Installation Instructions

FLEX Ex I/O 24V DC 4 Non-Isolated Source Output Module

Catalog Number 1797-OB4D

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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.literature.rockwellautomation.com) 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.

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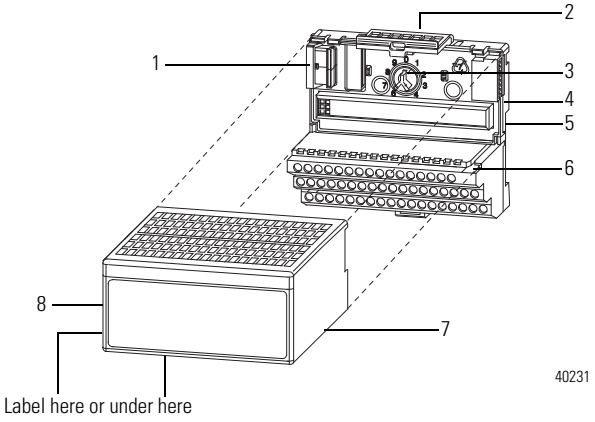
Throughout this manual we use notes to make you aware of safety considerations.

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 identify a hazard, avoid a hazard, and recognize the consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.

Module Installation



Component identification			
1	FlexBus connector	5	Terminal base unit
2	Latching mechanism	6	Alignment groove
3	Keyswitch	7	Alignment bar
4	Cap plug	8	Module

Install the Module

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.

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

1. Rotate keyswitch (3) on terminal base unit (5) 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 (1) is pushed all the way to the left to connect with the neighboring terminal base/adapter.

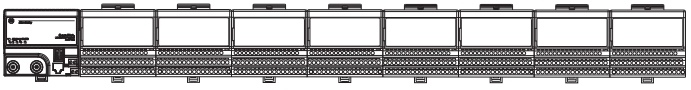
   You cannot install the module unless the connector is fully extended.

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 (8) with its alignment bar (7) 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 (2) 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.



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7. Remove the cap plug (4) 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 and must have a suitable metal enclosure. It has a protection factor of IP20.

WARNING

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

Installation on 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
Lilienthalstrasse 200
68307 Mannheim, Germany
Attn: PA Sales Dept.
Kirsten Becker
Telephone +49 776 1298
www.pepperl-fuchs.com

The IS-RPI cabinets (type IVK2-ISRPI-V8LC, IVK2-ISRPI-V8HYW, or IVK2-ISPRI-V16LC) ensures the basic protection for the intrinsically safe apparatus of the FLEX Ex 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
68307 Mannheim
IVK2-ISRPI-V8LC (or IVK2-ISRPI-V8HYW or
IVK2-ISRPI-V16LC)
II 3 D Ex tD A22 IP54 T70 °C X
CE
Serial (manufacturing) number
Model

Electrostatic Charge

Protect the system against electrostatic charge. Post a sign near this module:

WARNING Avoid electrostatic charging.

ADVERTÊNCIA! PREVENIR CONTRA O ACÚMULO DE CARGA ELETROSTÁTICA.

For your convenience, a sign that can be cut out 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.

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 2014/30/EU by applying the following standards:

- EN 61000-6-4:2007, Electromagnetic Compatibility (EMC) - Part 6-4: Generic Standard for Industrial Environments (Class A)
- EN 61000-6-2:2005, Electromagnetic Compatibility (EMC) - Part 6-2: Generic Standards - Immunity for Industrial Environments
- EN 61326-1:2013 (Industrial), Electrical Equipment For Measurement, Control, and Laboratory Use - Industrial EMC Requirements

European Hazardous Location Approval

The following applies to products marked CE Ex II (1)2 G and CE Ex II (1) D

- Are Equipment Group II, Equipment Category (1)2, and comply with the Essential Health and Safety Requirements relating to the design and construction of such equipment given in Annex II to Directive 2014/34/EU. See the EC Declaration of Conformity at http://www.rockwellautomation.com/products/certification for details.
- The type of protection is "Ex ib[ia] IIC T4" and "[Ex iaD]" according to EN 60079-11.
- Comply to Standards EN 60079-0:2006, EN 60079-11:2007, EN 60079-26:2004, EN 61241-0:2006, and EN 61241-11:2006, reference certificate number DMT 02 ATEX E 040 X.
- Are intended for use in areas in which explosive atmospheres caused by gases, vapors, mists, or air are likely to occur occasionally. Such locations correspond to Zone 1 or 2 classification according to ATEX directive 2014/34/EU.

IEC Hazardous Location Approval

The following applies to products with the IECEx certification:

- Are intended for use in areas in which explosive atmospheres caused by gases, vapors, mists, or air are likely to occur only infrequently and for short periods. Such locations correspond to Zone 1 or 2 classification to IEC 60079-0.
- The type of protection is "Ex ib[ia] IIC T4" and "[Ex iaD]" according to IEC 60079-11.
- Comply to Standards IEC 60079-0:2004, IEC 60079-11:2006, IEC 60079-26:2004, IEC 61241-0:2004, and IEC 61241-11:2005, reference IECEx certificate number IECEx BVS 09.0024X.

Special Conditions for Safe Use:

The intrinsically safe circuits (ch0 to ch4) may extend into areas with combustible dust. However it shall be ensured that the apparatus, connected to these intrinsically safe circuits, meet the requirements for category 1D respectively 2D and are marked accordingly.

All the other intrinsically safe circuits may also extend into areas with combustible dust. However it shall be ensured that the apparatus, connected to these intrinsically safe circuits, meet the requirements for category 2D and are marked accordingly.

The module may only be used with the terminal base type 1797-TB3/* or type 1797-TB3S/* (DMT 98 ATEX E012U)

A warning label shall be installed in immediate proximity of these apparatus: **ATTENTION! Avoid electrostatic charging**.

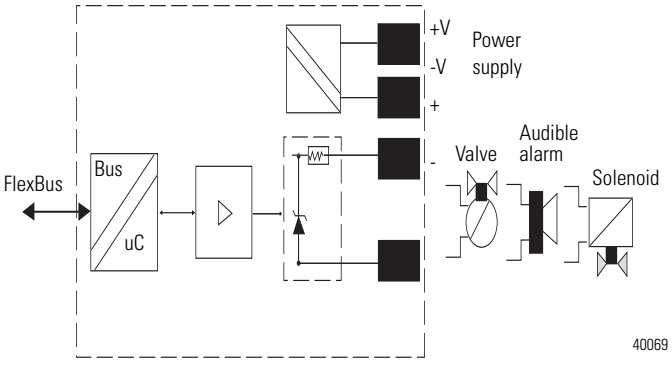
Outputs

Each output can operate a digital field device.

Do not apply any nonintrinsically safe signals to this module.

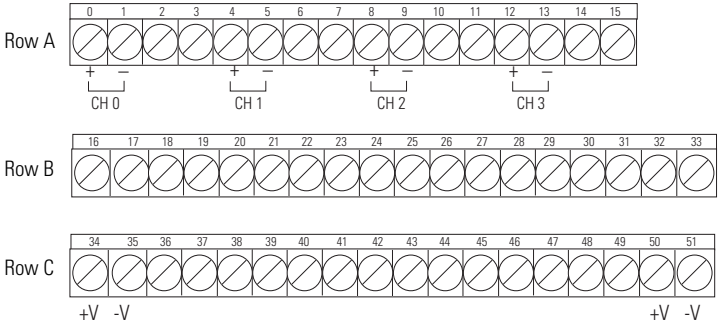
When using an intrinsically safe electrical apparatus according to EN50020, the European Community directives and regulations must be followed.

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



Wire to a 1797-TB3 or 1797-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)**.

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.

Module Wire Connections

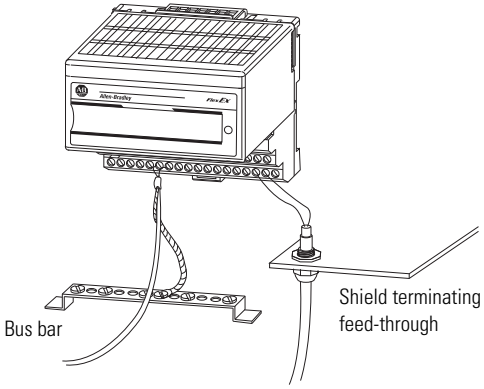
Output	Output +	Output -
Output 0	A-0	A-1
Output 1	A-4	A-5
Output 2	A-8	A-9
Output 3	A-12	A-13
+V	Terminals C-34 and C-50	
-V	Terminals C-35 and C-51	

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 or unintended operation of your system, or both.

Ground the Module

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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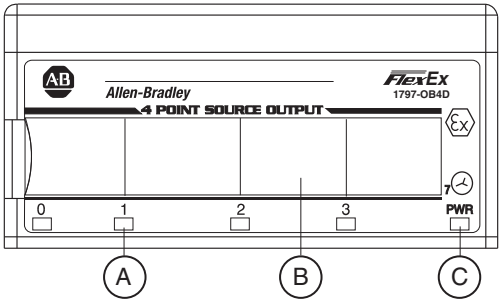
Indicators



A = Status indicators
B = Insertable labels for writing individual input designations
C = Power indicator (green indicates power applied to the module)

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Status Indicators

Indicator	Status Description
Yellow	Individual input present
Flashing red	Channel fault
Solid red	Module did not pass power up check
	Channel 0 is solid red while power-up check is running

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			DA 3	DA 2	DA 1	DA 0	FS 3	FS 2	FS 1	FS 0	D3	D2	D1	D0
Configuration 1								RA						Alarm Filter Ch 0…3		

Where:
OVL = Overload alarm for individual channel
F = Fault alarm for individual channel
DA = Detect Alarms, Detection of Output faults (0 = Disable, 1 = Enable)
FS = Fault state (0 is reset and 1 is hold last state)
D = Data, Output data 0 = Off 1 = On
L = Latch alarms (0 = Disable, 1 = Enable)
Out Enb = Output Enable
RA = Reset Alarms (0 = Normal, 1 = Reset)

Field Descriptions

Field	Description
Fault Alarm	0 = No fault 1 = Wire-off fault or overload 100 Hz (10 ms) filter is integrated **Note**: A wire-off fault or overload can be detected using this single bit.

Field Descriptions

Overload Alarm	0 = No fault 1 = Output channel overloaded (Load resistance range 30…5000 Ω) 100 Hz (10 ms) filter is integrated
Data	Output data 0 = Off 1 = On Default = 0
Fault State	0 = Output goes to 0 during fault 1 = Hold last state Default = 0
Detect Alarms	These bits can be used to activate/deactivate wire-off detection and overload monitoring of the outputs for each channel. 0 = Wire-off detection/overload monitoring deactivated 1 = Wire-off detection/overload monitoring activated **Note**: Leakage current will be present when output is at 0 state if Wire Off detection is activated. The normal load range is defined as 30 Ω…5 kΩ. In this range, no faults will occur. Wire off is assured to be reported for loads > 75 kΩ. It does not matter if the output is OFF or ON.
Latch Alarms	This bit defines for all channels, whether, in the event of a wire off or overload fault, the corresponding fault bit (Overload Alarm, Fault Alarm) remains set until the Reset Alarms bit in the configuration data word is reset by the user. This ensures that a fault message is sent to the control system in the event of a fault that is short in duration. The alarms should be latched if the Latch Alarms bit is 1 and the outputs go to 0 state until the Reset Alarm occurs. 0 = Alarms and outputs are automatically reset 1 = Alarms and outputs are blocked and must be reset by setting the bit Reset Alarms through the user program. Default = 0
Outputs Enable	0 = Outputs disabled 1 = Outputs enabled Default = 0 This bit must be set to 1 by the program for normal operation of the outputs. When set to 0 the outputs will follow the Fault State status.

Field Descriptions

<table>
<tr><td>Alarm Filter</td><td>These 3 bits are used to set the time constant of the fault/overload alarm filter for channels 0…3.

Default = 0

<table><tr><th>Value Binary</th><th>Time constant</th></tr><tr><td>000</td><td>0.25 ms (Hardware)</td></tr><tr><td>001</td><td>0.5 ms</td></tr><tr><td>010</td><td>1 ms</td></tr><tr><td>011</td><td>2 ms</td></tr><tr><td>100</td><td>4 ms</td></tr><tr><td>101</td><td>8 ms</td></tr><tr><td>110</td><td>16 ms</td></tr><tr><td>111</td><td>32 ms</td></tr></table></td></tr>
<tr><td>Reset Alarms</td><td>With this bit, wire off/overload faults are reset and the latch condition of the outputs cancelled. See Latch Alarms (LA). To reset the wire off/overload faults set the RA bit to 1 and back to 0. The reset will not occur until a 0 > 1 > 0 transition occurs.

RSLogix 5000 Software Tip: The Reset Alarms bit is found in the Module Configuration word. Program a Module Reconfigure typed MSG to set and then clear the RA bit.

0 = Normal
1 = Reset
Default: 0</td></tr>
</table>

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

General

Attribute	Value
Number of outputs	4, nonisolated, sourcing
IS output type	Ex ia IIB/IIC T4, AEx ia IIC T4, Class I, II, III Division 1 Groups A, B, C, D, E, F, G T4
IS module type	Ex ib IIB/IIC T4, AEx ib IIC T4, Class I Division 1 Groups A…D T4
V-I Characteristics	Refer to Output Voltage versus Current Capability on page 30
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	 ≤1.2 ms ≤1.2 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)	$U_i \leq 5.8V$ DC $I_i \leq 400$ mA L_i = Negligible $C_i \leq 1.35$ µF
Isolation path Output to power supply Output to FlexBus Power supply to FlexBus Output to output	Isolation type Galvanic to DIN EN 60079-11 Galvanic to DIN EN 60079-11 Galvanic to DIN EN 60079-11 None

General

Power supply (+V, -V Intrinsically safe)	$U_i \leq 9.5V$ DC $I_i \leq 1$ A L_i = Negligible C_i = Negligible
Module field-side power consumption	7.5 W
Power dissipation	5 W
Thermal dissipation	17.07 BTU/hr
Module location	1797-TB3 or 1797-TB3S Terminal base unit
Conductors wire size, max	4 mm^2 (12 gauge) stranded 1.2 mm (3/64 in.) insulation
Dimensions HxWxD	46 x 94 x 75 mm (1.8 x 3.7 x 2.95 in.)
Weight, approx.	200 g (7.05 oz.)
Keyswitch position	7

Environmental Specification

Attribute	Value
Temperature, operating	-20…+70 °C (-4…+158 °F)
Temperature, storage	-40…+85 °C (-40…+185 °F)
Relative humidity	5…95% noncondensing
Shock, operating	Tested to 15 g peak acceleration, 11(+1) ms pulse width
Shock, nonoperating	Tested to 15 g peak acceleration, 11(+1) ms pulse width
Vibration	Tested 2 g @ 10…500 Hz per IEC68-2-6

Certifications

Certifications when product is marked [1]	Value
CENELEC	II (1) 2G Ex ib[ia] IIC T4 II (1) D [Ex iaD]
UL, C-UL	Class I, Groups A, B, C and D; Class II, Groups E, F and G; Class III Hazardous Locations Class I, Zone 1, AEx ib[ia] IIC T4.
FM	Intrinsically safe Class I, Div 1, Groups A, B, C, D, T4. Associated Apparatus with instrincally safe connections Class I, II, III, Div 1, Groups A-G. Intrinsically safe Class I, Zone 1, AEx ib[ia] IIC T4.
INMETRO	BR-Ex ia/ib IIB/IIC T4
IECEx	[Zone 0] Ex ib[ia] IIC T4 [Ex iaD]

(1) See the Product Certification link at http://www.ab.com for Declaration of Conformity, Certificates, and other certification details.

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 states.(1)
- write a programmable fault state value to the module, depending upon the module type.(2)

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.(1)
- write a programmable fault state value to the module, depending upon the module type.(2)

(1) This selection is shown as Reset Outputs in RSNetWorx software, but its action is Apply Local Module Safe States.

(2) This option is only available in some adapters.

FLEX Ex Output Module Operation

The following describes the 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.

Entity Parameters

CE, CENELEC I/O Entity Parameters

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

Entity Parameters

	Protection	Group	Allowed Capacitance	Allowed Inductance
1797-OB4D U_0 = 27.4V I_0 = 110 mA	Ex ia	IIB	677 nF	8 mH
		IIC	87 nF	2 mH
If concentrated capacitance and/or inductance are available, use the following values.	Ex ia	IIB	150 nF	5 mH
		IIC	30 nF	2 mH

The values of L_o and C_o listed in the table above are allowed if one of the following conditions is met:

- The total L_i of the external circuit (excluding the cable) is < 1% of the L_o value or
- The total C_i of the external circuit (excluding the cable) is < 1% of the C_o value.

The values of L_o and C_o listed in the table above shall be reduced to 50% when both of the following conditions are met:

- The total L_i of the external circuit (excluding the cable) is ≥ 1% of the L_o value and
- The total C_i of the external circuit (excluding the cable) is ≥ 1% of the C_o value.

Note: The reduced capacitance of the external circuit (including cable) shall not be greater than 1µF for IIB and IIA and 600nF for IIC.

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:

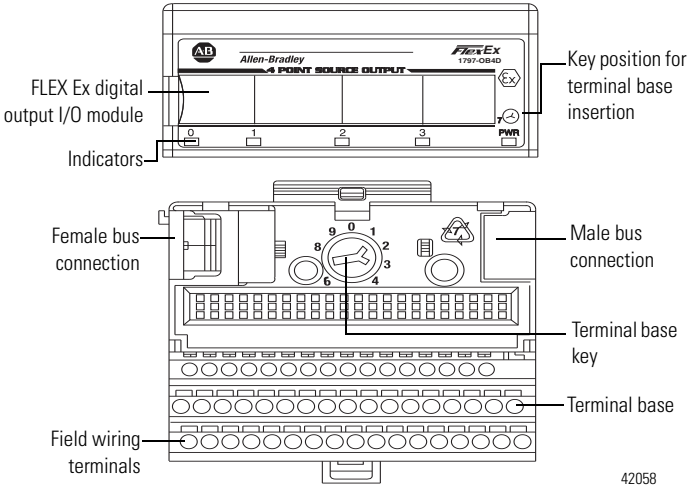
- UL 913, 1988, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations
- UL 1203, Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
- UL 2279, Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations
- UL 61010, UL Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements
- 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

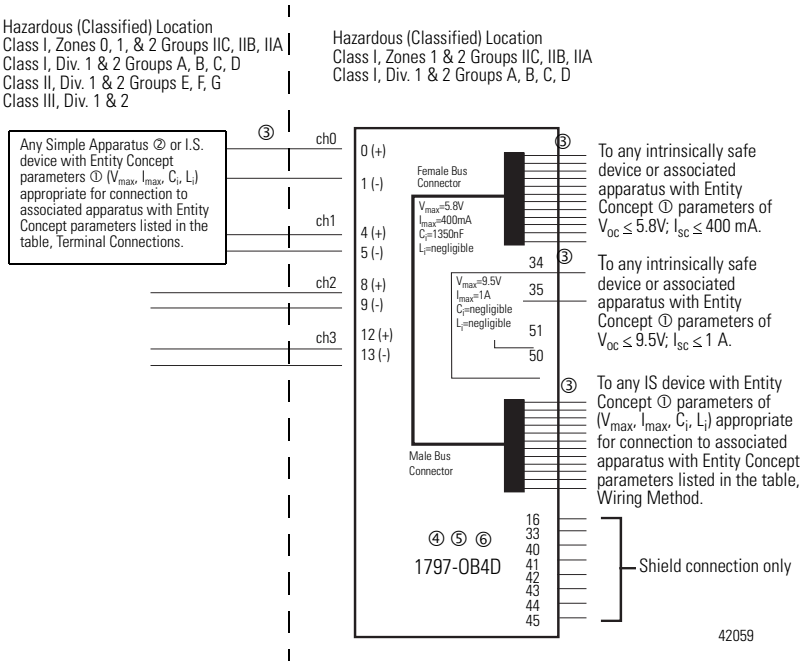
- Wiring method 1: Each channel is wired separately.
- Wiring method 2: Multiple channels in one cable, providing each channel is separated in accordance with the National Electric Code (NEC) or Canadian Electric Code (CEC).

Wiring Method

Wiring Method	Channel	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)	Groups	C_a (µF)	L_a (mH)
1 and 2	Any one channel (for example, 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.



Terminal Connections

Terminals	V_t (V)	I_t (mA)	Groups	C_a (μF)	L_a (μH)
Male bus connector	5.8	400	A to 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. The internal capacitances Ci of the terminal base must be taken into account to verify the intrinsic safety.

The values of L_o and C_o listed in the table above are allowed if one of the following conditions is met:

- The total L_i of the external circuit (excluding the cable) is < 1% of the L_o value or
- The total C_i of the external circuit (excluding the cable) is < 1% of the C_o value.

The values of L_o and C_o listed in the table above shall be reduced to 50% when both of the following conditions are met:

- The total L_i of the external circuit (excluding the cable) is ≥ 1% of the L_o value, and
- The total C_i of the external circuit (excluding the cable) is ≥ 1% of the C_o value.

Note: The reduced capacitance of the external circuit (including cable) shall not be greater than 1µF for IIB and IIA and 600nF for IIC.

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

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 to 32, 36 to 39, and 46 to 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:

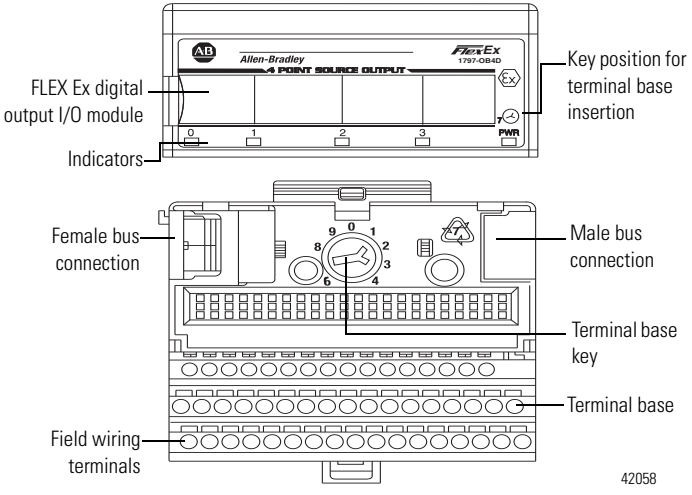
- FM C1. No.3600:1998, Electrical Equipment for Use in Hazardous (Classified) Locations General Requirements
- FM C1. No.3610:1999, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III Division 1 Hazardous (Classified) Locations
- FM C1. No.3615:1989, Explosionproof Electrical 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

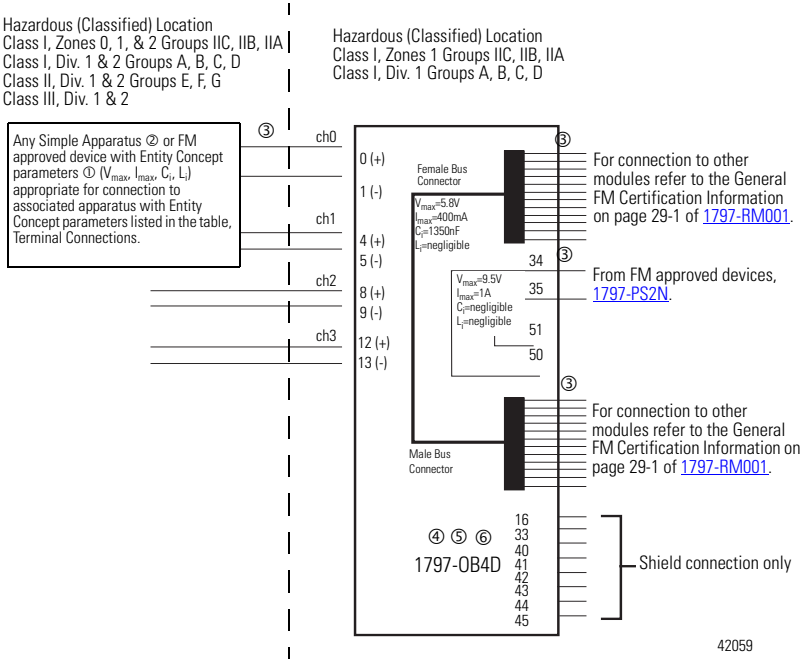
- Wiring method 1: Each channel is wired separately.
- Wiring method 2: Multiple channels in one cable, providing each channel is separated in accordance with the National Electric Code (NEC).

Wiring Method

Wiring Method	Channel	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)	Groups	C_a (μF)	L_a (mH)
1 and 2	Any one channel (for example, 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.



Terminal Connections

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.

The values of L_o and C_o listed in the table above are allowed if one of the following conditions is met:

- The total L_i of the external circuit (excluding the cable) is < 1% of the L_o value or
- The total C_i of the external circuit (excluding the cable) is < 1% of the C_o value.

The values of L_o and C_o listed in the table above shall be reduced to 50% when both of the following conditions are met:

- The total L_i of the external circuit (excluding the cable) is ≥ 1% of the L_o value, and
- The total C_i of the external circuit (excluding the cable) is ≥ 1% of the Co value.

Note: The reduced capacitance of the external circuit (including cable) shall not be greater than 1µF for IIB and IIA and 600nF for IIC.

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

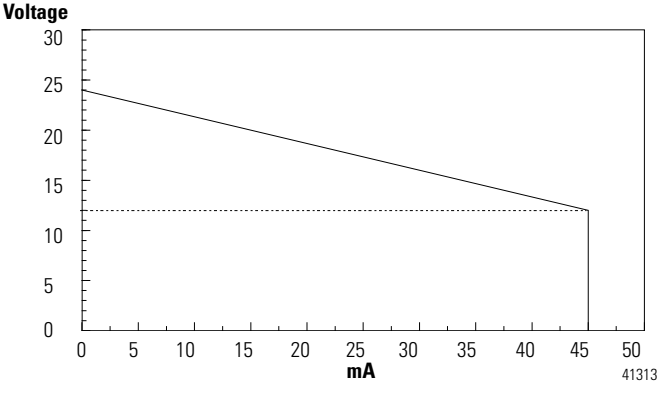
③ Wiring methods must be in accordance with the National Electric Code, ANSI/NFPA 70, Article 504 and 505. For additional information refer to ANSI/ISA RP12.6.

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 to 32, 36 to 39, and 46 to 49 shall not be connected.

⑥ **WARNING:** Substitution of components may impair intrinsic safety.

Output Voltage versus Current Capability



IMPORTANT For detailed certification information, refer to the FLEX Ex System Certification Reference Manual, publication 1797-RM001.

WARNING Avoid electrostatic charging.
ADVERTÊNCIA! PREVENIR CONTRA O ACÚMULO DE CARGA ELETROSTÁTICA.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its 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	1.440.646.3434 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 its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning, it may need 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.

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