



## *Installation Instructions*

# FLEX Ex 8 Output and HART Analog Modules

(Cat. No. 1797-OE8, -OE8H)

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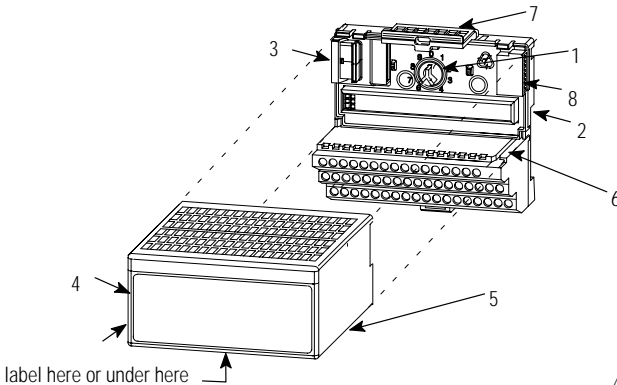
Throughout this manual we use notes to make you aware of safety considerations.

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### Important User Information

<b>WARNING</b> 	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.
<b>IMPORTANT</b>	Identifies information that is critical for successful application and understanding of the product.
<b>ATTENTION</b> 	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"><li>• identify a hazard</li><li>• avoid a hazard</li><li>• recognize the consequence</li></ul>
<b>SHOCK HAZARD</b> 	Labels may be located on or inside the drive to alert people that dangerous voltage may be present.
<b>BURN HAZARD</b> 	Labels may be located on or inside the drive to alert people that surfaces may be dangerous temperatures.



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## Module Installation

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

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**ATTENTION**

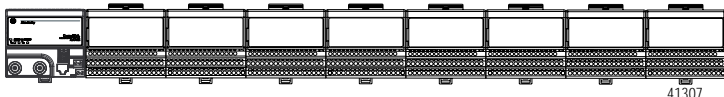
This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

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.

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1. Rotate keyswitch (1) on terminal base unit (2) clockwise to position 4 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

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

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**WARNING**

These modules cannot be used in an intrinsically safe environment after they have been exposed to non-intrinsically safe signals.

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### 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  
Konigsberger Allee 85-87, D-68307  
Mannheim, Germany  
Attn: PA Sales Dept.  
Kirsten Becker  
Telephone +49 776 1298  
[www.pepperl-fuchs.com](http://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)  
Ⓔ II 3D IP54 T 70°C  
CE  
Serial (manufacturing) number  
Model

## Electrostatic Charge

Protect the system against electrostatic charge. Post a sign near these modules: **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 terminal base 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.

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### European Communities (EC) Directive Compliance

If these products have the CE mark they are approved for installation within the European Union and EEA regions. They have 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:

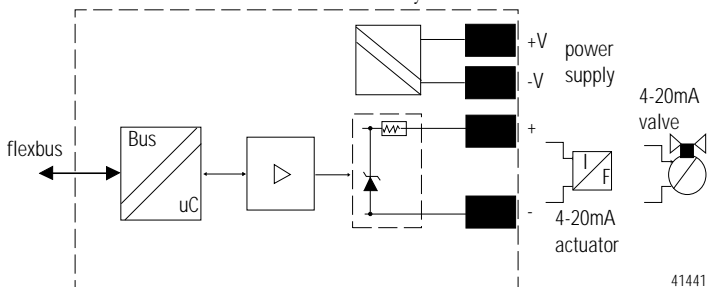
- EN50014:1997 + A1-A2, Electrical Apparatus for Potentially Explosive Atmospheres
- EN50020:1994, Electrical Apparatus for Potentially Explosive Atmospheres - Intrinsic Safety “i”
- EN50284:1999, Special Requirements for Construction, Test, and Marking of Electrical Apparatus of Equipment Group II,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

## Outputs

Each output channel can operate an analog field device. **Do not apply any non-intrinsically safe signals to these modules.**

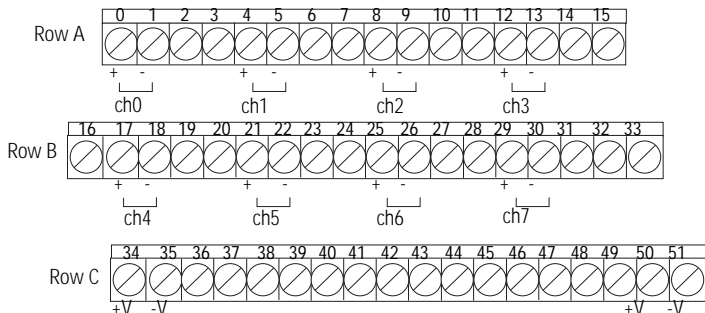
When using an intrinsically safe electrical apparatus according to EN50020, the European Community directives and regulations must be followed.

The channels in these modules 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, 19, 20, 23, 24, 27, 28, 31, 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) and on the 16-33 row (B) (terminals 17, 21, 25, 29) 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), and on the 16-33 row (B) (terminals 18, 22, 26, 30) for each output as indicated in the following table.
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).

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**WARNING**

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

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.

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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	Output +	Output -
Output 0	A-0	A-1	Output 4	B-17	B-18
Output 1	A-4	A-5	Output 5	B-21	B-22
Output 2	A-8	A-9	Output 6	B-25	B-26
Output 3	A-12	A-13	Output 7	B-29	B-30
+V	Terminals 34 and 50				
-V	Terminals 35 and 51				

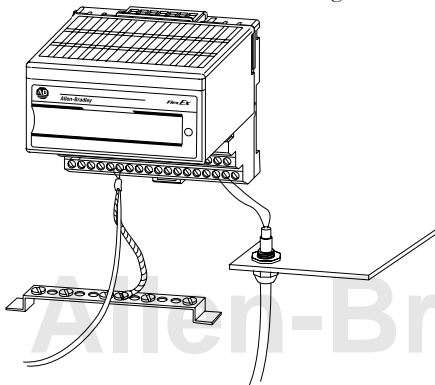
### ATTENTION



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.

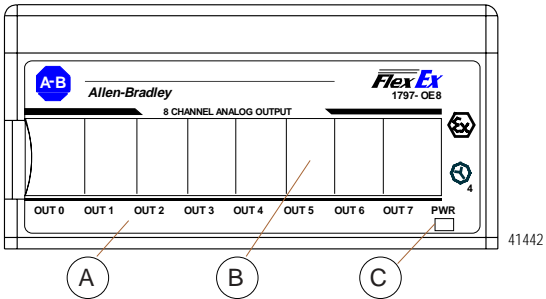
## Grounding

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



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 the module

## Input Map (Read Words)

Bit⇒	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
<b>Word</b> ↓																
<b>0</b>	Flt Alm ch7	Flt Alm ch6	Flt Alm ch5	Flt Alm ch4	Flt Alm ch3	Flt Alm ch2	Flt Alm ch1	Flt Alm ch0	Diagnostic Status							
<b>1</b>	Res Flg	MODULE Command Response							MODULE Response Data							

Where:ch = channel

Flt Alm = Fault Alarm

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	
<b>Word</b> ↓																	
<b>0</b>	Out Enb	Glbl Rst	RESERVED					Dig Out ch7	Dig Out ch6	Dig Out ch5	Dig Out ch4	Dig Out ch3	Dig Out ch2	Dig Out ch1	Dig Out ch0		
<b>1</b>	Channel 0 Output Data																
<b>2</b>	Channel 1 Output Data																
<b>3</b>	Channel 2 Output Data																
<b>4</b>	Channel 3 Output Data																
<b>5</b>	Channel 4 Output Data																
<b>6</b>	Channel 5 Output Data																
<b>7</b>	Channel 6 Output Data																
<b>8</b>	Channel 7 Output Data																
<b>9</b>	Lo Flt Md		Flt Md ch 2-3	Flt Md ch 0-1	Alg Flt Ste ch2-3	Alg Flt Ste ch0-1	Data Format ch2-3					Data Format ch0-1					
<b>10</b>	Lth Md 4-7	Lth Md 0-3	Flt Md ch 6-7	Flt Md ch 4-5	Alg Flt Ste ch6-7	Alg Flt Ste ch4-5	Data Format ch6-7					Data Format ch4-5					
<b>11</b>	Dig Flt Ste ch7	Dig Flt Ste ch6	Dig Flt Ste ch5	Dig Flt Ste ch4	Dig Flt Ste ch3	Dig Flt Ste ch2	Dig Flt Ste ch1	Dig Flt Ste ch0	Alg Dig Md ch7	Alg Dig Md ch6	Alg Dig Md ch5	Alg Dig Md ch4	Alg Dig Md ch3	Alg Dig Md ch2	Alg Dig Md ch1	Alg Dig Md ch0	
<b>12</b>	Cd Flg	MODULE Command						MODULE Command Data									

Where:ch = channel

Dig Out = Digital Output

Lo Flt Md = Local Fault Mode

Flt Md = Fault Mode

Alg Flt Ste = Analog Fault State

Lth Md = Latch Mode

Dig Flt Ste = Digital Fault State

Alg Dig Md = Analog/Digital Mode

Out Enb = Output Enable

Glbl Rst = Global Reset

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## Data Format Control

Data Format				Range	Resolution	Full Range	Interpretation	Data Table Value	Count per mA
0	0	0	0	0-20mA	0.1% of 0-20mA	0-22mA	0-22mA	0-22000	1000
0	0	0	1	0-20mA	0.2% of 0-20mA	0-22mA	0-110%	0-11000	500
0	0	1	0	0-20mA		0-20mA	not assigned		
0	0	1	1	0-20mA	0.03% of 0-20mA	0-20mA	unsigned integer	0-65,535	3276
0	1	0	0	4-20mA	0.1% of 4-20mA	2-22mA	2-22mA	2000-22000	1000
0	1	0	1	4-20mA		4-20mA	not assigned		
0	1	1	0	4-20mA		4-20mA	not assigned		
0	1	1	1	4-20mA	0.03% of 4-20mA	4-20mA	unsigned integer	0-65,535	4095
1	0	0	0	0-20mA		0-20mA	not assigned		
1	0	0	1	0-20mA		0-20mA	not assigned		
1	0	1	0	0-20mA		0-20mA	not assigned		
1	0	1	1	0-20mA	0.28% of 0-20mA	0-22mA	D/A count	0-8000	363
1	1	0	0	4-20mA			not assigned		
1	1	0	1	4-20mA	0.16% of 4-20mA	3-21mA	-6.25 to +106.25%	-625 to +10625	625
1	1	1	0	4-20mA	0.16% of 4-20mA	2-22mA	-12.5 to +112.5%	-1250 to +11250	625
1	1	1	1	4-20mA		4-20mA	not assigned		




## Repair

These modules are not field repairable. Any attempt to open the modules will void the warranty and IS certification. If repair is necessary, return the module to the factory.

<b>Specifications - 1797-OE8 and -OE8H</b>	
Number of Outputs	8 single-ended, non-isolated
IS Output Type	EEx ia IIB/IIC T4, AEx ia IIC T4, Class I, II, III Division 1 Groups A-G T4
IS Module Type	EEx ib IIB/IIC T4, AEx ib IIC T4, Class I Division 1 Groups A-D T4
Resolution	13 bit
Transfer Characteristics	
Accuracy at 20°C (68°F)	0.1% of output signal range
Temperature Drift	0.010%/C of output signal range
Load Range	
Current	0-22mA
Voltage Available at 22mA Load	>11V 0-500Ω @ 22mA
Data Format	Configurable
Step Response to 99% of FS	4ms
Indicators	8 red fault indicators 1 green power
Output (Intrinsically Safe) (16 pin male and female flexbus connector)	$U_i \leq 5.8V$ dc $I_i \leq 400mA$ $L_i =$ Negligible $C_i = \leq 1.35\mu F$
Isolation Path	Isolation Type
Output to Power Supply	Galvanic to DIN EN50020
Output to Flexbus	Galvanic to DIN EN50020
Output to Output	None
Power Supply to Flexbus	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	6.3W
Power Dissipation	5.4W
Thermal Dissipation	18.4 BTU/hr
Module Location	Cat. No. 1797-TB3 or -TB3S Terminal Base Unit

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### Specifications - 1797-OE8 and -OE8H (Continued)

Conductors Wire Size	12 gauge (4mm <sup>2</sup> ) stranded maximum 1.2mm (3/64in) insulation maximum
Dimensions	46 x 94 x 75mm (1.8 x 3.7 x 2.95in)
Weight	200g (approximately)
Keyswitch Position	4
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
Non-Operating	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)
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 00 ATEX E 042 X 
UL, C-UL	UL Certificate Number 99.19699 c  US Class I Division 1 Hazardous
FM	FM Certificate Number 3009806 

## Field Descriptions

Analog/Digital Output Mode	<p>Selects if the channel acts as a normal analog output or as a switched digital output.</p> <p>Analog Output Mode will follow the Analog Data Format selected.</p> <p>Digital Output Mode will output 0mA = OFF, 22mA = ON if the Fault Mode is 0 = disable. Digital Output Mode will output 2mA = OFF, 22mA = ON if the Fault Mode is 1 = wire off fault detection enabled.</p> <p>Range: 0 = normal analog output, 1 = switched digital output.</p>
Analog Output Data	<p>Specifies the value of the analog output data to the module. Specific format is controlled by Module Data Format Control parameter. This data is used when the channel is in analog output mode.</p>
Digital Output Data	<p>Specifies the value of the digital output data to the module. This data is used when the channel is in digital output mode.</p> <p>Range: 0 = output, 0mA = OFF, 1 = 22mA = ON if the Fault Mode is 0 = disable. 0 = output, 2mA = OFF, 1 = 22mA = ON if the Fault Mode is 1 = wire off fault detection enabled.</p>
Global Reset	<p>This bit acts to reset all outputs to accept normal system output data. It acts in conjunction with the Latch Retry parameter. If any channel faults occur, the Latch Retry parameter can be set to cause the fault to be latched and the output to go to its safe state value.</p> <p>This is an edge triggered signal. It must first be set to the "1" state, reset will then occur on the "1" to "0" transition.</p>

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Output Enable	<p>Signals module that communications has been interrupted to the network. Output modules should execute their fault routine or go to safe state.</p> <p>On power-up, the module remains OFF, 0mA out.</p> <p>After normal power-up, this bit must be set to a "1" by user program to begin normal module functioning. If the bit is reset to "0" by a communication fault, the module should use the information contained in the Module Safe State data until the value is set to "1", when normal function continues.</p>
Analog Fault State	<p>Determines how module reacts to faults when channel is used in analog normal mode.</p> <p>Range: 0 = go to minimum value of data range, 1 = go to maximum value of data range, 2 = hold last state, 3 = 50% of data range.</p>
Digital Fault State	<p>Determines how module reacts to faults when channel is used in digital mode.</p> <p>Range: 0 = reset, 1 = hold last state.</p>
Fault Mode	<p>Selects whether the channel pair fault detection is enabled or disabled. There is a 100Hz (10ms) filter for wire-off/lead-break detection.</p> <p>Range: 0 = disable, 1 = wire-off fault detection enabled.</p>



Latch Retry Mode	<p>Latch Retry determines channel operation under wire-off fault conditions. These bits control the action of two channel groups - channels 0-3 and/or channels 4-7. When a channel fault occurs, the channel fault alarm will be set (if enabled) and the safe state mode will be enabled. If retry is selected, the channel will periodically try to reestablish proper output. If latch is selected, the fault will be latched until a Global Reset is issued.</p> <p>Range: 0 = retry, 1 = latch.</p>
Local Fault Mode	<p>This parameter determines how the Module Safe State will be used for bus communication and internal module faults. This parameter sets this characteristic for the module.</p> <p>Range: 0 = fault states activated by bus communication faults, 1 = fault states activated by any failure (bus communications, etc.).</p>

## 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.

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## Adapter Operation

### *Network Communication Monitoring*

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

- continue writing the last valid received data to the module (hold last state)
- apply local module safe states<sup>1</sup>
- write a programmable fault state value to the module, depending upon the module type<sup>2</sup>

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 zero<sup>1</sup>
- write a programmable fault state value to the module, depending upon the module type<sup>2</sup>

1 This selection could be shown as "Reset Outputs" but its action is "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.

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## CE, CENELEC I/O Entity Parameters

Signal output (+ to -) 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
$U_0 = 21V$ $I_0 = 100mA$ $P_0 = 520mW$	EEx ia	IIB	1.27 $\mu$ F	8mH
		IIC	188nF	2mH
If concentrated capacitance and/or inductance are available, use the following values.	EEx ia	IIB	295nF	10mH
		IIC	70nF	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

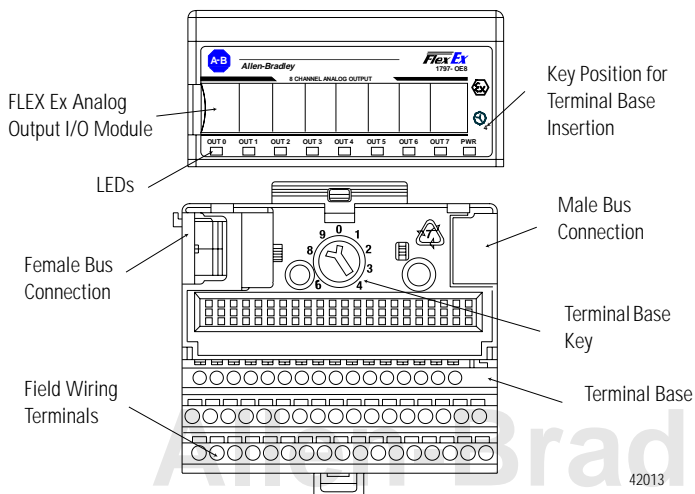
- CSA-E79-11-95, Electrical Apparatus for Explosive Gas Atmospheres, Part 11: Intrinsic Safety “i”
- CSA C22.2 No. 14-95, Industrial Control Equipment

### 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)	$V_l$ (V)	$I_l$ (mA)	Groups	$C_a$ ( $\mu$ F)	$L_a$ (mH)
1 and 2	Any one channel e.g. ch0	0(+), 1(-)	21.0	100.0	-	-	A, B, IIC	0.08	2.0
							C, E, IIB	0.24	8.0
							D, F, G, IIA	0.64	16.0



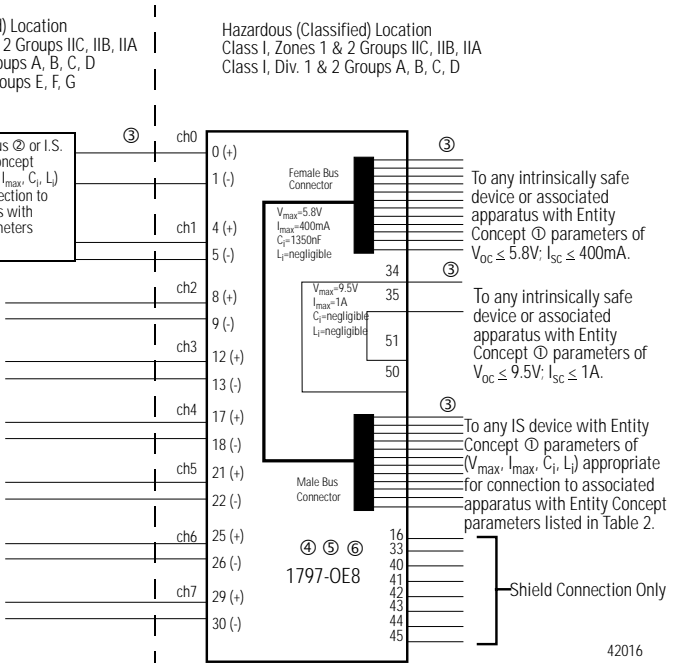
**IMPORTANT**

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	$V_t$ (V)	$I_t$ (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-OE8, must be used with terminal base 1797-TB3 or 1797-TB3S.
- ⑤ Terminals 2, 3, 6, 7, 10, 11, 14, 15, 19, 20, 23, 24, 27, 28, 31, 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.

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## 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

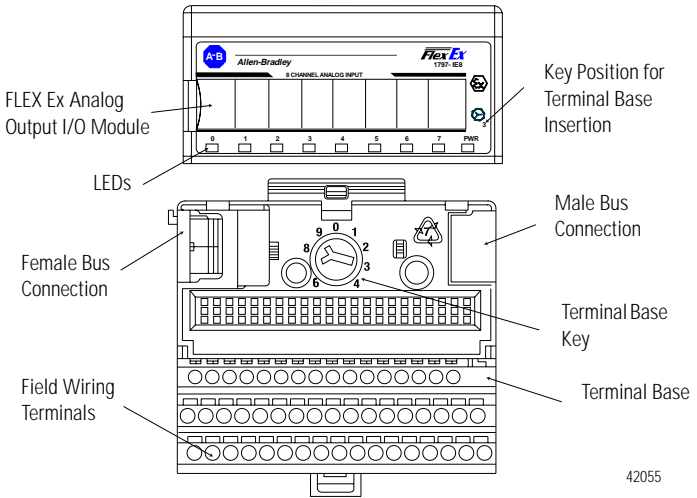
### Wiring Methods

- 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	$C_a$ ( $\mu$ F)	$L_a$ (mH)
1 and 2	Any one channel e.g. ch0	0(+), 1(sig)	21.0	100.0	-	-	A, B	0.20	3.5
							C, E	0.60	10.5
							D, F, G	1.60	28.0





**IMPORTANT**

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

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Hazardous (Classified) Location  
 Class I, Zones 0 Groups IIC, IIB, IIA  
 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, Zones 1 Groups IIC  
 Class I, Div. 1 Groups A, B, C, D

Any Simple Apparatus ② or FM approved device with Entity Concept parameters ③ ( $V_{max}$ ,  $I_{max}$ ,  $C_i$ ,  $L_i$ ) appropriate for connection to associated apparatus with Entity Concept parameters listed in Table 1.

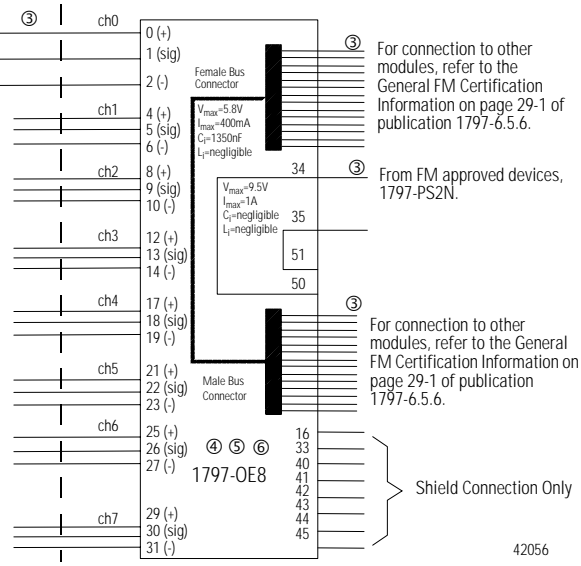


Table 2

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  $V_i$  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 $\mu$ 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-OE8, must be used with terminal base 1797-TB3 or 1797-TB3S.
- ⑤ Terminals 2, 3, 6, 7, 10, 11, 14, 15, 19, 20, 23, 24, 27, 28, 31, 32, 36-39, and 46-49 shall not be connected.
- ⑥ **WARNING:** Substitution of components may impair intrinsic safety.

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**IMPORTANT**

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

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**Attention: Avoid electrostatic charge.**

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## Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

## Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

## New Product Satisfaction Return

Rockwell tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

[www.rockwellautomation.com](http://www.rockwellautomation.com)

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