



Installation Instructions

FLEX Ex NAMUR Input Module

(Cat. No. 1797-IBN16)

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at <http://www.ab.com/manuals/gi>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.





No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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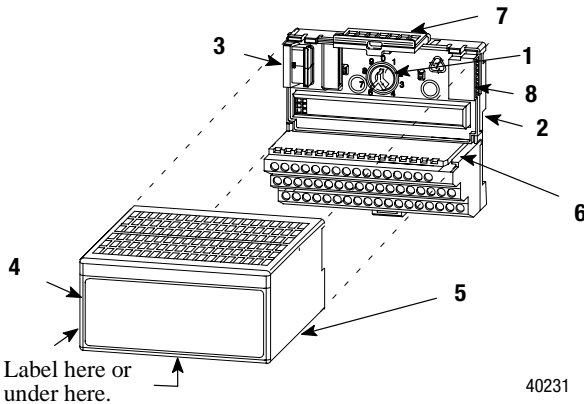
Throughout this manual we use notes to make you aware of safety considerations.

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Important User Information

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: <ul style="list-style-type: none">• identify a hazard• avoid a hazard• recognize the consequence
SHOCK HAZARD 	Labels may be located on or inside the drive to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be located on or inside the drive to alert people that surfaces may be dangerous temperatures.

Module Installation



This module must be used with a 1797-TB3 or -TB3S intrinsically safe terminal base unit.

ATTENTION



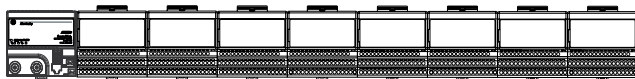
This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as “open type” equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

1. Rotate keyswitch (1) on terminal base unit (2) clockwise to position 6 as required for this type of module. **Do not change the position of the keyswitch after wiring the terminal base unit**
2. Make certain the flexbus connector (3) is pushed all the way to the left to connect with the neighboring terminal base/adaptor. You cannot install the module unless the connector is fully extended.

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3. Make sure the pins on the bottom of the module are straight so they will align properly with the connector in the terminal base unit.
4. Position the module (4) with its alignment bar (5) aligned with the groove (6) on the terminal base.
5. Press firmly and evenly to seat the module in the terminal base unit. The module is seated when the latching mechanism (7) is locked into the module.
6. Make certain that you only connect terminal base units to other intrinsically safe system modules or adapters to maintain the integrity of the intrinsically-safe backplane.



20128-M

7. Remove cap plug (8) and attach another intrinsically safe terminal base unit to the right of this terminal base unit if required.

Installation in Zone 1

This module must not be exposed to the environment. Provide a suitable metal enclosure. This module has a protection factor of IP20.

ATTENTION




This module cannot be used in an intrinsically safe environment after it has been exposed to non-intrinsically safe signals.

Installation in Zone 22

When the module is installed in Zone 22, the following cabinets must be used: IVK-ISRPI-V16LC; IVK-ISRPI-V8HYW; or IVK-ISRPI-V8LC. These cabinets can be purchased from Pepperl+Fuchs GmbH, Königsberger Allee 85-87, D-68307 Mannheim Germany. Information available at www.pepperl-fuchs.com.

The IS-RPI cabinets (type IVK2-ISRPI-V8LC, IVK2-ISRPI-V8HYW, or IVK2-ISRPI-V16LC) ensures the basic protection for the intrinsically safe apparatus of the IS-RPI system for use in Zone 22. It corresponds with category 3D according to RL 94/9 EG and with the type label marked with the following information:

Pepperl+Fuchs GmbH
68301 Mannheim
IVK2-ISRPI-V8LC (or IVK2-ISRPI-V8HYW or
IVK2-ISRPI-V16LC)
EX  II 3D IP54 T 70°C
CE
Serial (manufacturing) number
Model

Electrostatic Charge

Protect the system against electrostatic charge. Post a sign near this module: **Attention! Avoid electrostatic charge.** For your convenience, a sign which can be cut out and posted is included in this installation instruction.

Removal and Insertion Under Power

WARNING



These modules are designed so you can **remove and insert them under power**. However, take special care when removing or inserting modules in an active process. I/O attached to any module being removed or inserted can change states due to its input/output signal changing conditions.

If you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

European Communities (EC) Directive Compliance

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

These products are tested to meet the Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) as amended by 92/31/EC and 93/68/EEC, by applying the following standards:

- EN 61000-6-4:2001, Electromagnetic Compatibility (EMC) - Part 6-4: Generic Standard for Industrial Environments (Class A)
- EN 61000-6-2:2001, Electromagnetic Compatibility (EMC) - Part 6-2: Generic Standards - Immunity for Industrial Environments
- EN61326-1997 + A1-A2, Electrical Equipment For Measurement, Control, and Laboratory Use - Industrial EMC Requirements

ATEX Directive

These products are tested in conjunction with associated I/O modules to meet the Council Directive 94/9/EC (ATEX) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres by applying the following standards:

- EN50014:1997 + A1-A2, Electrical Apparatus for Potentially Explosive Atmospheres
- EN50020:1994, Electrical Apparatus for Potentially Explosive Atmospheres - Intrinsic Safety “i”
- EN50284:1999, Special Requirements for Construction, Test, and Marking of Electrical Apparatus of Equipment Group II, Category 1G
- EN50281-1-1:1998 + A1, Electrical Apparatus for Use in the Presence of Combustible Dust - Part 1-1: Protection by Enclosure

Inputs

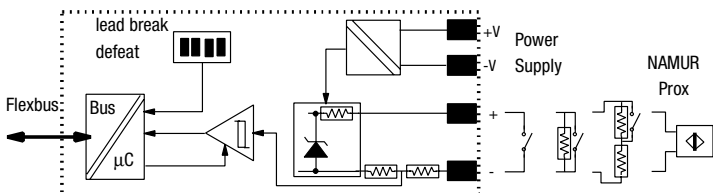
Each input can be operated from a NAMUR sensor or a mechanical contact (if mechanical inputs are used). **Do not apply any non-intrinsically safe signals to this module.**

When using an intrinsically safe electrical apparatus according to EN50020, the European Community directives and regulations must be followed.

The channels in this module are electrically connected to each other and have a common plus-line.

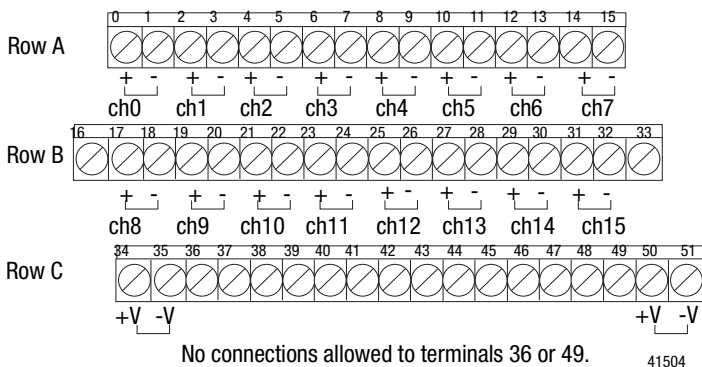
IMPORTANT

When interconnecting several lines, you must consider the total accumulated power and check for intrinsic safety.



Wiring to a 1797-TB3 or -TB3S Terminal Base Unit

Connect wiring to the terminal base as shown below.



1. Connect the individual input wiring to (+) terminals (0, 2, 4, 6, 8, 10, 12, 14) on the 0-15 row (A) and on the 16-33 row (B) (terminals 17, 19, 21, 23, 25, 27, 29, 31) as indicated in the table below.
2. Connect the associated input to the corresponding (-) terminal (1, 3, 5, 7, 9, 11, 13, 15) on the 0-15 row (A), and on the 16-33 row (B) (terminals 18, 20, 22, 24, 26, 28, 30, 32) for each input as indicated in the table below.
3. Connect +V dc power to terminal 34 on the 34-51 row (C).
4. Connect -V to terminal 35 on the 34-51 row (C).

WARNING



Make certain that you power this module with an intrinsically safe power supply. Do not exceed the values listed in the specifications for this module.

If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

5. If continuing power to the next terminal base unit, connect a jumper from terminal 50 (+V) on this base unit to terminal 34 on the next base unit.

6. If continuing common to the next terminal base unit, connect a jumper from terminal 51 (-V) on this base unit to terminal 35 on the next base unit.

Wiring

Input	Input Source	Input Signal	Input	Input Source	Input Signal
Input 0	A-0	A-1	Input 8	B-17	B-18
Input 1	A-2	A-3	Input 9	B-19	B-20
Input 2	A-4	A-5	Input 10	B-21	B-22
Input 3	A-6	A-7	Input 11	B-23	B-24
Input 4	A-8	A-9	Input 12	B-25	B-26
Input 5	A-10	A-11	Input 13	B-27	B-28
Input 6	A-12	A-13	Input 14	B-29	B-30
Input 7	A-14	A-15	Input 15	B-31	B-32
+V	Terminals 34 and 50				
-V	Terminals 35 and 51				
Terminals 16, 33, 40, 41, 42, 43, 44 and 45 are connected to chassis ground.					

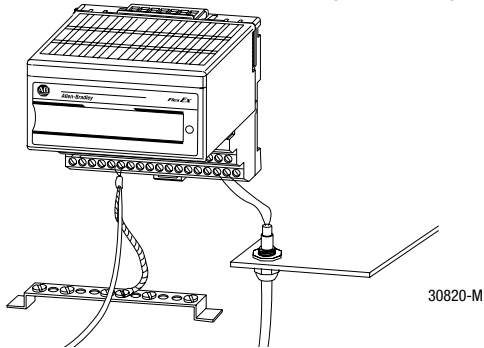
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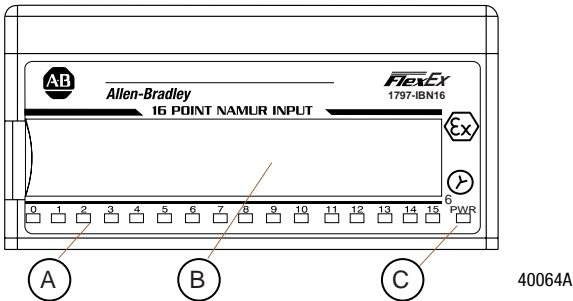
Do not use the unused terminals on this terminal base unit. Using these terminals as supporting terminals can result in damage to the module and/or unintended operation of your system.

Grounding

All I/O wiring must use shielded wire. Shields must be terminated external to the module, such as bus bars and shield-terminating feed throughs.



Indicators



A = Status Indicators - yellow - individual input present; flashing red - channel fault; solid red - module did not pass powerup check (channel 0 is solid red while powerup check is running)

B = Insertable labels for writing individual input designations

C = Power Indicator - green indicates power applied to module

Input/Output Mapping

Dec. Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Oct. Bit	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Read 0	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1	I0
Read 1	F15	F14	F13	F12	F11	F10	F9	F8	F7	F6	F5	F4	F3	F2	F1	F0
Read 1	Input 15 Counter															
Write 0			CF	CR			FC					Input Filter - Ch 12-15		Input/Alarm Filter - Ch 0-11		

Where: I = Input

F = Fault Alarm for an individual channel

CF = Counter Fast - Filter time constant or bypass, depending on setting (when input 15 is in counter mode) - 0 = normal, 1 = fast

CR = Counter Reset- Resets the counter value in read word 1 when input 15 is in counter mode.
0 = normal, 1 = reset

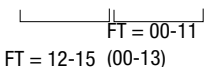
FC = Fault mode or Counter mode - determines content of read word 1 (counter value of input 15, or fault data of individual channel). 0 = counter, 1 = fault data - wire off or short circuit detect

Setting Input Filter Times

You can select the input filter time constant for each group of channels (channels 00 through 11, or channels 12 through 15).

For example, to set a filter time constant of 5ms for a dc input module, set bits 05, 04, 03, 02, 01, and 00 as shown below.

Dec.	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	
(Octal)	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00	
0:010											1	0	0	1	0	0	=44 Octal or 36 Decimal



 FT = 12-15 (00-13)

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Input Filter Times

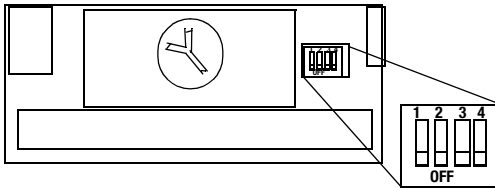
Bits			Description	Maximum Filter Time
02	01	00	Filter Times 00-11 (00-13)	
05	04	03	Filter Times 12-15 (14-17)	
0	0	0	Filter Time 0 (default)	1ms
0	0	1	Filter Time 1	1ms
0	1	0	Filter Time 2	2ms
0	1	1	Filter Time 3	3ms
1	0	0	Filter Time 4	5ms
1	0	1	Filter Time 5	9ms
1	1	0	Filter Time 6	17ms
1	1	1	Filter Time 7	33ms

Note: Bits 00-02 also control the filter times of all 16 fault alarm bits of read word 1 when module is in fault mode.

Setting the Fault Detect Switch

A switch, located on the backside of the module, lets you select the action of the module when a fault (wire off or short circuit) is detected. Switch position 1 determines the action for channels 0 through 3, position 2 for channels 4 through 7, position 3 for channels 8 through 11, and position 4 for channels 12 through 15. Set the switch:

- OFF to disable fault detection for the selected channels
- ON to enable fault detection for the selected channels.



Repair

This module is not field-repairable. Any attempt to open this module will void the warranty and IS certification. If repair is necessary, return this module to the factory.

Specifications - 1797-IBN16 16 NAMUR Input Module

Number of Inputs	16 (1 group of 16), non-isolated, sinking
IS Input Type	EEx ia IIB/IIC T4, AEx ia IIC T4, Class I, II, III Division 1 Group A-G T4
IS Module Type	EEx ib IIB/IIC T4, AEx ib IIC T4, Class I, Division 1 & 2 Group A-D T4
Input Type	DIN19234, NAMUR compatible
ON-State Current	2.1mA
OFF-State Current	1.2mA
Hysteresis	0.2mA
Input Frequency	1000Hz maximum
Input Pulse Width	>500µs on or off
Maximum Load Voltage	U/V = 7.5V dc
Short Circuit Current	I = 7.5mA
Short Circuit Threshold	I > 6mA
Lead Breakage Threshold	I < 0.35mA
Input Delay Times OFF to ON ON to OFF	1ms, 2ms, 3ms, 5ms, 9ms, 17ms, 33ms 1ms, 2ms, 3ms, 5ms, 9ms, 17ms, 33ms 1ms default - selectable thru output image table (see <i>Setting Input Filter Times</i>)
Indicators (field side indication, customer device driven)	16 yellow status indicators 16 red fault indicators 1 green module power indicator
Output (intrinsically safe) (16 pin male and female flexbus connector)	$U_i \leq 5.8V$ dc $I_i \leq 400mA$ $L_i =$ Negligible $C_i =$ Negligible
Isolation Path Input to power supply Input to flexbus Input to input Power supply to flexbus	Isolation Type Galvanic to DIN EN50020 Galvanic to DIN EN50020 None Galvanic to DIN EN50020
Power Supply (+V, -V intrinsically safe)	$U_i \leq 9.5V$ dc $I_i \leq 1A$ $L_i =$ Negligible $C_i =$ Negligible

Module Field-Side Power Consumption	2.8W
Power Dissipation	2.8W
Thermal Dissipation	Maximum 9.6 BTU/hr
Module Location	Cat. No. 1797-TB3 or -TB3S Terminal Base Unit
Conductor Wire Size	12 gauge (4mm ²) stranded maximum 3/64in (1.2mm) insulation maximum
Dimensions	46mm x 94mm x 75mm (1.8in x 3.7in x 2.95in)
Weight	200g (approximate)
Keyswitch Position	6
Environmental Conditions	
Operational Temperature	-20 to +70°C (-4 to +158°F)
Storage Temperature	-40 to +85°C (-40 to +185°F)
Relative Humidity	5 to 95% noncondensing
Shock Operating	Tested to 15g peak acceleration, 11(+1)ms pulse width
Nonoperating	Tested to 15g peak acceleration, 11(+1)ms pulse width
Vibration	Tested 2g @ 10-500Hz per IEC68-2-6
Agency Certification	
CENELEC	II (1) 2G EEx ia/ib IIB/IIC T4 II (1D) (2D)
U, C-UL	Class I Division 1 and 2 Groups A-D T4 Class I Zone 1 and 2 AEx ib/[ia] IIC T4
FM	Class I Division 1 and 2 Groups A-D T4 Class I Zone 1 and 2 AEx ib/[ia] IIC T4
Certificate of Conformity	
CENELEC	DMT 98 ATEX E013 X
UL, C-UL	UL, C-UL Certificate Number 99.19699
FM	FM Certificate Number 3009806

CE/CENELEC I/O Entity Parameters (Each Channel)

	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0/R_0 Ratio
$U_0 \leq 14.5V$ $I_0 \leq 15mA$ $P_0 < 40mW$ Characteristic: linear	EEx ia	IIB	1 μ F	10mH	2.6mH/ Ω
	EEx ia	IIC	300nF	2mH	0.65mH/ Ω

UL, C-UL I/O Entity Parameters

Table 1

Wiring Method	Channel	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)	Groups	C_a (μ F)	L_a (mH)
1 and 2	Any one channel e.g. ch0	0(+), 1(-)	14.5	15	-	-	A, B	0.3	80.0
							C, E	0.9	320.0
							D, F, G	2.4	640.0

Wiring Methods

- Wiring method 1 - Each channel is wired separately.
- Wiring method 2 - Multiple channels in one cable, providing each channel is separated in accordance with the National Electric Code (NEC) or Canadian Electric Code (CEC).

Table 2

Terminals	V_t (V)	I_t (mA)	Groups	C_a (μ F)	L_a (μ H)
Male Bus Connector	5.8	400	A-G	3.0	3.0

① The entity concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of V_t and I_t of the associated apparatus are less than or equal to V_{oc} and I_{sc} or V_{max} and I_{max} of the intrinsically safe apparatus and the approved values of C_a and L_a of the associated apparatus are greater than $C_i + C_{cable}$ and $L_i + L_{cable}$ respectively for the intrinsically safe apparatus.

② Simple apparatus is defined as a device which neither generates nor stores more than 1.2V, 0.1A, 20 μ J, or 25mW.

- ③ Wiring methods must be in accordance with the National Electric Code, ANSI/NFPA 70, Article 504 and 505 or the Canadian Electric Code CSA C22.1, Part 1, Appendix F. For additional information refer to ANSI/ISA RP12.6.
- ④ This module, 1797-IBN16, must be used with terminal base 1797-TB3 or 1797-TB3S.
- ⑤ Terminals 36-39, and 46-49 shall not be connected.
- ⑥ Any combination of up to eight channels may be connected in parallel and connected to simple apparatus in a hazardous location. If two channels are connected in parallel, the total cable inductance must be limited to 20mH for Groups A and B, 80mH for Groups C and E, and 160mH for Groups D, F, and G. If eight channels are connected in parallel, the total cable inductance must be limited to 2mH for Groups A and B, 8mH for Groups C and E and 16mH for Groups D, F, and G.
- ⑦

WARNING

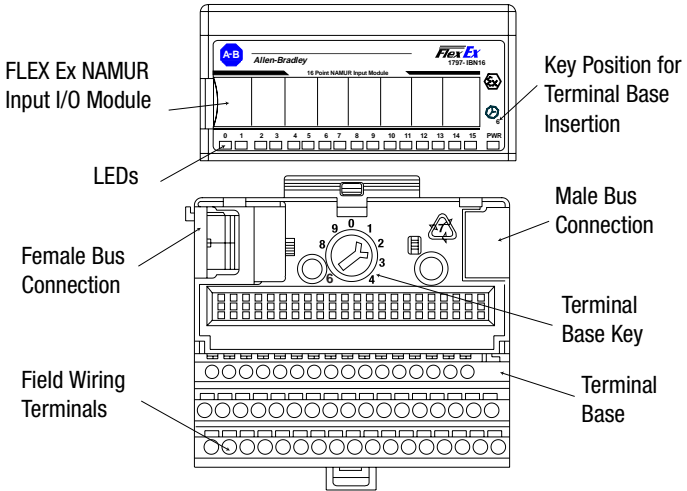
Substitution of components may impair intrinsic safety.

**AVERTISSEMENT**

La substitution de composant peut compromettre la sécurité intrinsèque.

**IMPORTANT**

For detailed certification information, refer to the FLEX Ex System Certification Reference Manual, publication 1797-6.5.6.



ATTENTION

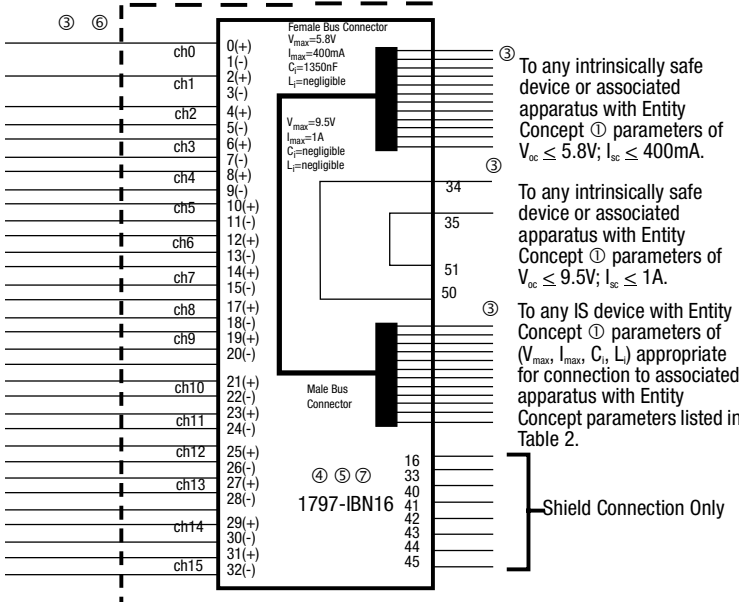


A terminal base may or may not have an I/O module installed.

Hazardous (Classified) Location
 Class I, Zones 0, 1, & 2 Groups IIC, IIB, IIA
 Class I, Div. 1 & 2 Groups A, B, C, D
 Class II, Div. 1 & 2 Groups E, F, G
 Class III, Div. 1 & 2

Hazardous (Classified) Location
 Class I, Zones 1 & 2 Groups IIC, IIB, IIA
 Class I, Div. 1 & 2 Groups A, B, C,

Any Simple Apparatus ② or I.S. device with Entity Concept parameters ① (V_{max} , I_{max} , C_i , L_i) appropriate for connection to associated apparatus with Entity Concept parameters listed in Table 1.



FM I/O Entity Parameters (Each Channel)

If this product has the FM mark, it has been designed, evaluated, tested and certified to meet the following standards:

- FM C1. No 3600:1998, Electrical Equipment for Use in Hazardous (Classified) Locations General Requirements
- FM C1. No 3610:1999, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III Division 1 Hazardous (Classified) Locations
- FM C1. No 3615:1989, Explosionproof Electrical Equipment General Requirements
- FM C1. No 3810:1989, 1995, Electrical and Electronic Test, Measuring and Process Control Equipment
- ANSI/NEMA 250, 1991, Enclosures for Electrical Equipment

Wiring Methods

- Wiring method 1 - Each channel is wired separately.
- Wiring method 2 - Multiple channels in one cable, providing each channel is separated in accordance with the National Electric Code (NEC).

Table 1

Wiring Method	Channel	Terminals	V _{oc} (V)	I _{sc} (mA)	V _t (V)	I _t (mA)	Groups	C _a (μF)	L _a (mH)
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Terminals	V _t (V)	I _t (mA)	Groups	C _a (μF)	L _a (μH)
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- ① The entity concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of V_{oc} and I_{sc} or V_i and I_i of the associated apparatus are less than or equal to V_{max} and I_{max} of the intrinsically safe apparatus and the approved values of C_a and L_a of the associated apparatus are greater than $C_i + C_{cable}$ and $L_i + L_{cable}$ respectively for the intrinsically safe apparatus.
- ② Simple apparatus is defined as a device which neither generates nor stores more than 1.2V, 0.1A, 20 μ J, or 25mW.
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WARNING

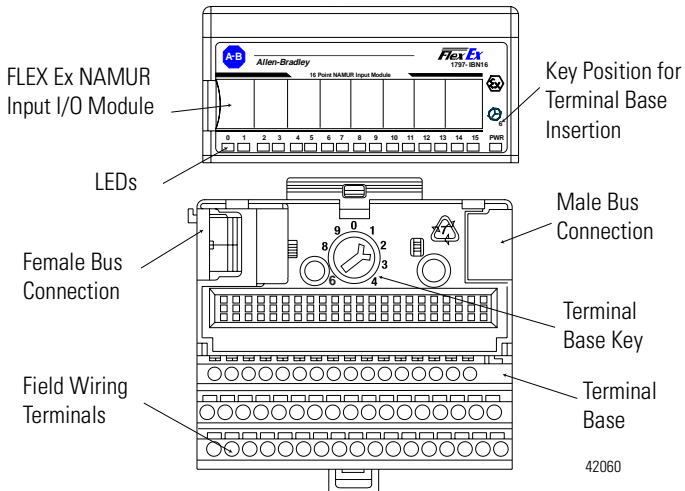
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**AVERTISSEMENT**

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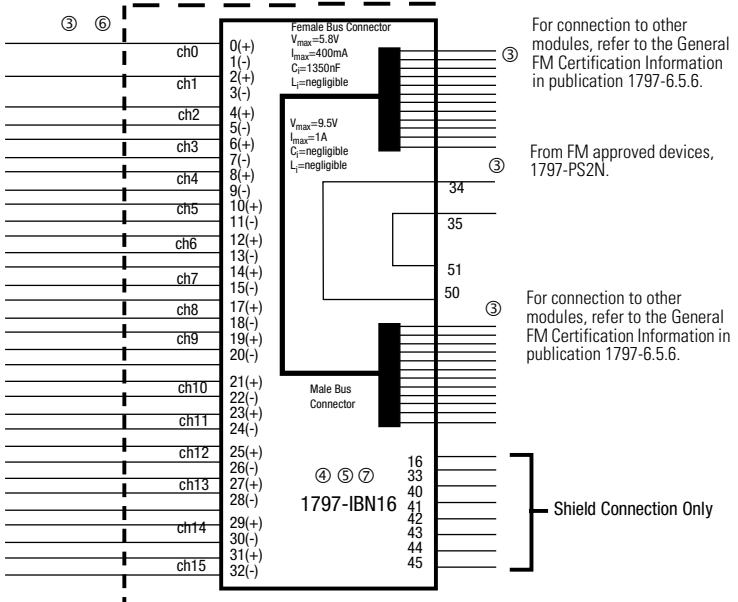


A terminal base may or may not have an I/O module installed.

Hazardous (Classified) Location
 Class I, Zone 0 Group IIC
 Class I, Div. 1 Groups A, B, C, D
 Class II, Div. 1 Groups E, F, G
 Class III, Div. 1

Hazardous (Classified) Location
 Class I, Zone 1 Group IIC
 Class I, Div. 1 Groups A, B, C, D

Any Simple Apparatus ② or FM approved device with Entity Concept parameters ① (V_{max} , I_{max} , C_i , L_i) appropriate for connection to associated apparatus with Entity Concept parameters listed in Table 1.



Attention: Avoid electrostatic charge.

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www.rockwellautomation.com

Corporate Headquarters

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