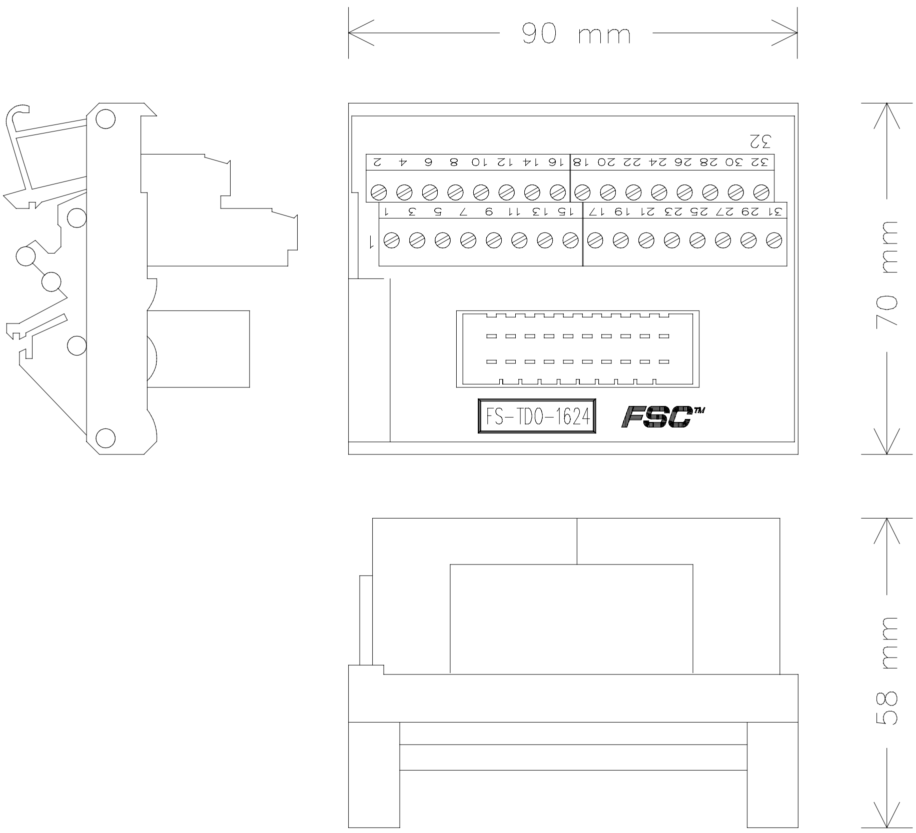


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TDO-1624 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TDO-1624 module is as follows:

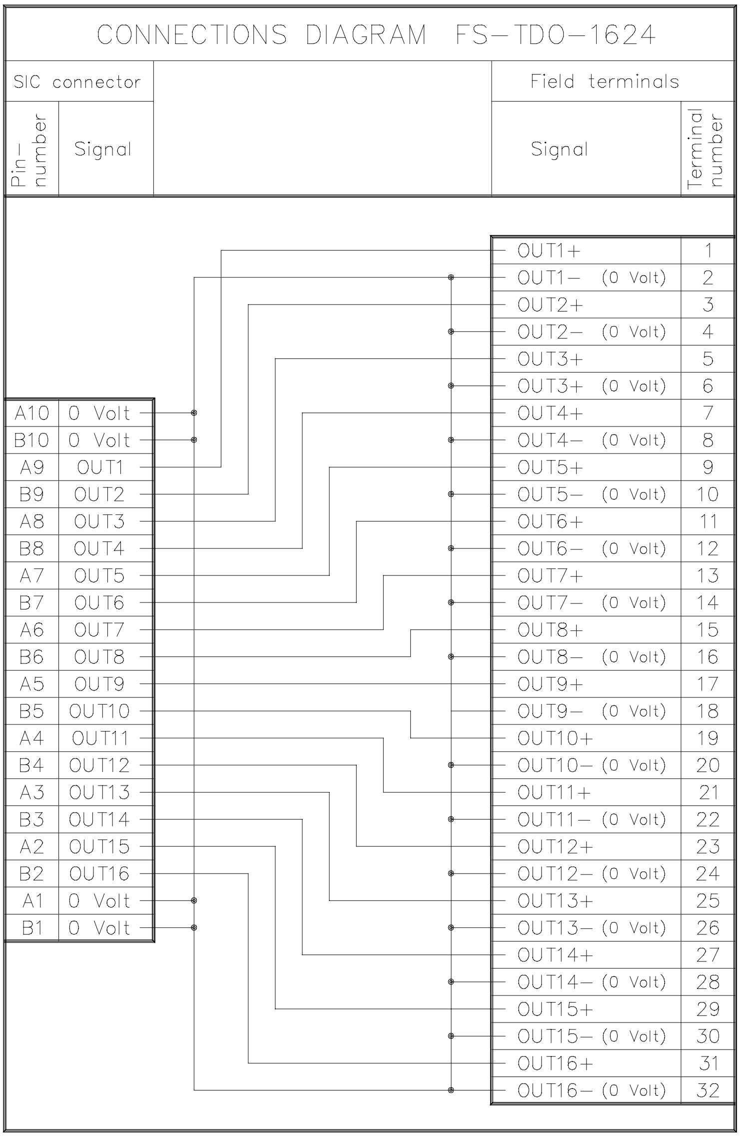


Figure 2 Connections diagram

Technical data

The FS-TDO-1624 module has the following specifications:

General	Type number:	FS-TDO-1624
	Approvals:	CE, UL approvals pending
Power	Number of channels:	16
	Maximum voltage:	36 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12)
	Maximum continuous current per channel:	1.5 A
	Actual maximum current defined by connected output module	
Physical	Module dimensions:	90 x 70 x 58 mm (L x W x H) 3.54 x 2.76 x 2.28 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	91 mm (3.58 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FS-TSRO-0824 Digital output (relay) FTA for AK5/6 applications (8 channels)

Description

The field termination assembly module FS-TSRO-0824 is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals). It has eight relay-based potential-free output channels suitable for applications up to AK6 without making use of fault exclusions.
The FS-TSRO-0824 module complies with safety requirements for general use in safety requirement classes AK5/6 as defined in DIN V 19250.

Each channel consists of:

- three relays,
- a fused NO field contact (5 AT, slow-acting), and
- a status indication LED.

The relays are capable of driving a wide variety of loads including 115/230 Vac, which gives the FSC system a 115/230 Vac output capability for AK5/6 applications. The energized state of the relay is indicated by an LED on the module.

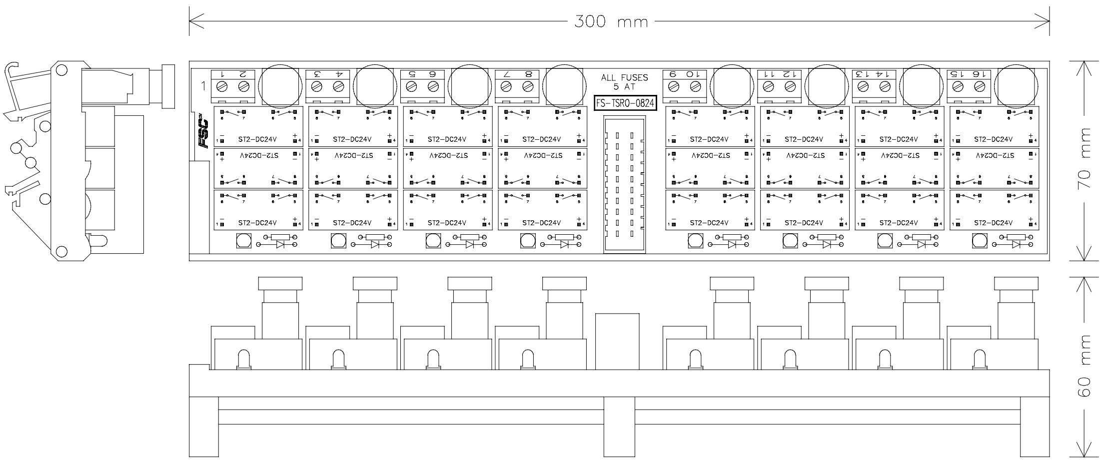


Figure 1 Mechanical layout

Eight channels can be connected to the FS-TSRO-0824 module via the system interconnection cable SIC-C-12.This cable is plugged into the SIC connector on the FTA module, and connects to a (redundant pair of) 10201/2/1 module(s).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

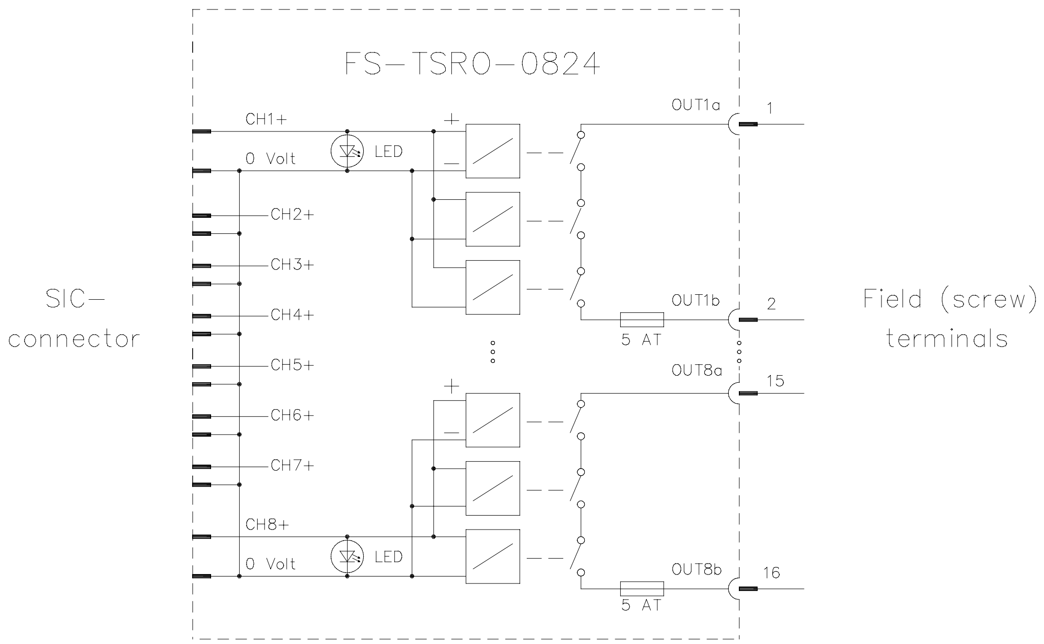


Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FS-TSRO-0824 module refer to the 'SIC to FTA applications' data sheet.

Connections The connections diagram of the FS-TSRO-0824 module is as follows:

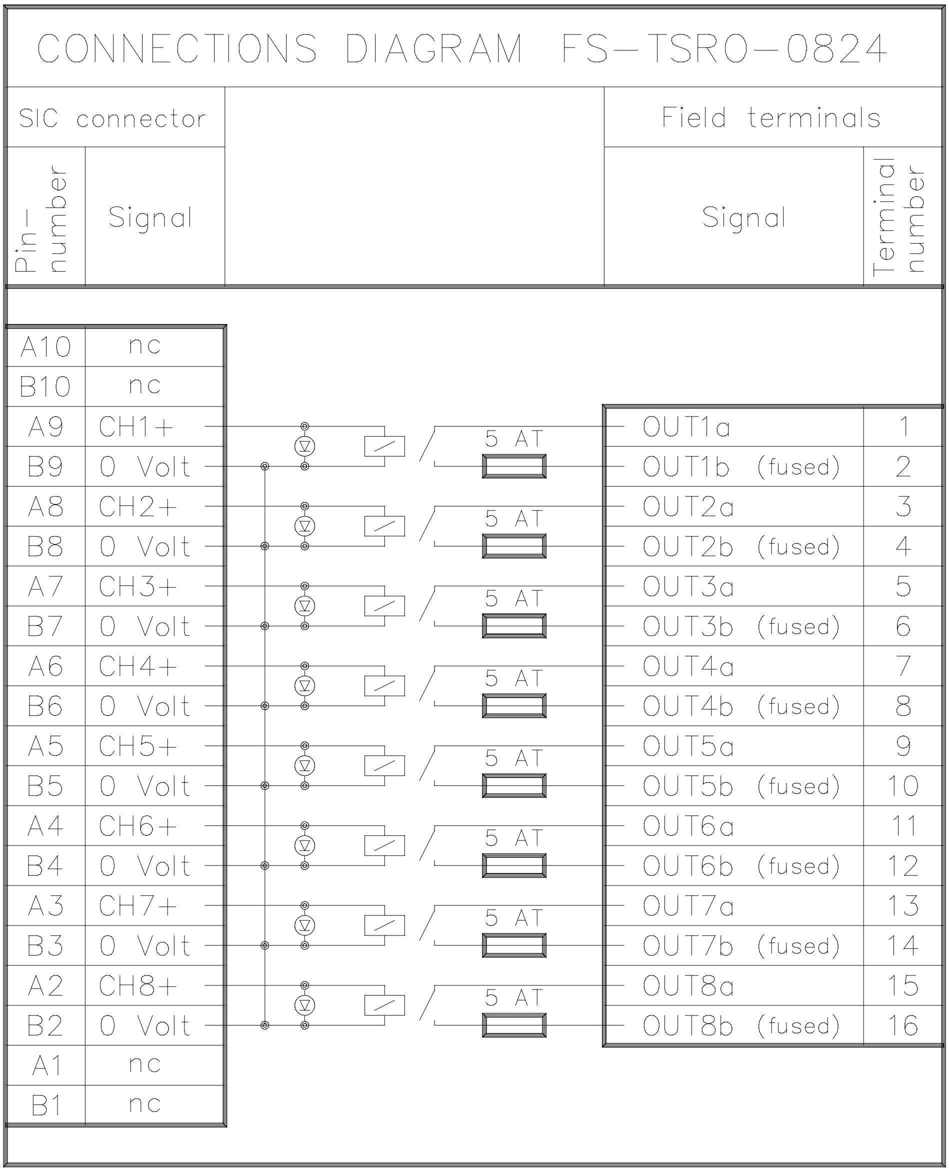


Figure 3 Connections diagram

Technical data

The FS-TSRO-0824 module has the following specifications:

General	Type number:	FS-TSRO-0824
	Approvals:	CE, UL, TÜV approvals pending
	Safety class:	AK1-6
Input	Nominal input voltage:	24 Vdc
	Max. input voltage:	36 Vdc
	Relay pick-up voltage:	19.2 Vdc
	Input current:	typically 40 mA at 24 Vdc
Output	Number of output channels:	8
	Max. output current:	5 A (fused)
	Min. output current:	1 mA at 5 V
	Max. output voltage:	250 Vac / 250 Vdc
	Max. switched load:	1250 VA / 150 W (see Figure 4)
Fuses	Rating:	5 AT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.78 in)
Physical	Module dimensions:	300 x 70 x 60 mm (L x W x H) 11.81 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	301 mm (11.85 in)
Termination	Screw terminals:	
	– max. wire diameter:	2.5 mm² (AWG 14)
	– strip length:	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Environment	Ambient temperature:	–5°C to +60°C (23°F to 140°F)
Isolation	Isolation:	
	– coil to contact	3750 Vac
	– contact to contact	1200 Vac

Technical data (continued)

Relay contact	Max. switching load:	250 Vac, 5 A 24 Vdc, 5 A* 48 Vdc, 1 A* 110 Vdc, 500 mA*
	Max. switching frequency:	20 Hz
	Expected life:	
	– electrical	100,000 switch operations
	– mechanical	10,000,000 switch operations
	Contact material:	gold flash over silver alloy

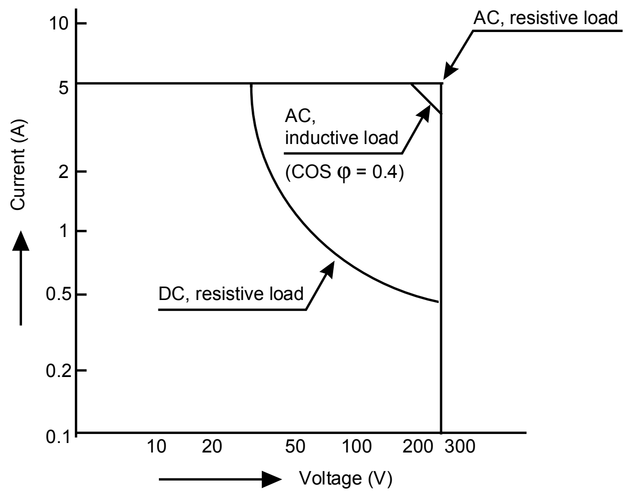


Figure 4 Maximum switched power

*** Note:**
When switching DC loads, only use resistive loads or inductive loads with spark suppression diodes.

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FS-TRO-0824 Digital output (relay contact) FTA (8 channels, NO/NC)

Description

The field termination assembly module FS-TRO-0824 is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals). It has eight non-fail-safe potential-free relay changeover contacts (NO/NC). The energized state of the relay is indicated by an LED on the module.

Eight channels can be connected to the FS-TRO-0824 module via the system interconnection cable SIC-C-12. This cable is plugged into the SIC connector on the FTA module, and connects to a (redundant pair of) 10201/2/1 module(s).
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

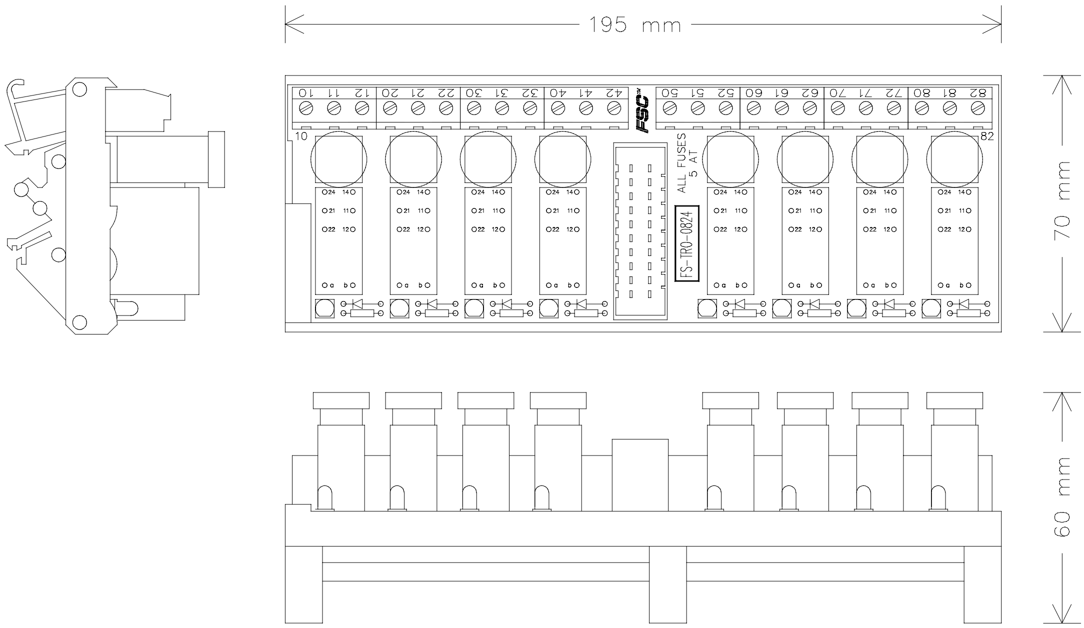

Figure 1 Mechanical layout

Each channel consists of:

- one relay,
- a changeover contact with a fused (5 AT) common, and
- a status indicator LED.

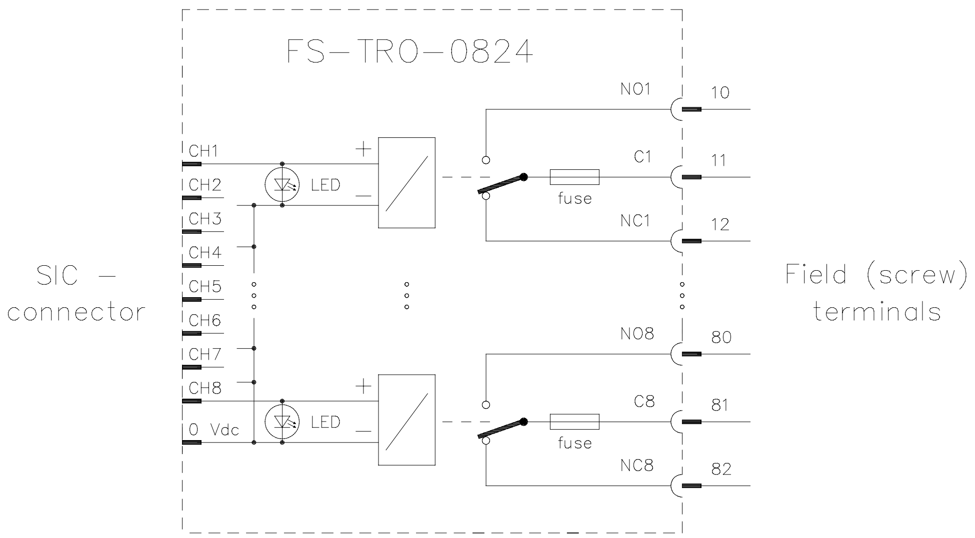

Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FS-TRO-0824 module refer to the 'SIC to FTA applications' data sheet.

Connections The connections diagram of the FS-TRO-0824 module is as follows:

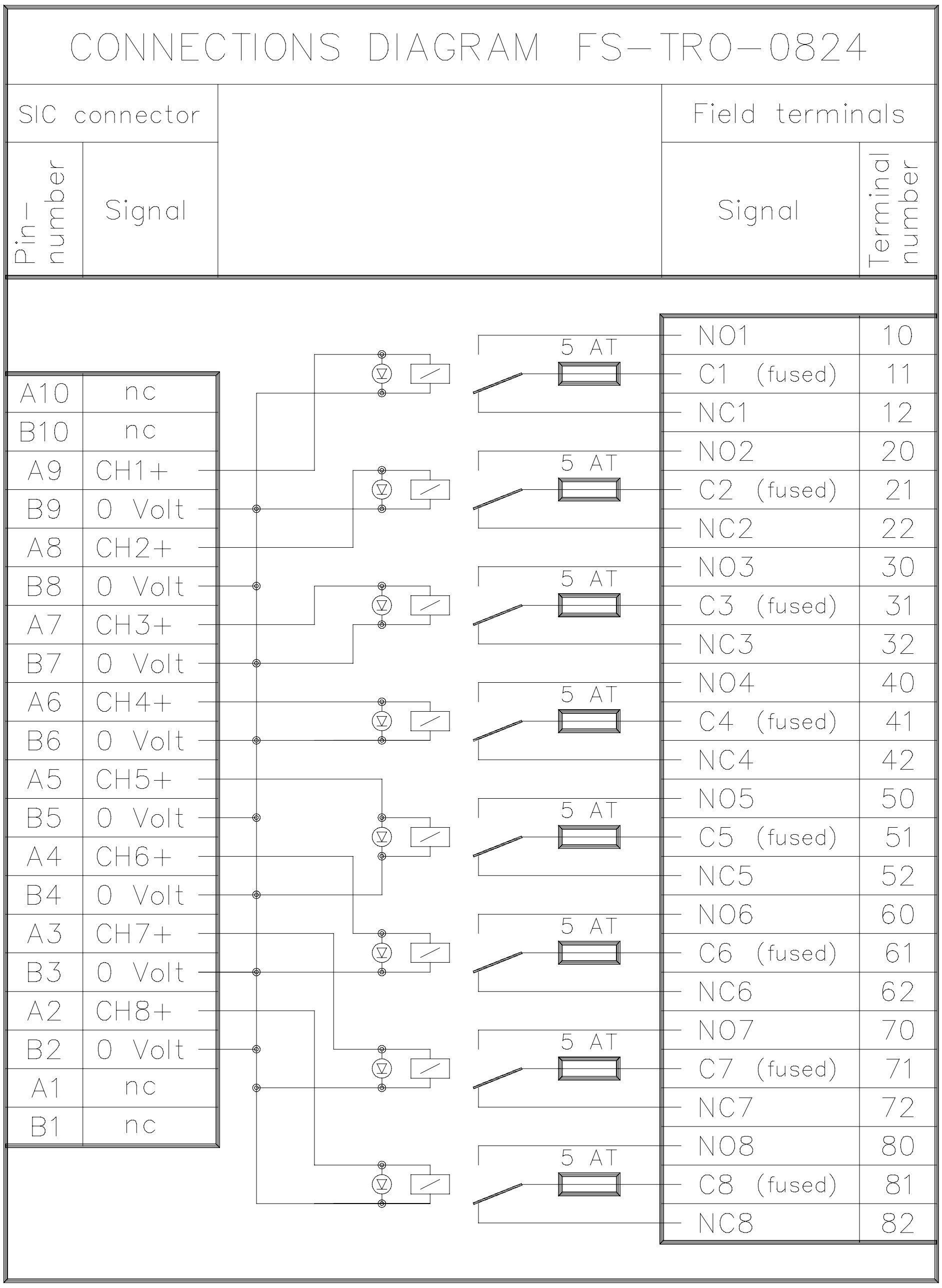

Figure 3 Connections diagram

Technical data

The FS-TRO-0824 module has the following specifications:

General	Type number:	FS-TRO-0824
	Approvals:	CE, UL, TÜV approvals pending
Input	Nominal input voltage:	24 Vdc
	Max. input voltage:	31 Vdc
	Relay cut-in voltage:	19 Vdc
	Input current:	typically 27 mA at 24 Vdc
Output	Number of output channels:	8
	Max. output current:	5 A
	Max. output voltage:	250 Vac / 300 Vdc
	Max. switched load:	1250 VA / 150 W at 30 Vdc (see Figure 4)
Fuses	Rating:	5 AT (slow-acting)
	Dimensions	5 x 20 mm (0.20 x 0.79 in)
Physical	Module dimensions:	195 x 70 x 60 mm (L x W x H) 7.68 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	196 mm (7.72 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Relay contacts	Max. current:	8 A
	Max. switched voltage:	250 Vac / 300 Vdc
	Max. switched load:	2000 VA / 192 W at 24 Vdc (see Figure 4)
	Max. switching frequency:	20 Hz
	Expected life:	
	– electrical	100,000 switch operations
	– mechanical	30,000,000 switch operations

Technical data (continued)

Relay contacts (cont.)

Isolation:	
– coil to contact	4000 Vac
– contact to contact	1000 Vac
Ambient temperature:	–40°C to +70°C (–40°F to +158°F)
Contact material:	silver-cadmium oxide

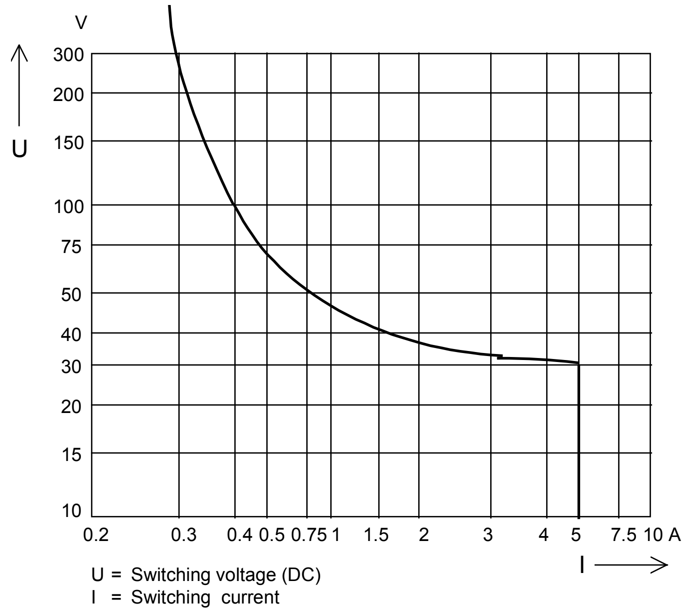

Figure 4 Maximum DC switched power curve for FS-TRO-0824 module

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FS-TRO-1024 Digital output (relay contact) FTA (10 channels)

Description

The field termination assembly module FS-TRO-1024 is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals).

The ten channels of a (redundant pair of) 10208/2/1 module(s) can be connected to the FS-TRO-1024 module via the system interconnection cable SIC-C-12.
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

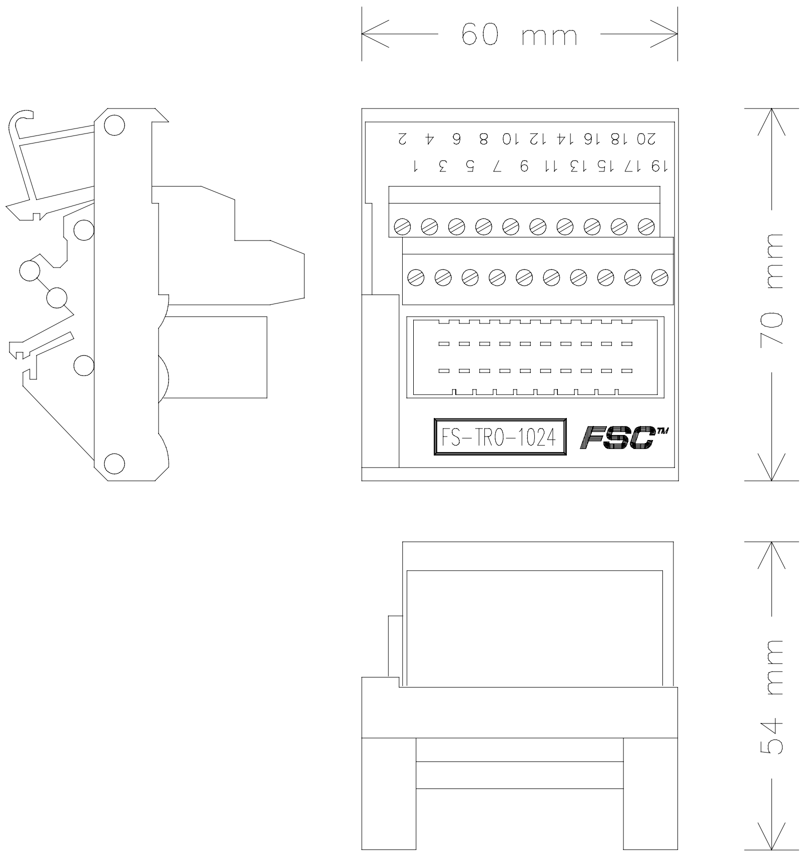

Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TRO-1024 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TRO-1024 module is as follows:

CONNECTIONS DIAGRAM FS-TRO-1024

SIC connector		Field terminals	
Pin-number	Signal	Signal	Terminal number
A10	C1	C1	1
B10	NO1	NO1	2
A9	C2	C2	3
B9	NO2	NO2	4
A8	C3	C3	5
B8	NO3	NO3	6
A7	C4	C4	7
B7	NO4	NO4	8
A6	C5	C5	9
B6	NO5	NO5	10
A5	C6	C6	11
B5	NO6	NO6	12
A4	C7	C7	13
B4	NO7	NO7	14
A3	C8	C8	15
B3	NO8	NO8	16
A2	C9	C9	17
B2	NO9	NO9	18
A1	C10	C10	19
B1	NO10	NO10	20

Figure 2 Connections diagram

Technical data

The FS-TRO-1024 module has the following specifications:

General	Type number:	FS-TRO-1024
	Approvals:	CE, UL approvals pending
Power	Number of channels:	10
	Maximum voltage:	36 Vac / 50 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12)
	Maximum switched power:	100 W / 1000 VA
	Maximum continuous current per channel:	2 A
	Contact material on 10208/2/1:	gold flush silver-cadmium oxide
Physical	Module dimensions:	60 x 70 x 54 mm (L x W x H) 2.36 x 2.76 x 2.13 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	61 mm (2.40 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

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FC-TSDO-0824C Fail-safe digital output FTA, Current limited (24 Vdc, 8 channels)

(FTA-T-35)

Description

The field termination assembly module FC-TSDO-0824C is the interface between the fail-safe digital output module 10201/2/1 with a system interconnection cable (SIC-C-12) and the external field wiring (screw terminals). It can be used for interfacing to Class I, Division 2 Hazardous locations.

The FC-TSDO-0824C provides eight current limited digital outputs to the field. Each output is capable of supplying 110 mA (= 2.5 Watt at 24 Vdc).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for the field wiring.

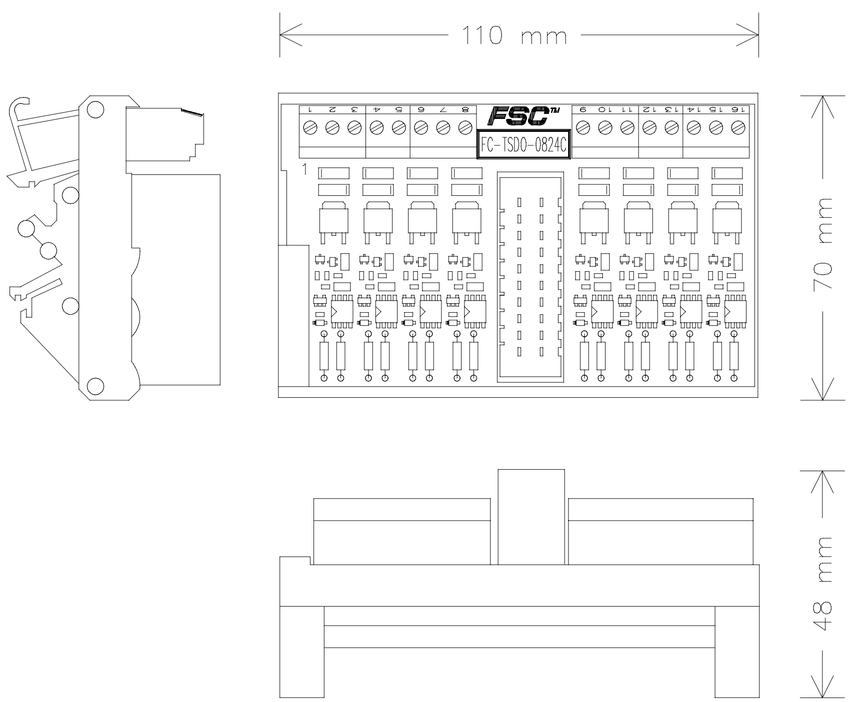


Figure 1 Mechanical layout

Main Function

The FC-TSDO-0824C can energize loads (e.g. solenoids or leds. with voltage-current limitation in compliance with Hazardous Class I, Division 2. The external output-signal (OUT+) is electronically current-limited.

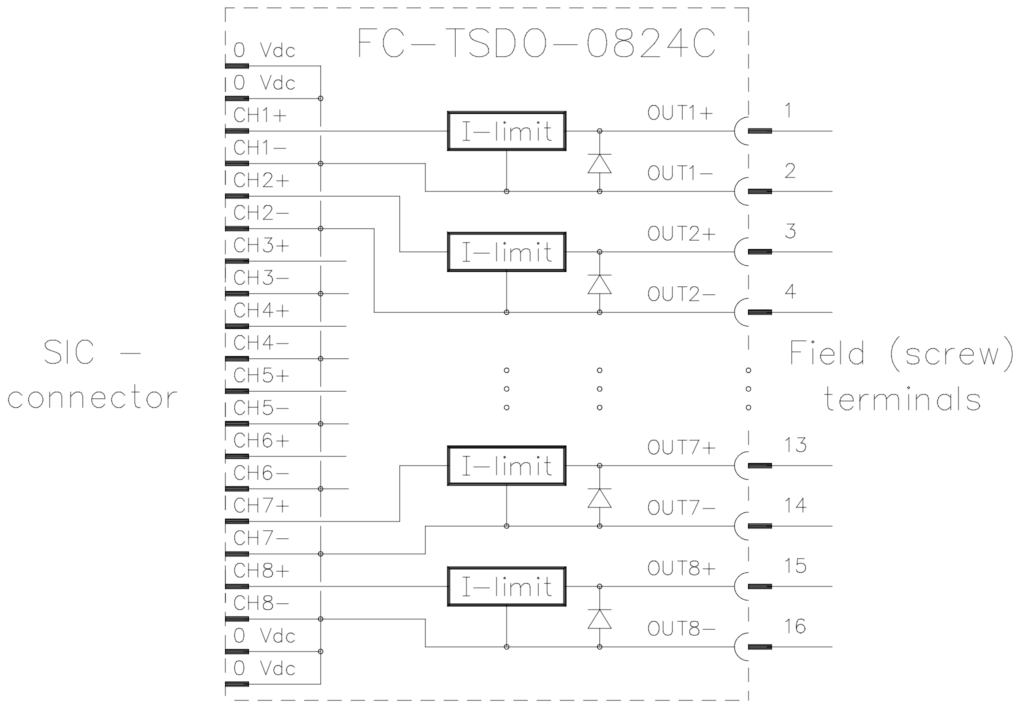


Figure 2 Schematic diagram

Connections

The connections diagram of the FC-TSDO-0824C is as follows:

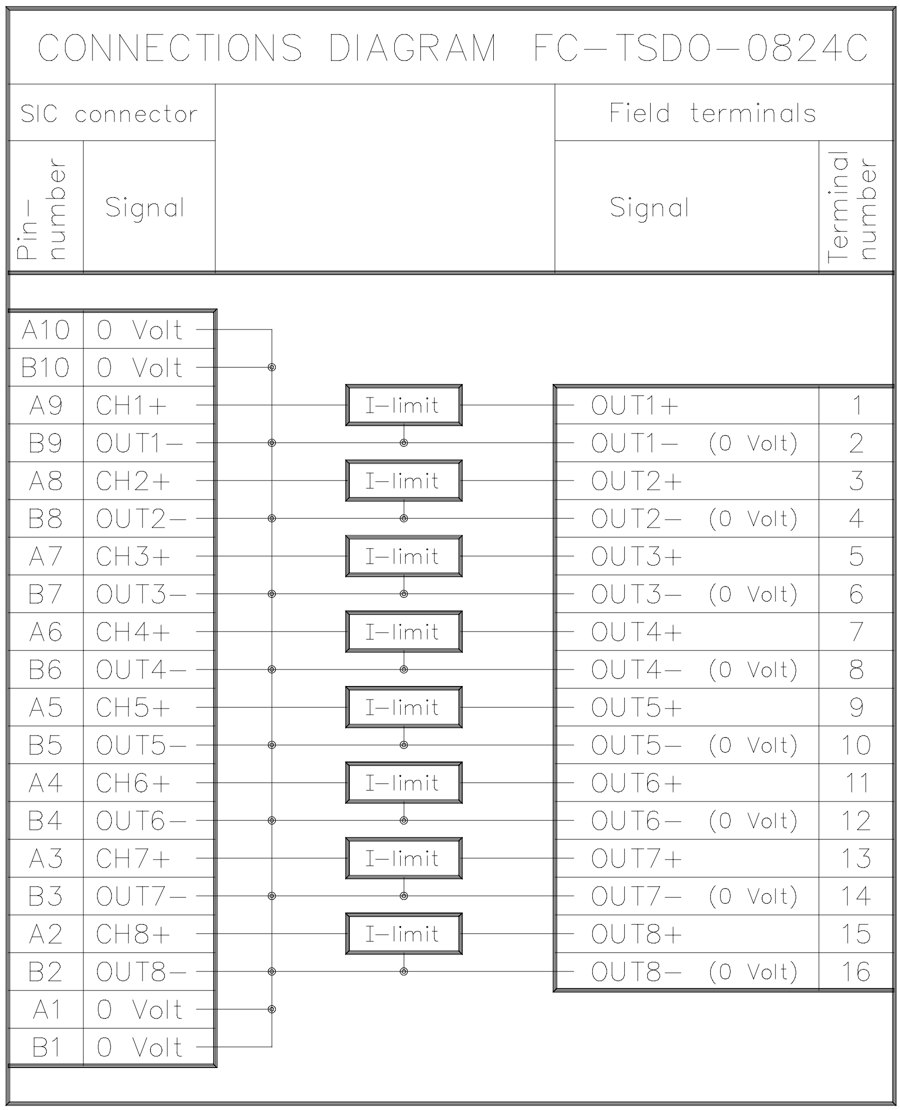


Figure 3 Connections diagram

Technical data

The FC-TSDO-0824C has the following specifications:

General	Type number:	FC-TSDO-0824C
	Approvals	CE; FM , UL, TÜV approvals pending
	Environmental shielding	Conformal coating
Power	Number of channels:	8
	Maximum voltage:	36 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12)
	Power requirements:	5 mA per channel (plus output load)
Output	Output current limit:	> 110 mA
	Max. output load:	2.5 Watt (at 24 Vdc)
	Voltage drop:	< 1.5 Vdc at 110 mA
	Off current:	< 0.1 mA
Physical	Module dimensions:	110 x 70 x 48 mm (L x W x H) 4.32 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	111 mm (4.36 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	HYDROGEN (Group A & B)	
	– max. loop inductance	3.0 mH
	– max. loop capacitance	0.2 µF
	NON-HYDROGEN (Group C & D)	
	– max. loop inductance	12 mH
	– max. loop capacitance	5 µF

FC-TSDOL-0424C Fail-safe digital output FTA, Current limited (24 Vdc, 4 channels)

(FTA-T-36)

Description

The field termination assembly module FC-TSDOL-0424C is the interface between the fail-safe loop-monitored digital output module 10216/2/1 with a system interconnection cable (SIC-C-12) and the external field wiring (screw terminals). It can be used for interfacing to Class I, Division 2 Hazardous locations.

The FC-TSDOL-0424C provides four loop-monitored current limited digital outputs to the field. Each output is capable of supplying 110 mA (= 2.5 Watt at 24 Vdc).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for the field wiring.

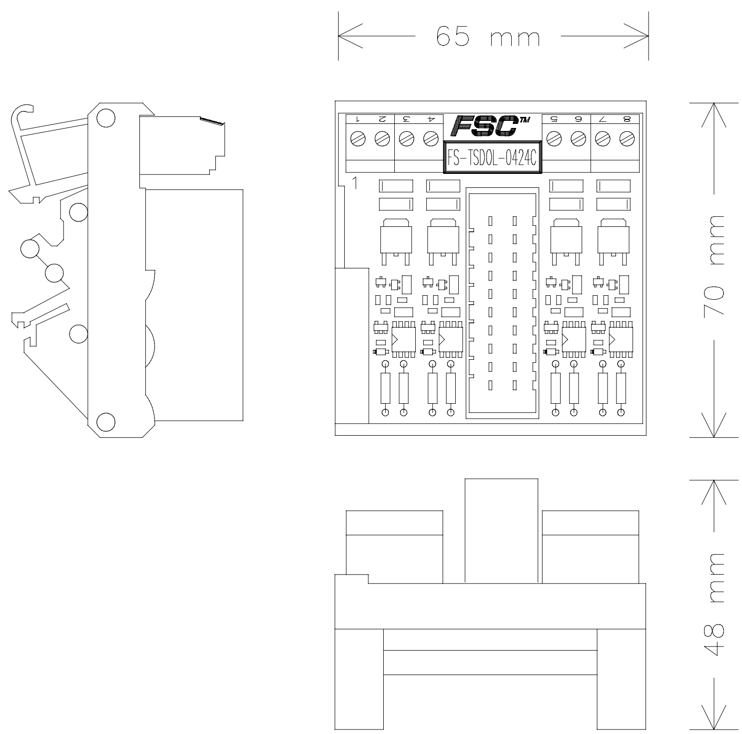


Figure 1 Mechanical layout

Main Function

The FC-TSDOL-0424C can energize loads (e.g. solenoids or leds. with voltage-current limitation in compliance with Hazardous Class I, Division 2. The external output-signal (OUT+) is electronically current-limited.

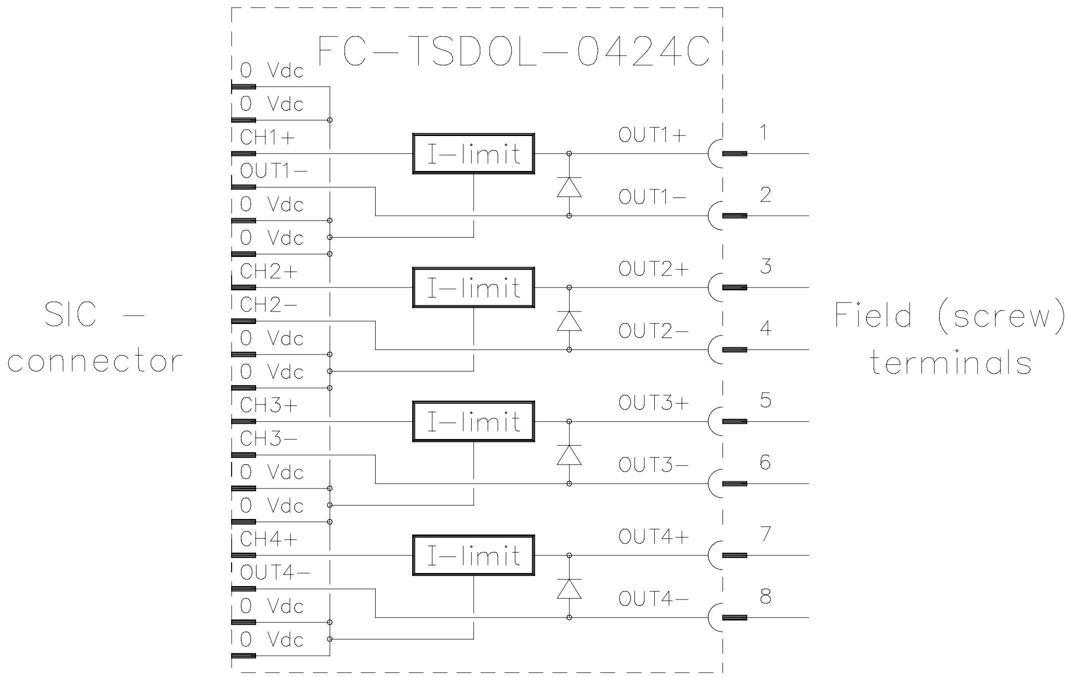


Figure 2 Schematic diagram

Connections The connections diagram of the FC-TSDOL-0424C is as follows:

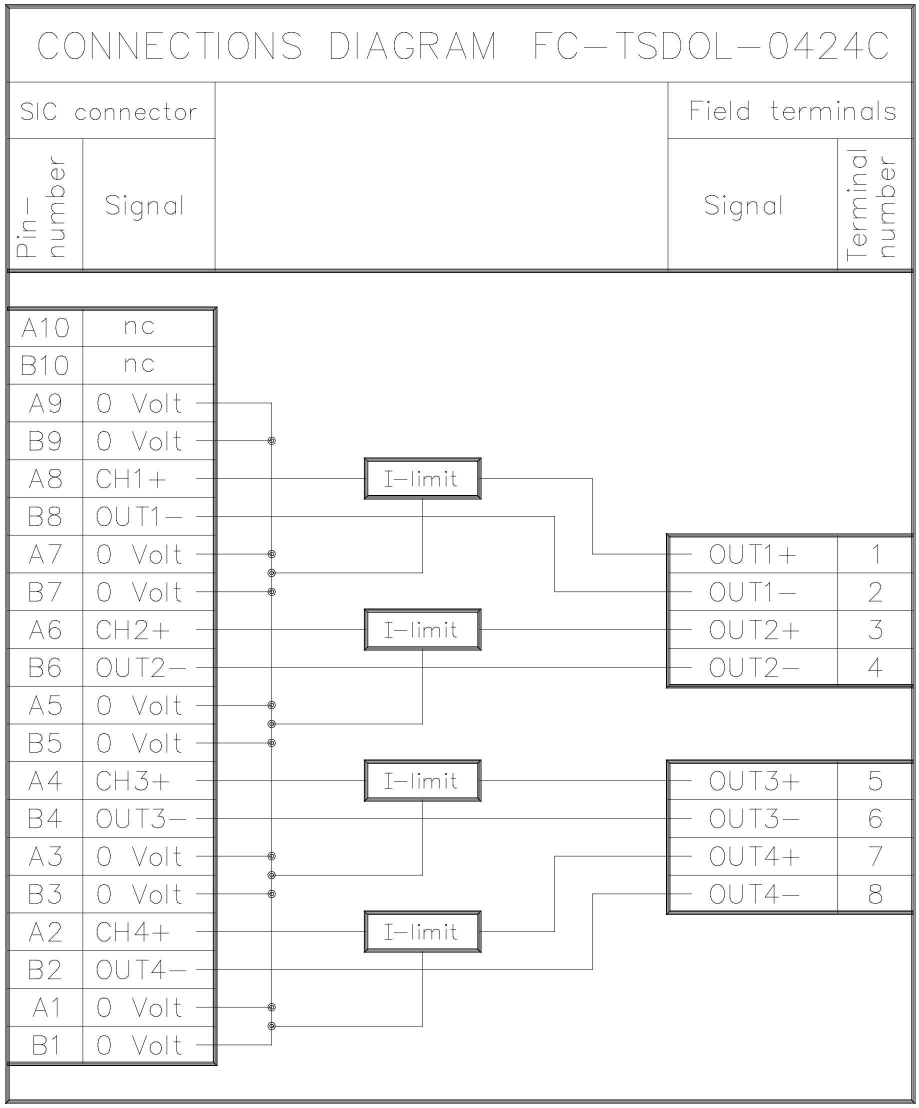


Figure 3 Connections diagram

Technical data

The FC-TSDOL-0424C has the following specifications:

General	Type number:	FC-TSDOL-0424C
	Approvals	CE; FM, UL, TÜV approvals pending
	Environmental shielding	Conformal coating
Power	Number of channels:	4
	Maximum voltage:	36 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12)
	Power requirements:	5 mA per channel (plus output load)
Output	Output current limit:	> 110 mA
	Max. output load:	2.5 Watt (at 24 Vdc)
	Voltage drop:	< 1.5 Vdc at 110 mA
	Off current:	< 0.1 mA
Physical	Module dimensions:	65 x 70 x 48 mm (L x W x H) 2.55 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	66 mm (2.59 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	HYDROGEN (Group A & B)	
	– max. loop inductance	3.0 mH
	– max. loop capacitance	0.2 µF
	NON-HYDROGEN (Group C & D)	
	– max. loop inductance	12 mH
	– max. loop capacitance	5 µF

FS-TSAO-0220m Fail-safe analog output FTA (0(4)-20 mA, 2 channels)

Description

The field termination assembly module FS-TSAO-0220m is the interface between the system interconnection cable SIC-C-12 and the external field wiring (screw terminals).

The two channels of a 10205/2/1 module can be connected to the FS-TSAO-0220m module via the system interconnection cable SIC-C-12.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

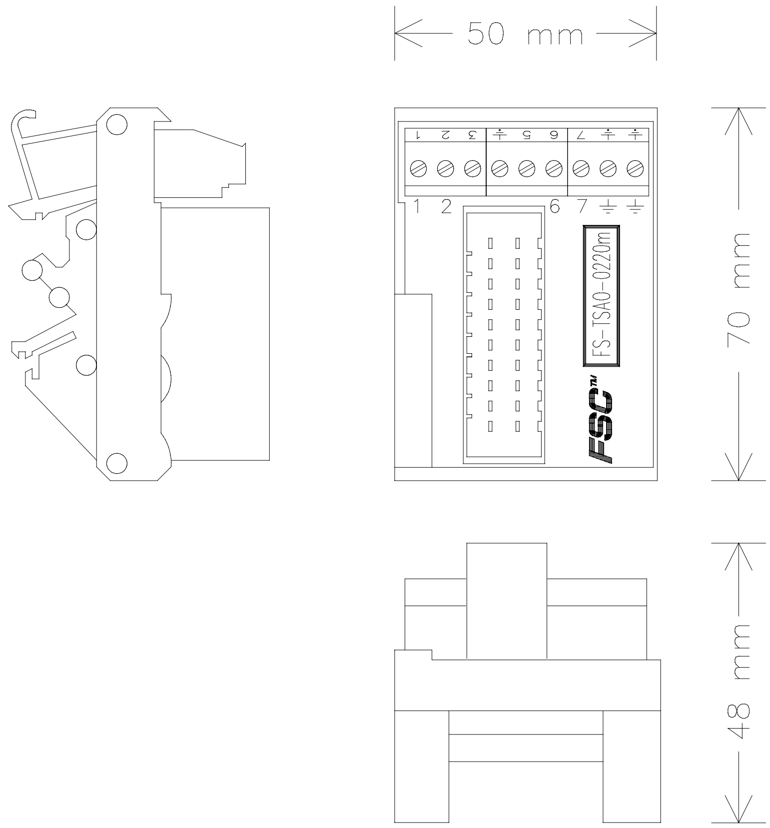


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TSAO-0220m module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FS-TSAO-0220m module is as follows:

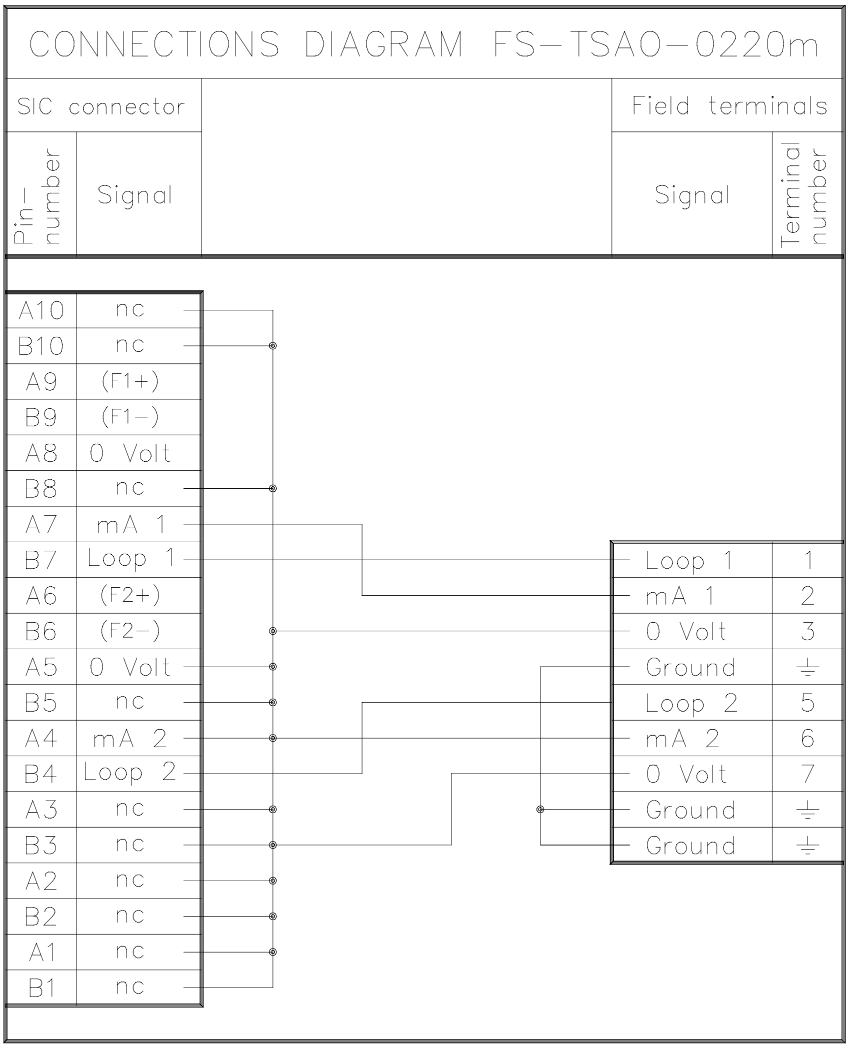


Figure 2 Connections diagram

Technical data

The FS-TSAO-0220m module has the following specifications:

General	Type number:	FS-TSAO-0220m
	Approvals:	CE, UL approvals pending
Power	Number of channels:	2
	Maximum voltage:	36 Vdc – IEC 1010 (1990), overvoltage category 3 (Table D.12)
	Maximum continuous current per channel:	25 mA
Physical	Module dimensions:	50 x 70 x 48 mm (L x W x H) 1.97 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	51 mm (2.01 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FSC

Honeywell

FS-TPSU-2430 24 Vdc to 30 Vdc/1 A converter

(FTA-T-15)

Description

The FS-TPSU-2430 module is a DC/DC converter, which is used to provide an isolated 30 Vdc / 1 A to other field termination assemblies (FTAs), e.g. the analog input FTA modules FTA-T-14, FS-TSAI-1620m, FS-TSHART-1620m or the active analog input FTA module FTA-T-16. It has voltage monitoring capabilities with local LED indication and also provides alarm functions (read back relay contact). The LED is on and the relay contact is closed if the local DC/DC output voltage is OK.

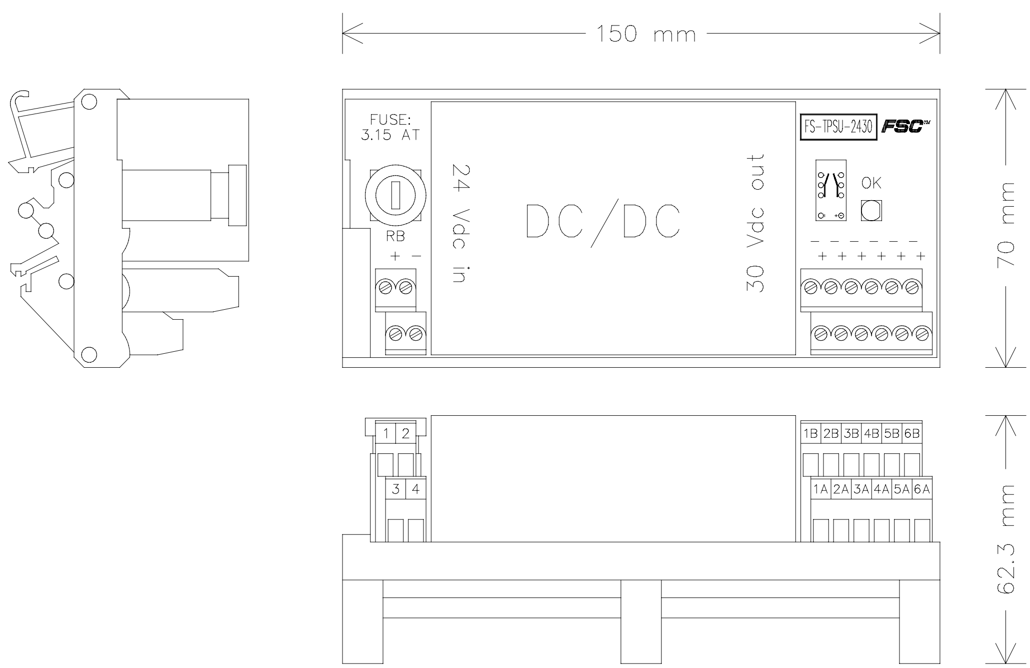


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FS-TPSU-2430 module refer to the 'SIC to FTA applications' data sheet.

Connections

The FS-TPSU-2430 module has four screw terminals for connection of incoming power wires and the read back wiring. The screw terminals are numbered 1 to 4. The function of each terminal is listed below:

Screw terminal	Function
1	Read back contact
2	Read back contact
3	24 Vdc IN +
4	24 Vdc IN –

Note:
Removal or connection of the 24 Vdc IN+ and/or 24 Vdc IN– wire(s) is only allowed when the 24 Vdc power supply to the FS-TPSU-2430 module has been switched off.

The FS-TPSU-2430 module has twelve screw terminals for connection of outgoing power wires. The screw terminals are numbered '1A', '1B', '2A', etc. to '6B'. The function of each terminal is listed below:

Screw terminal	Function
1A	30 Vdc OUT
1B	0 Vdc OUT
2A	30 Vdc OUT
2B	0 Vdc OUT
3A	30 Vdc OUT
3B	0 Vdc OUT
4A	30 Vdc OUT
4B	0 Vdc OUT
5A	30 Vdc OUT
5B	0 Vdc OUT
6A	30 Vdc OUT
6B	0 Vdc OUT

Technical data

The FS-TPSU-2430 module has the following specifications:

General	Type number:	FS-TPSU-2430
	Approvals:	CE, TÜV, UL, FM**
	Safety class:	AK1-6
	MTBF:	approx. 400,000 hours
Input	Nominal input voltage:	24 Vdc
	Input voltage range:	18 to 36 Vdc
	Inrush current:	≤ 4 A *(see note below)*
Output	Output voltage:	30 Vdc, ± 0.25 V
	Output current:	1 A (short-circuit proof)
	Short-circuit current:	< 3.3 A
	Ripple (0-30 MHz):	< 0.1 Vrms
	Regulation:	< 1% (load + line)
	Transient response:	class C according to NFC42801C
	Power-on overshoot:	output < 31 V
	Overvoltage protection:	31 V
	Long-term stability (after 30 min. operation):	< 0.3%
	Efficiency:	> 75%
	Switching frequency:	> 25 kHz
Physical	Module dimensions:	150 x 70 x 62.3 mm (L x W x H) 5.91 x 2.76 x 2.45 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	151 mm (5.94 in)
Fuse	Rating:	3.15 AT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.79 in)

Note:
The inrush current limiter is only active at power-on.
To regain the inrush current limiting function, the FS-TPSU-2430 module must be switched off for at least 30 seconds.
Switching on the module within 30 seconds may blow a fuse or activate a circuit breaker.

** See datasheet 10105/2/1

Technical data (continued)

Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Isolation	Isolation voltage:	
	– input to output	2000 Vac (1 min.)
	– input to relay contact	2000 Vac (1 min.)
	– output to relay contact	2000 Vac (1 min.)
Environment	Operating temperature:	–5°C to +70°C (23°F to 158°F)
	Storage temperature:	–40°C to +85°C (–40°F to +185°F)
	Cooling:	natural convection
Alarm functions	Overvoltage protection:	dual, two-fault-tolerant
	Restart overvoltage protection:	only after removal of 24 Vdc power
	Undervoltage detector:	LED on if voltage OK, readback relay contact closed if voltage OK
	Undervoltage level:	typically 27.5 Vdc
Readback	Relay contact rating:	36 Vdc / 40 mA, 30 Vac / 40 mA

FTA-E-01 Fail-safe digital input FTA (24/48/60 Vdc, 24 channels)

Description

The field termination assembly module FTA-E-01 is the interface between the system interconnection cables (SIC) and the external field wiring (on E-56 ELCO).

Twenty-four channels (separated into three groups of eight channels with a 250 mA fuse in the common +) can be connected to the FTA-E-01 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The three SIC connectors are marked '1A', '1B' and '2A' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails.

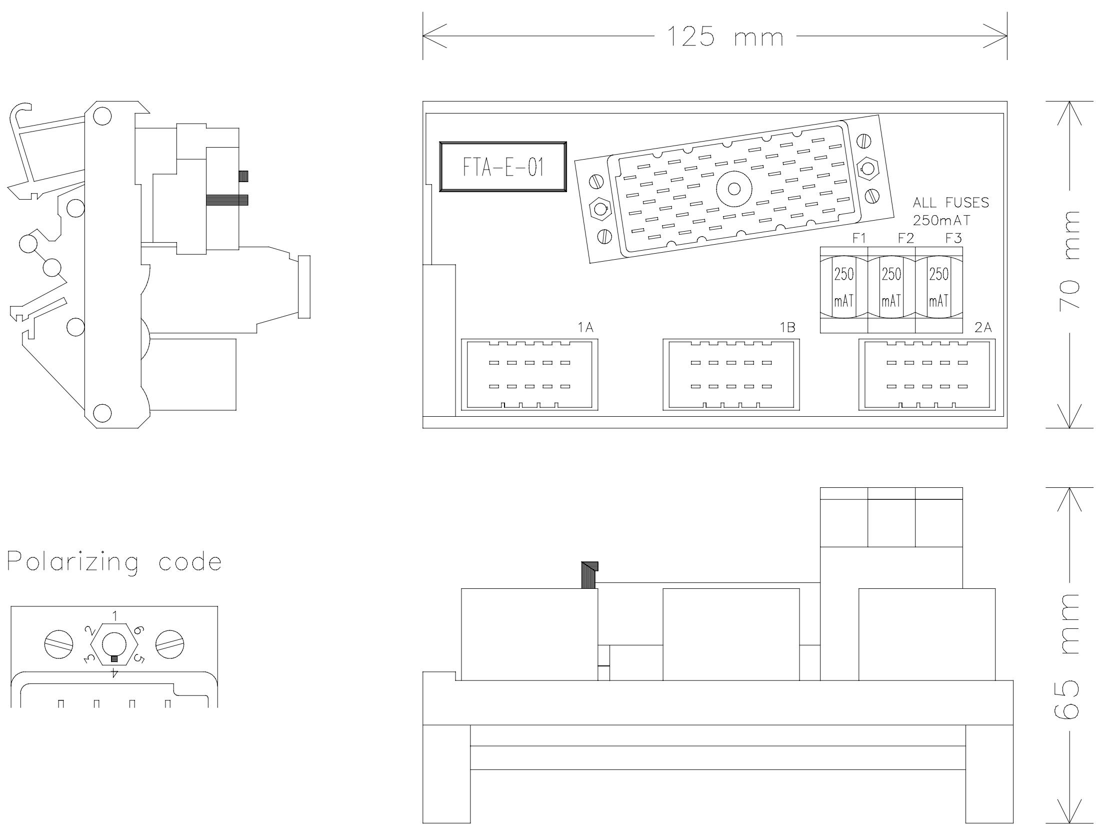


Figure 1 Mechanical layout

The polarizing notches of the ELCO socket can be set to any of six positions per side (factory-set at position 4). Changing the polarization requires removal of the FTA from the DIN EN rail and the use of a polarizing tool, make ELCO (part no. 06 1989 02).
The ELCO socket has guide pins and socket gills to ensure correct alignment when mating.

Applications

For details on applications and connection options for the FTA-E-01 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-E-01 module is as follows:

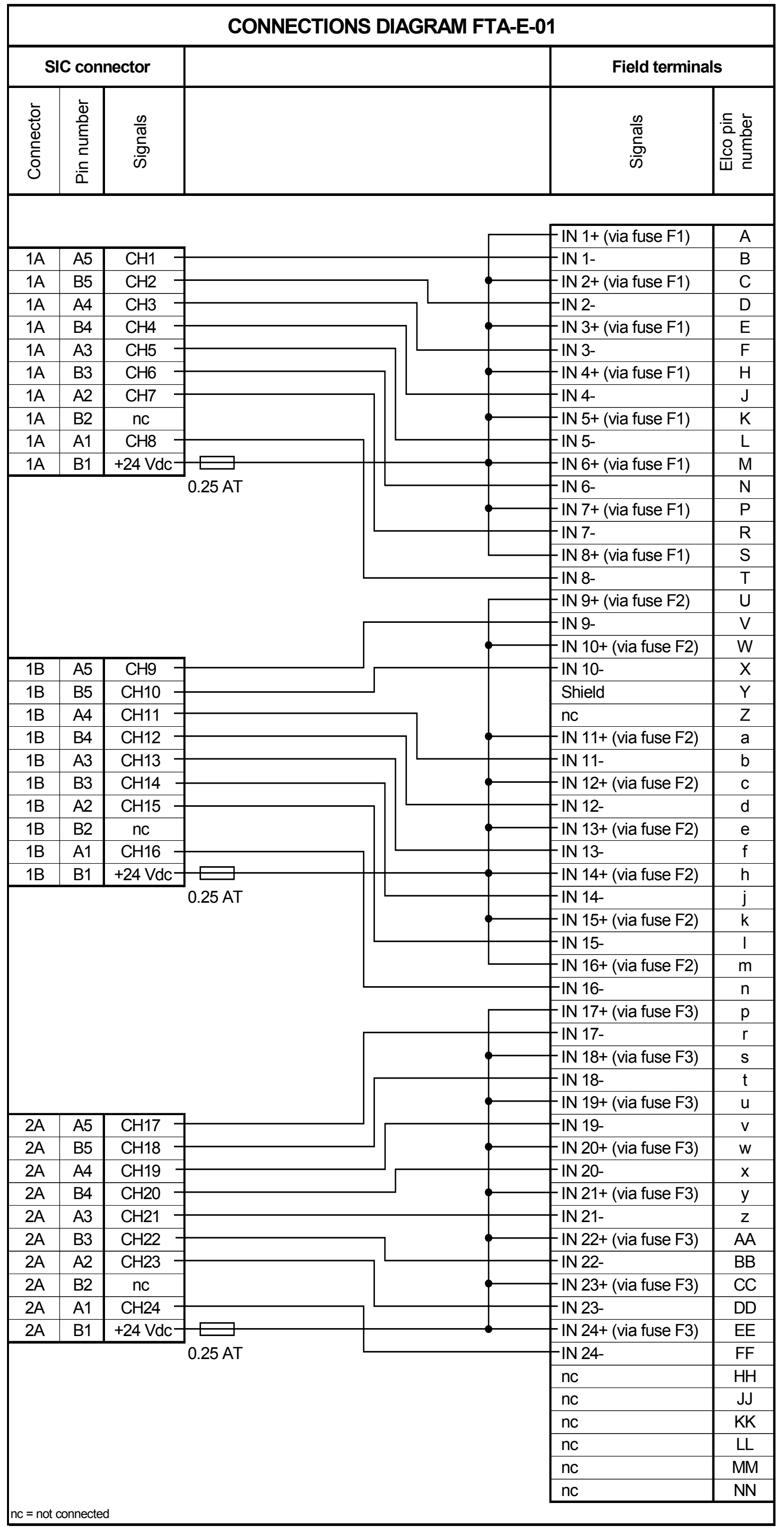


Figure 2 Connections diagram

Technical data

The FTA-E-01 module has the following specifications:

General	Type number:	FTA-E-01
	Approvals:	CE, UL, TÜV
Power	Number of channels:	24 (3 groups of 8)
	Maximum voltage:	36 Vac / 50Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
Physical	Module dimensions:	125 x 70 x 65 mm (L x W x H) 4.92 x 2.76 x 2.56 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	126 mm (4.96 in)
Fuses	Rating:	250 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.79 in) or 5 x 25 mm(0.2 x 0.98 in)
Termination	ELCO socket:	8016 series, 56 pins

FTA-E-02 Fail-safe digital output FTA (24/48/60 Vdc, 24 channels)

Description

The field termination assembly module FTA-E-02 is the interface between the system interconnection cables (SIC) and the external field wiring (on E-56 ELCO).

Twenty-four channels (separated into six groups of four channels) can be connected to the FTA-E-02 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The six SIC connectors are marked '1A', '1B', '2A', '2B', '3A' and '3B' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails.

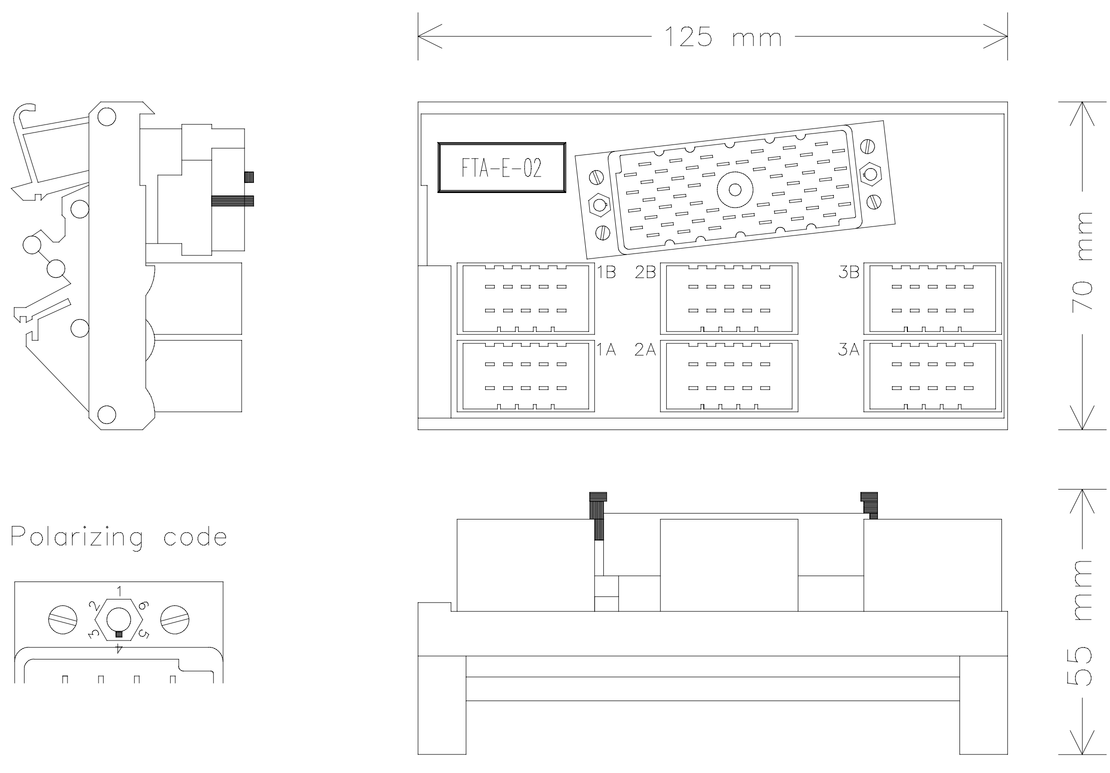


Figure 1 Mechanical layout

The polarizing notches of the ELCO socket can be set to any of six positions per side (factory-set at position 4). Changing the polarization requires removal of the FTA from the DIN EN rail and the use of a polarizing tool, make ELCO (part no. 06 1989 02).
The ELCO socket has guide pins and socket gills to ensure correct alignment when mating.

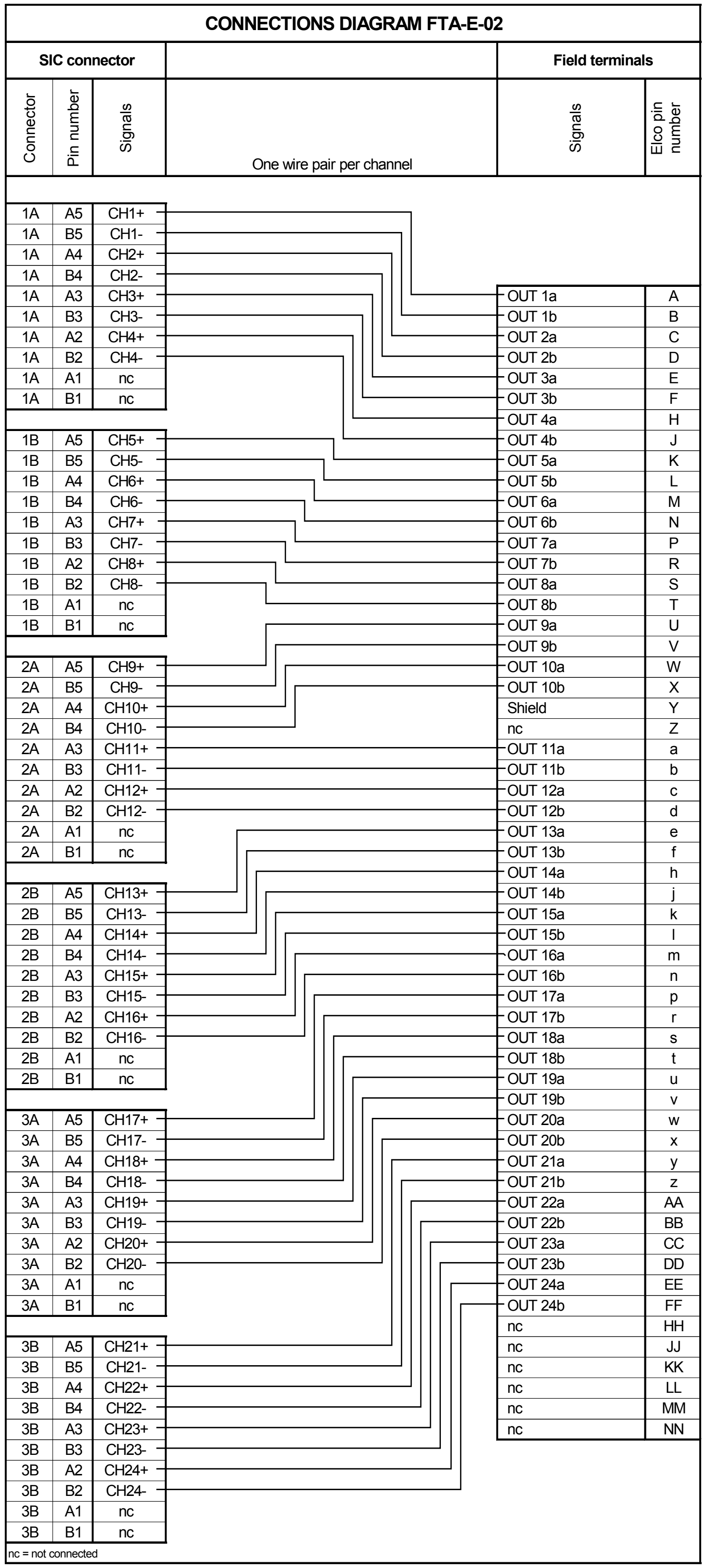
Applications

For details on applications and connection options for the FTA-E-02 module refer to the 'SIC to FTA applications' data sheet.

Connections diagrams

Figure 2 and Connections diagram
Figure 3 on the next two pages show the connections diagrams of the FTA-E-02 module.
Figure 2 applies to configurations with one wire pair per channel (e.g. 10102/2/1, 10201/2/1, 10216/2/1 and 10205/2/1). Connections diagram
Figure 3 applies to configurations with two wire pairs per channel (e.g. 10215/2/1).

Connections diagram



CONNECTIONS DIAGRAM FTA-E-02

One wire pair per channel

SIC connector:

Connector	Pin number	Signals
1A	A5	CH1+
1A	B5	CH1-
1A	A4	CH2+
1A	B4	CH2-
1A	A3	CH3+
1A	B3	CH3-
1A	A2	CH4+
1A	B2	CH4-
1A	A1	nc
1A	B1	nc
1B	A5	CH5+
1B	B5	CH5-
1B	A4	CH6+
1B	B4	CH6-
1B	A3	CH7+
1B	B3	CH7-
1B	A2	CH8+
1B	B2	CH8-
1B	A1	nc
1B	B1	nc
2A	A5	CH9+
2A	B5	CH9-
2A	A4	CH10+
2A	B4	CH10-
2A	A3	CH11+
2A	B3	CH11-
2A	A2	CH12+
2A	B2	CH12-
2A	A1	nc
2A	B1	nc
2B	A5	CH13+
2B	B5	CH13-
2B	A4	CH14+
2B	B4	CH14-
2B	A3	CH15+
2B	B3	CH15-
2B	A2	CH16+
2B	B2	CH16-
2B	A1	nc
2B	B1	nc
3A	A5	CH17+
3A	B5	CH17-
3A	A4	CH18+
3A	B4	CH18-
3A	A3	CH19+
3A	B3	CH19-
3A	A2	CH20+
3A	B2	CH20-
3A	A1	nc
3A	B1	nc
3B	A5	CH21+
3B	B5	CH21-
3B	A4	CH22+
3B	B4	CH22-
3B	A3	CH23+
3B	B3	CH23-
3B	A2	CH24+
3B	B2	CH24-
3B	A1	nc
3B	B1	nc

Field terminals:

Signals	Elco pin number
OUT 1a	A
OUT 1b	B
OUT 2a	C
OUT 2b	D
OUT 3a	E
OUT 3b	F
OUT 4a	H
OUT 4b	J
OUT 5a	K
OUT 5b	L
OUT 6a	M
OUT 6b	N
OUT 7a	P
OUT 7b	R
OUT 8a	S
OUT 8b	T
OUT 9a	U
OUT 9b	V
OUT 10a	W
OUT 10b	X
Shield	Y
nc	Z
OUT 11a	a
OUT 11b	b
OUT 12a	c
OUT 12b	d
OUT 13a	e
OUT 13b	f
OUT 14a	h
OUT 14b	j
OUT 15a	k
OUT 15b	l
OUT 16a	m
OUT 16b	n
OUT 17a	p
OUT 17b	r
OUT 18a	s
OUT 18b	t
OUT 19a	u
OUT 19b	v
OUT 20a	w
OUT 20b	x
OUT 21a	y
OUT 21b	z
OUT 22a	AA
OUT 22b	BB
OUT 23a	CC
OUT 23b	DD
OUT 24a	EE
OUT 24b	FF
nc	HH
nc	JJ
nc	KK
nc	LL
nc	MM
nc	NN

nc = not connected

Figure 2 Connections diagram (one wire pair per channel)

Connections diagram

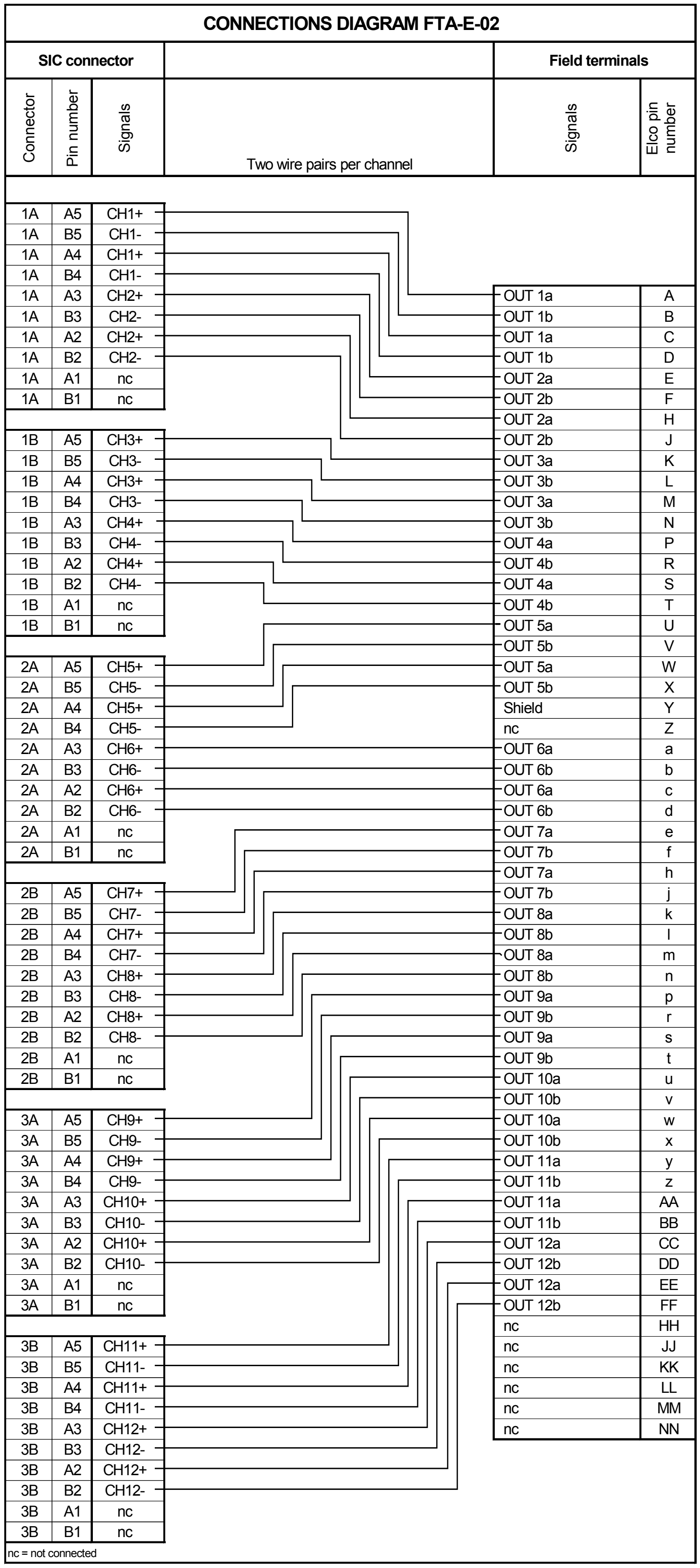


Figure 3 Connections diagram (two wire pairs per channel)

Technical data

The FTA-E-02 module has the following specifications:

General	Type number:	FTA-E-02
	Approvals:	CE, UL, TÜV
Power	Number of channels:	24 (6 groups of 4)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
	Maximum continuous current per channel:	2 A
Physical	Module dimensions:	125 x 70 x 55 mm (L x W x H) 4.92 x 2.76 x 2.17 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	126 mm (4.96 in)
Termination	ELCO socket:	8016 series, 56 pins

Left blank intentionally.

FTA-E-03 Digital output FTA (24 Vdc, 24 channels)

Description

The field termination assembly module FTA-E-03 is the interface between the system interconnection cables (SIC) and the external field wiring (on E-56 ELCO).

Twenty-four channels (separated into three groups of eight channels with a common –) can be connected to the FTA-E-03 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The three SIC connectors are marked '1A', '1B' and '2A' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails.

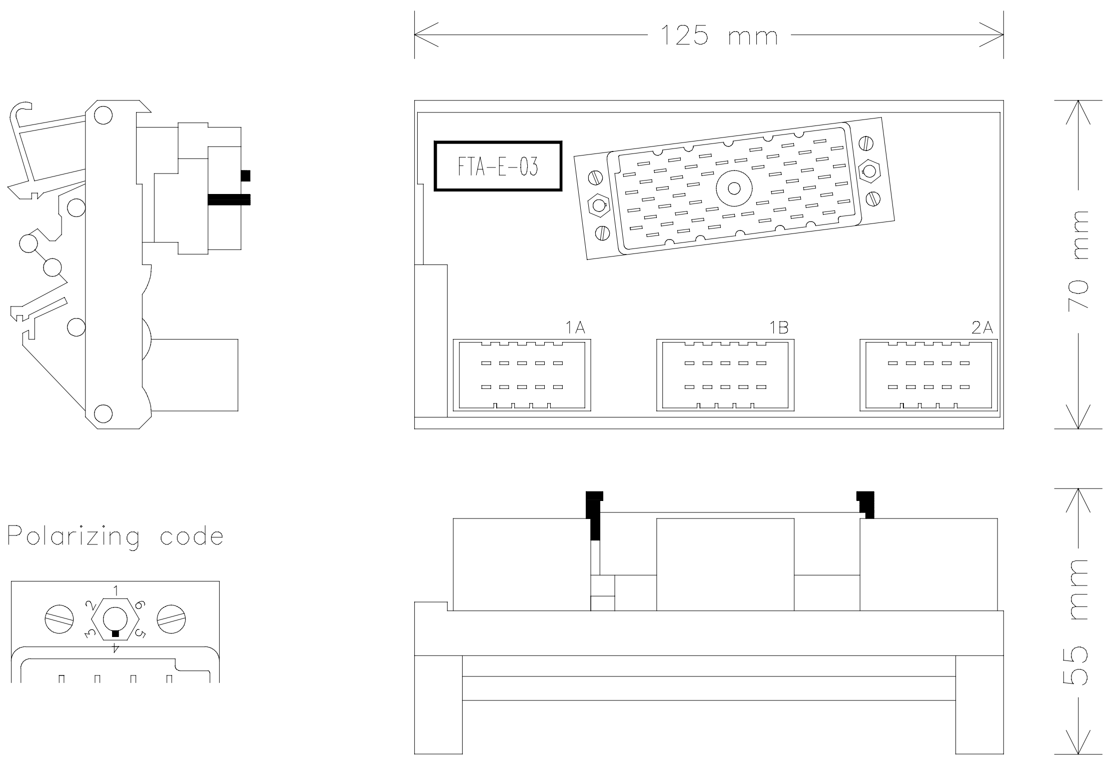


Figure 1 Mechanical layout

The polarizing notches of the ELCO socket can be set to any of six positions per side (factory-set at position 4). Changing the polarization requires removal of the FTA from the DIN EN rail and the use of a polarizing tool, make ELCO (part no. 06 1989 02).
The ELCO socket has guide pins and socket gills to ensure correct alignment when mating.

Applications

For details on applications and connection options for the FTA-E-03 module refer to the 'SIC to FTA applications' data sheet.

Connections diagrams

Figure 2 and Figure 3 on the next two pages show the connections diagrams of the FTA-E-03 module.
Figure 2 shows the connections diagram for 16-channel digital output modules. Figure 3 is a connection example for the 12-channel digital output module 10206/2/1.

Connections diagram

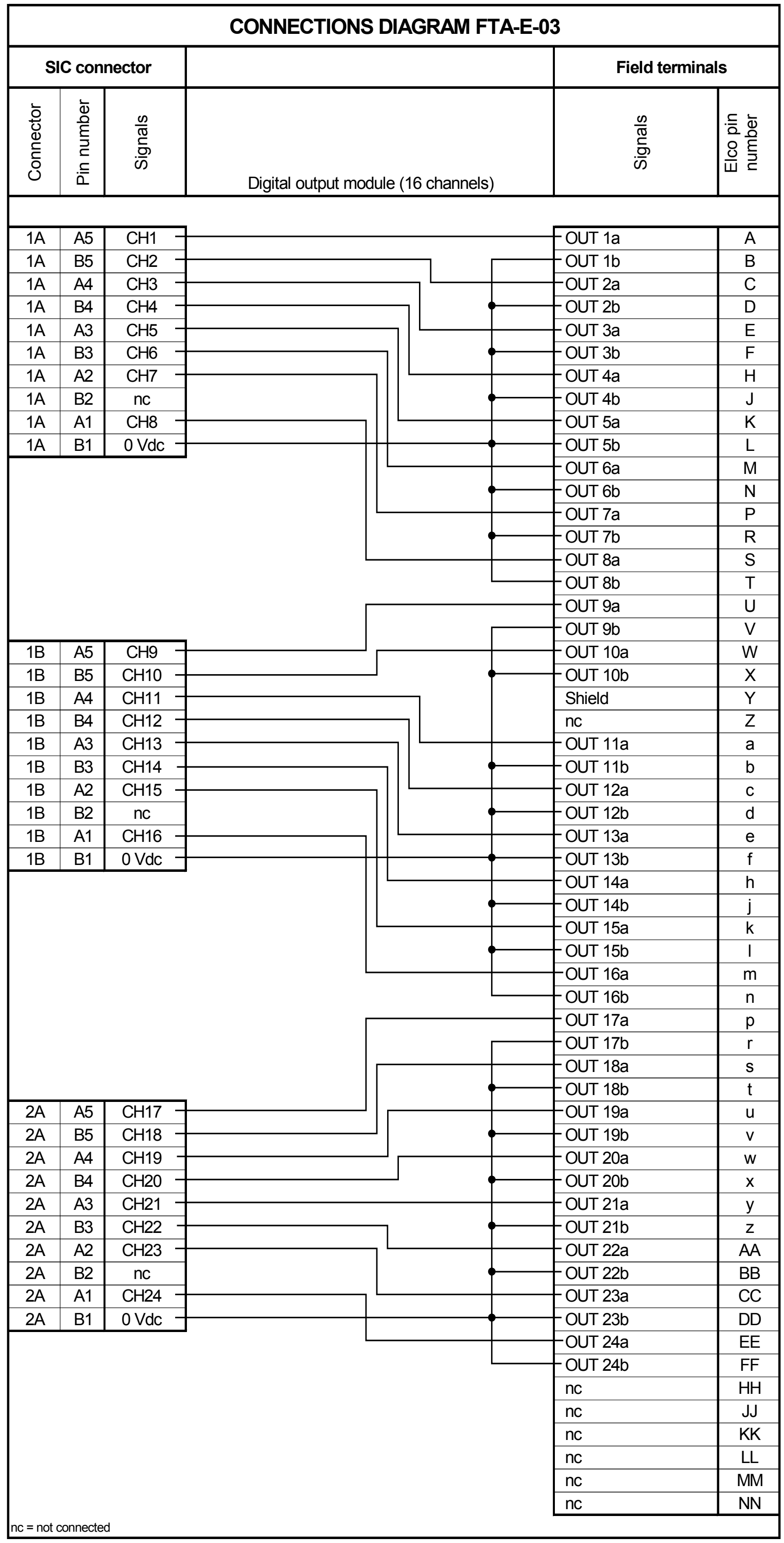


Figure 2 Connections diagram
(for 16-channel digital output modules)

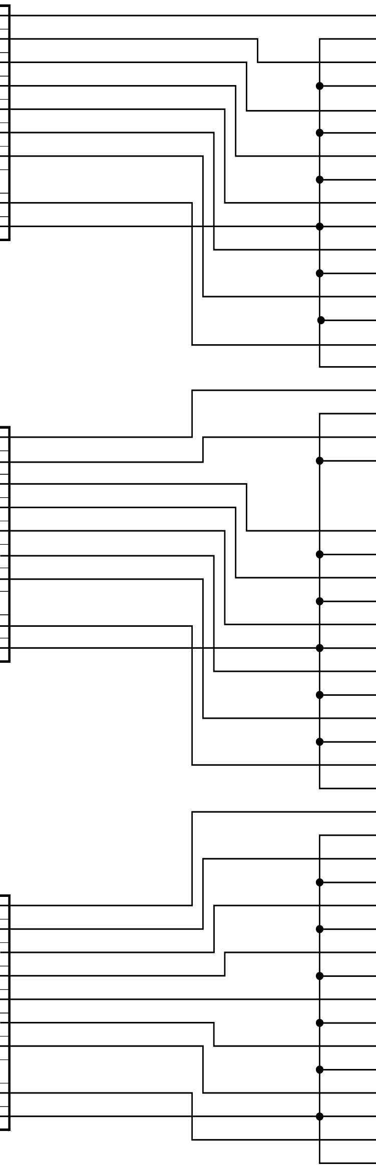
Connections diagram

CONNECTIONS DIAGRAM FTA-E-03

Example for 12-channel digital output module 10206/2/1

SIC connector

Connector	Pin number	Signals
1A	A5	CH1
1A	B5	CH2
1A	A4	CH3
1A	B4	CH4
1A	A3	CH5
1A	B3	CH6
1A	A2	CH7
1A	B2	nc
1A	A1	CH8
1A	B1	0 Vdc
1B	A5	CH9
1B	B5	CH10
1B	A4	CH11
1B	B4	CH12
1B	A3	0 Vdc
1B	B3	0 Vdc
1B	A2	0 Vdc
1B	B2	nc
1B	A1	0 Vdc
1B	B1	0 Vdc
2A	A5	CH13
2A	B5	CH14
2A	A4	CH15
2A	B4	CH16
2A	A3	CH17
2A	B3	CH18
2A	A2	CH19
2A	B2	nc
2A	A1	CH20
2A	B1	0 Vdc



Field terminals

Signals	Elco pin number
OUT 1a	A
OUT 1b	B
OUT 2a	C
OUT 2b	D
OUT 3a	E
OUT 3b	F
OUT 4a	H
OUT 4b	J
OUT 5a	K
OUT 5b	L
OUT 6a	M
OUT 6b	N
OUT 7a	P
OUT 7b	R
OUT 8a	S
OUT 8b	T
OUT 9a	U
OUT 9b	V
OUT 10a	W
OUT 10b	X
Shield	Y
nc	Z
OUT 11a	a
OUT 11b	b
OUT 12a	c
OUT 12b	d
0 Vdc	e
0 Vdc	f
0 Vdc	h
0 Vdc	j
0 Vdc	k
0 Vdc	l
0 Vdc	m
0 Vdc	n
OUT 13a	p
OUT 13b	r
OUT 14a	s
OUT 14b	t
OUT 15a	u
OUT 15b	v
OUT 16a	w
OUT 16b	x
OUT 17a	y
OUT 17b	z
OUT 18a	AA
OUT 18b	BB
OUT 19a	CC
OUT 19b	DD
OUT 20a	EE
OUT 20b	FF
nc	HH
nc	JJ
nc	KK
nc	LL
nc	MM
nc	NN

nc = not connected

Figure 3 Connections diagram
(example for 12-channel digital output module 10206/2/1)

Technical data

The FTA-E-03 module has the following specifications:

General	Type number:	FTA-E-03
	Approvals:	CE, UL, TÜV
Power	Number of channels:	24 (3 groups of 8)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
	Maximum continuous current per channel:	2 A
Physical	Module dimensions:	125 x 70 x 55 mm (L x W x H) 4.92 x 2.76 x 2.17 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	126 mm (4.96 in)
Termination	ELCO socket:	8016 series, 56 pins

Left blank intentionally.

FTA-E-04 Digital output (relay contact) FTA (25 channels)

Description

The field termination assembly module FTA-E-04 is the interface between the system interconnection cables (SIC) and the external field wiring (on E-56 ELCO).

Twenty-five channels (separated into five sets of five channels) can be connected to the FTA-E-04 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The five SIC connectors are marked '1A', '1B', '2A', '2B' and '3A' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails.

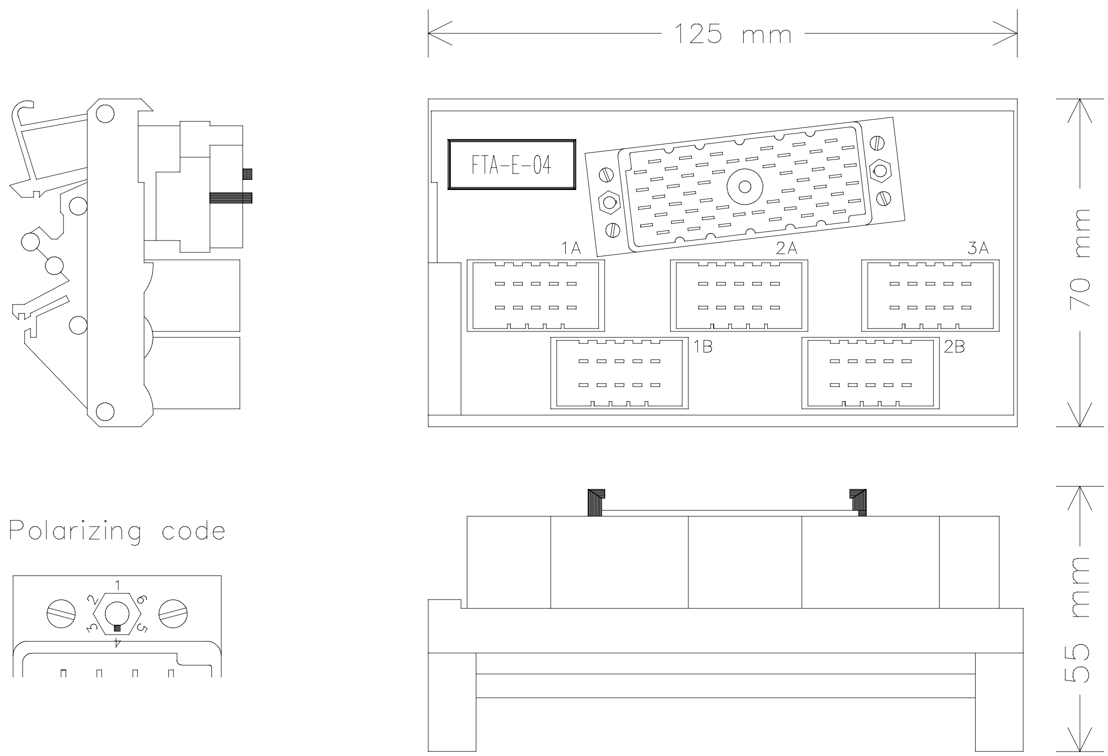


Figure 1 Mechanical layout

The polarizing notches of the ELCO socket can be set to any of six positions per side (factory-set at position 4). Changing the polarization requires removal of the FTA from the DIN EN rail and the use of a polarizing tool, make ELCO (part no. 06 1989 02).
The ELCO socket has guide pins and socket gills to ensure correct alignment when mating.

Applications

For details on applications and connection options for the FTA-E-04 module refer to the 'SIC to FTA applications' data sheet.

Connections diagram

CONNECTIONS DIAGRAM FTA-E-04

SIC connector: Connector	SIC connector: Pin number	SIC connector: Signals	Field terminals: Signals	Field terminals: Elco pin number
1A	A5	CH1 c	OUT 1a	A
1A	B5	CH1 no	OUT 1b	B
1A	A4	CH2 c	OUT 2a	C
1A	B4	CH2 no	OUT 2b	D
1A	A3	CH3 c	OUT 3a	E
1A	B3	CH3 no	OUT 3b	F
1A	A2	CH4 c	OUT 4a	H
1A	B2	CH4 no	OUT 4b	J
1A	A1	CH5 c	OUT 5a	K
1A	B1	CH5 no	OUT 5b	L
1B	A5	CH6 c	OUT 6a	M
1B	B5	CH6 no	OUT 6b	N
1B	A4	CH7 c	OUT 7a	P
1B	B4	CH7 no	OUT 7b	R
1B	A3	CH8 c	OUT 8a	S
1B	B3	CH8 no	OUT 8b	T
1B	A2	CH9 c	OUT 9a	U
1B	B2	CH9 no	OUT 9b	V
1B	A1	CH10 c	OUT 10a	W
1B	B1	CH10 no	OUT 10b	X
			Shield	Y
			nc	Z
2A	A5	CH11 c	OUT 11a	a
2A	B5	CH11 no	OUT 11b	b
2A	A4	CH12 c	OUT 12a	c
2A	B4	CH12 no	OUT 12b	d
2A	A3	CH13 c	OUT 13a	e
2A	B3	CH13 no	OUT 13b	f
2A	A2	CH14 c	OUT 14a	h
2A	B2	CH14 no	OUT 14b	j
2A	A1	CH15 c	OUT 15a	k
2A	B1	CH15 no	OUT 15b	l
2B	A5	CH16 c	OUT 16a	m
2B	B5	CH16 no	OUT 16b	n
2B	A4	CH17 c	OUT 17a	p
2B	B4	CH17 no	OUT 17b	r
2B	A3	CH18 c	OUT 18a	s
2B	B3	CH18 no	OUT 18b	t
2B	A2	CH19 c	OUT 19a	u
2B	B2	CH19 no	OUT 19b	v
2B	A1	CH20 c	OUT 20a	w
2B	B1	CH20 no	OUT 20b	x
3A	A5	CH21 c	OUT 21a	y
3A	B5	CH21 no	OUT 21b	z
3A	A4	CH22 c	OUT 22a	AA
3A	B4	CH22 no	OUT 22b	BB
3A	A3	CH23 c	OUT 23a	CC
3A	B3	CH23 no	OUT 23b	DD
3A	A2	CH24 c	OUT 24a	EE
3A	B2	CH24 no	OUT 24b	FF
3A	A1	CH25 c	OUT 25a	HH
3A	B1	CH25 no	OUT 25b	JJ
			nc	KK
			nc	LL
			nc	MM
			nc	NN

nc = not connected

Figure 2 Connections diagram

Technical data

The FTA-E-04 module has the following specifications:

General	Type number:	FTA-E-04
	Approvals:	CE, UL, TÜV
Power	Number of channels:	25 (5 groups of 5)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
	Maximum continuous current per channel:	2 A
Physical	Module dimensions:	125 x 70 x 55 mm (L x W x H) 4.92 x 2.76 x 2.17 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	126 mm (4.96 in)
Termination	ELCO socket:	8016 series, 56 pins

FTA-E-05 Active digital output (relay) FTA (25 channels)

Description

The field termination assembly module FTA-E-05 is the interface between the system interconnection cables (SIC) and the external field wiring (on E-56 ELCO).

Twenty-five potential-free relay contact output channels (separated into five groups of five channels) can be connected to the FTA-E-05 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The five SIC connectors are marked '1A', '1B', '2A', '2B' and '3A' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails.

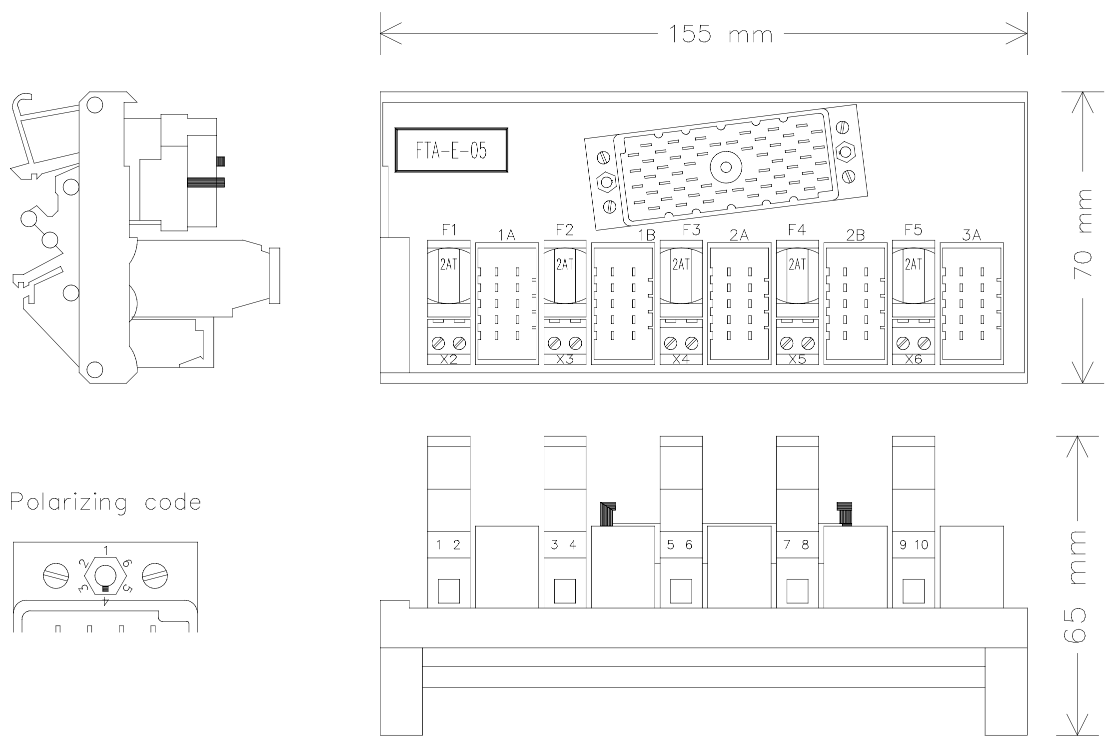


Figure 1 Mechanical layout

Each group has a fuse (2 A) and a screw terminal pair for external power. This way the potential-free relay contacts of 10208/2/1 modules can be used as powering outputs to the field.

The polarizing notches of the ELCO socket can be set to any of six positions per side (factory-set at position 4). Changing the polarization requires removal of the FTA from the DIN EN rail and the use of a polarizing tool, make ELCO (part no. 06 1989 02).
The ELCO socket has guide pins and socket gills to ensure correct alignment when mating.

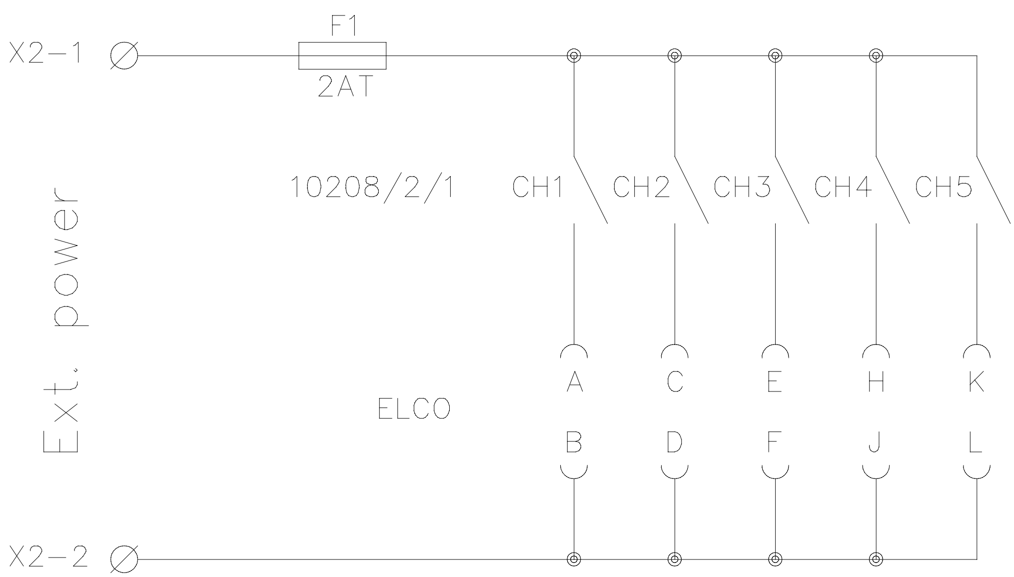


Figure 2 Schematic diagram of one group

Applications

For details on applications and connection options for the FTA-E-05 module refer to the 'SIC to FTA applications' data sheet.

Connections diagram

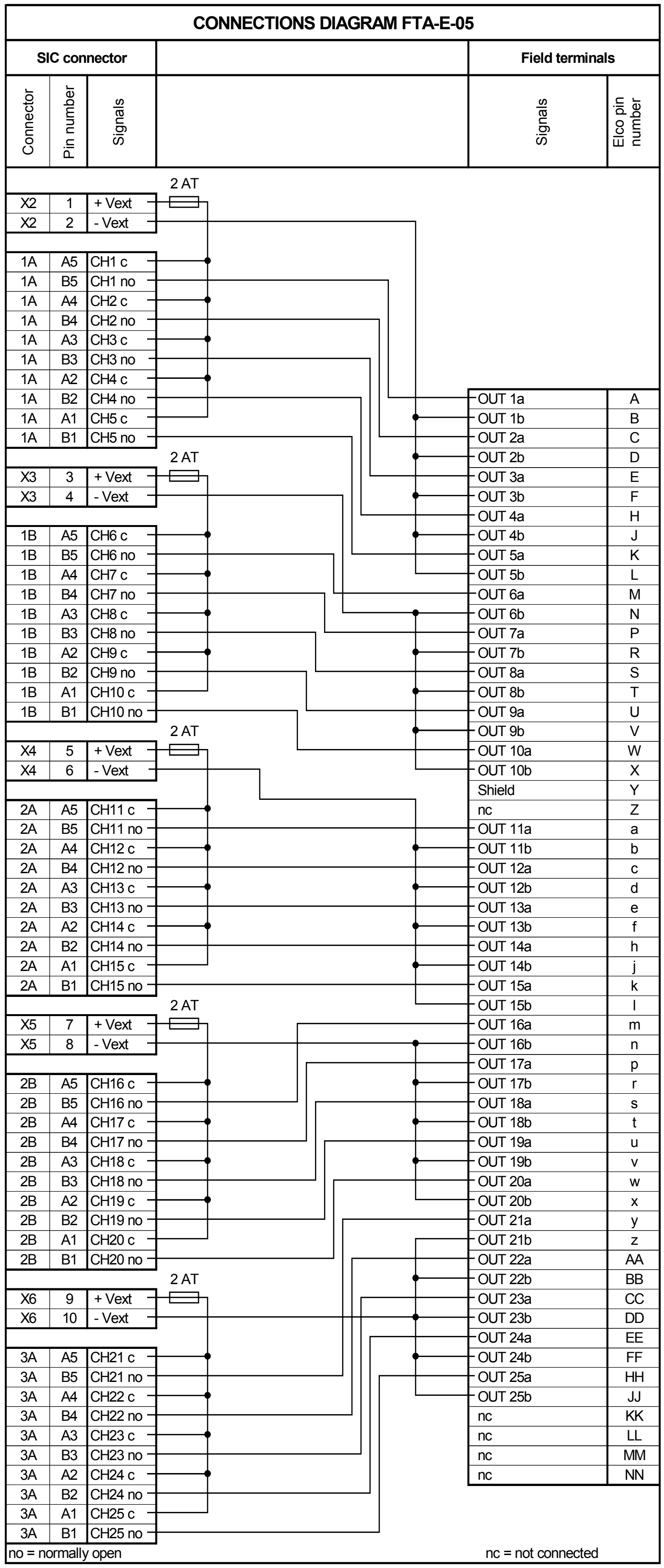


Figure 3 Connections diagram

Technical data

The FTA-E-05 module has the following specifications:

General	Type number:	FTA-E-05
	Approvals:	CE, UL, TÜV
Power	Number of channels:	25 (5 groups of 5)
	Maximum voltage:	30 Vac / 36 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
Fuses	Rating:	2 AT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.79 in) or 5 x 25 mm(0.2 x 0.98 in)
Physical	Module dimensions:	155 x 70 x 65 mm (L x W x H) 6.10 x 2.76 x 2.56 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	156 mm (6.14 in)
Termination	ELCO socket:	8016 series, 56 pins

Honeywell

FTA-T-02 Fail-safe digital output FTA (24/48/60 Vdc, 24 channels)

Description

The field termination assembly module FTA-T-02 is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals).

Twenty-four channels (separated into six groups of four channels) can be connected to the FTA-T-02 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The six SIC connectors are marked '1A', '1B', '2A', '2B', '3A' and '3B' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

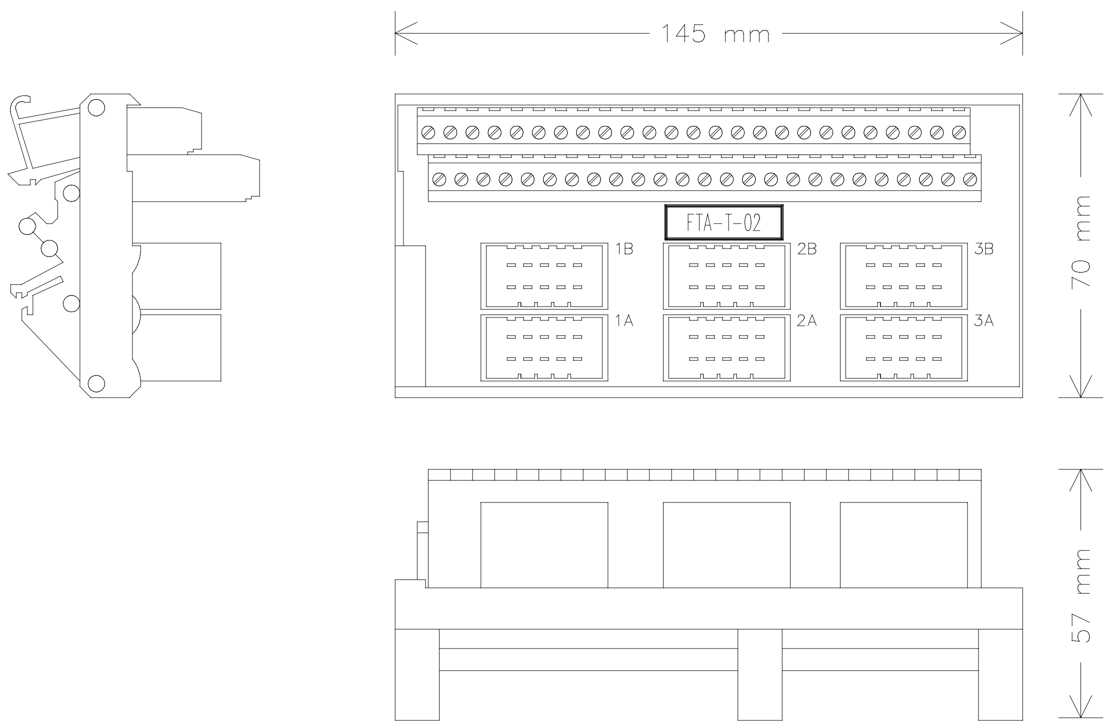


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FTA-T-02 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-T-02 module is as follows:

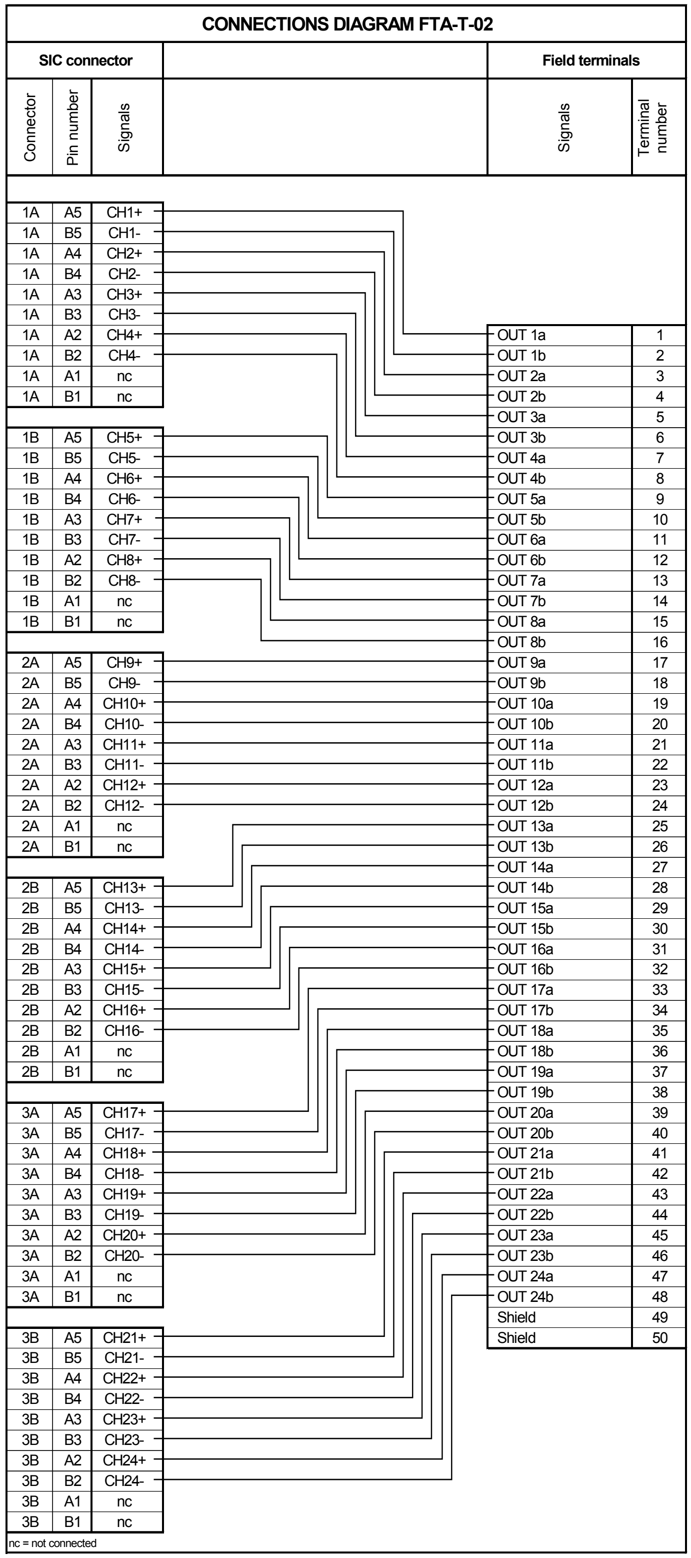


Figure 2 Connections diagram

Technical data

The FTA-T-02 module has the following specifications:

General	Type number:	FTA-T-02
	Approvals:	CE, UL, TÜV
Power	Number of channels:	24 (6 groups of 4)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
	Maximum continuous current per channel:	2 A
Physical	Module dimensions:	145 x 70 x 57 mm (L x W x H) 5.71 x 2.76 x 2.24 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	146 mm (5.75 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FTA-T-03 Digital output FTA (24 Vdc, 24 channels)

Description

The field termination assembly module FTA-T-03 is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals).

Twenty-four channels (separated into three groups of eight channels with a common –) can be connected to the FTA-T-03 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The three SIC connectors are marked '1A', '1B' and '2A' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

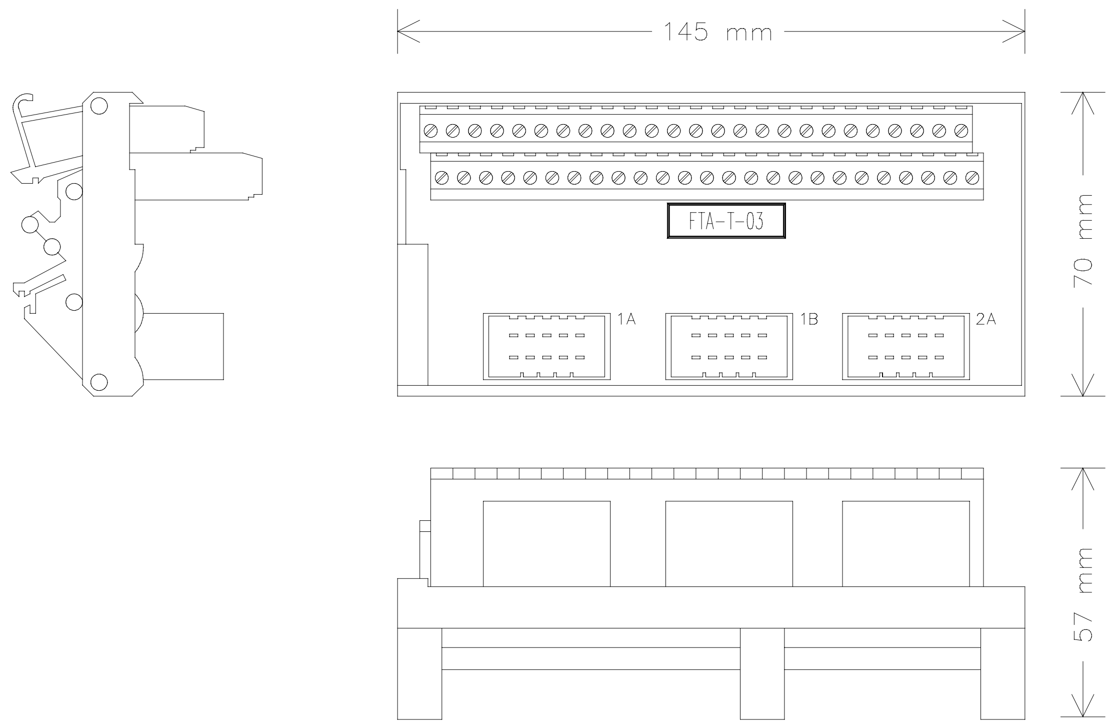


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FTA-T-03 module refer to the 'SIC to FTA applications' data sheet.

Connections diagrams

Figure 2 and Figure 3 on the next two pages show the connections diagrams of the FTA-T-03 module.
Figure 2 shows the connections diagram for 16-channel digital output modules. Figure 3 is a connection example for the 12-channel digital output module 10206/2/1.

Connections diagram

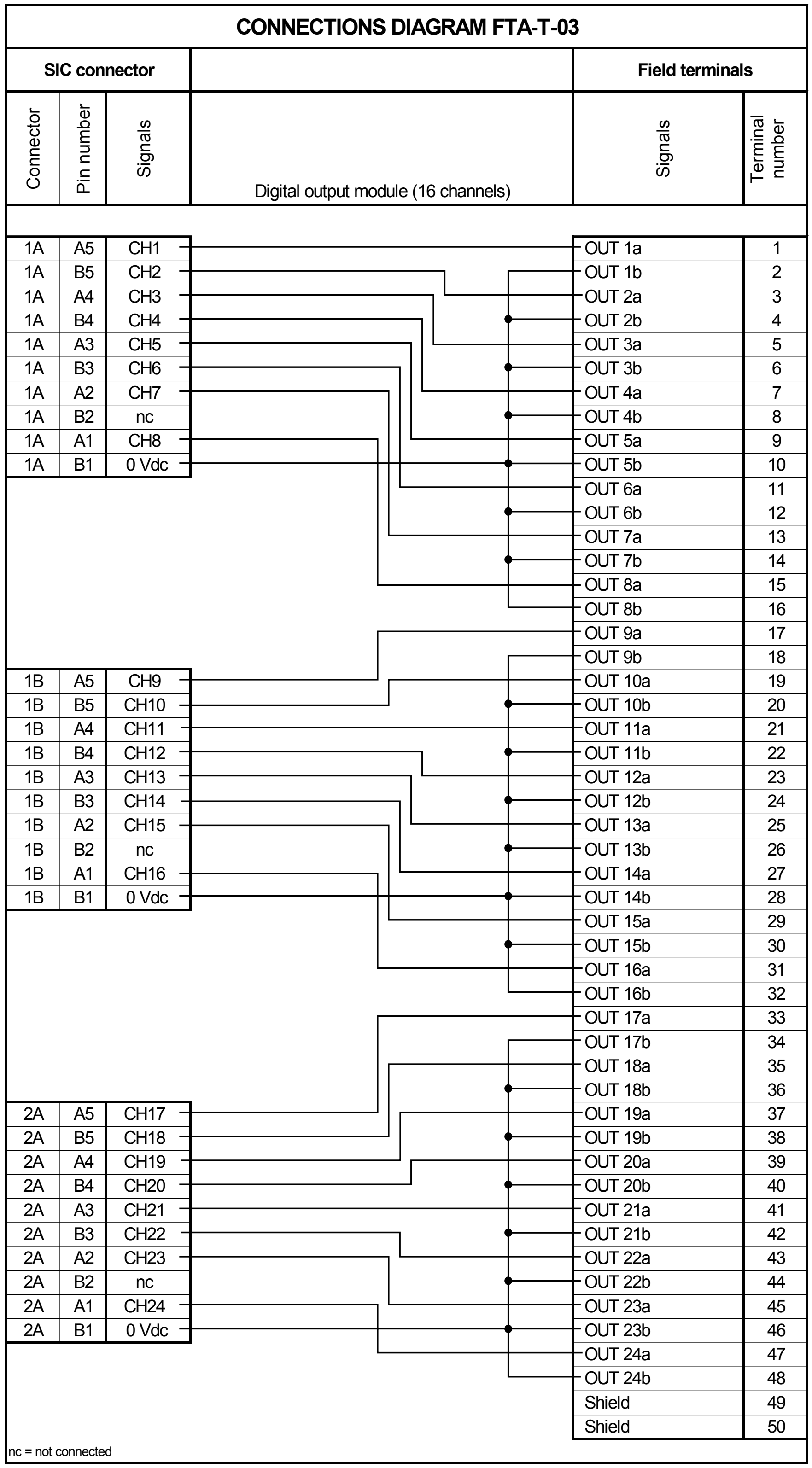


Figure 2 Connections diagram
(for 16-channel digital output modules)

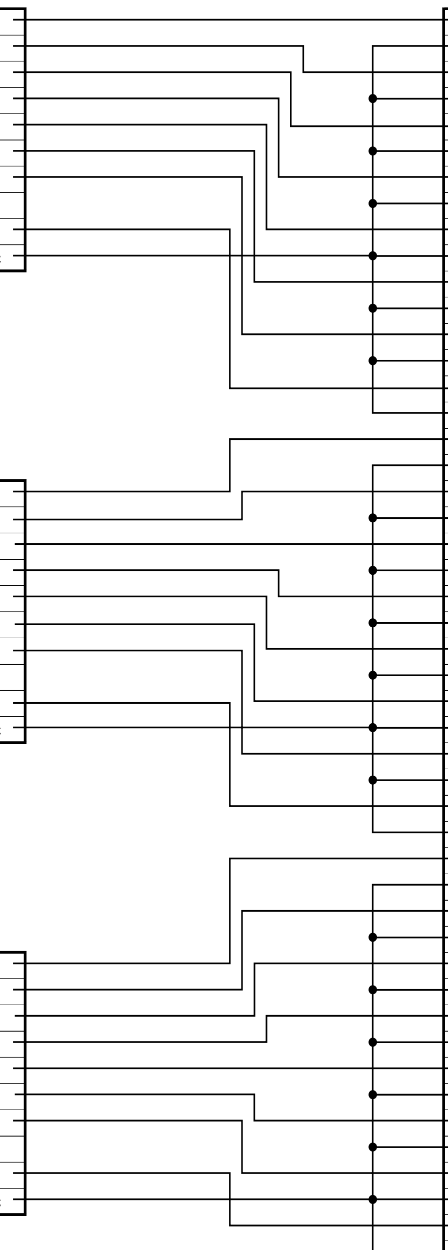
Connections diagram

CONNECTIONS DIAGRAM FTA-T-03

Example for 12-channel digital output module (10206/2/1)

SIC connector

Connector	Pin number	Signals
1A	A5	CH1
1A	B5	CH2
1A	A4	CH3
1A	B4	CH4
1A	A3	CH5
1A	B3	CH6
1A	A2	CH7
1A	B2	nc
1A	A1	CH8
1A	B1	0 Vdc
1B	A5	CH9
1B	B5	CH10
1B	A4	CH11
1B	B4	CH12
1B	A3	0 Vdc
1B	B3	0 Vdc
1B	A2	0 Vdc
1B	B2	nc
1B	A1	0 Vdc
1B	B1	0 Vdc
2A	A5	CH13
2A	B5	CH14
2A	A4	CH15
2A	B4	CH16
2A	A3	CH17
2A	B3	CH18
2A	A2	CH19
2A	B2	nc
2A	A1	CH20
2A	B1	0 Vdc



Field terminals

Signals	Terminal number
OUT 1a	1
OUT 1b	2
OUT 2a	3
OUT 2b	4
OUT 3a	5
OUT 3b	6
OUT 4a	7
OUT 4b	8
OUT 5a	9
OUT 5b	10
OUT 6a	11
OUT 6b	12
OUT 7a	13
OUT 7b	14
OUT 8a	15
OUT 8b	16
OUT 9a	17
OUT 9b	18
OUT 10a	19
OUT 10b	20
OUT 11a	21
OUT 11b	22
OUT 12a	23
OUT 12b	24
0 Vdc	25
0 Vdc	26
0 Vdc	27
0 Vdc	28
0 Vdc	29
0 Vdc	30
0 Vdc	31
0 Vdc	32
OUT 13a	33
OUT 13b	34
OUT 14a	35
OUT 14b	36
OUT 15a	37
OUT 15b	38
OUT 16a	39
OUT 16b	40
OUT 17a	41
OUT 17b	42
OUT 18a	43
OUT 18b	44
OUT 19a	45
OUT 19b	46
OUT 20a	47
OUT 20b	48
Shield	49
Shield	50

nc = not connected

Figure 3 Connections diagram
(example for 12-channel digital output module 10206/2/1)

Technical data

The FTA-T-03 module has the following specifications:

General	Type number:	FTA-T-03
	Approvals:	CE, UL, TÜV
Power	Number of channels:	24 (3 groups of 8)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12)
		125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
	Maximum continuous current per channel:	2 A
Physical	Module dimensions:	145 x 70 x 57 mm (L x W x H) 5.71 x 2.76 x 2.24 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	146 mm (5.75 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FTA-T-04 Digital output (relay contact) FTA (25 channels)

Description

The field termination assembly module FTA-T-04 is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals).

Twenty-five channels (separated into five groups of five channels) can be connected to the FTA-T-04 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The five SIC connectors are marked '1A', '1B', '2A', '2B' and '3A' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

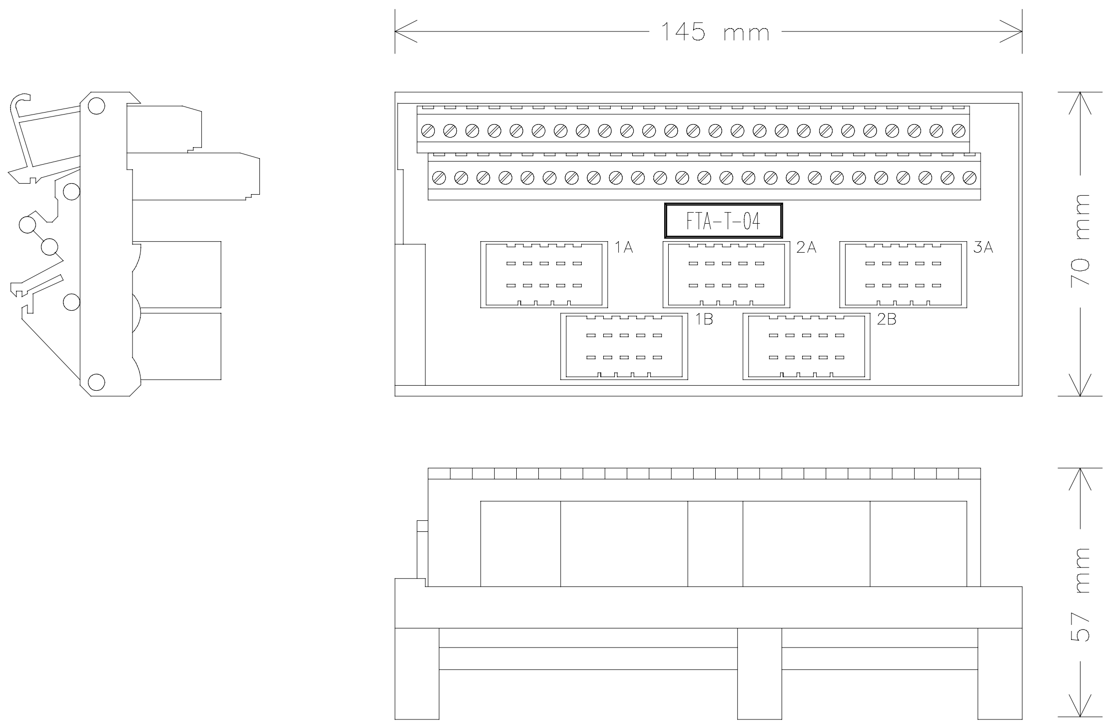


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FTA-T-04 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-T-04 module is as follows:

CONNECTIONS DIAGRAM FTA-T-04

SIC connector

Connector	Pin number	Signals
1A	A5	CH1 c
1A	B5	CH1 no
1A	A4	CH2 c
1A	B4	CH2 no
1A	A3	CH3 c
1A	B3	CH3 no
1A	A2	CH4 c
1A	B2	CH4 no
1A	A1	CH5 c
1A	B1	CH5 no
1B	A5	CH6 c
1B	B5	CH6 no
1B	A4	CH7 c
1B	B4	CH7 no
1B	A3	CH8 c
1B	B3	CH8 no
1B	A2	CH9 c
1B	B2	CH9 no
1B	A1	CH10 c
1B	B1	CH10 no
2A	A5	CH11 c
2A	B5	CH11 no
2A	A4	CH12 c
2A	B4	CH12 no
2A	A3	CH13 c
2A	B3	CH13 no
2A	A2	CH14 c
2A	B2	CH14 no
2A	A1	CH15 c
2A	B1	CH15 no
2B	A5	CH16 c
2B	B5	CH16 no
2B	A4	CH17 c
2B	B4	CH17 no
2B	A3	CH18 c
2B	B3	CH18 no
2B	A2	CH19 c
2B	B2	CH19 no
2B	A1	CH20 c
2B	B1	CH20 no
3A	A5	CH21 c
3A	B5	CH21 no
3A	A4	CH22 c
3A	B4	CH22 no
3A	A3	CH23 c
3A	B3	CH23 no
3A	A2	CH24 c
3A	B2	CH24 no
3A	A1	CH25 c
3A	B1	CH25 no

Field terminals

Signals	Terminal number
OUT 1a	1
OUT 1b	2
OUT 2a	3
OUT 2b	4
OUT 3a	5
OUT 3b	6
OUT 4a	7
OUT 4b	8
OUT 5a	9
OUT 5b	10
OUT 6a	11
OUT 6b	12
OUT 7a	13
OUT 7b	14
OUT 8a	15
OUT 8b	16
OUT 9a	17
OUT 9b	18
OUT 10a	19
OUT 10b	20
OUT 11a	21
OUT 11b	22
OUT 12a	23
OUT 12b	24
OUT 13a	25
OUT 13b	26
OUT 14a	27
OUT 14b	28
OUT 15a	29
OUT 15b	30
OUT 16a	31
OUT 16b	32
OUT 17a	33
OUT 17b	34
OUT 18a	35
OUT 18b	36
OUT 19a	37
OUT 19b	38
OUT 20a	39
OUT 20b	40
OUT 21a	41
OUT 21b	42
OUT 22a	43
OUT 22b	44
OUT 23a	45
OUT 23b	46
OUT 24a	47
OUT 24b	48
OUT 25a	49
OUT 25b	50

Figure 2 Connections diagram

Technical data

The FTA-T-04 module has the following specifications:

General	Type number:	FTA-T-04
	Approvals:	CE, UL, TÜV
Power	Number of channels:	25 (5 groups of 5)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12)
		125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
	Maximum continuous current per channel:	2 A
Physical	Module dimensions:	145 x 70 x 57 mm (L x W x H) 5.71 x 2.76 x 2.24 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	146 mm (5.75 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FTA-T-05 Fail-safe digital output FTA (24 Vdc, 12 channels)

Description

The field termination assembly module FTA-T-05 is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals).

Twelve channels (separated into six groups of two channels) can be connected to the FTA-T-05 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The six SIC connectors are marked '1A', '1B', '2A', '2B', '3A' and '3B' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

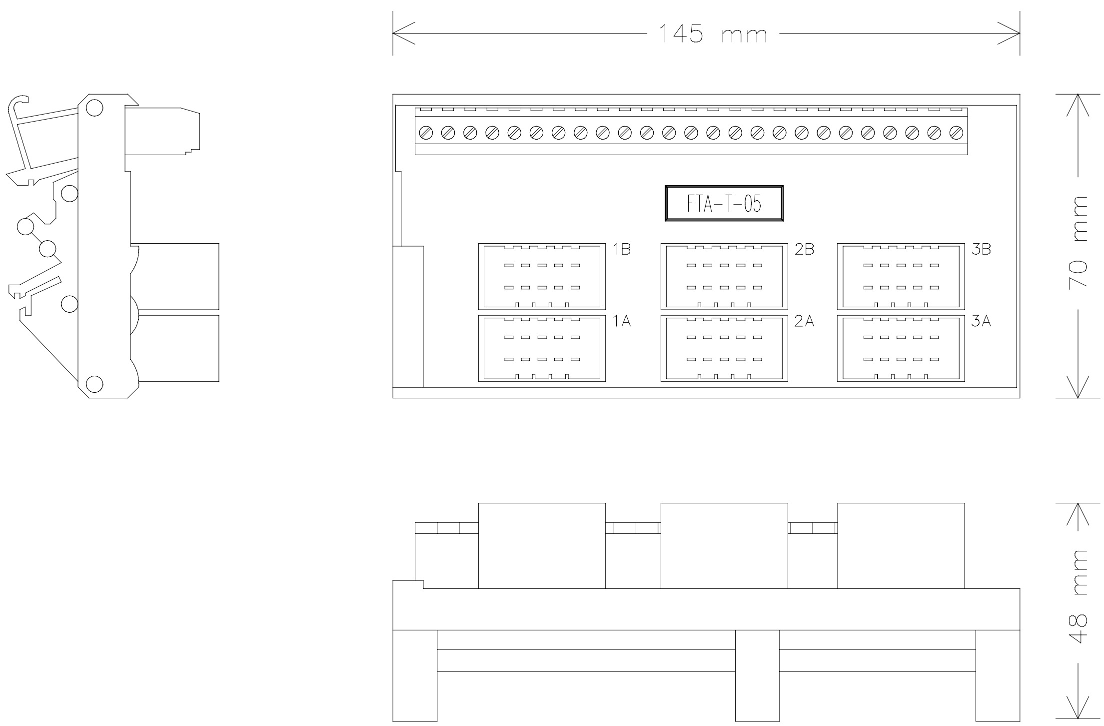


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FTA-T-05 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-T-05 module is as follows:

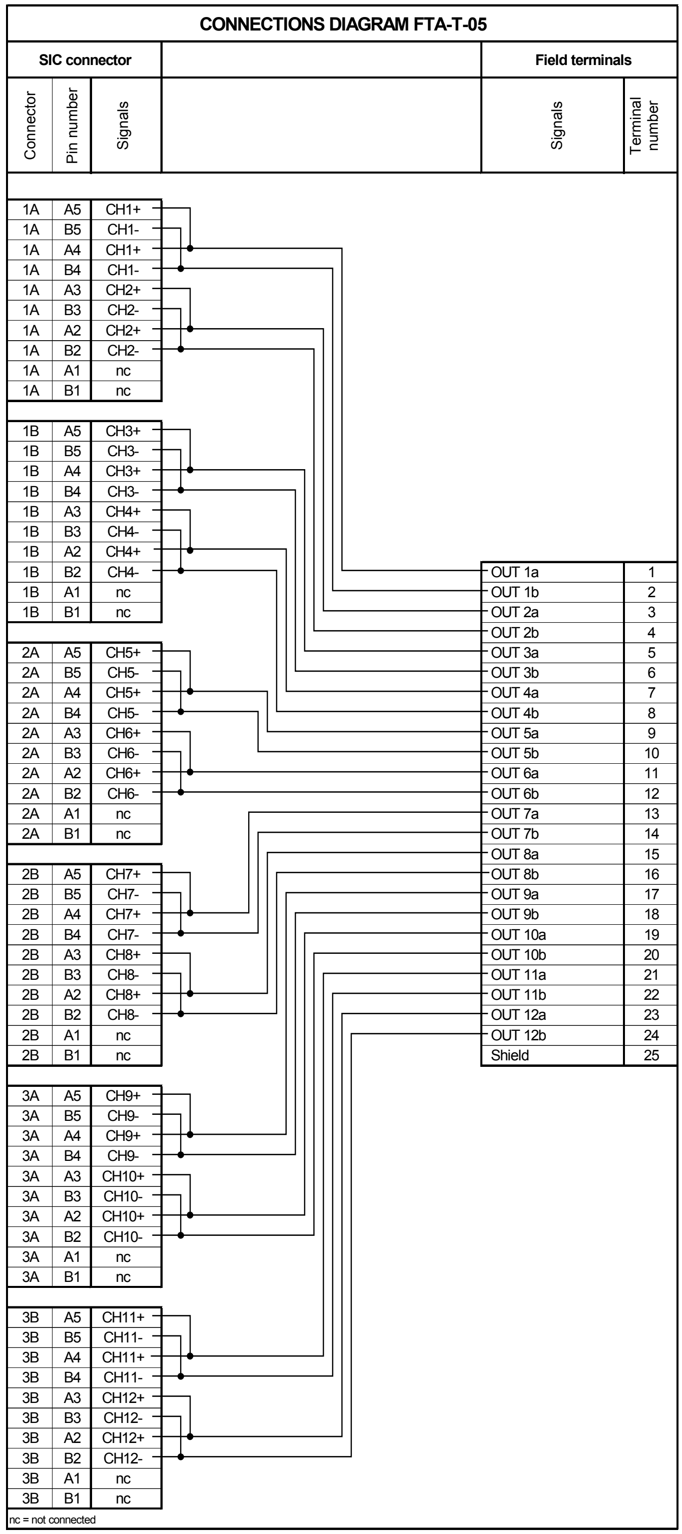


Figure 2 Connections diagram

Technical data

The FTA-T-05 module has the following specifications:

General	Type number:	FTA-T-05
	Approvals:	CE, UL, TÜV
Power	Number of channels:	12 (6 groups of 2)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
	Maximum continuous current per channel:	3 A
Physical	Module dimensions:	145 x 70 x 48 mm (L x W x H) 5.71 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	146 mm (5.75 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

Left blank intentionally.

FTA-T-08 Fail-safe digital output (relay contact) FTA (4 channels)

Description

The FTA-T-08 module has four fail-safe potential-free relay contact (NO) output channels, created by two different relays connected in series. These relays are capable of driving a wide variety of loads including 115/230 Vac, which gives the FSC system a fail-safe 115/230 Vac output capability.
The energized state of the relay is indicated by an LED on the module.

Four channels can be connected to the FTA-T-08 module via a system interconnection cable (SIC). This cable is plugged into the SIC connectors on the FTA module. The SIC connector is marked '1A' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

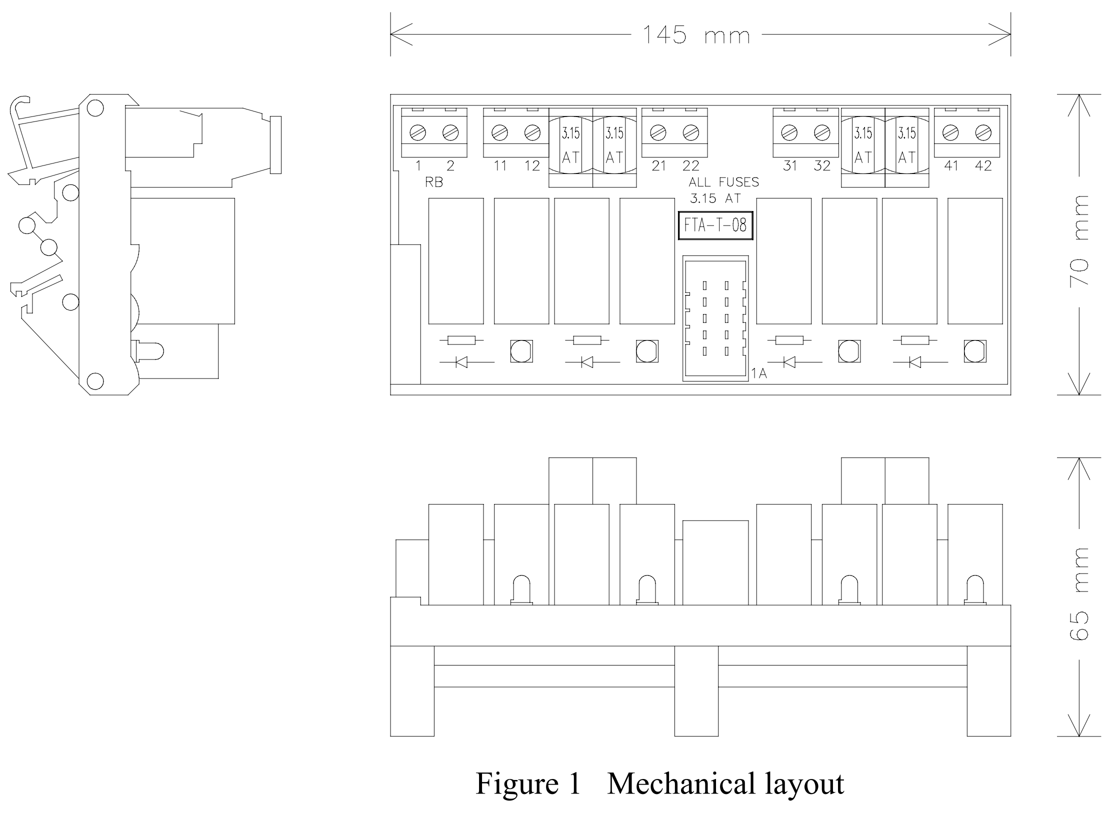


Figure 1 Mechanical layout

Each channel consists of:

- two relays of different manufacturers,
- a fused NO field contact (3.15 AT), and
- a status indicator LED.

The module has a common readback circuit for all four channels, which is closed if all relays are functioning correctly. If the readback circuit is opened, this indicates that one of the relays of the FTA is faulty.

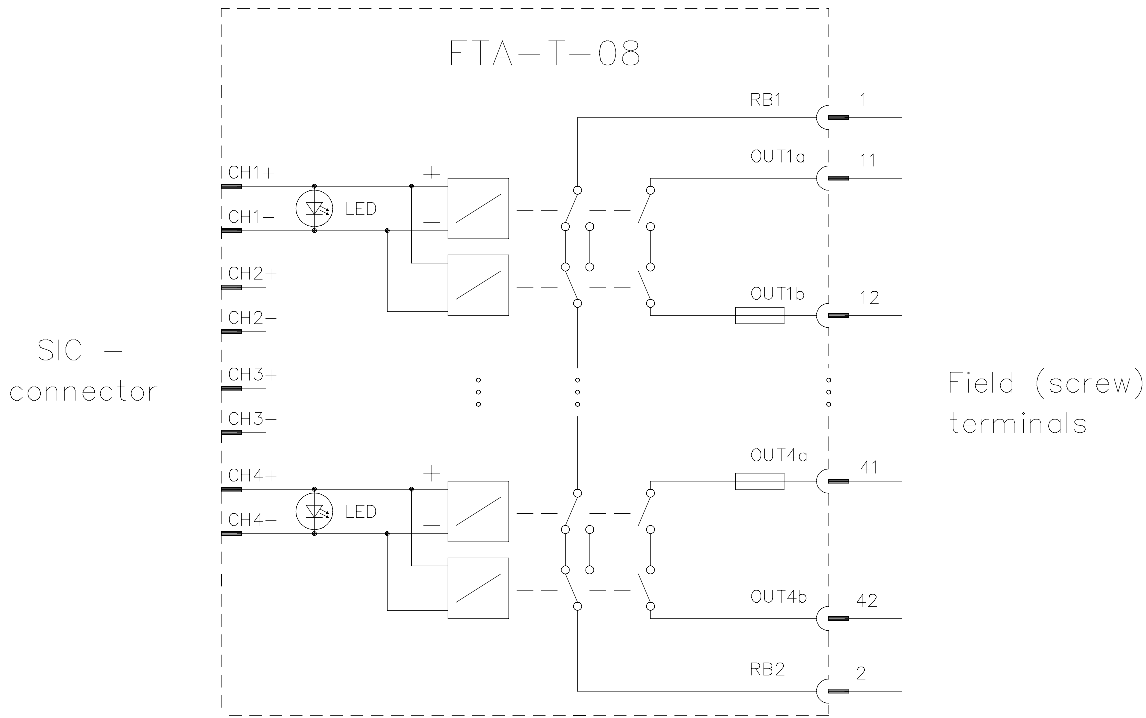


Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FTA-T-08 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-T-08 module is as follows:

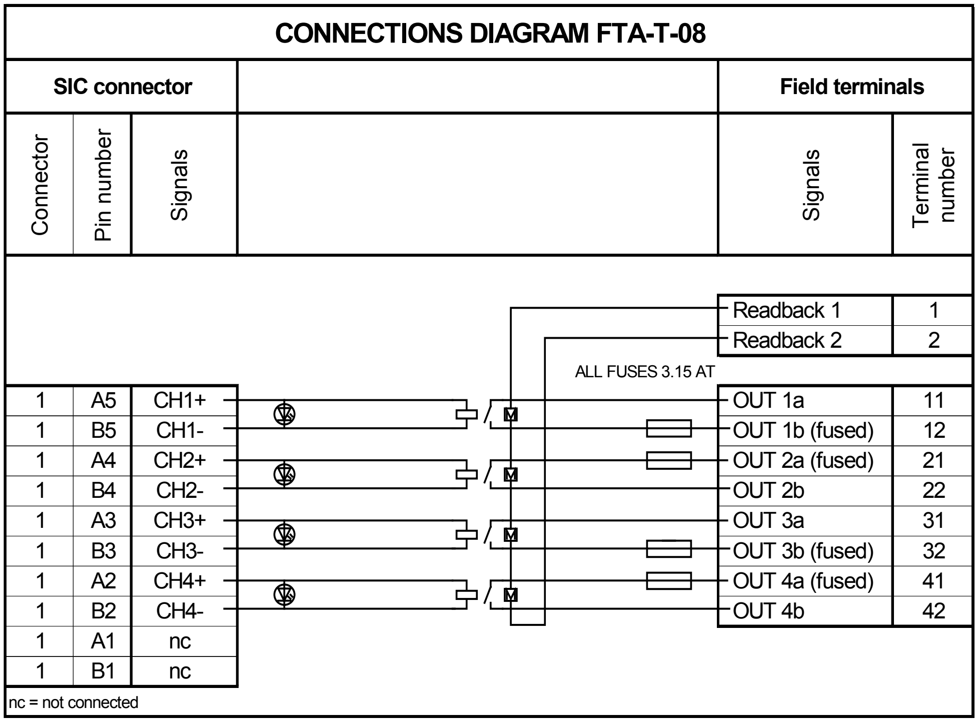


Figure 3 Connections diagram

Technical data

The FTA-T-08 module has the following specifications:

General

Type number:	FTA-T-08
Approvals:	CE, TÜV, UL

Input

Nominal input voltage:	24 V
Max. input voltage:	31 V
Relay cut-in voltage:	19 V
Input current:	typically 50 mA at 24 V

Output

Number of output channels:	4
Max. output current:	3.15 A (fused)
Min. output current:	400 mA at 24 Vdc
Max. output voltage:	250 Vac / 150 Vdc
Max. output load:	800 VA / 150 W

Technical data (continued)

Fuses	Rating:	3.15 AT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.78 in) or 5 x 25 mm (0.2 x 0.98 in)
Physical	Module dimensions:	145 x 70 x 65 mm (L x W x H) 5.71 x 2.76 x 2.56 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	146 mm (5.75 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Relay contact	Max. switching load:	250 Vac, 5 A 24 Vdc, 3.15 A* 48 Vdc, 750 mA* 60 Vdc, 600 mA* 110 Vdc, 350 mA*
	Max. switched frequency:	20 Hz
	Expected life:	
	– electrical	80,000 switch operations
	– mechanical	5,000,000 switch operations
	Ambient temperature:	–40°C to +60°C (–40°F to +140°F)
	Contact material:	silver alloy

*** Note:**
When switching DC loads, only use resistive loads or inductive loads with spark suppression diodes.

FTA-T-11 Fail-safe digital output FTA (110 Vdc, 8 channels)

Description

The field termination assembly module FTA-T-11 is the interface between the system interconnection cables (SIC) and the external field wiring (screw terminals).
It was specially developed to meet isolation requirements for higher voltages in accordance with IEC 1010 (1990), overvoltage category 3 (Table D.12).

Eight channels (separated into two groups of four channels) can be connected to the FTA-T-11 module via system interconnection cables (SIC). These cables are plugged into the SIC connectors on the FTA module. The two SIC connectors are marked '1A' and '2A' (white print on the board).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

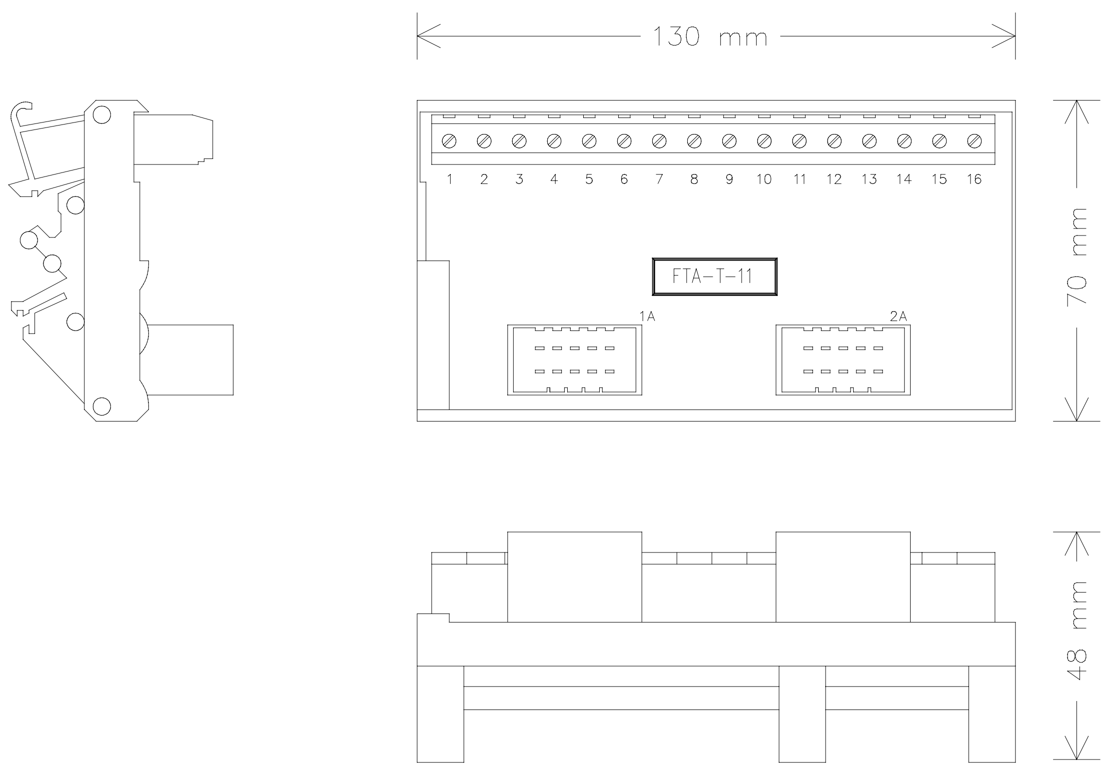


Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FTA-T-11 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-T-11 module is as follows:

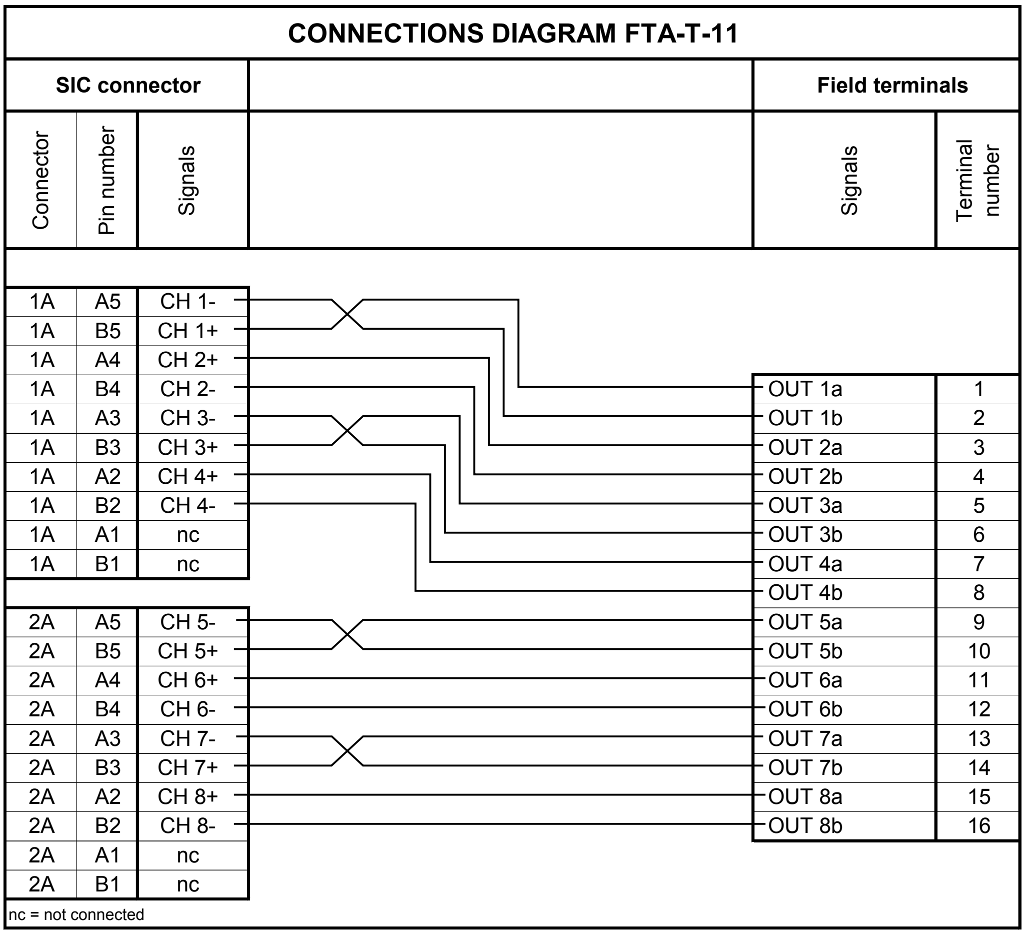


Figure 2 Connections diagram

Technical data

The FTA-T-11 module has the following specifications:

General	Type number:	FTA-T-11
	Approvals:	CE, TÜV
Power	Number of channels:	8 (2 groups of 4)
	Maximum voltage:	100 Vac / 120 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12)
	Max. continuous current per channel:	2 A
Physical	Module dimensions:	130 x 70 x 48 mm (L x W x H) 5.12 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	131 mm (5.16 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

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Honeywell

FTA-T-12 Isolated passive digital input FTA (8 channels)

Description

The field termination assembly module FTA-T-12 is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals). It has eight non-fail-safe isolated 24 Vdc input channels.

Eight channels can be connected to the FTA-T-12 module via a system interconnection cable (SIC). This cable is plugged into the SIC connector on the FTA module.
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

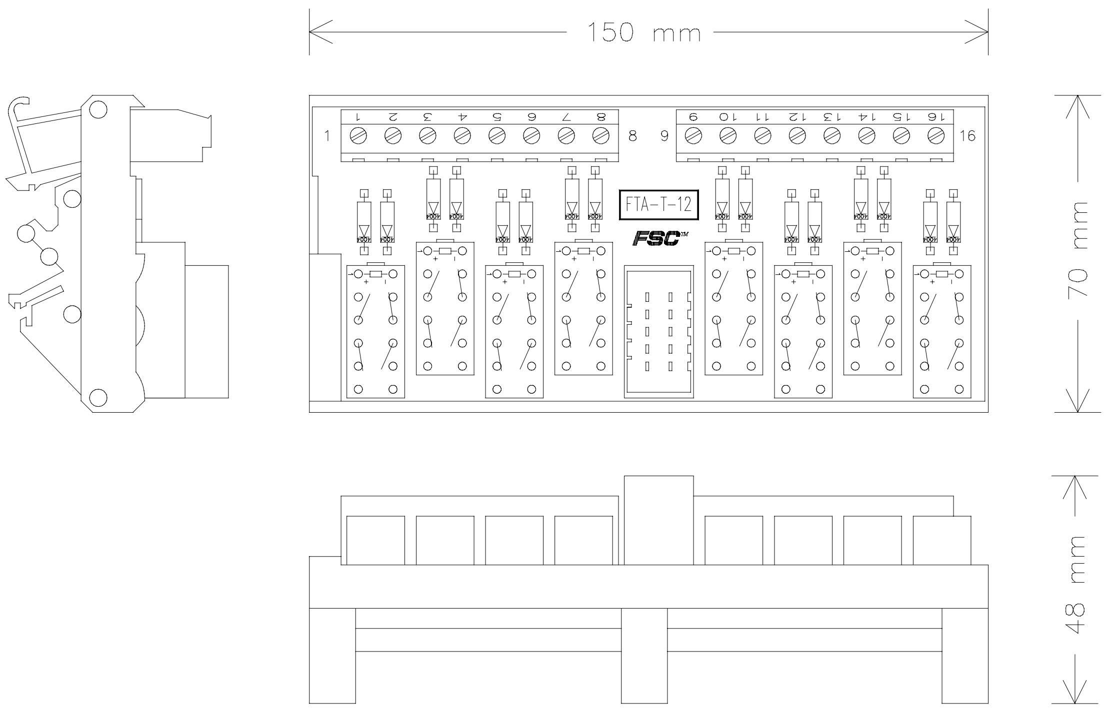

Figure 1 Mechanical layout

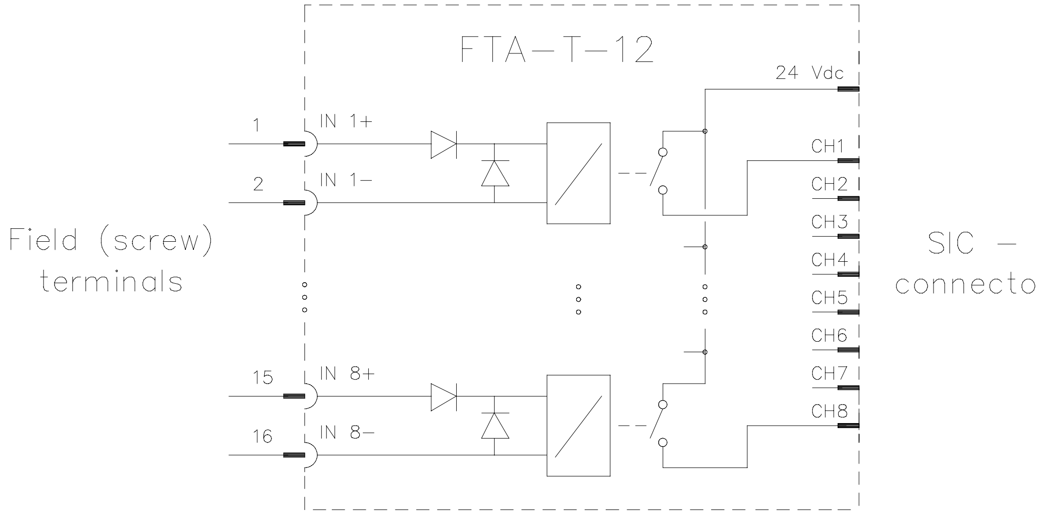

Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FTA-T-12 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-T-12 module is as follows:

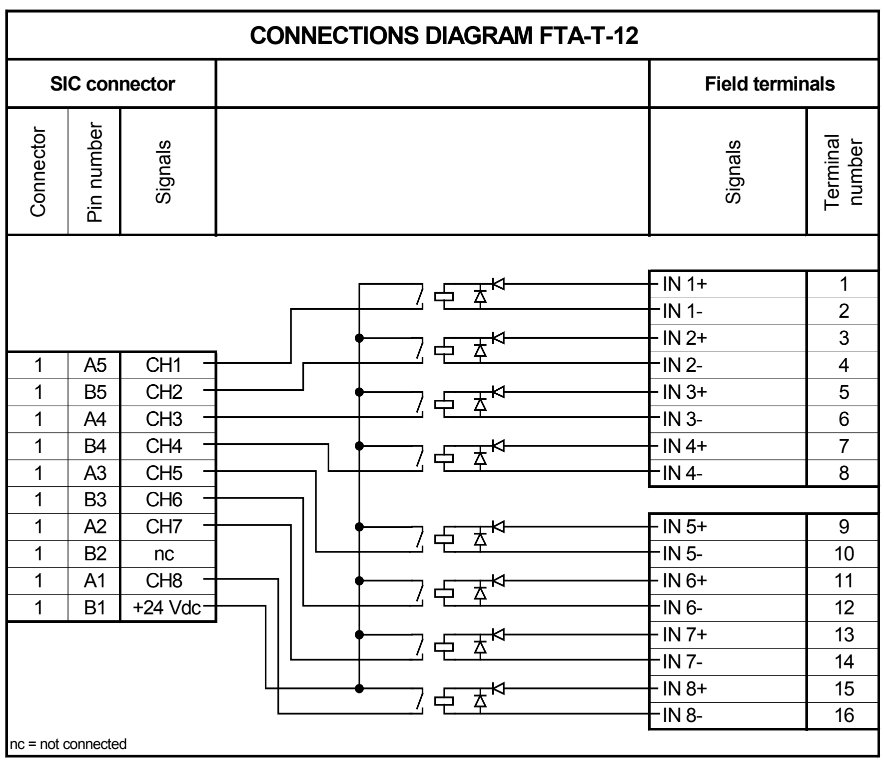

Figure 3 Connections diagram

Technical data

The FTA-T-12 module has the following specifications:

General	Type number:	FTA-T-12
	Approvals:	CE, TÜV, UL
Input	Number of input channels:	8
	Nominal input voltage:	24 Vdc
	Drop-out voltage:	2.8 Vdc
	Pick-up voltage:	17.5 Vdc
	Max. input voltage:	47.5 Vdc
	Reverse polarity protection:	series diode
	Max. reverse voltage:	300 V
	Input current:	typically 9 mA at 24 Vdc
	Max. switching frequency:	20 Hz
Output	Output voltage:	0.1 to 36 V
	Output current:	10 µA to 1 A
	Contact material:	gold-clad silver alloy
Physical	Module dimensions:	150 x 70 x 48 mm (L x W x H) 5.91 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	151 mm (5.94 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Isolation	Galvanic isolation:	
	– input to output	1000 Vac
	– input to input	1000 Vac

Left blank intentionally.

FTA-T-14 Fail-safe 0(4)-20 mA analog input FTA (16 channels)

Description

The field termination assembly module FTA-T-14 is the interface between field components (sensors, etc.) and the fail-safe high-density analog input module 10105/2/1 in the FSC system. It can be used for interfacing signals from Class I, Division 2 Hazardous Locations.

The FTA-T-14 module has sixteen analog input channels, which may be used for both safety-related and non-safety-related applications. These sixteen channels (separated into two groups of eight channels with common 0 V) are connected via a system interconnection cable (SIC), which is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connection of power supply, ground and field wiring.

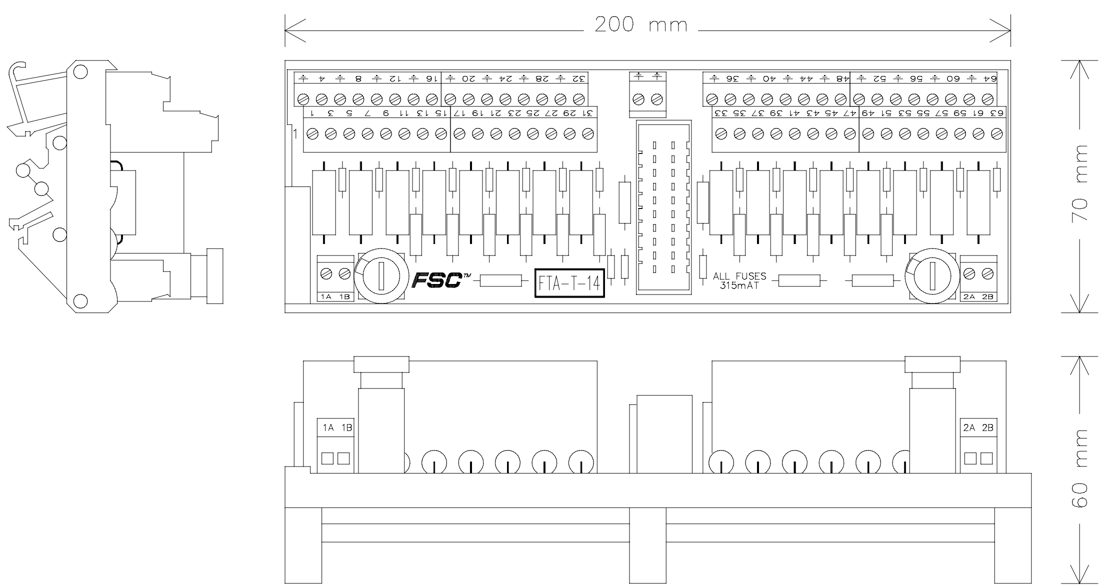

Figure 1 Mechanical layout

Main functions

The FTA-T-14 module has three main functions:

- linear direct conversion of 0(4)-20 mA DC field signals to the signal levels of the fail-safe high-density analog input module 10105/2/1,
- power supply distribution to each transmitter with voltage-current limitation in compliance with Hazardous Area Class I Division 2, and
- enable monitoring of the external power connected to the FTA-T-14 module.

Linear direct conversion

The input circuit of each channel consists of a high-precision resistor, which converts the input current (0 to 20 mA) to the input voltage for the high-density analog input module 10105/2/1. The power to the analog transmitter is supplied via a series resistor. Each analog signal has its own terminal for the field cable shield.

Figure 2 below shows the schematic diagram for connecting a transmitter (active and passive).

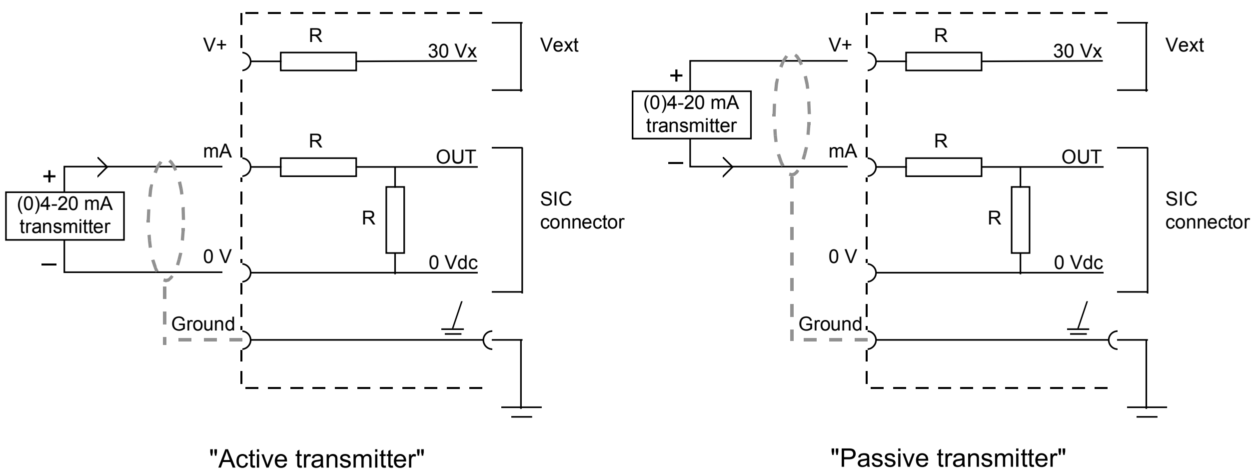

Figure 2 Schematic diagram for connecting a transmitter

Class I Division 2

The FTA-T-14 module may be used in for non-incendive field circuits to Class I, Division 2 applications. The external output voltage (V+) is current-limited by means of a series resistor.

Transmitter voltage

Figure 3 below shows the available transmitter voltage for passive transmitters.

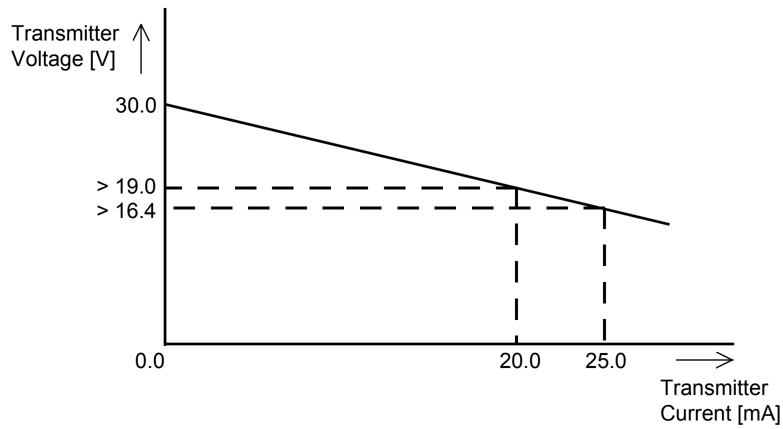

Figure 3 Transmitter voltage for passive transmitters

External power

If all inputs are active, no external power is required.

For loops, which contain passive transmitters, analog process data is only available if the supply voltage to the electronics is guaranteed. The high-density analog input concept (using FTA-T-14/15 modules) offers full monitoring of power that is provided externally. If DC/DC converter modules FTA-T-15 are used, even redundant power supplies are covered.

External power can be connected to the FTA-T-14 module via one or both of the two screw terminal pairs marked '1A', '1B', '2A' and '2B'. The screw terminal pairs are interconnected on the FTA module. The sixteen channels on the FTA module are divided into two groups of eight channels, with each group being protected by a 315 mA fuse. Single-channel errors (shorts from V+ to 0 V) cannot blow the group fuse.

Note:
The 0 V connection of the external power is directly connected to the common 0 V of all sixteen analog inputs.

The FSC application software must monitor the external power voltage via the fail-safe high-density analog input module 10105/2/1 when safety-related analog input signals are connected to the FTA-T-14.

Figure 4 below shows the schematic diagram for power distribution with monitoring.

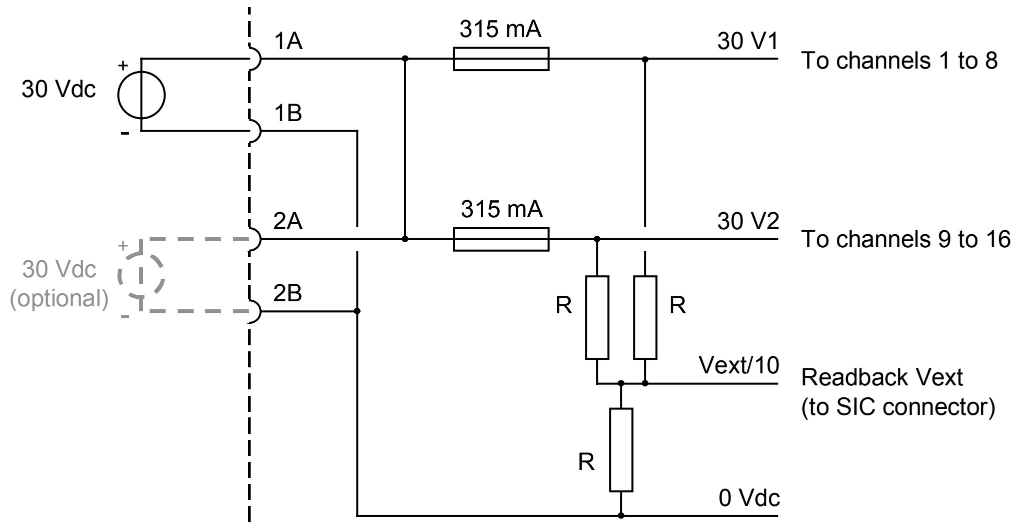

Figure 4 Schematic diagram for power distribution with monitoring

Applications

For details on applications and connection options for the FTA-T-14 module refer to the 'SIC to FTA applications' data sheet.

Connections

External power and ground

The external supply voltage (Vext) and ground are connected to the following screw terminals (marked '1A', '1B', '2A', '2B' and '⏚' on the FTA):

Screw terminal	Function
1A	30 Vdc Vext
1B	0 Vdc Vext
2A	30 Vdc Vext
2B	0 Vdc Vext
⏚	Ground connection
⏚	Ground connection

Connections diagram

The FTA-T-14 module has sixteen groups (= sixteen channels) of four screw terminals to provide optimum connection of field wiring, with a ground terminal per channel for screening of analog input cables. The screw terminals are numbered 1 to 64. The connections diagram of the FTA-T-14 module is as follows:

Connections diagram

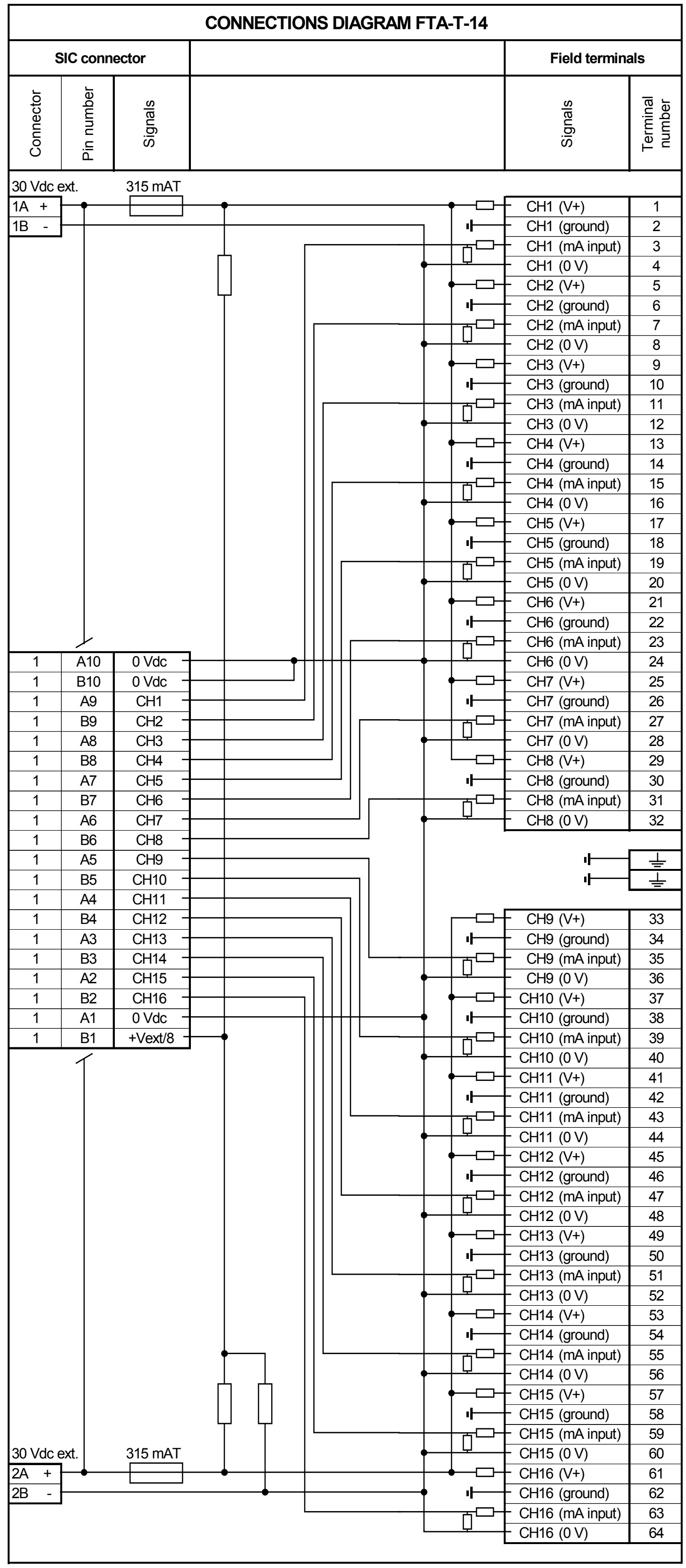

Figure 5 Connections diagram

Technical data

The FTA-T-14 module has the following specifications:

General	Type number:	FTA-T-14
	Approvals:	CE, TÜV, UL, FM**
Input	Number of input channels:	16 (2 groups of 8 with common 0 V)
	Power requirements:	30 Vdc external 3 mA (without input loop loads)
	Input current:	0 to 25 mA
	Input resistance:	250 Ohm (± 1%)
Output	To passive transmitters (Vext):	
	– output resistance:	270 Ohm (± 5%)
	– igniting current per channel:	< 120 mA at 30 Vdc
	To 10105/2/1 module:	
	– output voltage	0 to 4 Vdc
	– accuracy	0.1%
Fuses	Rating:	315 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.20 x 0.79 in)
Physical	Module dimensions:	200 x 70 x 60 mm (L x W x H) 7.87 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	201 mm (7.91 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	HYDROGEN (Group A & B):	
For non-incendive	– max. loop inductance	6 mH
	– max. loop capacitance	0.25 µF
Field circuits, Class1 Division 2	NON-HYDROGEN (Group C & D):	
	– max. loop inductance	20 mH
	– max. loop capacitance	5 µF

** See datasheet 10105/2/1

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FTA-T-15 24 Vdc to 30 Vdc/1 A converter

Description

The FTA-T-15 module is a DC/DC converter, which is used to provide an isolated 30 Vdc / 1 A to other field termination assemblies (FTAs), e.g. the analog input FTA module FTA-T-14 or the active analog input FTA module FTA-T-16. It has voltage monitoring capabilities with local LED indication and also provides alarm functions (read back relay contact). The LED is on and the relay contact is closed if the local DC/DC output voltage is OK.

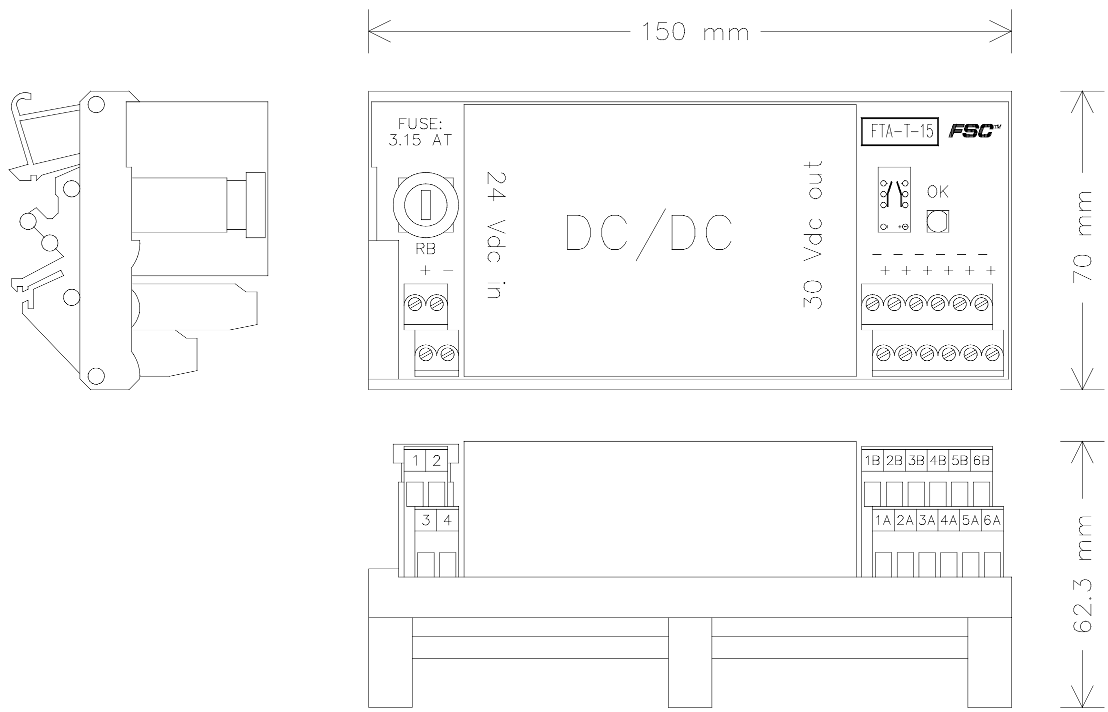

Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FTA-T-15 module refer to the 'SIC to FTA applications' data sheet.

Connections

The FTA-T-15 module has four screw terminals for connection of incoming power wires and the read back wiring. The screw terminals are numbered 1 to 4. The function of each terminal is listed below:

Screw terminal	Function
1	Read back contact
2	Read back contact
3	24 Vdc IN +
4	24 Vdc IN –

Note:
Removal or connection of the 24 Vdc IN+ and/or 24 Vdc IN– wire(s) is only allowed when the 24 Vdc power supply to the FTA-T-15 module has been switched off.

The FTA-T-15 module has twelve screw terminals for connection of outgoing power wires. The screw terminals are numbered '1A', '1B', '2A', etc. to '6B'. The function of each terminal is listed below:

Screw terminal	Function
1A	30 Vdc OUT
1B	0 Vdc OUT
2A	30 Vdc OUT
2B	0 Vdc OUT
3A	30 Vdc OUT
3B	0 Vdc OUT
4A	30 Vdc OUT
4B	0 Vdc OUT
5A	30 Vdc OUT
5B	0 Vdc OUT
6A	30 Vdc OUT
6B	0 Vdc OUT

Technical data

The FTA-T-15 module has the following specifications:

General	Type number:	FTA-T-15
	Approvals:	CE, TÜV, UL, FM**
	Safety class:	AK1-6
	MTBF:	approx. 400,000 hours
Input	Nominal input voltage:	24 Vdc
	Input voltage range:	18 to 36 Vdc
	Inrush current:	≤ 4 A *(see note below)*
Output	Output voltage:	30 Vdc, ± 0.25 V
	Output current:	1 A (short-circuit proof)
	Short-circuit current:	< 3.3 A
	Ripple (0-30 MHz):	< 0.1 Vrms
	Regulation:	< 1% (load + line)
	Transient response:	class C according to NFC42801C
	Power-on overshoot:	output < 31 V
	Overvoltage protection:	31 V
	Long-term stability (after 30 min. operation):	< 0.3%
	Efficiency:	> 75%
	Switching frequency:	> 25 kHz
Physical	Module dimensions:	150 x 70 x 62.3 mm (L x W x H) 5.91 x 2.76 x 2.45 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	151 mm (5.94 in)
Fuse	Rating:	3.15 AT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.79 in)

Note:
The inrush current limiter is only active at power-on.
To regain the inrush current limiting function, the FTA-T-15 module must be switched off for at least 30 seconds. Switching on the module within 30 seconds may blow a fuse or activate a circuit breaker.

** See datasheet 10105/2/1

Technical data (continued)

Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Isolation	Isolation voltage:	
	– input to output	2000 Vac (1 min.)
	– input to relay contact	2000 Vac (1 min.)
	– output to relay contact	2000 Vac (1 min.)
Environment	Operating temperature:	–5°C to +70°C (23°F to 158°F)
	Storage temperature:	–40°C to +85°C (–40°F to +185°F)
	Cooling:	natural convection
Alarm functions	Overvoltage protection:	dual, two-fault-tolerant
	Restart overvoltage protection:	only after removal of 24 Vdc power
	Undervoltage detector:	LED on if voltage OK, readback relay contact closed if voltage OK
	Undervoltage level:	typically 27.5 Vdc
Readback	Relay contact rating:	36 Vdc / 40 mA, 30 Vac / 40 mA

FTA-T-16 Fail-safe active digital input FTA with line-monitoring (16 channels)

Description

The field termination assembly module FTA-T-16 is the interface between field components (sensors, etc.) and the fail-safe high-density analog input module 10105/2/1 in the FSC system. It can be used for interfacing signals from Class I, Division 2 Hazardous Locations.

The FTA-T-16 module has sixteen digital input channels, which may be used for both safety-related and non-safety-related applications. These sixteen channels are connected via a system interconnection cable (SIC), which is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connection of power supply and field wiring.

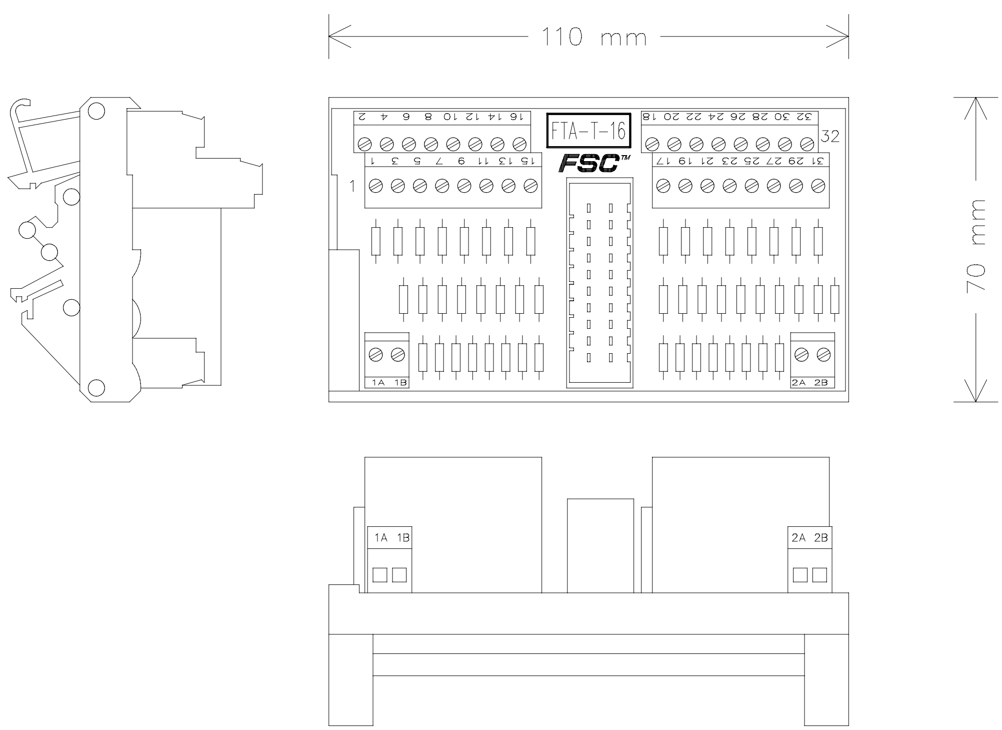

Figure 1 Mechanical layout

Main functions

The FTA-T-16 module has three main functions:

- loop-monitored input function,
- power supply to each transmitter with voltage-current limitation in compliance with Hazardous Area Class I Division 2, and
- enable monitoring of the external power connected to the FTA-T-16 module.

Loop-monitored input

The FTA-T-16 module supports a loop-monitored input function for serial and parallel field resistor or digital sensor contact configurations. Figure 2 below shows the schematic diagrams for connecting serial and parallel resistor configurations.

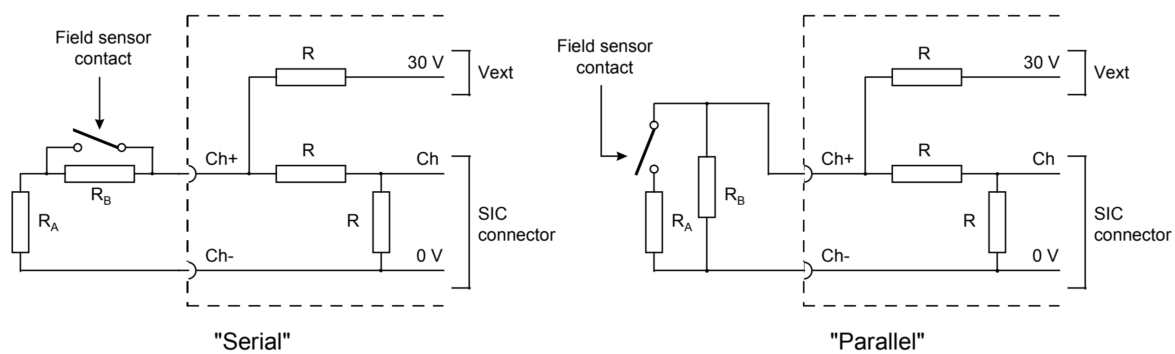

Figure 2 Schematic diagrams for connecting serial and parallel resistor configurations

In these configurations, R_A is 1.0 kOhm and R_B is 3.3 kOhm or 10 kOhm (± 10%). The maximum field wire resistance is 500 Ohm.

Monitoring of external power

External power can be connected to the FTA-T-16 module via one or both of the two screw terminal pairs marked '1A', '1B', '2A' and '2B'. The screw terminal pairs are interconnected on the FTA module.

The FSC application software must monitor the external power voltage via the analog input module when safety related analog signals are connected to the FTA-T-16.

Figure 3 below shows the schematic diagram for power distribution with monitoring.

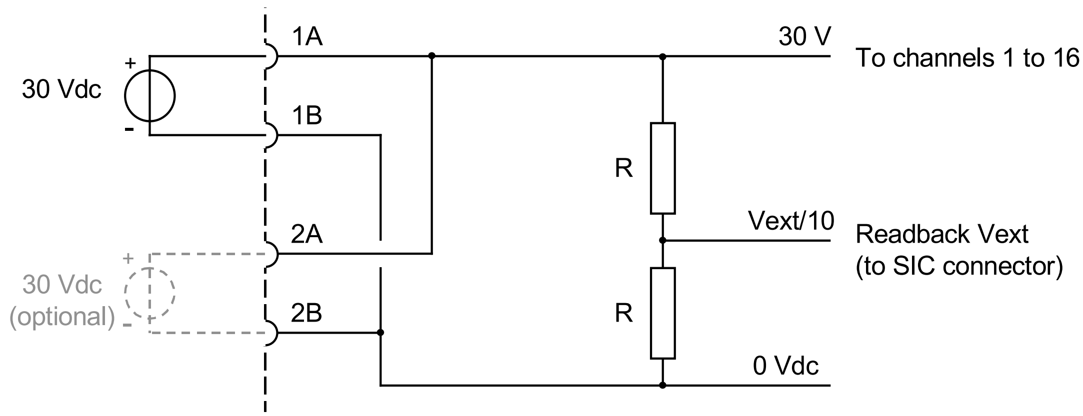

Figure 3 Schematic diagram for power distribution with monitoring

Applications

For details on applications and connection options for the FTA-T-16 module refer to the 'SIC to FTA applications' data sheet.

Connections

External power

The external supply voltage (Vext) is connected to the following screw terminals (marked '1A', '1B', '2A' and '2B' on the FTA):

Screw terminal	Function
1A	30 Vdc Vext
1B	0 Vdc Vext
2A	30 Vdc Vext
2B	0 Vdc Vext

Connections diagram

The FTA-T-16 module has 32 screw terminals for connection of field wiring. The screw terminals are numbered 1 to 32. The connections diagram of the FTA-T-16 module is as follows:

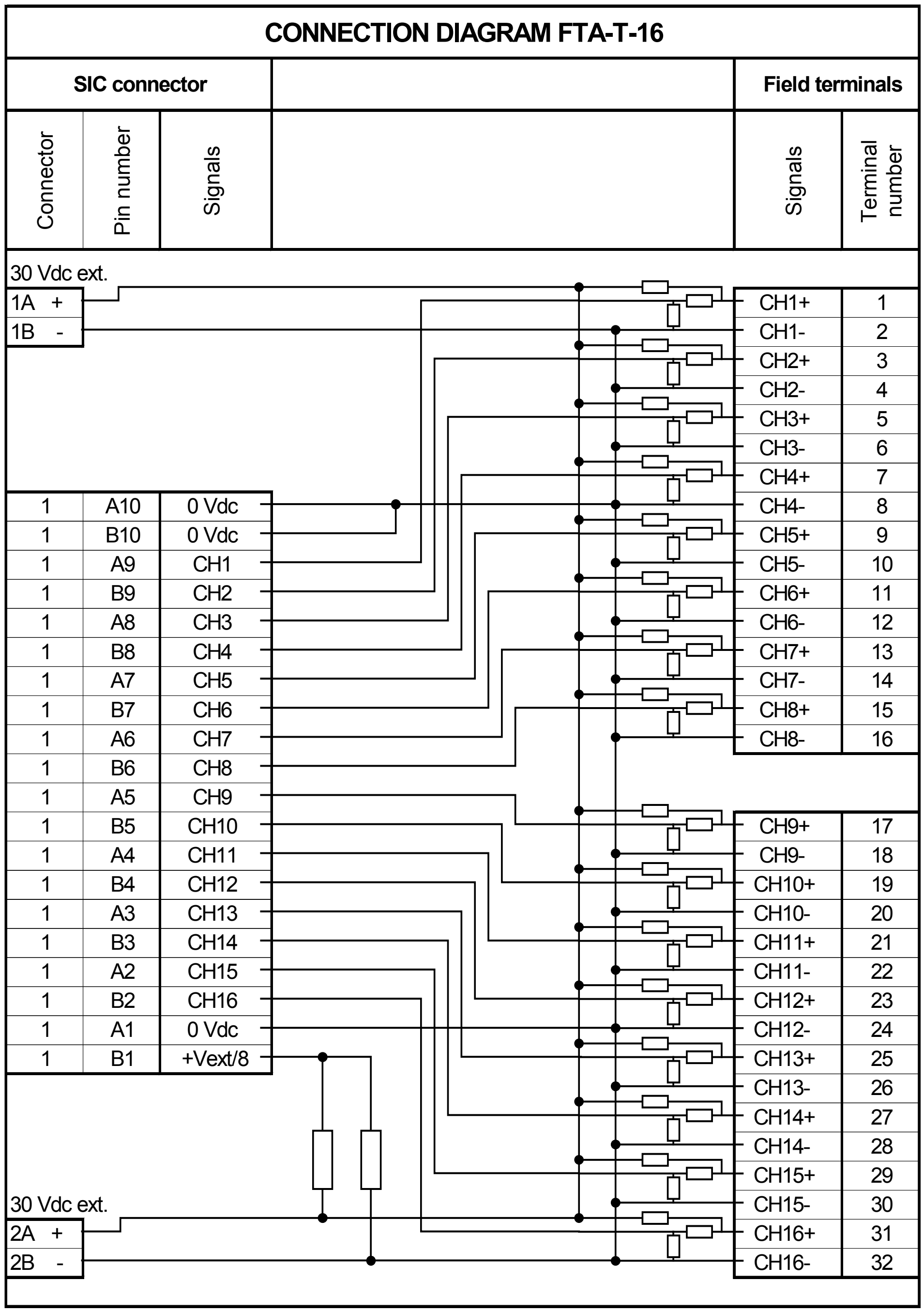

Figure 4 Connections diagram

Technical data

The FTA-T-16 module has the following specifications:

General	Type number:	FTA-T-16
	Approvals:	CE, TÜV, UL, FM**
Input	Number of input channels:	16
	Power requirements:	30 Vdc external 150 mA (all inputs closed)
	Max. current per channel:	< 12 mA at 30 Vdc
Output	To passive transmitters (Vext):	
	– open voltage	typically 24 Vdc
	To 10105/2/1 module:	
	– output voltage	0 to 3.5 Vdc
Physical	Module dimensions:	110 x 70 x 60 mm (L x W x H) 4.33 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	111 mm (4.37 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications for non-incendive Field circuits to Class 1 Division 2	Field wire resistance:	< 500 Ohm
	Field device resistance (see Figure 2):	
	– R_A	1k0 (serial or parallel), ± 10%
	– R_B	3k3 / 10k (serial or parallel), ± 10%
	HYDROGEN (Group A & B):	
	– max. loop inductance	500 mH
	– max. loop capacitance	0.3 µF
	NON-HYDROGEN (Group C & D):	
	– max. loop inductance	1 H
	– max. loop capacitance	7 µF

** See datasheet 10105/2/1

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FTA-T-17 Digital output (relay) FTA for AK5/6 applications (4 channels)

Description

The field termination assembly module FTA-T-17 is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals). It has four relay-based potential-free output channels suitable for applications up to AK6 without making use of fault exclusions.
The FTA-T-17 module complies with safety requirements for general use in safety requirement classes AK5/6 as defined in DIN V 19250 and SIL 3 (IEC 61508).

Each channel consists of:

- three relays,
- a fused NO field contact (5 AT, slow-acting), and
- a status indication LED.

The relays are capable of driving a wide variety of loads including 115/230 Vac, which gives the FSC system a 115/230 Vac output capability for AK5/6 applications. The energized state of the relay is indicated by an LED on the module.

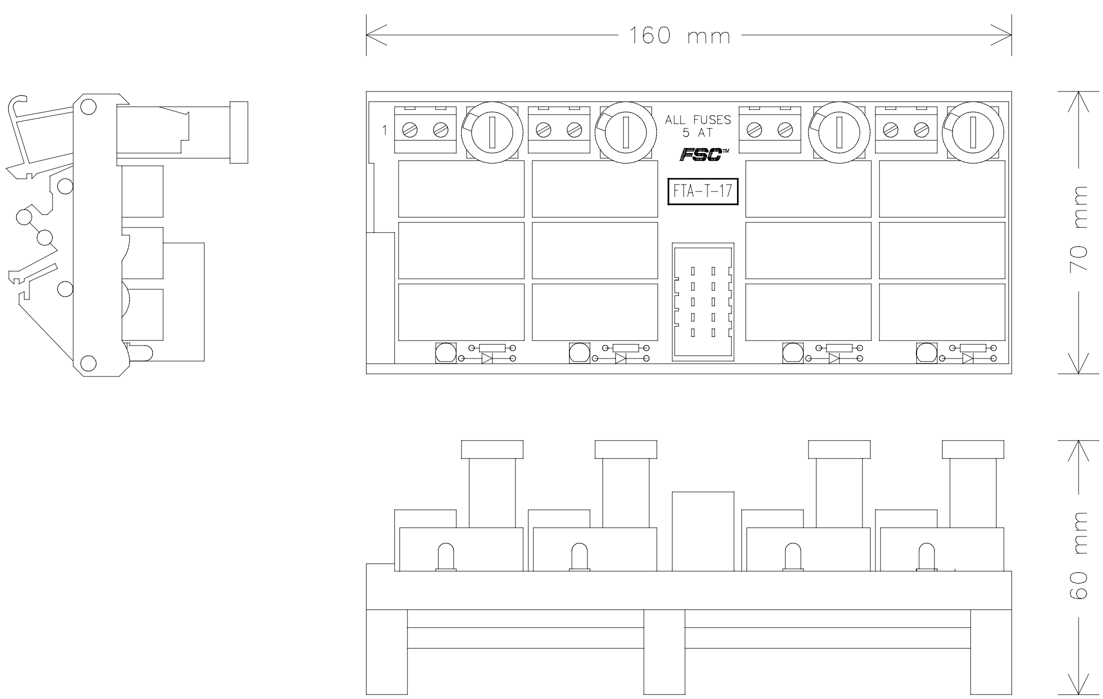


Figure 1 Mechanical layout

Four channels can be connected to the FTA-T-17 module via a system interconnection cable (SIC).This cable is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

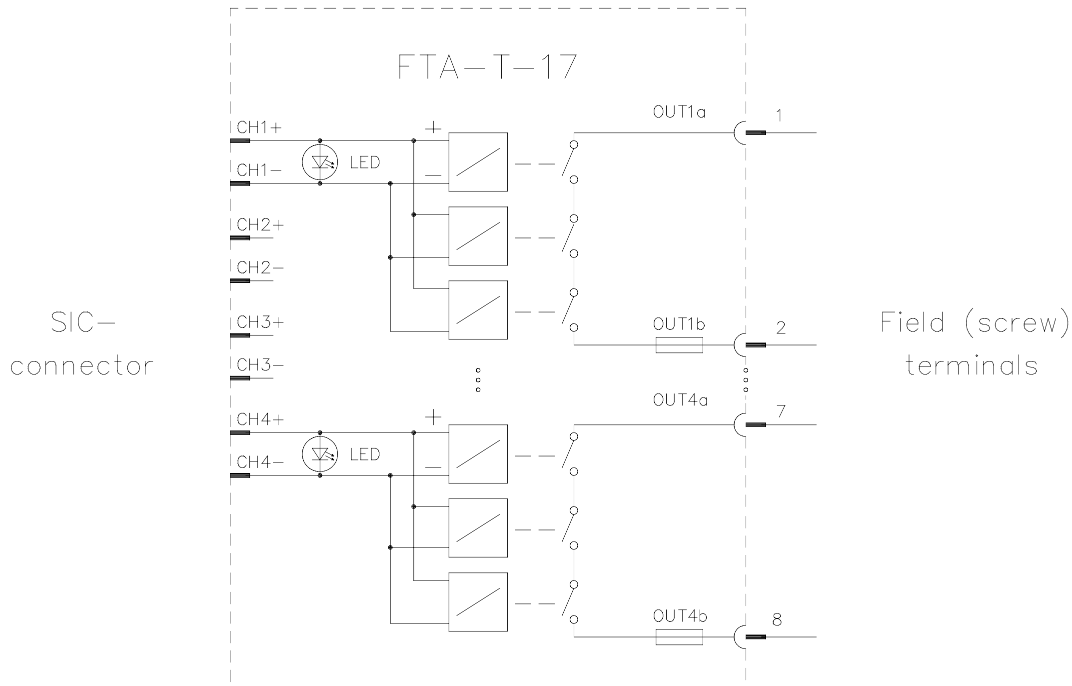


Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FTA-T-17 module refer to the 'SIC to FTA applications' data sheet.

Connections

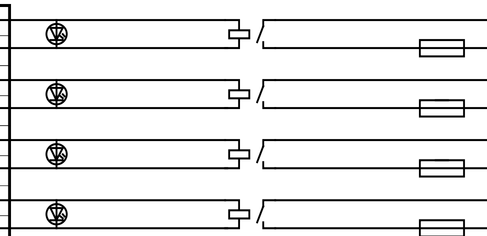
The connections diagram of the FTA-T-17 module is as follows:

CONNECTIONS DIAGRAM FTA-T-17

SIC connector

Connector	Pin number	Signals
1	A5	CH1+
1	B5	CH1-
1	A4	CH2+
1	B4	CH2-
1	A3	CH3+
1	B3	CH3-
1	A2	CH4+
1	B2	CH4-
1	A1	nc
1	B1	nc

ALL FUSES 5 AT



Field terminals

Signals	Terminal number
OUT 1a	1
OUT 1b (fused)	2
OUT 2a	3
OUT 2b (fused)	4
OUT 3a	5
OUT 3b (fused)	6
OUT 4a	7
OUT 4b (fused)	8

nc = not connected

Figure 3 Connections diagram

Technical data

The FTA-T-17 module has the following specifications:

General	Type number:	FTA-T-17
	Approvals:	CE, UL, TÜV
	Safety class:	AK1-6
Input	Nominal input voltage:	24 Vdc
	Max. input voltage:	36 Vdc
	Relay pick-up voltage:	19.2 Vdc
	Input current:	typically 40 mA at 24 Vdc
Output	Number of output channels:	4
	Max. output current:	5 A (fused)
	Min. output current:	1 mA at 5 V
	Max. output voltage:	250 Vac / 250 Vdc
	Max. switched load:	1250 VA / 150 W (see Figure 4)
Fuses	Rating:	5 AT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.78 in)
Physical	Module dimensions:	160 x 70 x 60 mm (L x W x H) 6.30 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	161 mm (6.34 in)
Termination	Screw terminals:	
	– max. wire diameter:	2.5 mm² (AWG 14)
	– strip length:	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Isolation	Isolation:	
	– coil to contact	3750 Vac
	– contact to contact	1200 Vac

Technical data (continued)

Relay contact	Max. switching load:	250 Vac, 5 A 24 Vdc, 5 A* 48 Vdc, 1 A* 110 Vdc, 500 mA*
	Max. switching frequency:	20 Hz
	Expected life:	
	– electrical	100,000 switch operations
	– mechanical	10,000,000 switch operations
	Contact material:	gold flash over silver alloy

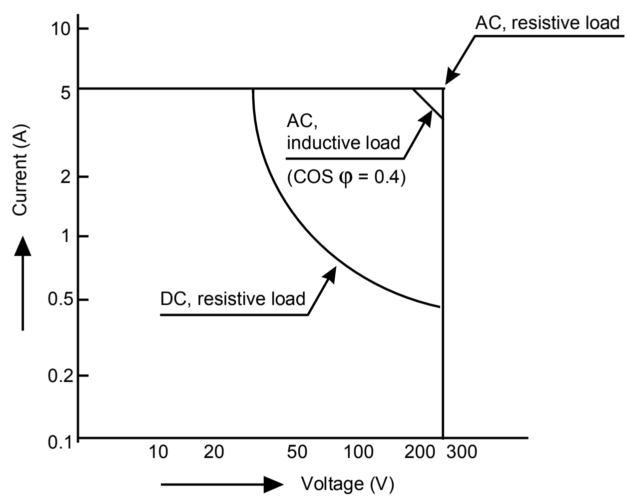


Figure 4 Maximum switched power

*** Note:**
When switching DC loads, only use resistive loads or inductive loads with spark suppression diodes.

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FTA-T-18

Fail-safe Gas -Flame detector input FTA (0 - 20 mA, 16 channels)

Description

The field termination assembly module FTA-T-18 is the interface between gas/ flame detectors in the field and the fail-safe high-density analog input module 10105/2/1 in the FSC system.

The FTA-T-18 module has sixteen analog input channels which may be used for both safety-related and non-safety-related applications. The FTA-T-18 module uses a SIC-C-12 system interconnection cable to transfer the 16 input signals to a (redundant pair of) 10105/2/1 module(s).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connection of power supply, ground and field wiring.

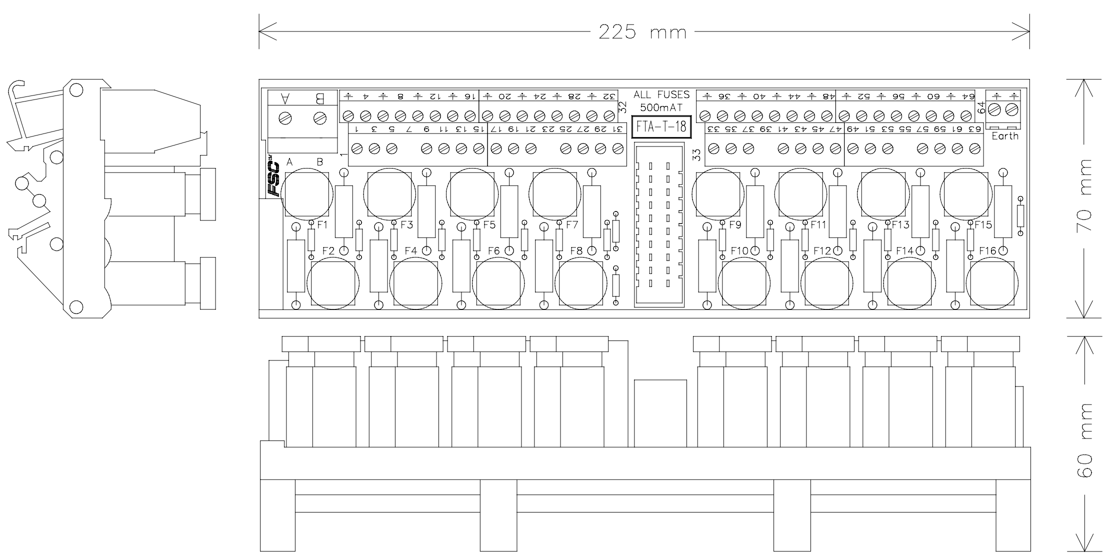

Figure 1 Mechanical layout

Main functions

The FTA-T-18 module has three main functions:

- linear direct conversion of 0(4)-20 mA DC field signals to the signal levels of the fail-safe high-density analog input module 10105/2/1,
- power supply distribution to each transmitter (500 mAT fused),
- enable monitoring of the external power connected to the FTA-T-18 module.

Linear direct conversion

The input circuit of each channel consists of a high-precision resistor which converts the input current (0 to 20 mAT) to the input voltage for the high-density analog input module 10105/2/1. The power to the analog transmitter is fused (500 mAT) per channel. Each analog input has its own terminal for the field cable shield.

Figure 2 below shows the schematic diagram for connecting a transmitter (active and passive).

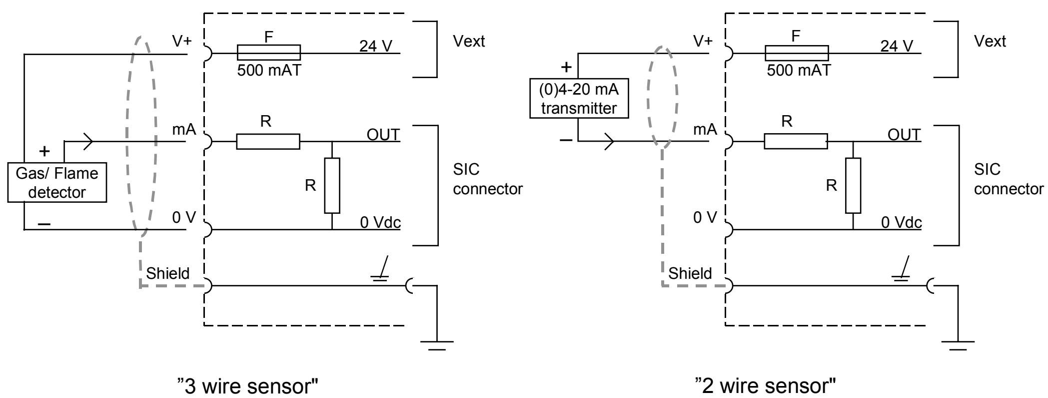

Figure 2 Schematic diagram for connecting a transmitter

External power

External power can be connected to the FTA-T-18 module via the power screw terminal pair marked 'A' and 'B'.

Note:
The 0 V connection of the external power is directly connected to the common 0 V of all sixteen analog inputs.

The FSC software can monitor the external power voltage via the fail-safe high-density analog input module 10105/2/1.

Applications

For details on applications and connection options for the FTA-T-18 module refer to the 'SIC to FTA applications' data sheet.

Connections

External power and ground

The external supply voltage (Vext) and ground are connected to the following screw terminals (marked 'A' and 'B' and '⏚' on the FTA):

Screw terminal	Function
A	24 Vdc Vext
B	0 Vdc Vext
⏚	Earth connection
⏚	Earth connection (1 earth wire is enough)

Connections diagram

The FTA-T-18 module has sixteen groups (= sixteen channels) of four screw terminals to provide optimum connection of field wiring, with a earth terminal per channel for screening of analog input cables. The screw terminals are numbered 1 to 64. The connections diagram of the FTA-T-18 module is as follows:

Connections diagram

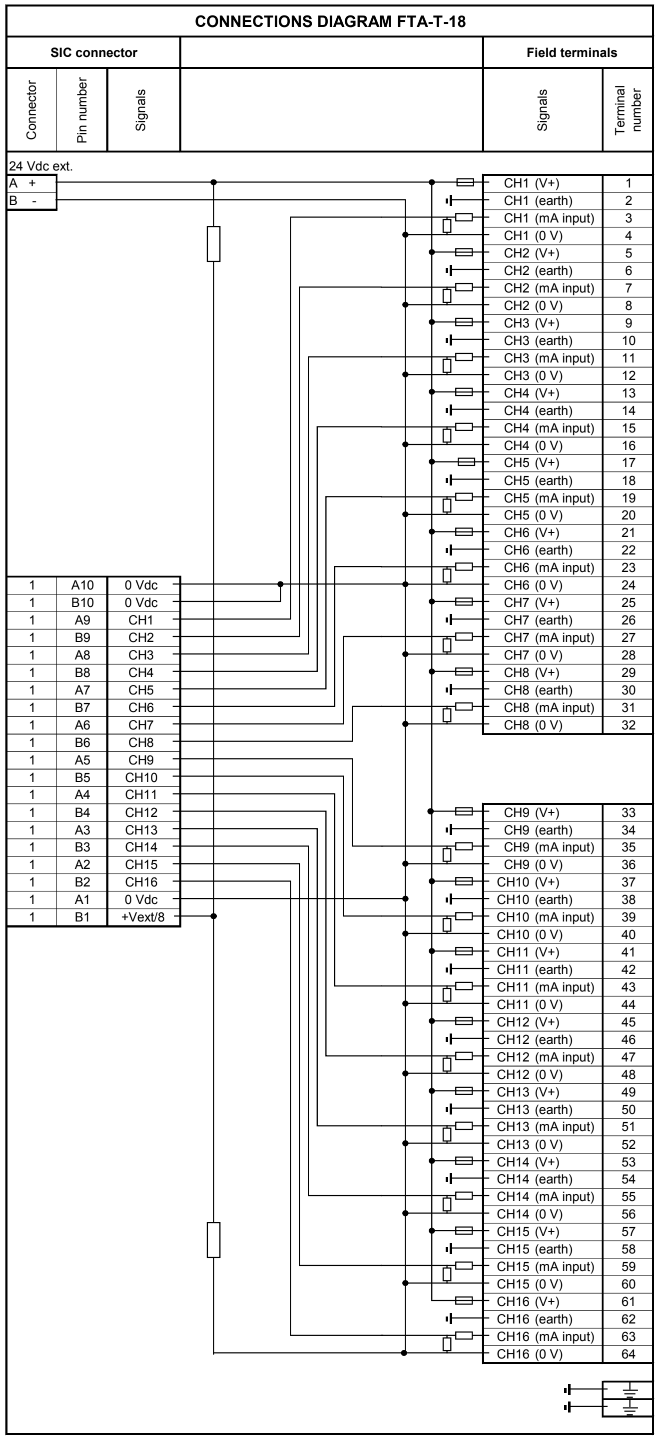

Figure 3 Connections diagram

Technical data

The FTA-T-18 module has the following specifications:

General	Type number:	FTA-T-18
	Approvals:	CE; TÜV, UL approvals pending
Input	Number of input channels:	16 (with common 0 V)
	Power requirements:	24 Vdc external 3 mA (without field loads)
	Input current:	0 to 25 mA
	Input resistance:	500 Ohm (± 5%)
Output	To 10105/2/1 module:	
	– output voltage	0 to 4 Vdc
	– accuracy	0.1%
Fuses	Rating:	500 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.20 x 0.79 in)
Physical	Module dimensions:	225 x 70 x 60 mm (L x W x H) 8.86 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	226 mm (8.90 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
	Power screw terminals (A, B):	
	– max. wire diameter	16 mm² (AWG 8)
	– strip length	7 mm (0.28 in)
	– tightening torque	1.2 Nm (0.88 ft-lb)

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Honeywell

FTA-T-19 Fail-safe Fire detector input FTA with line monitoring (24 Vdc, 16 channels)

Description

The field termination assembly module FTA-T-19 is the interface between (digital) fire detectors and the fail-safe high-density analog input module 10105/2/1 in the FSC system. It may be used for installations in, and interfacing signals to Class I, Division 2 Hazardous Locations.

The FTA-T-19 module has sixteen digital detector input channels which may be used for both safety-related and non-safety-related applications. The FTA-T-19 module uses a SIC-C-12 system interconnection cable to transfer the 16 input signals to a (redundant pair of) 10105/2/1 module(s).
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connection of power supply and field wiring.

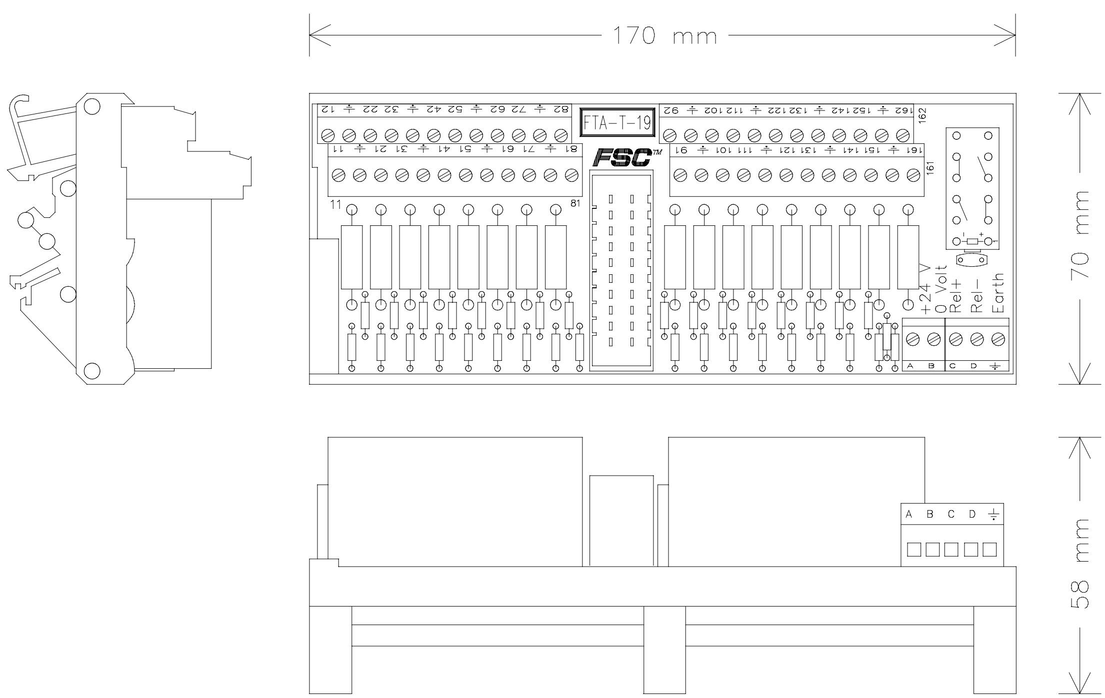

Figure 1 Mechanical layout

Main functions

The FTA-T-19 module has three main functions:

- power supply to each detector with voltage-current limitation in compliance with Hazardous Area Class I Division 2,
- fire detection input function, and
- global reset of the connected sensors.

Detector power supply

The FTA-T-19 module requires an external 24 Vdc power supply. This provides a field signal with open voltage of approx. 24 Vdc and a short-circuit current of approx. 35 mA. The normal operating voltage (with a 4.7 kOhm EOL resistor) is approx. 20.5 Volt.

Fire detector input

The FTA-T-19 module converts an input for 24 V fire detectors to levels suitable for the 10105/2/1 module.
Figure 2 below shows the schematic diagram for the connection of fire detectors or manual call points.

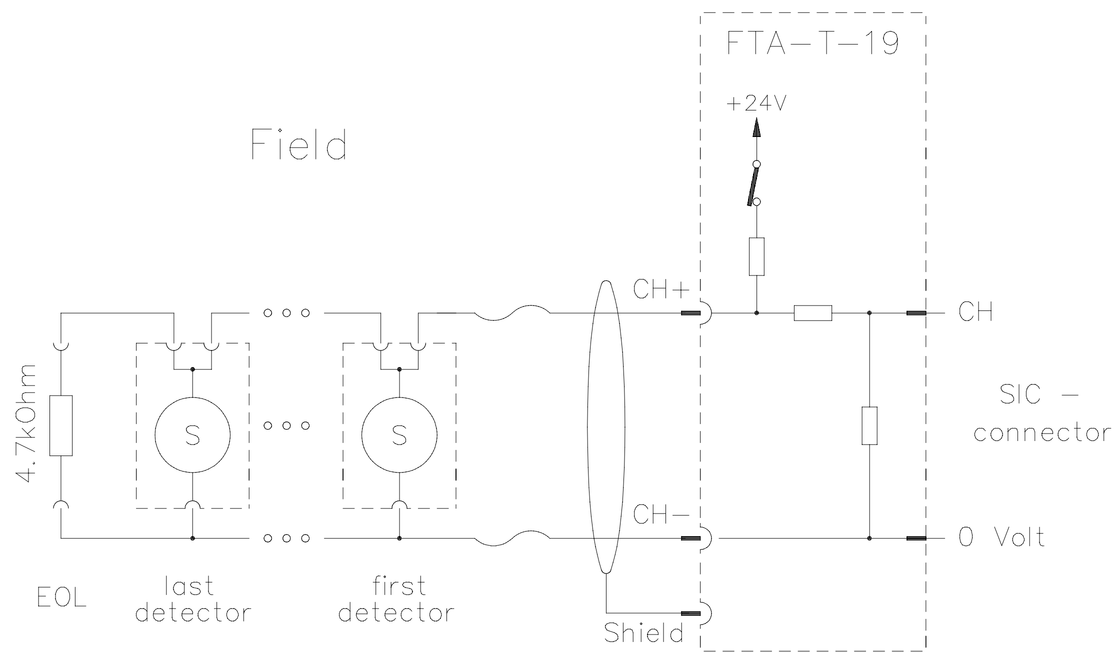

Figure 2 Typical schematic diagram for FTA-T-19 input

Global reset

The relay on the FTA-T-19 module enables a reset of all connected detectors by removing the supply voltage to the field. The relay is normally de-energized (energized = reset detectors). The Global Reset function is non-safety related .

Applications

For details on applications and connection options for the FTA-T-19 module refer to the 'SIC to FTA applications' data sheet.

Connections

Common signals

The connections for common signals are as follows:

Screw terminal	Function
A	+ 24 Vdc Vext
B	0 Vdc Vext
C	Rel+
D	Rel–
E	Earth

Connections diagram

The FTA-T-19 module has 48 screw terminals for connection of field wiring. The connections diagram of the FTA-T-19 module is as follows:

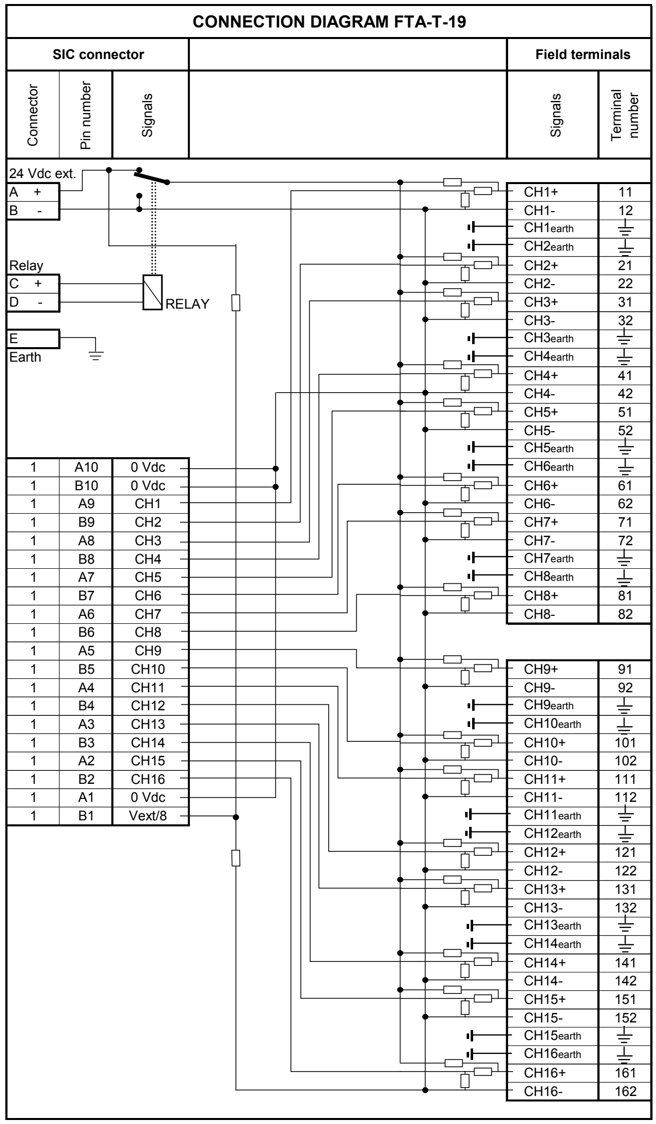

Figure 3 Connections diagram

Technical data

The FTA-T-19 module has the following specifications:

General	Type number:	FTA-T-19
	Approvals:	CE; TÜV, UL, FM approvals pending
Input	Number of input channels:	16
	Power requirements:	24 Vdc external max. 570 mA
	Max. current per channel:	35 mA at 24 Vdc
Output	Open voltage:	typically 23.5 Vdc (at 24 Vdc ext.)
	With EOL resistor:	typically 20.5 Vdc (at 24 Vdc ext.)
Physical	Module dimensions:	170 x 70 x 58 mm (L x W x H) 6.72 x 2.76 x 2.28 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	171 mm (6.73 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	Field wire resistance:	< 100 Ohm
	End-of-line (EOL) resistor:	e.g. 4k7, ± 5% (≥ 0.25 W) (see F&G Application Manual)
	HYDROGEN (Group A & B):	
	– max. loop inductance	60 mH
	– max. loop capacitance	0.3 µF
	NON-HYDROGEN (Group C & D):	
	– max. loop inductance	230 mH
	– max. loop capacitance	7 µF

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FTA-T-20 Digital output (relay contact) FTA (8 channels, NO/NC)

Description

The field termination assembly module FTA-T-20 is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals). It has eight non-fail-safe potential-free relay changeover contacts (NO/NC). The energized state of the relay is indicated by an LED on the module.

Eight channels can be connected to the FTA-T-20 module via a system interconnection cable (SIC). This cable is plugged into the SIC connector on the FTA module.
The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

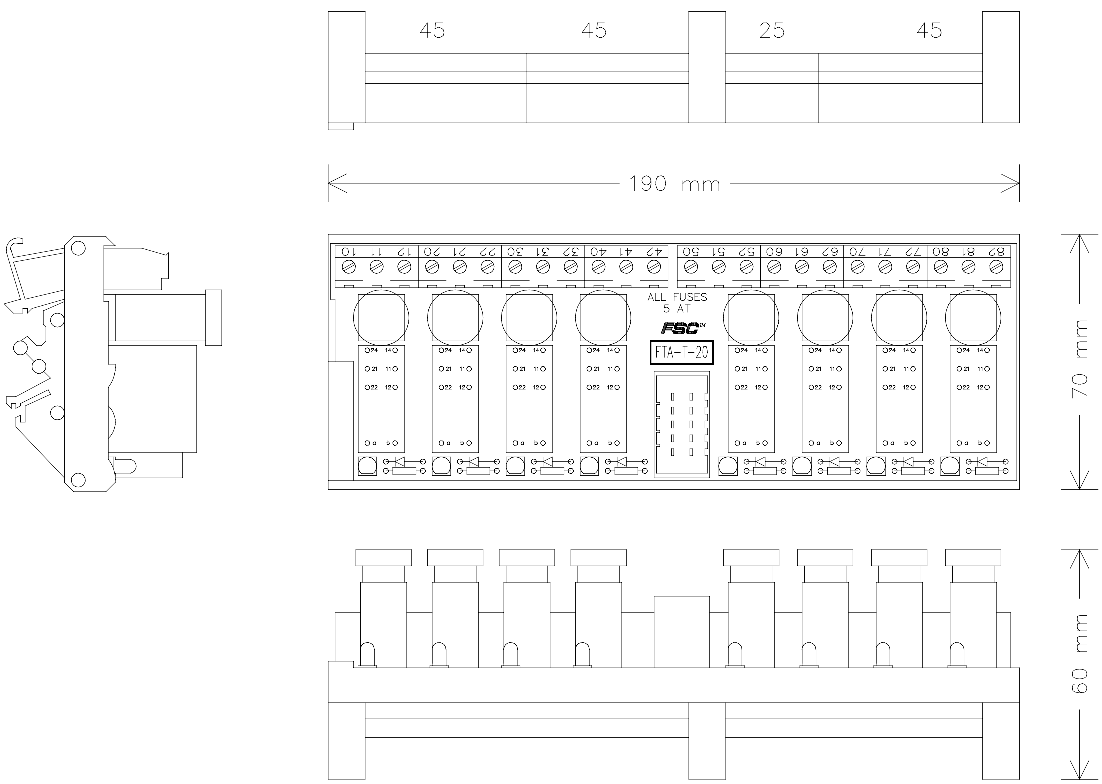


Figure 1 Mechanical layout

Each channel consists of:
- one relay,
- a changeover contact with a fused (5 AT) common, and
- a status indicator LED.

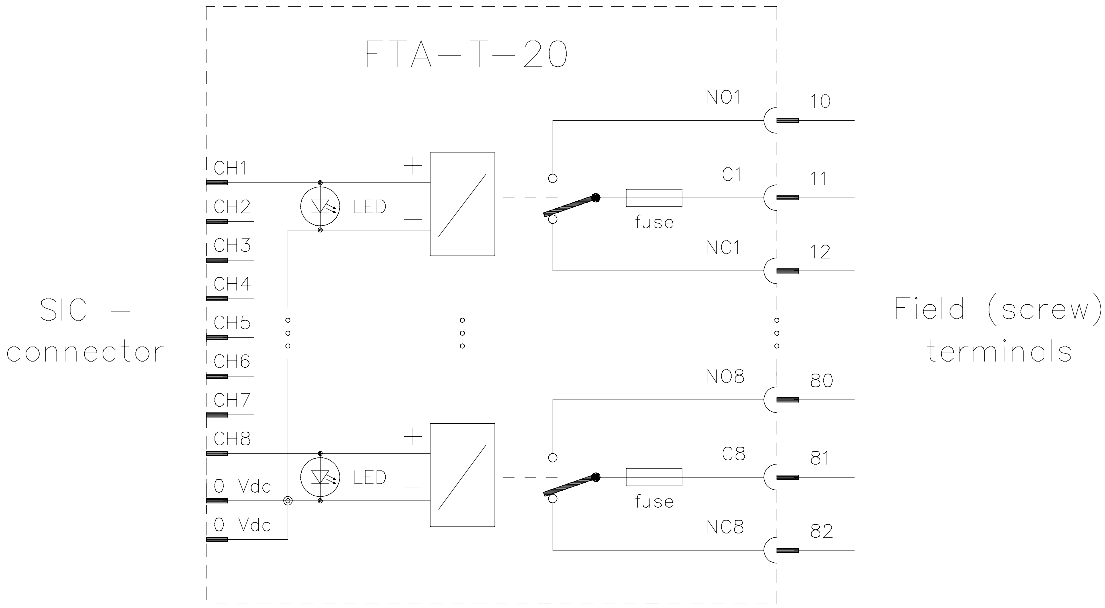


Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FTA-T-20 module refer to the 'SIC to FTA applications' data sheet.

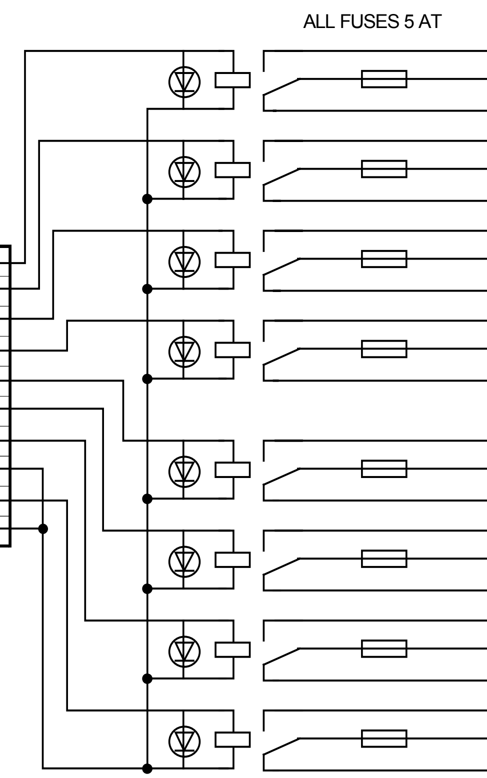
Connections

The connections diagram of the FTA-T-20 module is as follows:

CONNECTIONS DIAGRAM FTA-T-20

SIC connector

Connector	Pin number	Signals
1	A5	CH1
1	B5	CH2
1	A4	CH3
1	B4	CH4
1	A3	CH5
1	B3	CH6
1	A2	CH7
1	B2	0 Vdc
1	A1	CH8
1	B1	0 Vdc



Field terminals

Signals	Terminal number
NO1	10
C1	11
NC1	12
NO2	20
C2	21
NC2	22
NO3	30
C3	31
NC3	32
NO4	40
C4	41
NC4	42
NO5	50
C5	51
NC5	52
NO6	60
C6	61
NC6	62
NO7	70
C7	71
NC7	72
NO8	80
C8	81
NC8	82

Figure 3 Connections diagram

Technical data

The FTA-T-20 module has the following specifications:

General	Type number:	FTA-T-20
	Approvals:	CE, UL, TÜV
Input	Nominal input voltage:	24 Vdc
	Max. input voltage:	31 Vdc
	Relay cut-in voltage:	19 Vdc
	Input current:	typically 27 mA at 24 Vdc
Output	Number of output channels:	8
	Max. output current:	5 A
	Max. output voltage:	250 Vac / 300 Vdc
	Max. switched load:	1250 VA / 150 W at 30 Vdc (see Figure 4)
Fuses	Rating:	5 AT (slow-acting)
	Dimensions	5 x 20 mm (0.20 x 0.79 in)
Physical	Module dimensions:	190 x 70 x 60 mm (L x W x H) 7.48 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	191 mm (7.52 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Relay contacts	Max. current:	8 A
	Max. switched voltage:	250 Vac / 300 Vdc
	Max. switched load:	2000 VA / 192 W at 24 Vdc (see Figure 4)
	Max. switching frequency:	20 Hz
	Expected life:	
	– electrical	100,000 switch operations
	– mechanical	30,000,000 switch operations

Technical data (continued)

Relay contacts (cont.)

Isolation:
- coil to contact 4000 Vac
- contact to contact 1000 Vac

Ambient temperature: –40°C to +70°C (–40°F to +158°F)

Contact material: silver-cadmium oxide

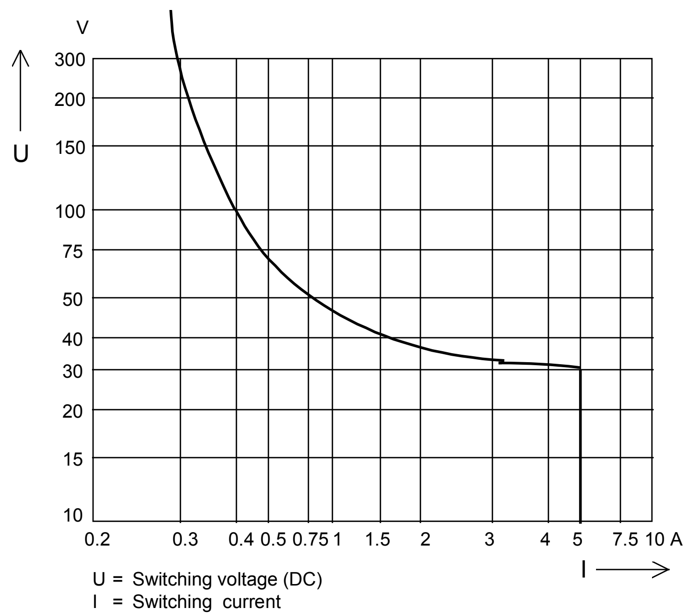


Figure 4 Maximum DC switched power curve for FTA-T-20 module

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FTA-T-21 Fail-safe digital input FTA (24/48/60 Vdc, NAMUR, 16 channels)

Description

The field termination assembly module FTA-T-21 is the interface between a system interconnection cable (SIC) and the external field wiring (screw terminals).

Sixteen channels (separated into two groups of eight channels with a 250 mA fuse in the common +) can be connected to the FTA-T-21 module via a system interconnection cable (SIC). This cable is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

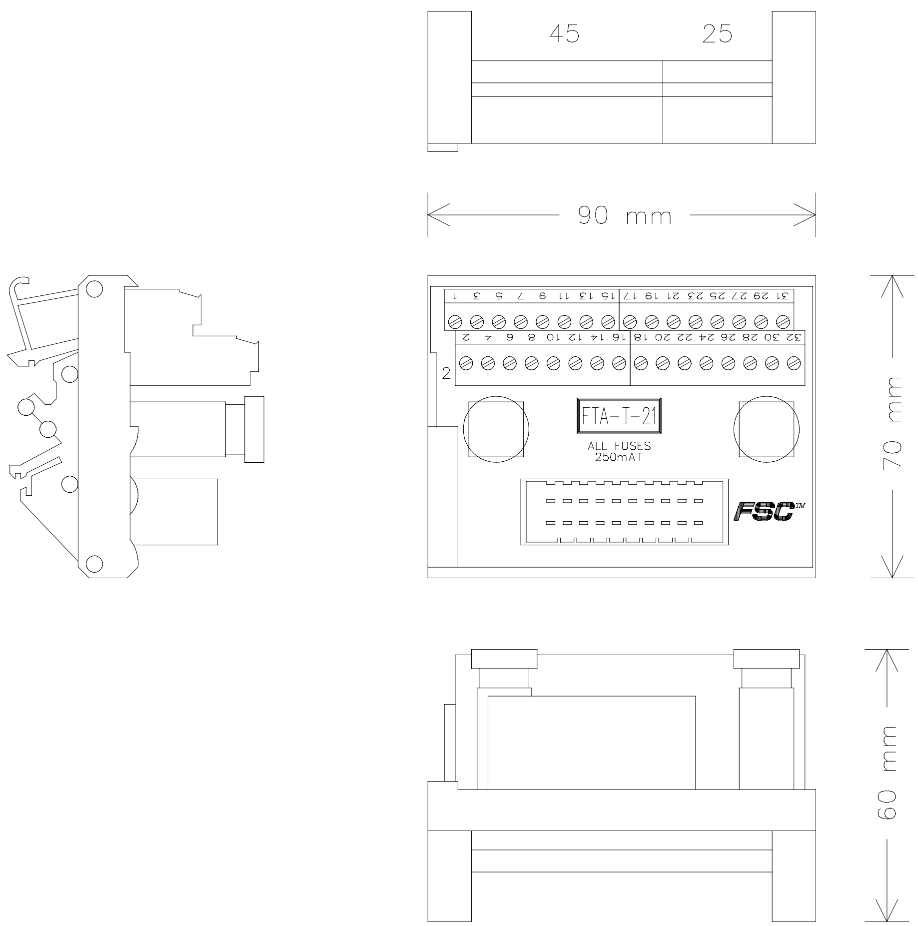

Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FTA-T-21 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-T-21 module is as follows:

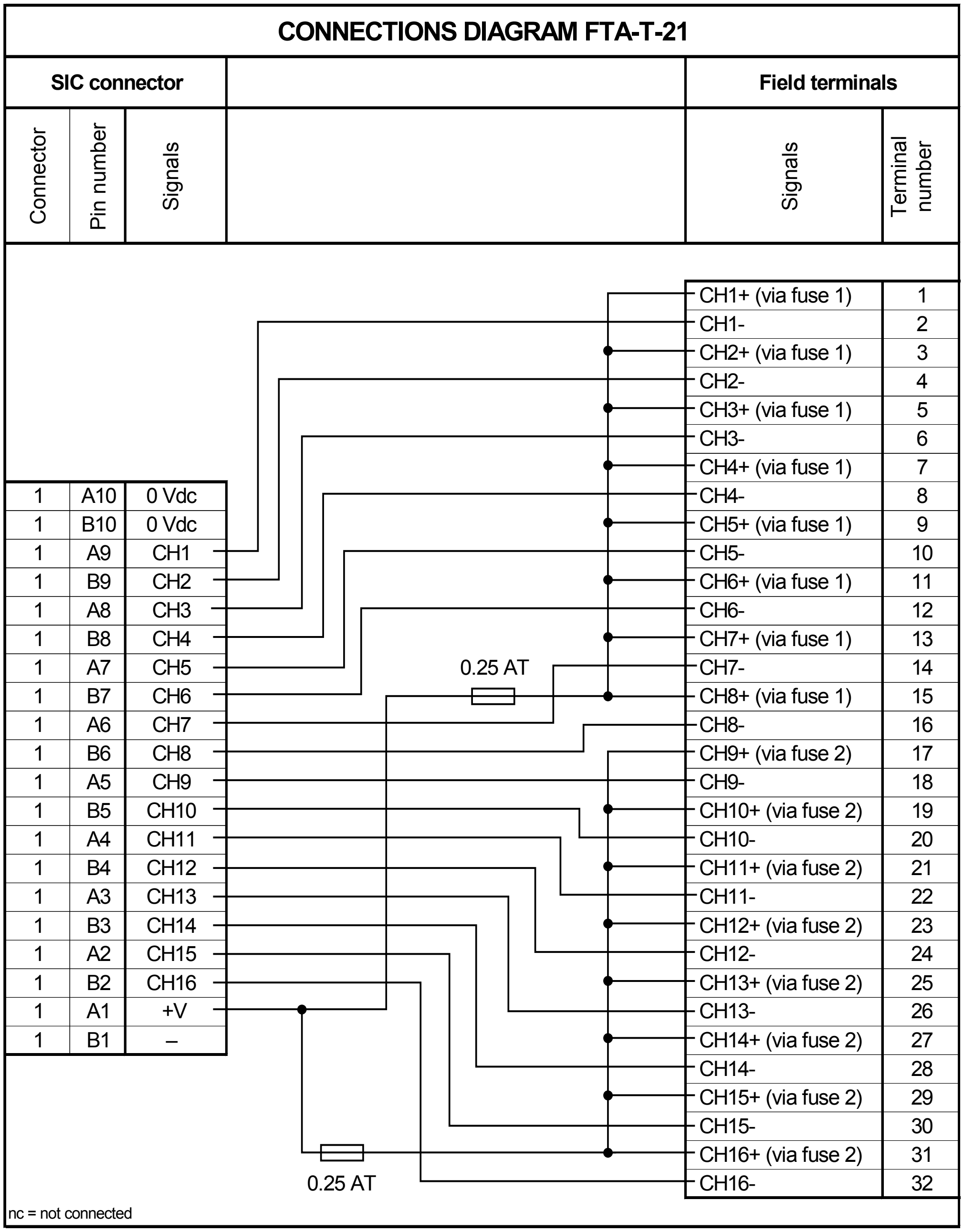

Figure 2 Connections diagram

Technical data

The FTA-T-21 module has the following specifications:

General	Type number:	FTA-T-21
	Approvals:	CE, UL, TÜV
Power	Number of channels:	16 (2 groups of 8)
	Maximum voltage:	36 Vac / 50 Vdc – IEC 61010-1 (1990), over voltage category 3 (Table D.12) 125 Vac / 150 Vdc – IEC 61010-1 (1990), over voltage category 2 (Table D.10)
Physical	Module dimensions:	90 x 70 x 60 mm (L x W x H) 3.54 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	91 mm (3.58 in)
Fuse	Rating:	250 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.79 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

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FTA-T-23 Current-limited digital input FTA (24 Vdc, 16 channels)

Description

The field termination assembly module FTA-T-23 is the interface between the system interconnection cables (SICs) and the external field wiring (screw terminals). It can be used for interfacing digital input signals from Class I, Division 2 Hazardous Locations.

Sixteen channels (separated into two groups of eight channels with a 250 mA fuse in the common +) can be connected to the FTA-T-23 module via a system interconnection cable (SIC). This cable is plugged into the SIC connector on the FTA module.

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

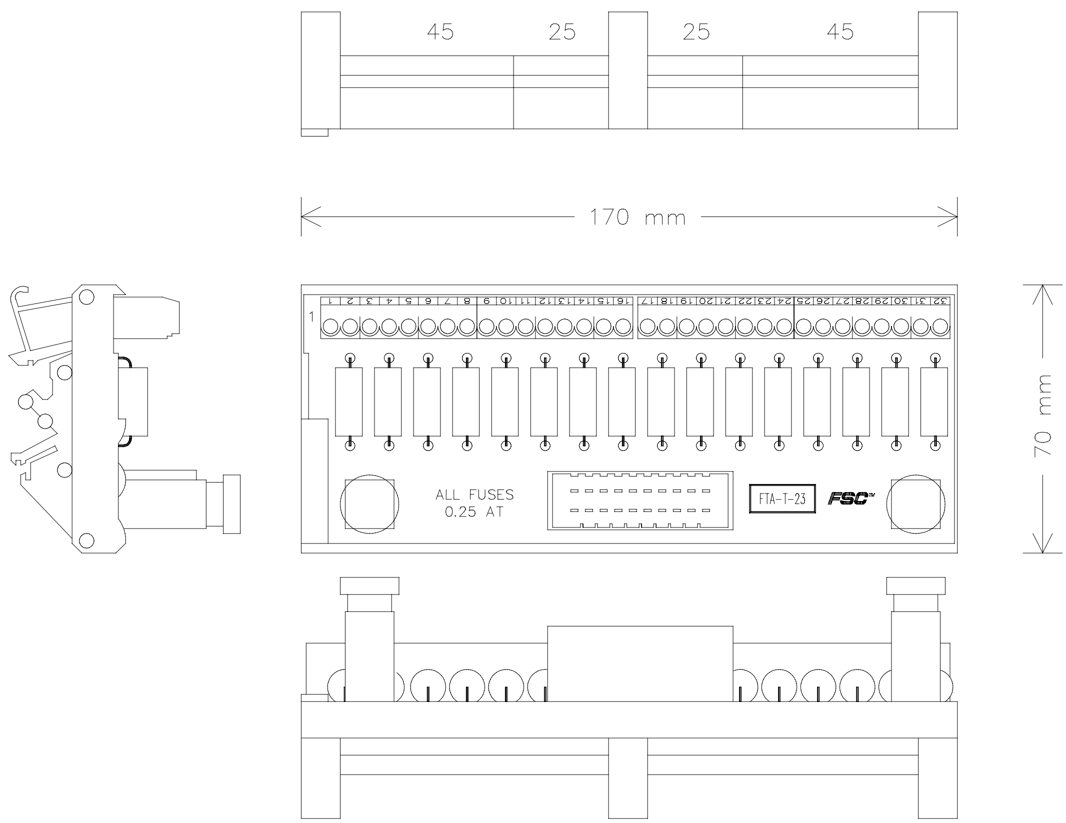

Figure 1 Mechanical layout

Applications

For details on applications and connection options for the FTA-T-23 module refer to the 'SIC to FTA applications' data sheet.

Connections

The connections diagram of the FTA-T-23 module is as follows:

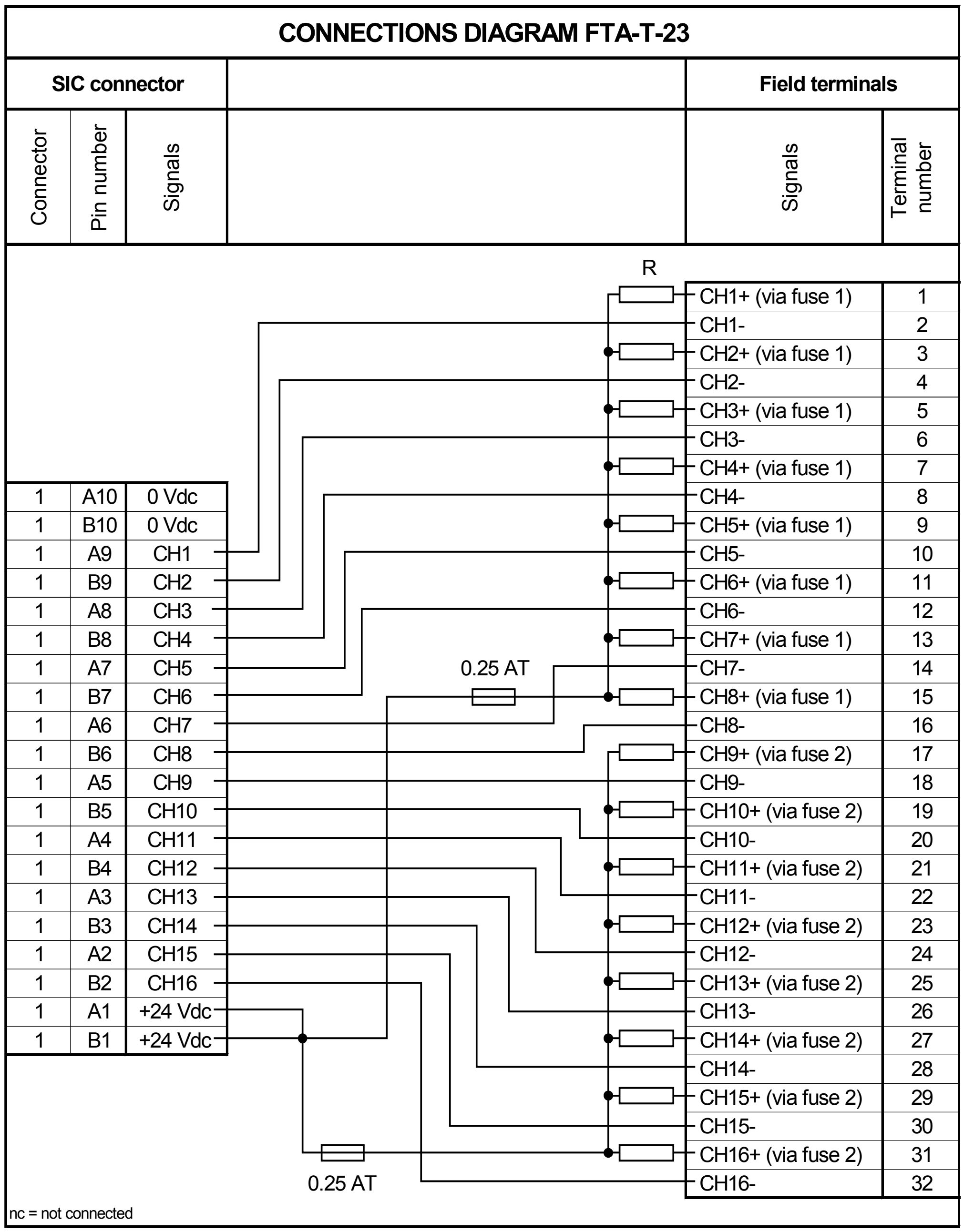

Figure 2 Connections diagram

Technical data

The FTA-T-23 module has the following specifications:

General	Type number:	FTA-T-23
	Approvals:	CE, UL, TÜV, FM
Input	Number of input channels:	16 (2 groups of 8)
	Input voltage:	24 Vdc, –15% … +30%
	Input current:	≤ 15 mA at 24 Vdc (with a redundant pair of fail-safe digital input modules 10101/2/1 as load)
	Igniting current per channel:	< 100 mA at 24 Vdc +30%
Physical	Module dimensions:	170 x 70 x 60 mm (L x W x H) 6.69 x 2.76 x 2.36 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	171 mm
Fuse	Rating:	250 mAT (slow-acting)
	Dimensions:	5 x 20 mm (0.2 x 0.79 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	Max. closed loop resistance:	250 Ohm
	Min. open loop resistance:	15 kOhm
for non-incendive field circuits to Class 1 Division 2	HYDROGEN (Group A & B):	
	– max. loop inductance	8 mH
	– max. loop capacitance	0.3 µF
	NON-HYDROGEN (Group C & D):	
	– max. loop inductance	22 mH
	– max. loop capacitance	7 µF

FTA-T-29 Fail-safe active/passive digital input FTA (115 Vac/dc, 16 channels)

Description

The field termination assembly module FTA-T-29 is a 16-channel fail-safe input converter module, universal for both 115 Vac and/or 115 Vdc. All inputs are galvanically isolated.
Each channel converts an externally supplied 115 V input signal to a 24 Vdc input signal which can be connected to the 24 Vdc fail-safe input module 10101/2/1, thus creating a fail-safe 115 V input for the FSC system.

Sixteen channels can be connected to the FTA-T-29 module via the system interconnection cable SIC-C-12. This cable is plugged into the SIC connector on the FTA module, and connects to a (redundant pair of) 10101/2/1 module(s).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for connecting field wiring.

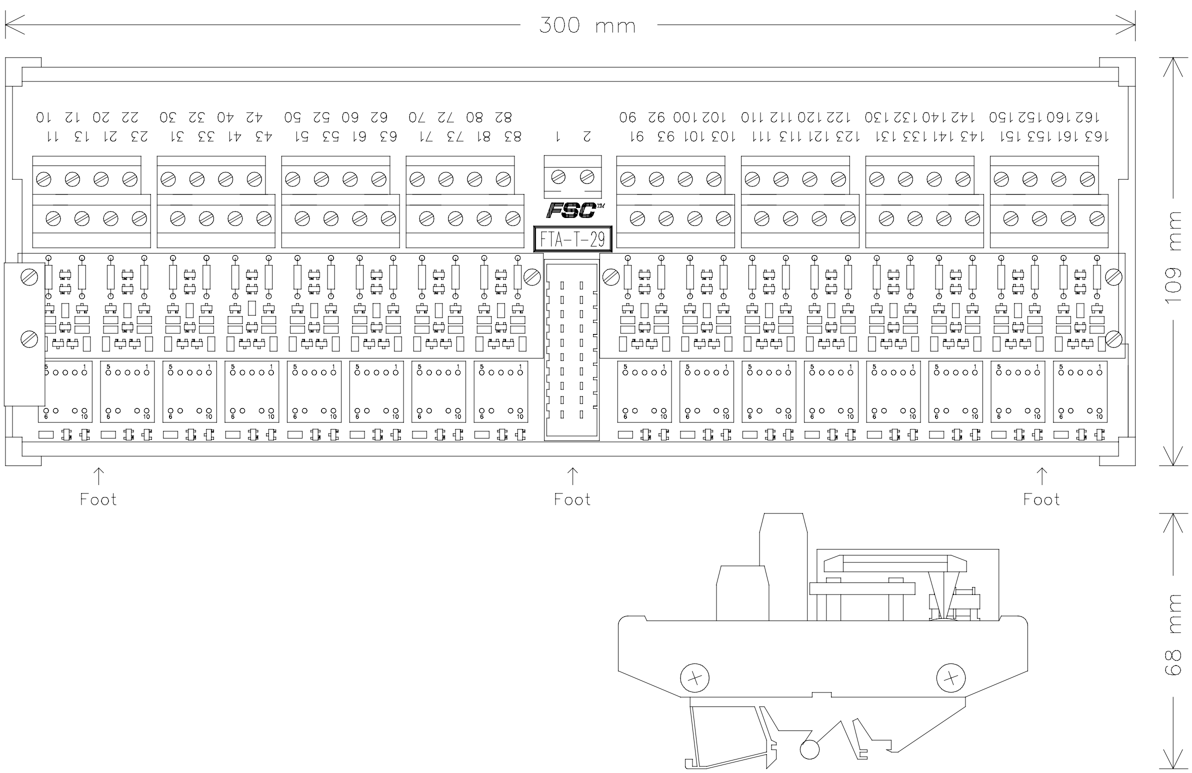

Figure 1 Mechanical layout

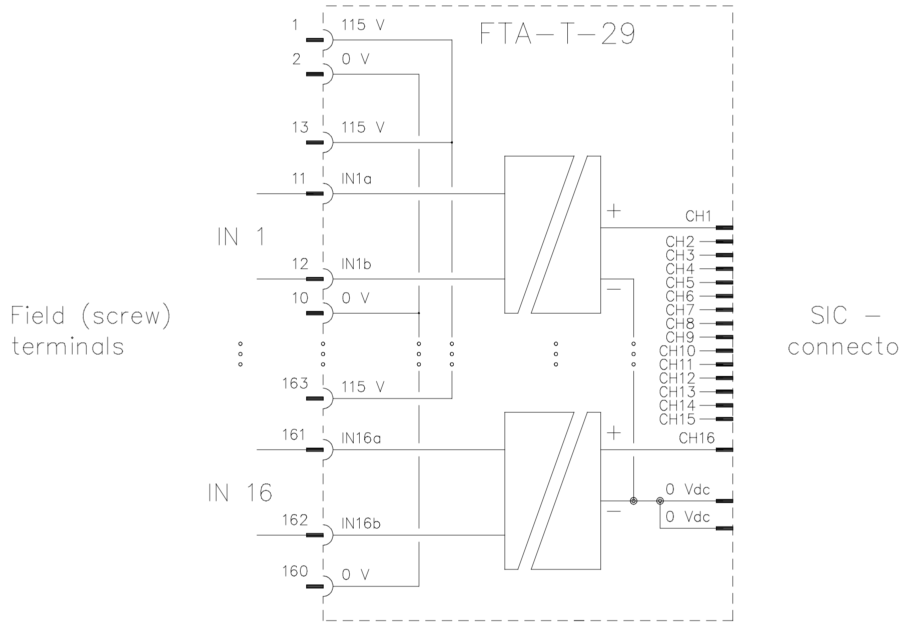

Figure 2 Schematic diagram

Applications

For details on applications and connection options for the FTA-T-29 module refer to the 'SIC to FTA applications' data sheet.

Field cable lengths

High-impedance AC inputs – like the inputs on this FTA – have a limited capability of handling the wire capacitance of standard multicore field cables. The wire capacitance of the field cable acts as a shunt impedance over the field contact (see Figure 3).

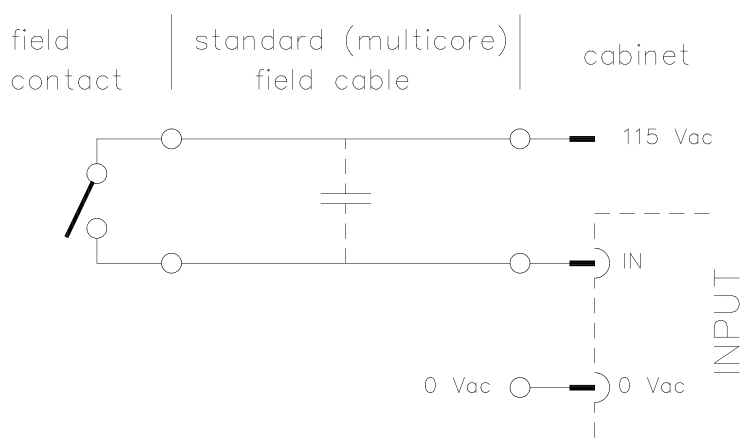

Figure 3 Standard (multicore) field cable

When the current through this shunt impedance exceeds the maximum 'LOW' current, the input may be activated by this shunt impedance, thus disabling the input function (by keeping the input activated continuously, i.e. ON). Every AC input will have a maximum 'LOW' current that it can handle.

The maximum allowable cable length depends on the maximum 'LOW' current (e.g. 1.2 mA), the typical cable capacitance (e.g. 120 pF/m), the maximum supply voltage (e.g. 130 Vac) and the supply frequency (e.g. 60 Hz).
The maximum length (in meters) can be calculated using the following formula:

$$L_{max} = \frac{I_{low}}{V_{max} * 2 * \pi * f * C_{typ}}$$

where:
L_{max} = maximum allowable cable length
I_{low} = maximum 'LOW' current
V_{max} = maximum supply voltage
f = supply frequency
C_{typ} = typical cable capacitance

As an example, we will calculate the maximum field cable length (in meters) using the values mentioned above:

$$L_{max} = \frac{(1.2 * 10^{-3})}{130 * 2 * \pi * 60 * (120 * 10^{-12})} = 204 \text{ m}$$

In this example, the maximum allowable field cable length is 204 meters (223 yards).

Solutions:

The field cable length limit can be eliminated by using field cables with wires that are shielded separately (see Figure 4).
The only (relevant) capacitance of the input wire is to the shield (0 Vac or earth) and this will not activate a 'LOW' input.
However, this type of cable is rather unusual. Field cables with shielded wire pairs are more commonly used. This allows for two connections methods:

1. Use the method of Figure 4 and leave the second wire of each pair unconnected, or
2. Connect the second wire of each pair to 0 Vac (see Figure 5). The 115 Vac / 0 Vac supply pair can be used for more than one input.

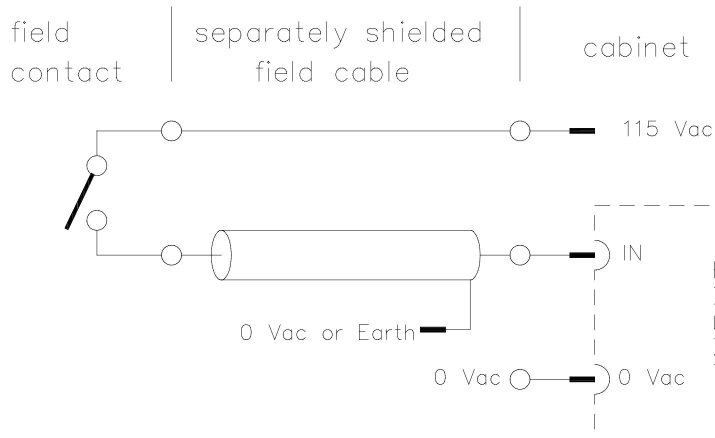

Figure 4 Field cable with separately shielded wires

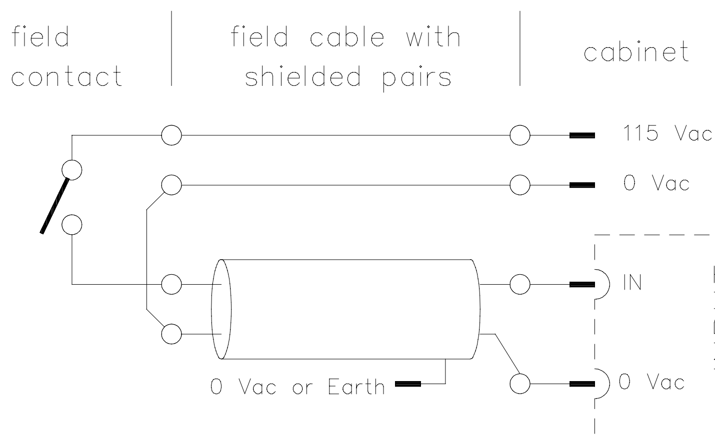

Figure 5 Field cable with shielded pairs

In practice, a mix of wiring methods may be used. For example, use a cable with shielded pairs between the control cabinet and a distribution box close to the process. This cable may be long, e.g. 3 km (1.8 mi). Then use a standard (multicore) cable for the connection between the distribution box and the field contact. This cable length is limited to the value calculated using the formula mentioned above.

Connecting active/ passive inputs

The FTA-T-29 module supports inputs for both active and passive signals. Figure 6 below shows the schematic diagram for connecting active inputs. Figure 7 shows the diagram for connecting passive inputs.

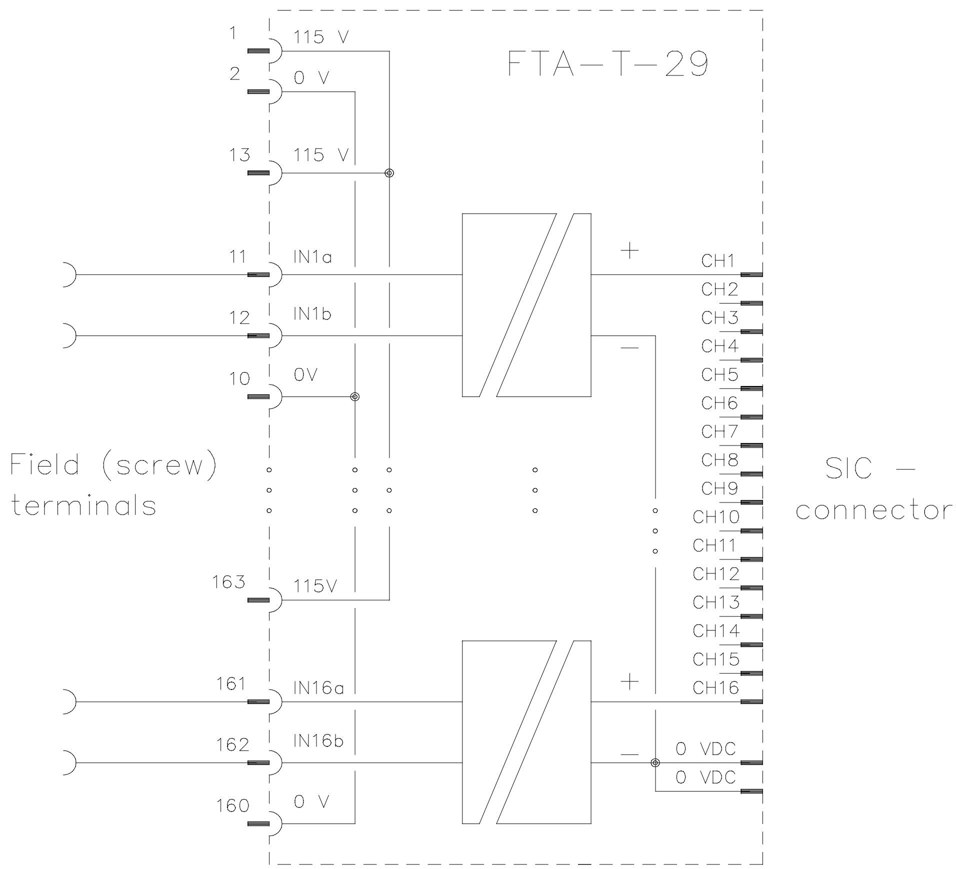

Figure 6 Schematic diagram for connecting active inputs.

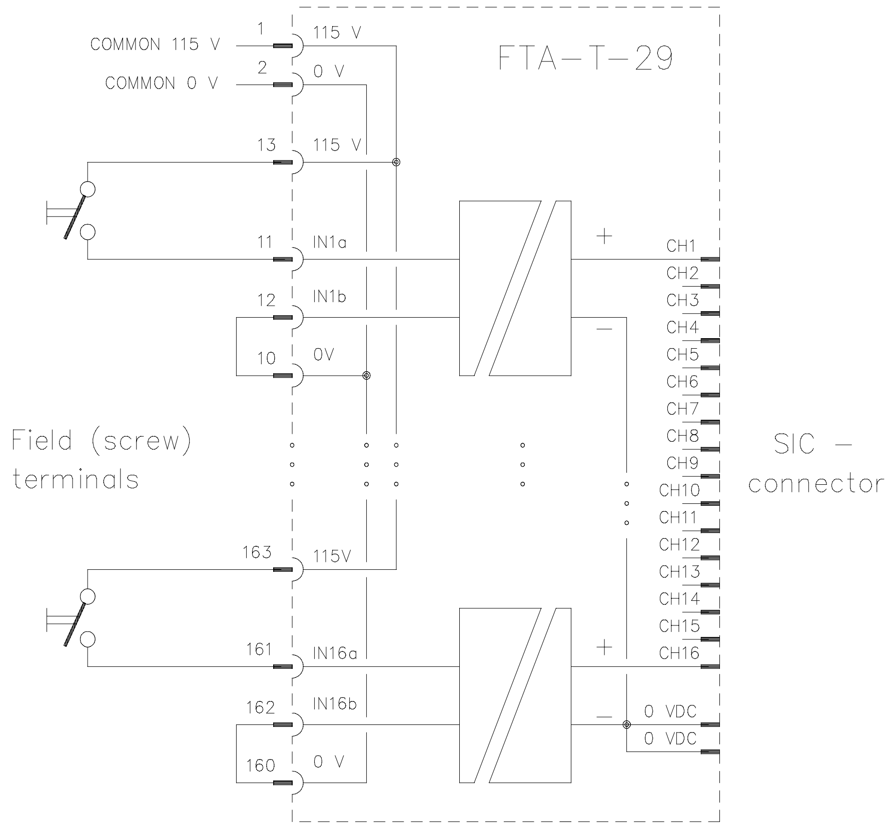

Figure 7 Schematic diagram for connecting passive inputs.

Connections

The connections diagram of the FTA-T-29 module is as follows:

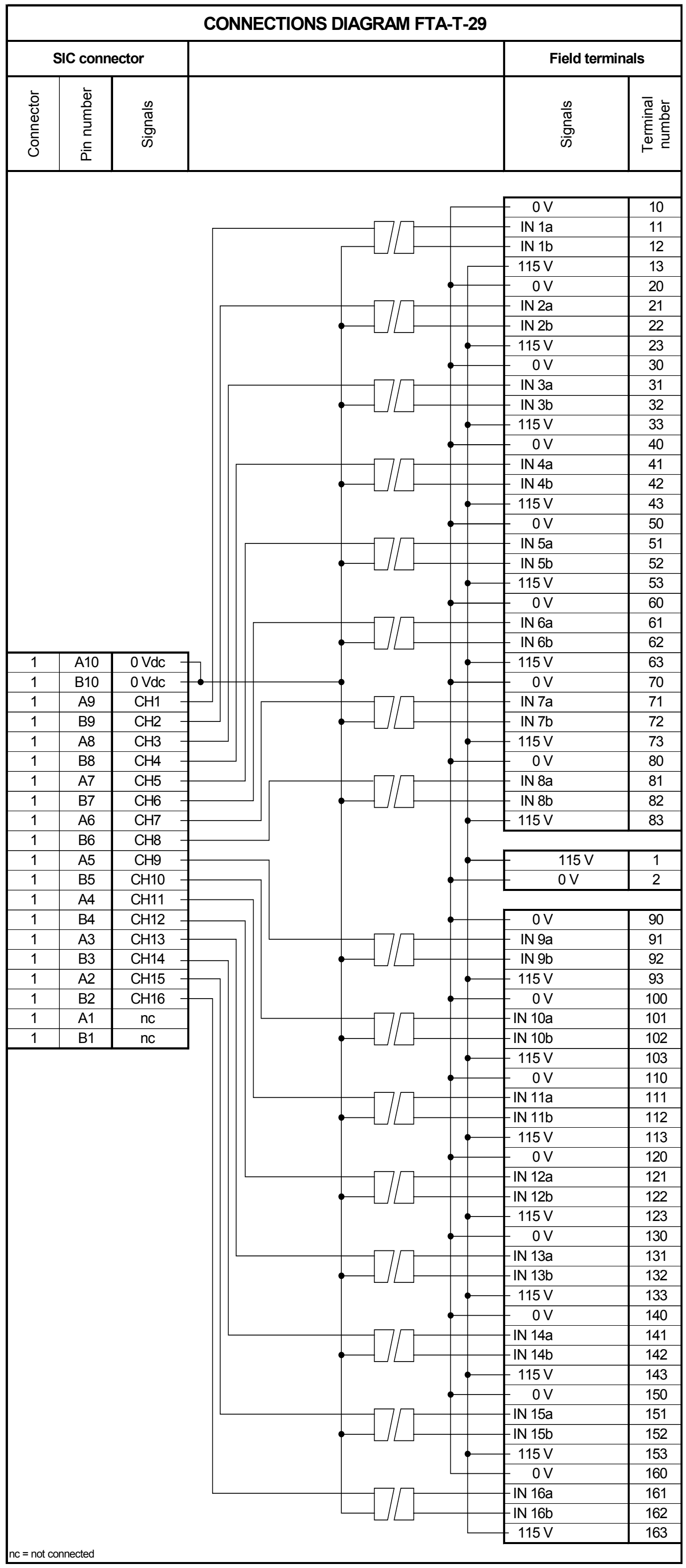

Figure 8 Connections diagram

Technical data

The FTA-T-29 module has the following specifications:

General	Type number:	FTA-T-29
	Approvals:	UL, CE, TÜV
Input	Number of input channels:	16
	Input voltage:	115 V, –15% ... + 30%
	Input frequency:	DC or 40...300 Hz
	Input current:	7.5 mA (± 1 mA) at 115 V
	Input impedance:	non-inductive, > 9 kOhm
	Input LOW:	U ≤ 15 V or I ≤ 1.2 mA *(see 'Field cable length' section in this data sheet)*
Physical	Module dimensions:	300 x 109 x 68 mm (L x W x H) 11.81 x 4.29 x 2.68 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	301 mm (11.85 in)
Isolation	Isolation input to output:	2 kV
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)

FTA-T-35 Fail-safe digital output FTA, Current limited (24 Vdc, 8 channels)

Description

The field termination assembly module FTA-T-35 is the interface between the fail-safe digital output module 10201/2/1 with a system interconnection cable (SIC-C-12) and the external field wiring (screw terminals). It can be used for interfacing to Class I, Division 2 Hazardous locations.

The FTA-T-35 provides eight current limited digital outputs to the field. Each output is capable of supplying 110 mA (= 2.5 Watt at 24 Vdc).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for the field wiring.

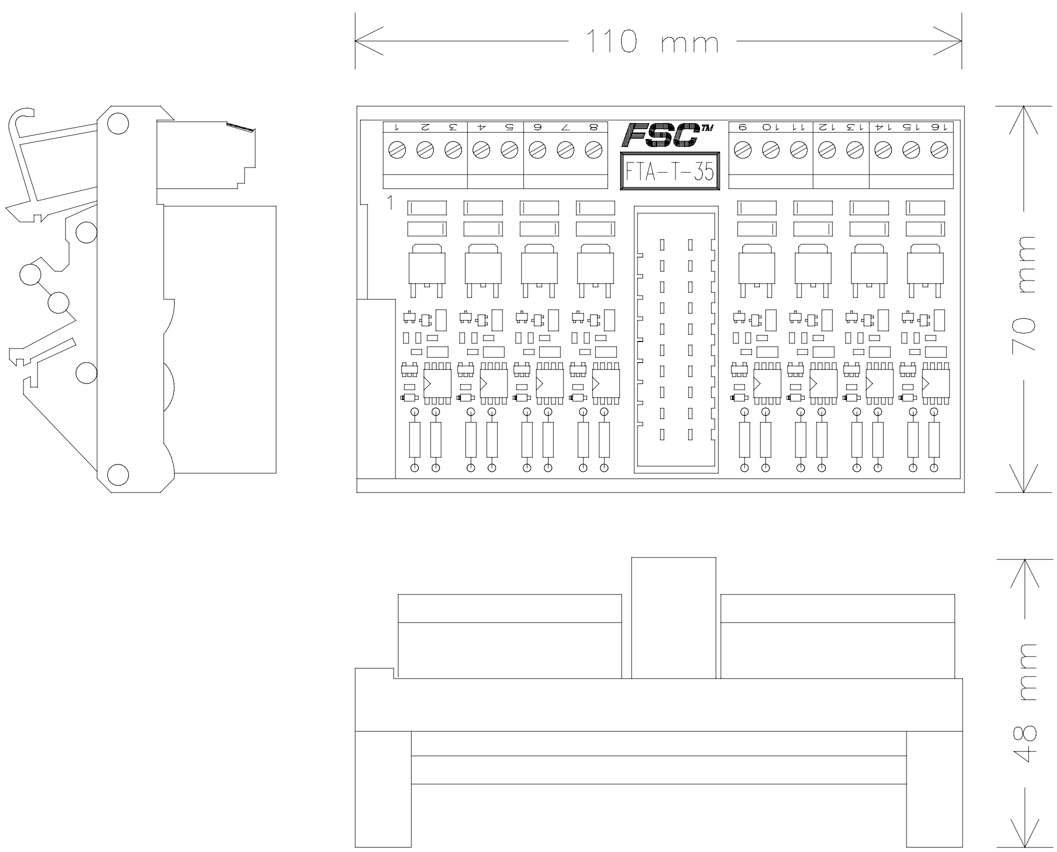

Figure 1 Mechanical layout

Main Function

The FTA-T-35 can energize loads (e.g. solenoids or leds. with voltage-current limitation in compliance with Hazardous Class I, Division 2. The external output-signal (OUT+) is electronically current-limited.

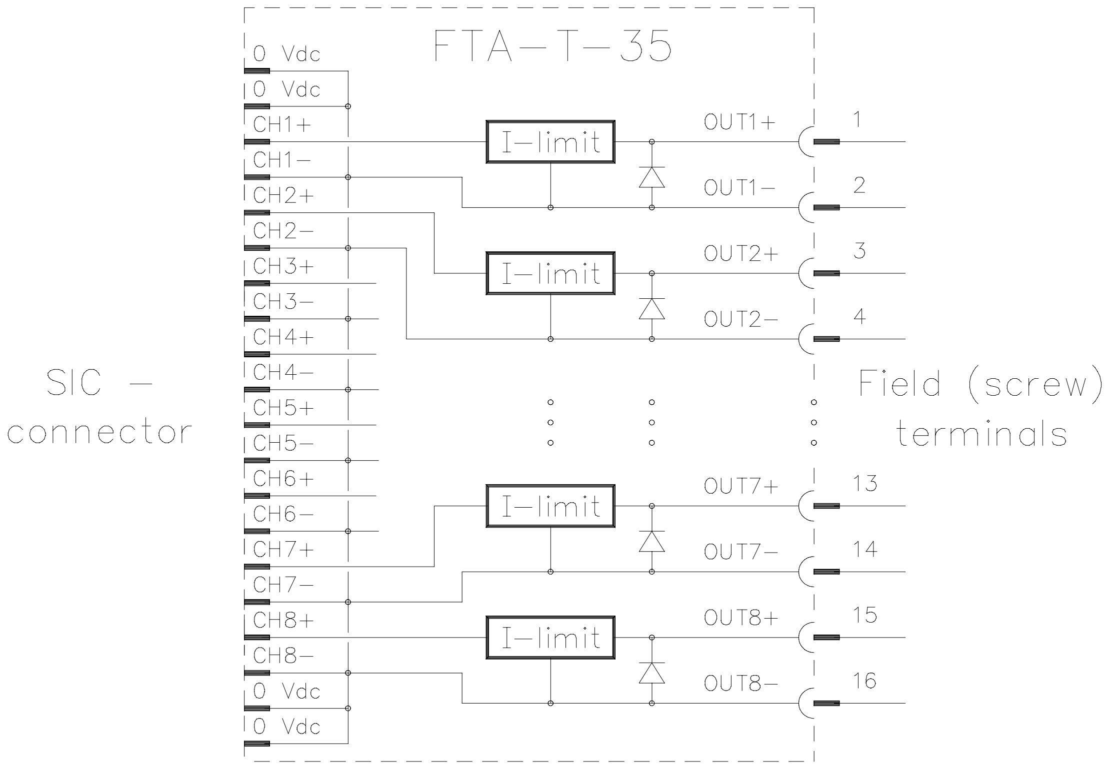

Figure 2 Schematic diagram

Connections

The connections diagram of the FTA-T-35 is as follows:

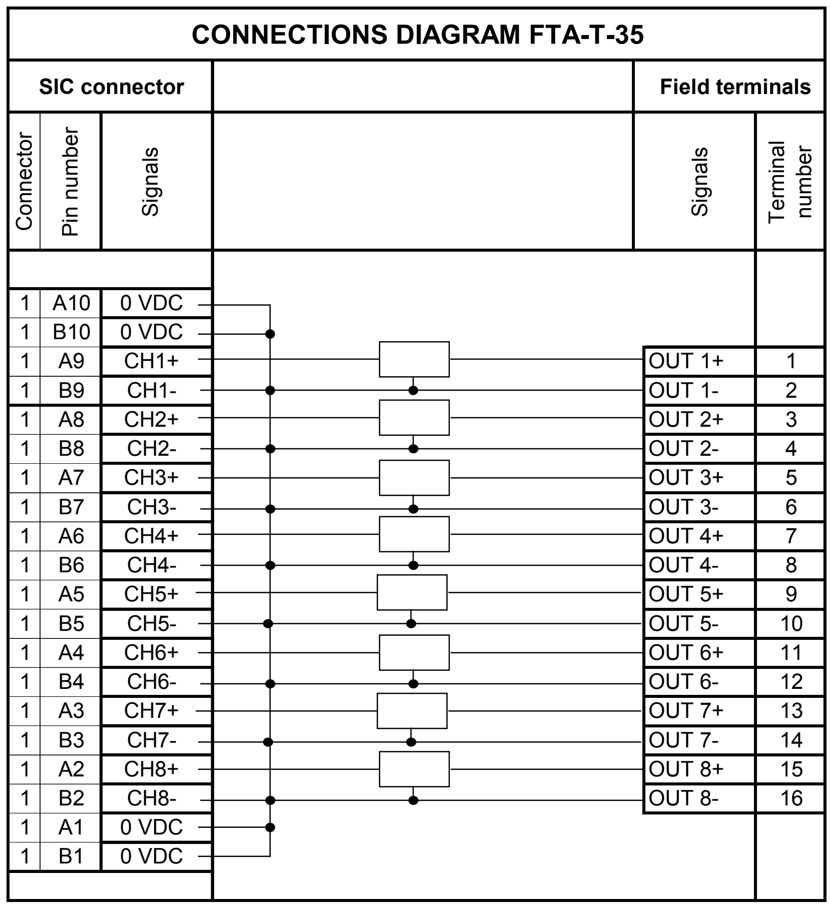

Figure 3 Connections diagram

Technical data

The FTA-T-35 has the following specifications:

General

Type number:	FTA-T-35
Approvals	CE; FM , UL, TÜV approvals pending
Environmental shielding	Conformal coating

Technical data	(continued)	
Power	Power requirements:	5 mA per channel (plus output load)
Output	Number of channels:	8
	Output current limit:	> 110 mA
	Max. output load:	2.5 Watt (at 24 Vdc)
	Voltage drop:	< 1.5 Vdc at 110 mA
	Off current:	< 0.1 mA
Physical	Module dimensions:	110 x 70 x 48 mm (L x W x H) 4.32 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	111 mm (4.36 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	HYDROGEN (Group A & B)	
	– max. loop inductance	3.0 mH
	– max. loop capacitance	0.2 μF
	NON-HYDROGEN (Group C & D)	
	– max. loop inductance	12 mH
	– max. loop capacitance	5 μF

FTA-T-36 Fail-safe digital output FTA, Current limited (24 Vdc, 4 channels)

Description

The field termination assembly module FTA-T-36 is the interface between the fail-safe loop-monitored digital output module 10216/2/1 with a system interconnection cable (SIC-C-12) and the external field wiring (screw terminals). It can be used for interfacing to Class I, Division 2 Hazardous locations.

The FTA-T-36 provides four loop-monitored current limited digital outputs to the field. Each output is capable of supplying 110 mA (= 2.5 Watt at 24 Vdc).

The FTA module has a universal snap-in facility for standard DIN EN rails, and screw terminals for the field wiring.

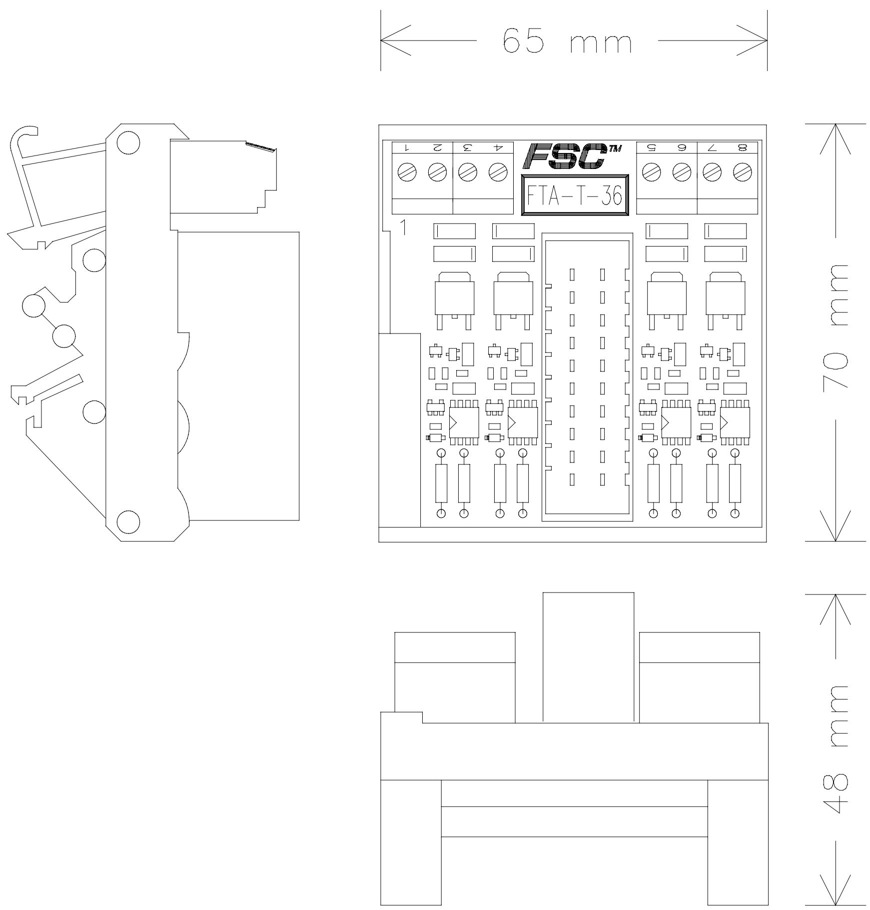

Figure 1 Mechanical layout

Main Function

The FTA-T-36 can energize loads (e.g. solenoids or leds. with voltage-current limitation in compliance with Hazardous Class I, Division 2. The external output-signal (OUT+) is electronically current-limited.

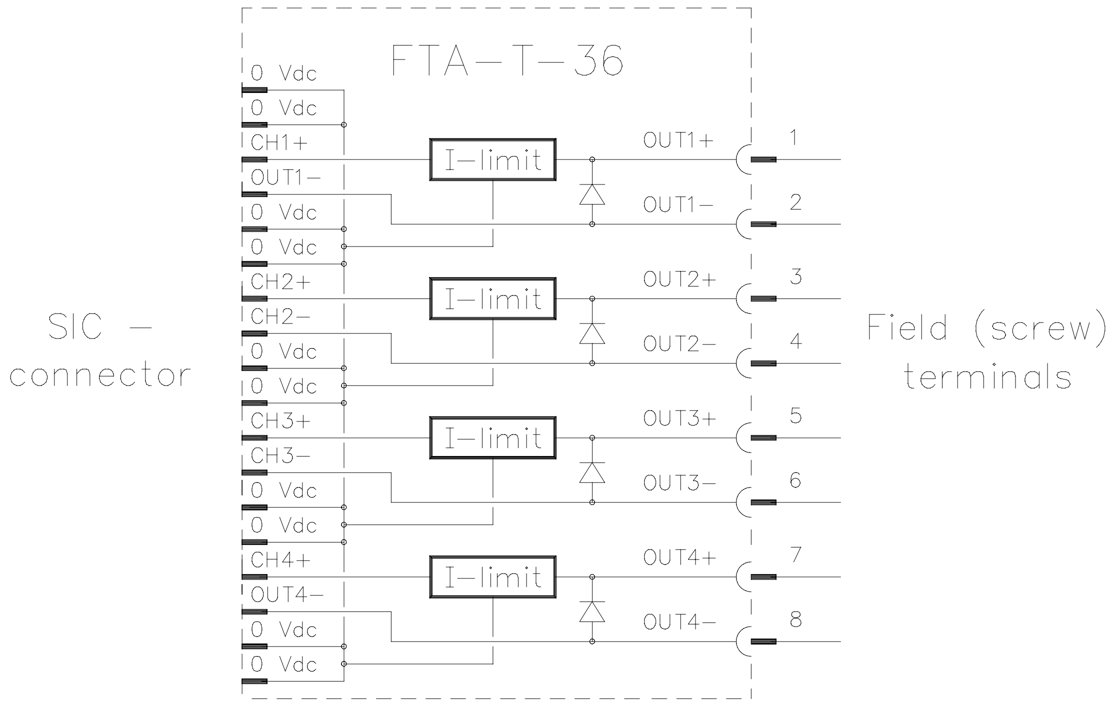

Figure 2 Schematic diagram

Connections

The connections diagram of the FTA-T-36 is as follows:

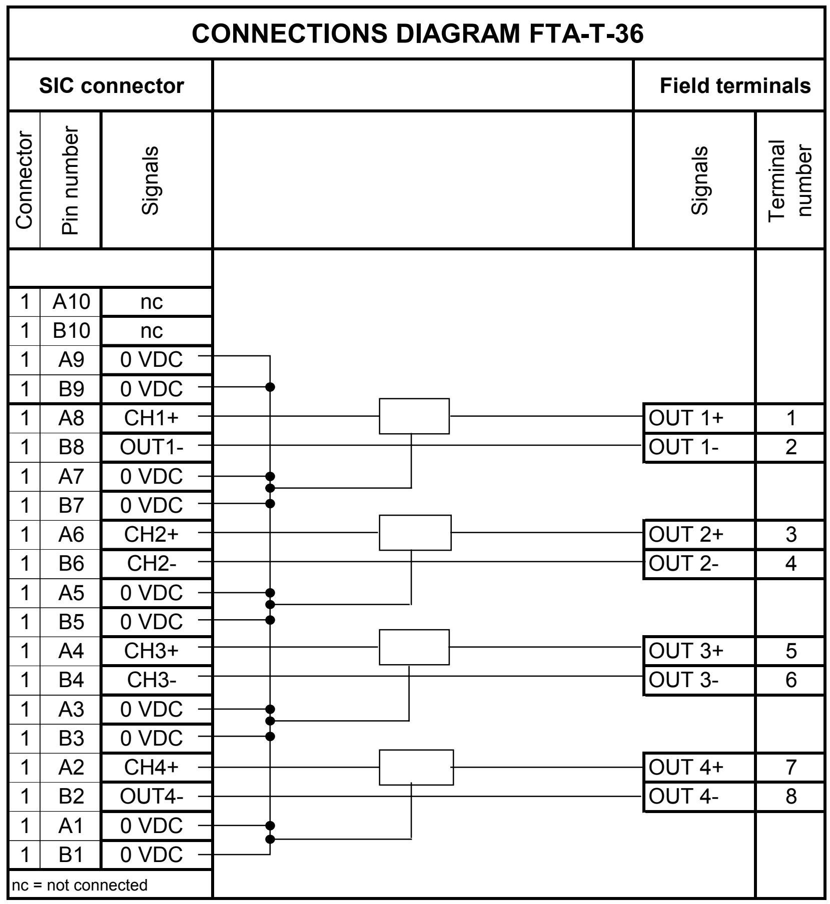

Figure 3 Connections diagram

Technical data

The FTA-T-36 has the following specifications:

General

Type number:	FTA-T-36
Approvals	CE; FM, UL, TÜV approvals pending
Environmental shielding	Conformal coating

Technical data (continued)

Power	Power requirements:	5 mA per channel (plus output load)
Output	Number of channels:	4
	Output current limit:	> 110 mA
	Max. output load:	2.5 Watt (at 24 Vdc)
	Voltage drop:	< 1.5 Vdc at 110 mA
	Off current:	< 0.1 mA
Physical	Module dimensions:	65 x 70 x 48 mm (L x W x H) 2.55 x 2.76 x 1.89 in (L x W x H)
	DIN EN rails:	TS32 / TS35 x 7.5
	Used rail length:	66 mm (2.59 in)
Termination	Screw terminals:	
	– max. wire diameter	2.5 mm² (AWG 14)
	– strip length	7 mm (0.28 in)
	– tightening torque	0.5 Nm (0.37 ft-lb)
Field signal specifications	HYDROGEN (Group A & B)	
	– max. loop inductance	3.0 mH
	– max. loop capacitance	0.2 µF
	NON-HYDROGEN (Group C & D)	
	– max. loop inductance	12 mH
	– max. loop capacitance	5 µF