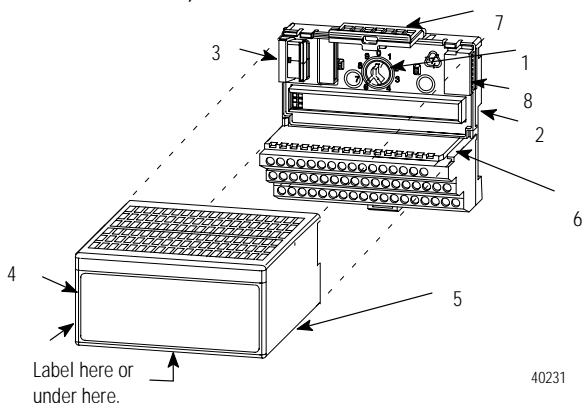




FLEX Ex 24V dc Non-Isolated Source 4 Output Module

(Cat. No. 1797-OB4D)

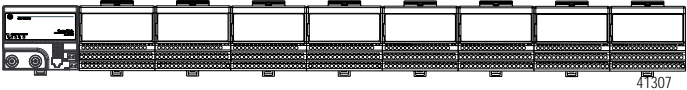


Module Installation

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

1. Rotate keyswitch (1) on terminal base unit (2) clockwise to position 7 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/ adapter. You cannot install the module unless the connector is fully extended.
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.



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.

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 is included in this installation instruction.

Removal and Insertion Under Power

ATTENTION

This module is designed so you can **remove and insert it under power.** However, take special care when removing or inserting this module 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.

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

This product is tested to meet the Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC - Generic Emission Standard, Part 2 - Industrial Environment
- EN 50082-2 EMC - Generic Immunity Standard, Part 2 - Industrial Environment

This product is intended for use in an industrial environment.

Ex Directive

This product is tested to meet the Council Directive 94/9/EC (ATEX 100a) Equipment and Protective systems Intended for Use in Potentially Explosive Atmospheres by applying the following standards:

- EN50014:1992, Electrical Apparatus for Potentially Explosive Atmospheres
- EN50020:1994, Electrical Apparatus for Potentially Explosive Atmospheres - Intrinsic Safety "i"
- prEN50284:1997, Special requirements for construction, test and marking of electrical apparatus of equipment group II, category 1G

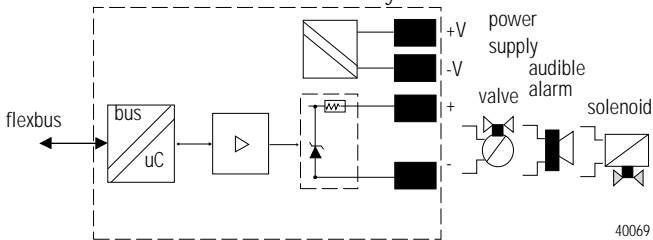
Outputs

Each output can operate a discrete field device.

Do not apply any non-intrinsically safe signals to this module.

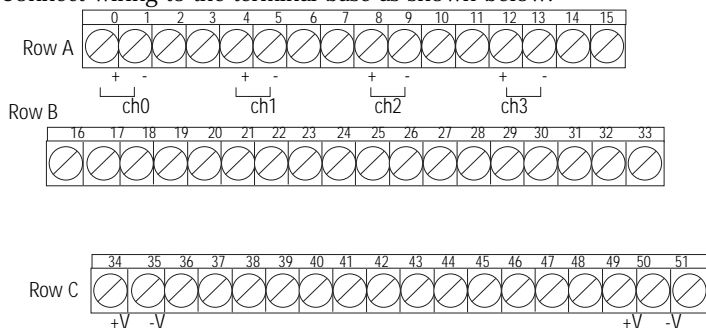
When using an intrinsically safe electrical apparatus according to EN50020, the European Community directives and regulations must be followed.

The channels in this module are electrically connected to each other.



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

Connect wiring to the terminal base as shown below.



No connections allowed to terminals 2, 3, 6, 7, 10, 11, 14, 15, 17 to 32, 36, 37, 38, 39, 46, 47, 48, 49

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1. Connect the individual output wiring to (+) terminals (0, 4, 8, 12) on the 0-15 row (A) as indicated in the table below.
2. Connect the associated output to the corresponding (-) terminal (1, 5, 9, 13) on the 0-15 row (A) for each output 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).

ATTENTION



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.

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

Output	Output +	Output -
Output 0	A-0	A-1
Output 1	A-4	A-5
Output 2	A-8	A-9
Output 3	A-12	A-13
+V	C-34 and C-50	
-V	C-35 and C-51	

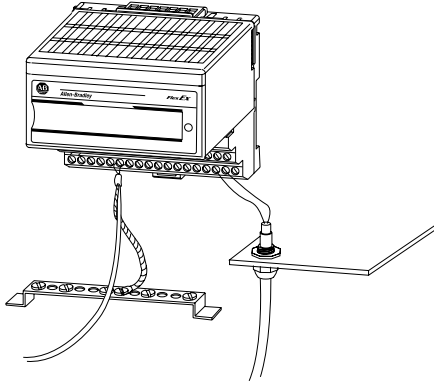
ATTENTION



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.

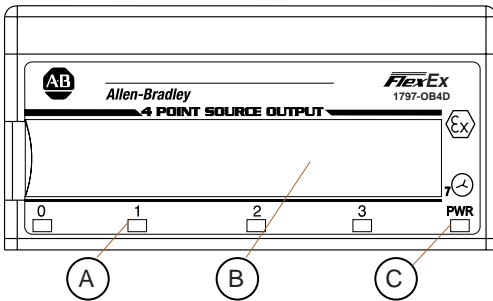
Grounding

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.



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Indicators



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

B = Insertable labels for writing individual input designations

C = Power Indicator - green indicates power applied to module

Memory 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	OVL 3	OVL 2	OVL 1	OVL 0	F3	F2	F1	F0								
Write 0	Out Enb	L			FM 3	FM 2	FM 1	FM 0	FS 3	FS 2	FS 1	FS 0	03	02	01	00
Write 1									FR					Alarm Filter - Ch 0-3		

Where: O = Output
 OVL = Overload alarm for individual channel
 FS = Fault state (0 is reset and 1 is hold last state)
 FM = Detection of output faults (0 is disable and 1 is enable)
 L = Latch alarms (0 is disable and 1 is enable)
 Out Enb = Output Enable
 FR = Fault reset (0 is normal and 1 is reset)
 F = Fault alarm for individual channel

Cooperative Operation of the ControlNet Ex Adapter and FLEX Ex Output Modules

The ControlNet Ex adapter (1797-ACNR15) combined with FLEX Ex output module provides a two-tier fault state mechanism. It is important to consider and understand the operation of this mechanism when designing your system.

Two sets of programmable fault states are available, one each in the adapter and output module. This two-tier method is meant to give you a wider fault coverage compared with normal methods.

Adapter Operation

Network Communication Monitoring

The adapter is the primary monitor of network activity. If it detects loss of network communication, it can be programmed to:

- continue writing the last valid received data to the module (hold last state)
- apply local module safe states¹
- write a programmable fault state value to the module, depending upon the module type²

This mechanism primarily targets fault behavior for loss of network communication.

Program Mode Behavior

The adapter also monitors the state of the controlling processor or scanner. Two states can be detected: run mode and program mode (idle).

When program mode is detected, the adapter can be configured to:

- continue writing the last valid received data to the module (hold last state)
- apply local module safe states to zero¹
- write a programmable fault state value to the module, depending upon the module type²

1 This selection is shown as "Reset Outputs" in RSNetWorx but its action in "Apply Local Module Safe States".

2 This option is only available in some adapters.

FLEX Ex Output Module Operation

Flexbus Communication Monitoring

The module monitors flexbus communication activity and the state of its Output Enable bit. If it detects loss of flexbus communication activity or the Output Enable bit transitioning to 0, it can be programmed to:

- continue writing the last valid received data to the outputs (hold last state)
- reset the outputs
- write the local module fault state value to the output, depending upon the module type

This mechanism primarily targets fault behavior for loss of backplane communication.

Power-Up State Behavior

The system and modules use the Output Enable bit at system power-up. The power-up state of the Output Enable bit is 0 and must be transitioned to 1 through application program control to initialize activity of a module's outputs.




Before the Output Enable bit is transitioned to 1, module outputs remain off. Once the initial power-up and application-program control transitions the Output Enable bit to 1, and module output activity begins, subsequent transitions of the Output Enable bit by any source will cause the output module to apply the local module fault state.

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-OB4D 4 pt Non-Isolated Source Output Module	
Number of Outputs	4, non-isolated, sourcing
IS Output Type	EEx ia IIB/IIC T4, AEx ia IIC T4, Class I, II, III Division 1 & 2 Groups A-G T4
IS Module Type	EEx ib IIB/IIC T4, AEx ib IIC T4, Class I Division 1 & 2 Groups A-D T4
V-I Characteristics	Refer to "Output Voltage/Current Capability" on page 20
Load Range	30-5000 Ω
Fault Detection	Fault bits in data table and LED (per channel) blinking red (1 Hz)
Electronic Protection	Lead break, overload, short circuit
Maximum Output Delay Times OFF to ON ON to OFF	$\leq 1.2\text{ms}$ $\leq 1.2\text{ms}$
Indicators	4 yellow status indicators 4 red fault indicators 1 green module power indicator
Output (Intrinsically Safe) (16 pin Male and Female Flexbus Connector)	$U_i \leq 5.8\text{V dc}$ $I_i \leq 400\text{mA}$ $L_i = \text{Negligible}$ $C_i \leq 1.35\mu\text{F}$
Isolation Path Output to Power Supply Output to Flexbus Power Supply to Flexbus Output to Output	Isolation type Galvanic to DIN EN 50020 Galvanic to DIN EN 50020 Galvanic to DIN EN 50020 None
Power Supply (+V, -V Intrinsically Safe)	$U_i \leq 9.5\text{V dc}$ $I_i \leq 1\text{A}$ $L_i = \text{Negligible}$ $C_i = \text{Negligible}$
Module Field-Side Power Consumption	7.5W
Power Dissipation	5W
Thermal Dissipation	17.07 BTU/hr
Module Location	Cat. No. 1797-IB3 or -IB3S Terminal Base Unit
Conductors Wire Size	12 gauge (4mm ²) stranded maximum 1.2mm (3/64in) insulation maximum
Dimensions	46mm x 94mm x 75mm (1.8in x 3.7in x 2.95in)
Weight	200g (approximate)
Keyswitch Position	7

Specifications - 1797-OB4D Continued

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
UL, C-UL	Class I Division 1 & 2 Groups A-D T4 Class I Zone 1 & 2 AEx ib/[ia] IIC T4
FM	Class I Division 1 Groups A-D T4 Class I Zone 1 AEx ib/[ia] IIC T4
Certificates	
CENELEC	DMT 98 ATEX E 040 X
UL, C-UL	 UL Certificate Number 99.19699
FM	 Class I Division 1 Hazardous FM Certificate Number 3009806 

CE, CENELEC I/O Entity Parameters

Signal output (+ to -) for ch 0 to ch 3 (terminals: 0-1; 4-5; 8-9; 12-13)

	Protection	Group	Allowed Capacitance	Allowed Inductance
1797-OB4D $U_o = 27.4V$ $I_o = 110mA$	EEx ia	IIB	677nF	8mH
		IIC	87nF	2mH
If concentrated capacitance and/or inductance are available, use the following values.	EEx ia	IIB	150nF	5mH
		IIC	30nF	2mH

UL, C-UL I/O Entity Parameters

If this product has the UL/C-UL mark, it has been designed, evaluated, tested, and certified to meet the following standards:

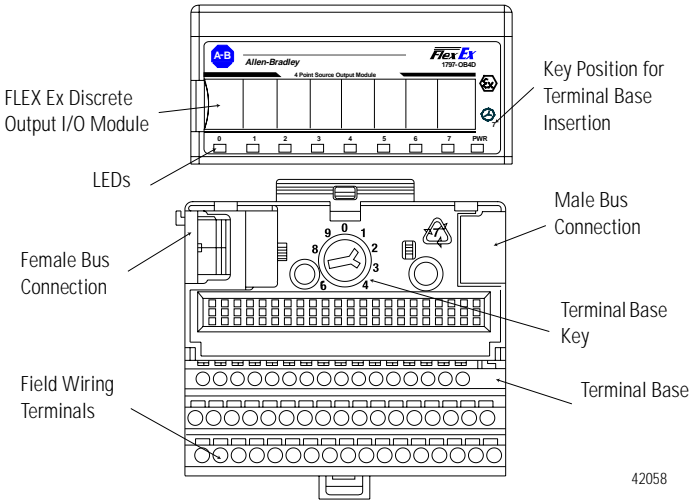
- UL 913, 1988, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations
- UL 1203, Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
- UL 2279, Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations
- UL 508, Industrial Control Equipment
- CSA C22.2 No. 157-92, Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
- CSA C22.2 No. 30-M1986, Explosion-Proof Enclosures for Use in Class I Hazardous Locations
- CSA-E79-0-95, Electrical Apparatus for Explosive Gas Atmospheres, Part 0: General Requirements
- CSA-E79-11-95, Electrical Apparatus for Explosive Gas Atmospheres, Part 11: Intrinsic Safety “i”
- CSA C22.2 No. 14-95, Industrial Control 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) or Canadian Electric Code (CEC).

Table 1

Wiring Method	Channel	Terminals	V _{OC} (V)	I _{SC} (mA)	V _I (V)	I _I (mA)	Groups	C _a (μF)	L _a (mH)
1 and 2	Any one channel e.g. ch0	0(+), 1(-)	27.4	110.0	-	-	A, B, IIC	0.03	2.0
							C, E, IIB	0.09	8.0
							D, F, G, IIA	0.24	16.0

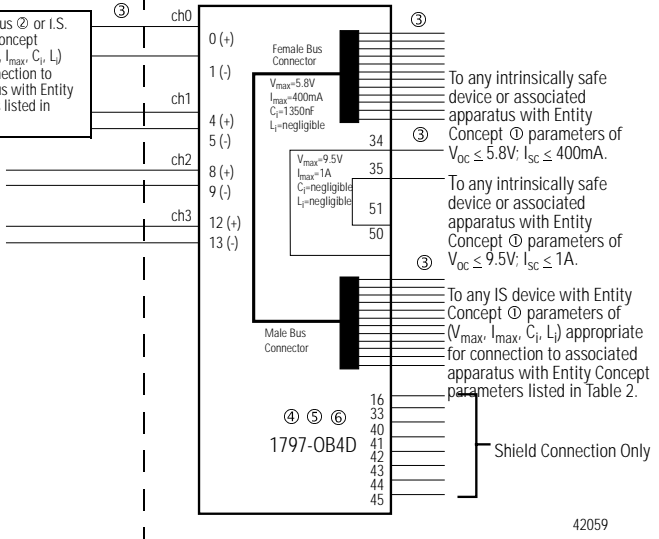


IMPORTANT A terminal base may or may not have an I/O module installed.

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, D

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.



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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_{oc} and I_{sc} or V_t and I_t 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.
- 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-OB4D, must be used with terminal base 1797-TB3 or 1797-TB3S.
- ⑤ Terminals 2, 3, 6, 7, 10, 11, 14, 15, 17-32, 36-39, and 46-49 shall not be connected.
- ⑥ **WARNING:** Substitution of components may impair intrinsic safety.
AVERTISSEMENT: La substitution de composant peut compromettre la securite intrinseque.

FM I/O Entity Parameters

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

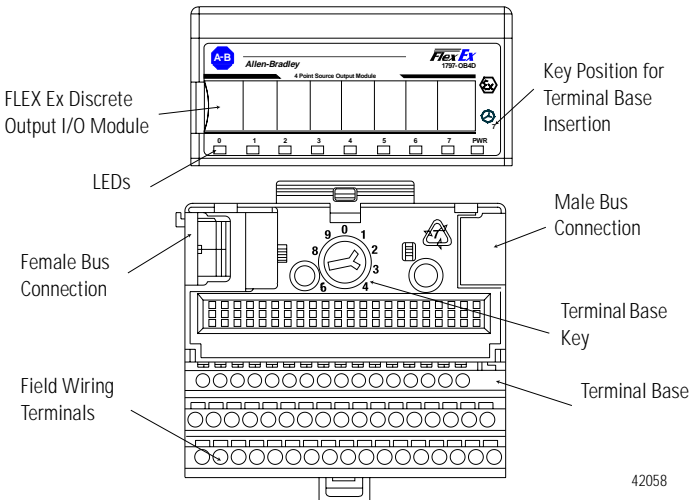
- FM C1. No.3600:1998, Electrical Equipment for Use in Hazardous (Classified) Locations General Requirements
- FM C1. No.3610:1999, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III Division 1 Hazardous (Classified) Locations
- FM C1. No.3615:1989, Explosionproof Electrical 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 (μ F)	L_a (mH)
1 and 2	Any one channel e.g. ch0	0(+), 1(-)	27.4	110.0	-	-	A, B	0.105	3.0
							C, E	0.315	9.0
							D, F, G	0.840	24.0



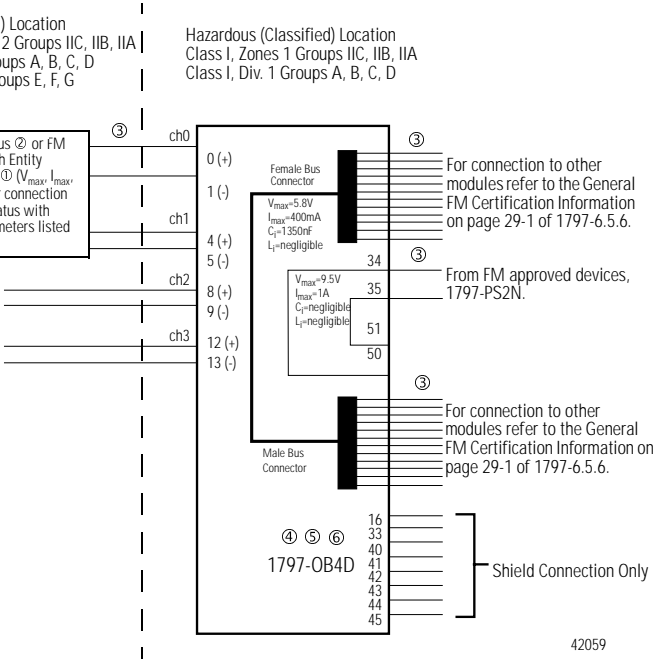
IMPORTANT

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 Groups IIC, IIB, IIA
 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.



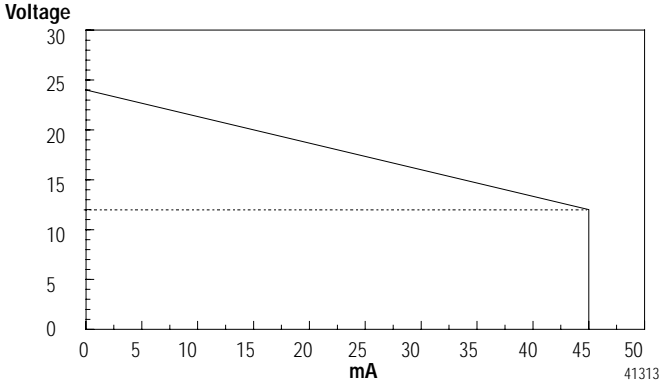
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Table 2

Terminals	V_t (V)	I_t (mA)	Groups	C_a (μF)	L_a (μH)
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_{oc} and I_{sc} or V_t and I_t 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.
- ③ Wiring methods must be in accordance with the National Electric Code, ANSI/NFPA 70, Article 504 and 505. For additional information refer to ANSI/ISA RP12.6.
- ④ This module, 1797-OB4D, must be used with terminal base 1797-TB3 or 1797-TB3S.
- ⑤ Terminals 2, 3, 6, 7, 10, 11, 14, 15, 17-32, 36-39, and 46-49 shall not be connected.
- ⑥ **WARNING:** Substitution of components may impair intrinsic safety.

Output Voltage/Current Capability



IMPORTANT

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

Attention: Avoid electrostatic charge.

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