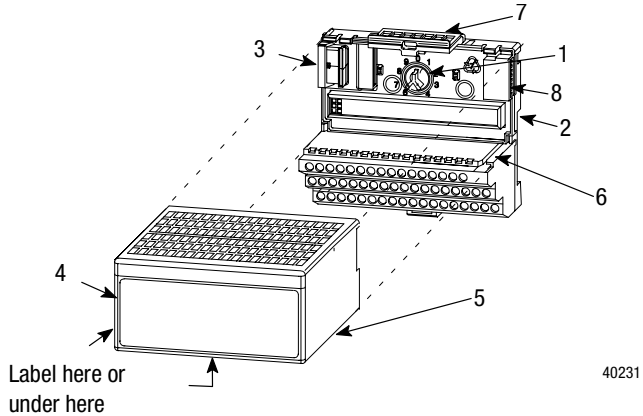




# FLEX Ex 8 Input Analog Module

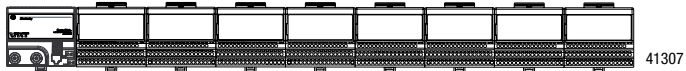
(Cat. No. 1797-IE8)



## 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 3 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.
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.

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

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### 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

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**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.

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### 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/EC 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

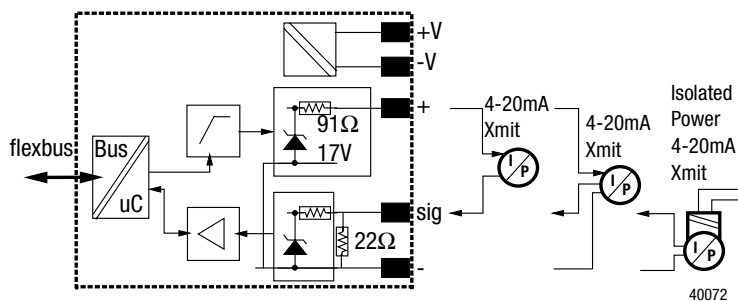
## Inputs

Each input can be operated from an analog field device signal. **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.

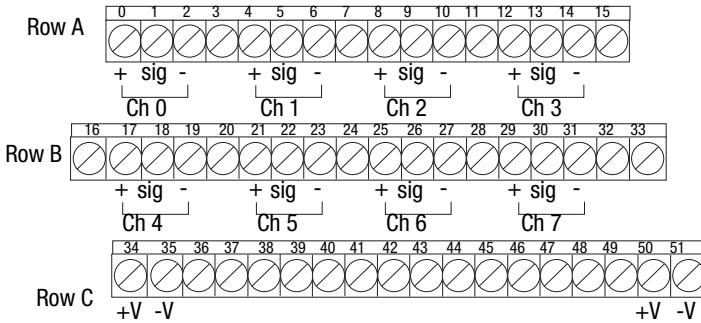
The channels in this module are electrically connected to each other and have a common plus-line.

**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 for two-wire transmitter devices to the terminal base as shown below.



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### For Two-Wire Transmitter Devices

1. Connect the individual input wiring to (+) terminals (0, 4, 8, 12) on the 0-15 row (A) and on the 16-33 row (B) (terminals 17, 21, 25, 29) as indicated in the table below.
2. Connect the associated input to the corresponding (sig) terminal (1, 5, 9, 13) on the 0-15 row (A), and on the 16-33 row (B) (terminals 18, 22, 26, 30) for each input as indicated in the following table.
3. Refer to the illustration on page 3 for other configurations.
4. Connect +V dc power to terminal 34 on the 34-51 row (C).
5. 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.

6. 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.
7. 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 Return | Input   | Input Source | Input Signal | Input Return |
|---------|---------------------|--------------|--------------|---------|--------------|--------------|--------------|
| Input 0 | A-0                 | A-1          | A-2          | Input 4 | B-17         | B-18         | B-19         |
| Input 1 | A-4                 | A-5          | A-6          | Input 5 | B-21         | B-20         | B-23         |
| Input 2 | A-8                 | A-9          | A-10         | Input 6 | B-25         | B-26         | B-27         |
| Input 3 | A-12                | A-13         | A-14         | Input 7 | B-29         | B-30         | B-31         |
| +V      | Terminals 34 and 50 |              |              |         |              |              |              |
| -V      | Terminals 35 and 51 |              |              |         |              |              |              |

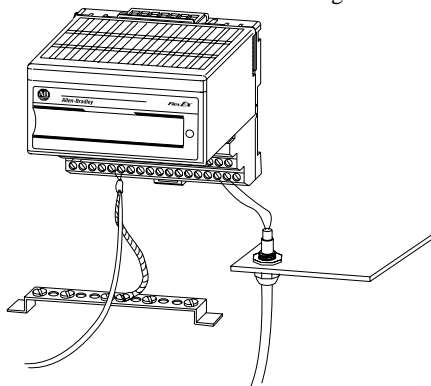
Terminals 16, 33, 40, 41, 42, 43, 44 and 45 are connected to chassis ground.



**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.

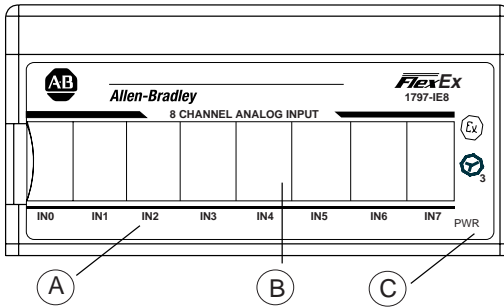
## Grounding

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.



30820-M

## Indicators



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A = Status Indicators - flashing red - channel fault - Channel 0 indicator will turn red while power-up check is running

B = Insertable labels for writing individual input designations

C = Power Indicator - green indicates power applied to module

## Input Map (Read Words)

| Bit⇒   | 15   | 14                      | 13           | 12           | 11           | 10           | 09           | 08                   | 07           | 06           | 05           | 04           | 03                | 02           | 01           | 00           |
|--------|--|-------------------------|--------------|--------------|--------------|--------------|--------------|----------------------|--------------|--------------|--------------|--------------|-------------------|--------------|--------------|--------------|
| Word ↓ | Read   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 0      | Channel 0 Input Data   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 1      | Channel 1 Input Data   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 2      | Channel 2 Input Data   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 3      | Channel 3 Input Data   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 4      | Channel 4 Input Data   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 5      | Channel 5 Input Data   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 6      | Channel 6 Input Data   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 7      | Channel 7 Input Data   |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |
| 8      | Ovr Alm ch 7   | Ovr Alm ch 6            | Ovr Alm ch 5 | Ovr Alm ch 4 | Ovr Alm ch 3 | Ovr Alm ch 2 | Ovr Alm ch 1 | Ovr Alm ch 0         | Und Alm ch 7 | Und Alm ch 6 | Und Alm ch 5 | Und Alm ch 4 | Und Alm ch 3      | Und Alm ch 2 | Und Alm ch 1 | Und Alm ch 0 |
| 9      | Rm Fit ch 7  | Rm Fit ch 6             | Rm Fit ch 5  | Rm Fit ch 4  | Rm Fit ch 3  | Rm Fit ch 2  | Rm Fit ch 1  | Rm Fit ch 0          | Lo Fit ch 7  | Lo Fit ch 6  | Lo Fit ch 5  | Lo Fit ch 4  | Lo Fit ch 3       | Lo Fit ch 2  | Lo Fit ch 1  | Lo Fit ch 0  |
| 10     |  |                         |              |              |              |              |              |                      |              |              |              |              | Diagnostic Status |              |              |              |
| 11     | Res Flg  | Module command response |              |              |              |              |              | Module response data |              |              |              |              |                   |              |              |              |
|        | Where: ch = channel<br>Ovr Alm = Over Alarm<br>Und Alm = Under Alarm<br>Rm Fit = Remote Fault<br>Lo Fit = Local Fault<br>Res Flg = Response Flag |                         |              |              |              |              |              |                      |              |              |              |              |                   |              |              |              |

## Output Map (Write Words)

| Bit⇒   | 15   | 14             | 13                       | 12 | 11 | 10 | 09      | 08                  | 07 | 06 | 05          | 04 | 03 | 02     | 01 | 00 |
|--------|--|----------------|--------------------------|----|----|----|---------|---------------------|----|----|-------------|----|----|--------|----|----|
| Word ↓ | Write  |                |                          |    |    |    |         |                     |    |    |             |    |    |        |    |    |
| 0      |  |                | High and Low Error Level |    |    |    | u/d 0-3 | Filter Cutoff 0-3   |    |    | Data Format |    |    | Fit Md |    |    |
| 1      |  |                | High and Low Error Level |    |    |    | u/d 0-3 | Filter Cutoff 0-3   |    |    | Data Format |    |    | Fit Md |    |    |
| 2      | cd flg   | Module command |                          |    |    |    |         | Module command data |    |    |             |    |    |        |    |    |
|        | Where: u/d = up/down<br>Fit Md = Fault Module<br>Cd Flg = Command Flag |                |                          |    |    |    |         |                     |    |    |             |    |    |        |    |    |

## Fault Mode - Write Words 0 and 1

|        |        |                               |
|--------|--------|-------------------------------|
| Word 0 | Bit 00 | Fault enable for channels 0-3 |
| Word 1 | Bit 00 | Fault enable for channels 4-7 |

Where: 0 = disabled  
1 = enable with wire-off overload

## “Add-On” Filter Selections - Write Words 0 and 1

| Word | Bits |    |    | Description                                 |
|------|------|----|----|---|
| 0    | 07   | 06 | 05 | Channels 0-3                                |
| 1    | 07   | 06 | 05 | Channels 4-7                                |
|      | 0    | 0  | 0  | Hardware filtering only (default filtering) |
|      | 0    | 0  | 1  | 40Hz (25ms)                                 |
|      | 0    | 1  | 0  | 20Hz (50ms)                                 |
|      | 0    | 1  | 1  | 10Hz (100ms)                                |
|      | 1    | 0  | 0  | 4Hz (250ms)                                 |
|      | 1    | 0  | 1  | 2Hz (500ms)                                 |
|      | 1    | 1  | 0  | 1Hz (1s)                                    |
|      | 1    | 1  | 1  | 0.5Hz (2s)                                  |

## Remote Transmitter Error Up/Down - Write Words 0 and 1

|        |        |                      |
|--------|--------|----------------------|
| Word 0 | Bit 08 | Up/down channels 0-3 |
| Word 1 | Bit 08 | Up/down channels 4-7 |

Where: 0 = up  
1 = down



## Data Format - Write Words 0 and 1

|        | Bits |    |    |    | Description   |
|--------|------|----|----|----|---|
| Word 0 | 04   | 03 | 02 | 01 | Data format for channels 0-3                          |
| Word 1 | 04   | 03 | 02 | 01 | Data format for channels 4-7                          |
|        | 0    | 0  | 0  | 0  | 0-22mA, w/error steps (default)                       |
|        | 0    | 0  | 0  | 1  | 0-22mA = 0 to 110%, w/error steps                     |
|        | 0    | 0  | 1  | 0  | 0-22mA = 0 to 104.8%, square root, w/error steps      |
|        | 0    | 0  | 1  | 1  | 0-22mA = 0 to 65,535, unsigned integer, w/error steps |
|        | 0    | 1  | 0  | 0  | 2-22mA, w/error steps                                 |
|        | 0    | 1  | 0  | 1  | 2-22mA = -12.5% to 112.5%, w/error steps              |
|        | 0    | 1  | 1  | 0  | 4-22mA = 0 to 106%, square root, w/error steps        |
|        | 0    | 1  | 1  | 1  | 4-20mA = 0 to 65,535, unsigned integer, w/error steps |
|        | 1    | 0  | 0  | 0  | Not assigned  |
|        | 1    | 0  | 0  | 1  | Not assigned  |
|        | 1    | 0  | 1  | 0  | Not assigned  |
|        | 1    | 0  | 1  | 1  | 0-22mA = A/D count, w/fixed error                     |
|        | 1    | 1  | 0  | 0  | 3.6-21mA = NAMUR NE 43, w/fixed error                 |
|        | 1    | 1  | 0  | 1  | 3-21mA = -6.25 to 106.28% w/fixed error               |
|        | 1    | 1  | 1  | 0  | 2-22mA = -12.5 to 112.5% w/fixed error                |
|        | 1    | 1  | 1  | 1  | Not assigned  |

## Error Level 0.1mA Steps

|                 | Bits |    |    |    |   | Description                               |
|-----------------|------|----|----|----|---|---|
| Word 0          | 13   | 12 | 11 | 10 | 9 | Error level channels 0-3                  |
| Word 1          | 13   | 12 | 11 | 10 | 9 | Error level channels 4-7                  |
|                 | 0    | 0  | 0  | 0  | 0 | Disabled                                  |
|                 |      |    |    |    |   | 0.1mA * binary valve = remote fault alarm |
|                 |      |    |    |    |   | Examples                                  |
| Data Format     | 0    | 0  | 1  | 1  | 1 | Binary value = 7, 0.1mA * 7 = 0.7mA       |
| 2-22mA          |      |    |    |    |   | Remote fault alarm at -4.38% or +104.38%  |
| -12.5 to 112.5% | 0    | 1  | 1  | 1  | 1 | Binary value = 15, 0.1mA * 15 = 1.5mA     |
|                 |      |    |    |    |   | Remote fault alarm at -9.38% or + 109.38% |

## 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-IE8**

|   |   |
|---|---|
| Number of Inputs  | 8 single-ended, non-isolated  |
| IS Input Type   | EEx ia IIB/IIC T4,<br>AEx ia IIC T4,<br>Class I, II, III Division 1 & 2 Groups A-G T4                   |
| IS Module Type  | EEx ib IIB/IIC T4,<br>AEx ib IIC T4,<br>Class I Division 1 & 2 Groups A-D T4                            |
| Resolution  | 16 bits   |
| Transfer Characteristics<br>Accuracy<br>at 20°C (68°F)<br>Temperature Drift                                 | 0.1% of output signal range<br>0.005%/C of output signal range  |
| Functional Data Range   | >15V @22mA<br>>21.5V @ 0mA  |
| Data Format   | Configurable  |
| Step Response to<br>99% of FS   | 4ms   |
| Module from Adapter Best/<br>Worst Update Time  | 50/1450µs   |
| Indicators  | 8 red fault indicators<br>1 green power   |
| Output (Intrinsically Safe)<br>(16 pin male and female<br>flexbus connector)                                | $U_i \leq 5.8V$ dc<br>$I_i \leq 400mA$<br>$L_i =$ Negligible<br>$C_i \leq 1.35\mu F$                    |
| Isolation Path<br>Input to Power Supply<br>Input to Flexbus<br>Input to Input<br>Power Supply to<br>Flexbus | Isolation Type<br>Galvanic to DIN EN50020<br>Galvanic to DIN EN50020<br>None<br>Galvanic to DIN EN50020 |
| Power Supply<br>(+V, -V intrinsically safe)   | $U_i \leq 9.5V$ dc<br>$I_i \leq 1A$<br>$L_i =$ Negligible<br>$C_i =$ Negligible                         |
| Module Field-side Power<br>Consumption  | 7.5W  |
| Power Dissipation   | 5.2W  |
| Thermal Dissipation   | 17.75 BTU/hr  |
| Module Location   | Cat. No. 1797-TB3 or -TB3S  |
| Conductor Wire Size   | 12 gauge (4mm <sup>2</sup> ) stranded maximum<br>3/64in (1.2mm) insulation maximum                      |
| Dimensions  | 46mm x 94mm x 75mm<br>(1.8in x 3.7in x 2.95in)  |
| Weight  | 200g (approximately)  |

**Specification 1797-IE8 (Continued)**

|                           |   |
|---------------------------|---|
| Keyswitch Position        | 3   |
| 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      | II (1) 2G EEx ia/ib IIB/IIC T4<br>Class I Division 1 & 2 Groups A-D T4<br>Class I Zone 1 & 2 AEx ib/[ia] IIC T4 |
| Certificate of Conformity | DMT 98 ATEX E 020 X   |

**CE, CENELEC I/O Entity Parameters**

Measurement input (sig to -) for ch 0 to ch 7 (terminals: 1-2; 5-6; 9-10; 13-14; 18-19; 22-23; 26-27; 30-31)

|  | Protection | Group | Allowed Capacitance | Allowed Inductance |
|--|------------|-------|---------------------|--------------------|
| $U_o = 5V$<br>$I_o = 1mA$<br>$P_o = 1.3mW$<br>$U_i = 28V$<br>$I_i = 93mA$<br>$C_i$ and $L_i$<br>negligible | EEx ia     | IIB   | 1000 $\mu$ F        | 1H                 |
|  |            | IIC   | 100 $\mu$ F         | 1H                 |

Source output (+ to sig) for ch 0 to ch 7  
(terminals: 0-1; 4-5; 8-9; 12-13; 17-18; 21-22; 25-26; 29-30)

|  | Protection | Group | Allowed Capacitance | Allowed Inductance |
|--|------------|-------|---------------------|--------------------|
| $U_o = 23.7V$<br>$I_o = 92.5mA$<br>$P_o = 548mW$                                       | EEx ia     | IIB   | 560nF               | 10mH               |
|  |            | IIC   | 66nF                | 2.5mH              |
| If concentrated capacitance and/or inductance are available, use the following values. | EEx ia     | IIB   | 320nF               | 10mH               |
|  |            | IIC   | 60nF                | 2mH                |

Source output plus measurement input (+ to -) for ch 0 to ch 7 (terminals: 0-2; 4-6; 8-10; 12-14; 17-19; 21-23; 25-27; 29-31)

|  | Protection | Group | Allowed Capacitance | Allowed Inductance |
|--|------------|-------|---------------------|--------------------|
| $U_o = 23.7V$<br>$I_o = 93.5mA$<br>$P_o = 555mW$                                       | EEx ia     | IIB   | 560nF               | 10mH               |
|  |            | IIC   | 66nF                | 2.5mH              |
| If concentrated capacitance and/or inductance are available, use the following values. | EEx ia     | IIB   | 320nF               | 10mH               |
|  |            | IIC   | 60nF                | 2mH                |

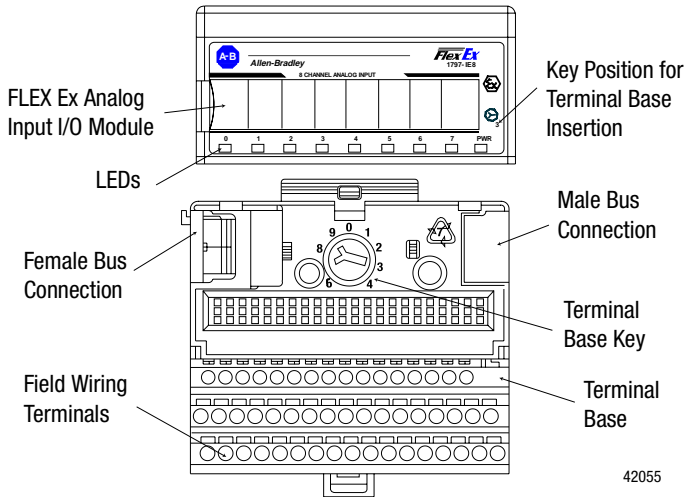
### UL, cUL I/O Entity Parameters

#### 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) | $V_t$ (V) | $I_t$ (mA) | Groups  | $C_a$ ( $\mu F$ ) | $L_a$ (mH) |
|---------------|--------------------------|--------------|--------------|---------------|-----------|------------|---------|-------------------|------------|
| 1 and 2       | Any one channel e.g. ch0 | 0(+), 1(sig) | 23.7         | 92.5          | -         | -          | A, B    | 0.06              | 2.0        |
|               |                          |              |              |               |           |            | C, E    | 0.18              | 8.0        |
|               |                          |              |              |               |           |            | D, F, G | 0.48              | 16.0       |
|               |                          | 1(sig), 2(-) |              |               |           |            | A, B    | 100               | 1000       |
|               |                          |              |              |               |           |            | C, E    | 300               | 1000       |
|               |                          |              |              |               |           |            | D, F, G | 800               | 1000       |
|               | 0(+), 1(sig), 2(-)       | -            | -            | 23.7          | 93.5      | A, B       | 0.08    | 2.0               |            |
|               |                          |              |              |               |           | C, E       | 0.24    | 8.0               |            |
|               |                          |              |              |               |           | D, F, G    | 0.64    | 16.0              |            |

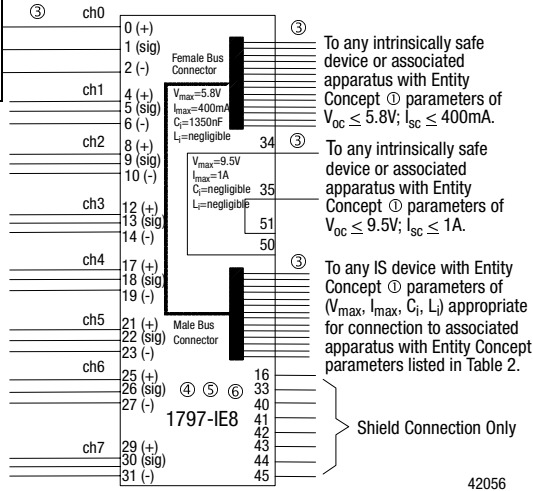


**Important:** A terminal base may or may not have an I/O module installed.

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          | $V_i$ (V) | $I_i$ (mA) | Groups | $C_a$ ( $\mu F$ ) | $L_a$ ( $\mu H$ ) |
|--------------------|-----------|------------|--------|-------------------|-------------------|
| 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 $\mu$ 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-IE8, must be used with terminal base 1797-TB3 or 1797-TB3S.

⑤ Terminals 3, 7, 11, 15, 20, 24, 28, 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.

**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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