

Installation Instructions

FLEX Ex Frequency Input Module

Catalog Number 1797-IJ2

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About This Publication

This publication provides information on selecting, installing, configuring, and troubleshooting the 1797-IJ2 module.

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://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.

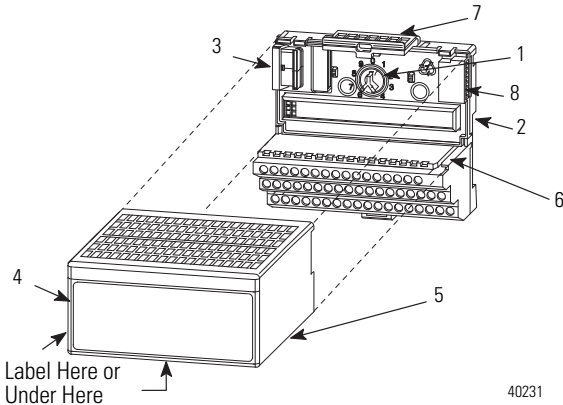
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Throughout this manual we use notes to make you aware of safety considerations.

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.
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
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
SHOCK HAZARD 	Labels may be on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be on or inside the equipment to alert people that surfaces may reach dangerous temperatures.

Module Installation



Install the Module

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

ATTENTION



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

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

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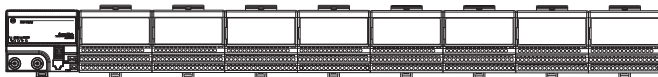
1. Rotate keyswitch (1) on terminal base unit (2) clockwise to position 1 as required for this type of module.

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.



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

Installation in Zone 1

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

ATTENTION



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

Installation in Zone 22

When the module is installed in Zone 22, the following cabinets must be used: IVK-ISRPI-V16LC; IVK-ISRPI-V8HYW; or IVK-ISRPI-V8LC. These cabinets can be purchased from Pepperl+Fuchs GmbH, Lilienthalstrasse 200, 68307 Mannheim, Germany. Information available at <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 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 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 unit 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 Community 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
- EN61326-1:2013 (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 ia ib 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 98 ATEX E 033 X.
- Are intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapors, mists, or air/dust mixtures are likely to occur. 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 mixtures of air and gases, vapors, mists, or air/dust mixtures are likely to occur. Such locations correspond to Zone 1 or 2 classification to IEC 60079-0.
- The type of protection is “Ex ia ib 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 09.0028X.

Special Conditions of Safe Use:

The intrinsically safe circuits (ch0 to ch1) 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.

Inputs

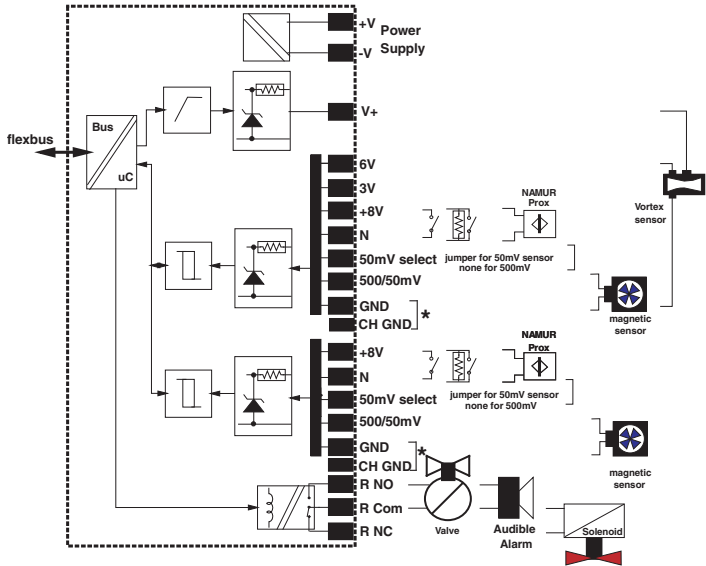
The frequency input module has 2 input channels. Each input can accept inputs from magnetic pickups or proximity probes. Each input channel has 2 input selections: frequency input or gate input. **Do not apply any nonintrinsically safe signals to this module.**

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

When using an intrinsically safe electrical apparatus according to EN 60079-11, the European directives and regulations must be followed.

IMPORTANT

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

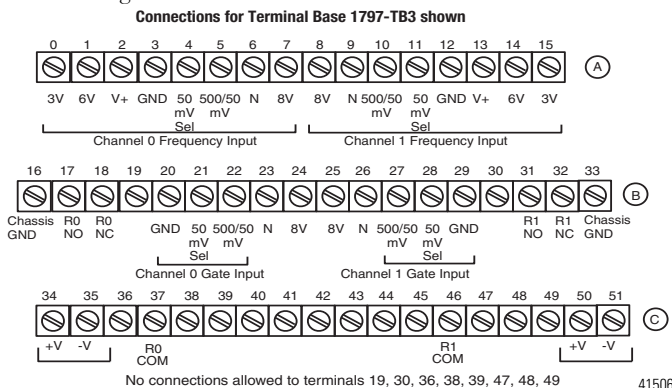


* For VORTEX and magnetic pickups only - jumper from GND to CH GND.

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Wire a 1797-TB3 or 1797-TB3S Terminal Base Unit

Connect wiring to the terminal base as shown below.



ATTENTION



For VORTEX signals and magnetic pickups only.

Connect the channel ground terminals to the chassis ground terminals to achieve the EMC protection class. Because, in this case, the intrinsically safe circuit is grounded, and you must check the installation requirements of the respective country for this context.

Wire the Module

Make wiring connections to the module terminal base unit according to the wiring table below.

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.

Type of Input	Channel 0 Terminations ⁴			Channel 1 Terminations ⁴		
	Power	Input	GND ⁵	Power	Input ¹	GND ⁵
Frequency						
NAMUR Proximity ¹	7	6		8	9	
Contact Switch ²	7	6		8	9	
500 mV ac Magnetic Pickup		5	3		10	12
50 mV ac Magnetic Pickup ³		5	3		10	12
6V ac Vortex	2	1	3	13	14	12
3V ac Vortex	2	0	3	13	15	12
Gate						
NAMUR Proximity ¹	24	23		25	26	
Contact Switch ²	24	23		25	26	
500 mV ac Magnetic Pickup		22	20		27	29
50 mV ac Magnetic Pickup ³		22	20		27	29

1 As defined by standard DIN 19234.

2 Add external resistor across field device for wire-off detection (0.4 mA) - (about 15...20 K Ω).

3 Add a jumper between 50 mV Sel and N (frequency - channel 0 = 4 to 6, channel 1 = 9 to 11; gate - channel 0 = 21 to 23, channel 1 = 28 to 26).

4 Connect cable shields to shield busbar or shield terminating feedthroughs.

5 All GND terminals are internally connected together.

Relay Connections

Channel 0 Relay Connections		Channel 1 Relay Connections	
COM	37	COM	46
N.O.	17	N.O.	31
N.C.	18	N.C.	32

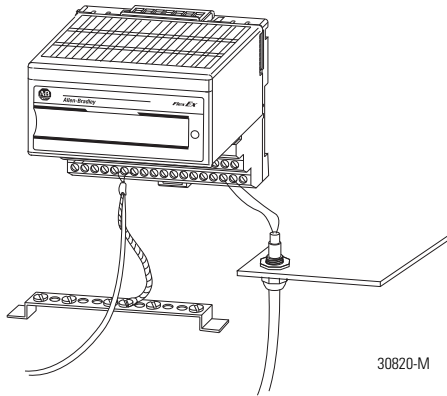
Ground the Module

ATTENTION



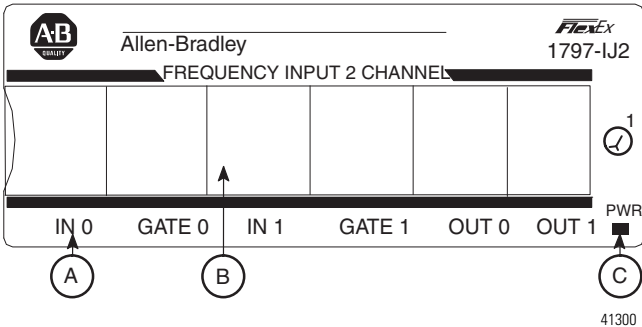
Do not use the unused terminals on this terminal base unit. Using these terminals as supporting terminals can result in damage to the module and/or unintended operation of your system.

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



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Indicators



A = Status Indicators for individual channels

B = Insertable labels for writing individual I/O designations

C = Power Indicator - green indicates power applied to module

Indicator	Indication	Description
Input (0 or 1) Frequency or Gate	Off/Dark	Input turned off, input not used, wire disconnected.
	On/Yellow	Input turned on. Wire connected, normal operation.
	Blinking Red	Wire disconnected, fault condition (for NAMUR proximity switch or switch contacts with shunt resistor).
Output Alarm (0 or 1)	Off/Dark	Output turned off.
	On/Yellow	Output turned on (logic drive on).
Module Power (OK)	Off/Dark	+V power off, or 5V logic power problem.
	Solid Green	Power applied to module.
Input 0	Red	Power up check running.

Resolution and Accuracy

Minimum Frequency Sampling Time in ms	Accuracy					Resolution (%)
	Sampling Accuracy	Time Base Accuracy	Worst Case Accuracy	Deviation in Hz Due to Total Accuracy		
				1.0...3276.7 Freq. Range (Hz)	1...32767 Freq. Range (Hz)	
2	±0.02%	±0.0225%	±0.0425%	±0.1...1.4	±1...14	0.01%
4	±0.01%	±0.0225%	±0.0325%	±0.1...1.1	±1...10	0.005%
5	±0.008%	±0.0225%	±0.0305%	±0.1...1.0	±1...10	0.004%
10	±0.004%	±0.0225%	±0.0265%	±0.1...0.9	±1...9	0.002%
20	±0.002%	±0.0225%	±0.0245%	±0.1...0.8	±1...8	0.001%
50	±0.0008%	±0.0225%	±0.0233%	±0.1...0.8	±1...8	0.0004%
100	±0.0004%	±0.0225%	±0.0229%	±0.1...0.8	±1...8	0.0002%
200	±0.0002%	±0.0225%	±0.0227%	±0.1...0.7	±1...7	0.0001%
500	±0.00008%	±0.0225%	±0.02258%	±0.1...0.7	±1...7	0.00004%
1000	±0.00004%	±0.0225%	±0.02254%	±0.1...0.7Hz	±1...7	0.00002%

Input Map

Bit→	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Word↓	Read															
0	Frequency 0...32,767 or 0.0...3,276.7 Channel 0															
1	% Full Scale 0.0...3,276.7% Channel 0 or Acceleration -32,768...32,767 Channel 0															
2	Frequency 0...32,767 or 0.0...3,276.7 Channel 1															
3	% Full Scale 0.0...3,276.7% Channel 1 or Acceleration -32,768...32,767 Channel 1															
4	R	R	Direction Ch 0	GS Ch 0	F/A Ch 0	WO Ch 0	MPA Ch 0	R	R	Direction Ch 1	GS Ch 1	F/A Ch 1	WO Ch 1	MPA Ch 1		
5	Reserved			Diagnostic Status Channel 0				Reserved				Diagnostic Status Channel 1				
6	Reserved															

Where: GS = Gate state
 F/A = Frequency/Accel alarm
 WO = Wire-off alarm
 MPA = Missing pulse alarm
 R = Reserved

Output Map

Bit⇒	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Word ↓	Write															
0	Out Enb	FSM	FR Ch 0	Number of Pulses to terminate sampling Ch 0		MPM Ch 0	Alt Pulse Term	LF	FR Ch 1	Number of Pulses to terminate sampling Ch 1		MPM Ch 1				
1	Maximum Frequency 0...32,767 or 0.0...3,276.7 or Absolute Value of Acceleration 0...32,767 - Channel 0															
2	Frequency Scaling Divisor 1...255 Ch 0								Frequency Scaling Multiplier 1...255 Ch 0							
3	WO FG Ch 0	WO FF Ch 0	IGI Ch 0	IFI Ch 0	Minimum Frequency Sample Time Ch 0		Init St Up Ch 0	ACT 0...3 Ch 0	F/A AS Ch 0	MPDM Ch 0	WOFM Ch 0					
4	Maximum Frequency 0...32,767 or 0.0...3,276.7 or Absolute Value of Acceleration 0...32,767 - Channel 1															
5	Frequency Scaling Divisor 1...255 Ch 1								Frequency Scaling Multiplier 1...255 Ch 1							
6	WO FG Ch 1	WO FF Ch 1	IGI Ch 1	IFI Ch 1	Minimum Frequency Sample Time Ch 1		Init St Up Ch 1	ACT 0...3 Ch 1	F/A AS Ch 1	MPDM Ch 1	WOFM Ch 1					
7	Reserved															

Where: Out Enb = Output enable
 FSM = Fault state mode
 FR = Frequency range
 MPM = Missing pulse multiplier
 LF = Local fault mode
 F/AAS = Frequency/Accel alarm select
 WOFF = Wire-off fault frequency
 WOFG = Wire-off fault gate
 WOFM = Wire-off fault mode
 IGI = Invert gate input
 IFI = Invert frequency input
 ACT = Acceleration calculation time
 MPDM = Missing pulse delay multiplier
 Alt Pulse Term = Alternate Number of Pulses to terminate sampling

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

Specifications - 1797-IJ2 Frequency Input Module

Number of inputs	2 frequency channels 2 gate channels	
IS input type	Ex ia IIB/IIC T4 AEx ia IIC T4 Class I, II, III Division 1 Group A to G T4	
IS module type	Ex ib IIB/IIC T4 AEx ib IIC T4 Class I, Division 1 Group A to D T4	
Input (intrinsically safe) to DIN19234 (NAMUR)		
No load voltage short circuit current	8V dc/8 mA	
Switching point/switching hysteresis	1.2...2.1 mA/0.2 mA	
Input pulse length/pulse pause	>20 μ s/>20 μ s	
Lead breakage monitoring	Breakage current <0.35 mA	
Inputs to flowmeter		
Input signal	Threshold 3V or 6V selectable	
Voltage available at 20 mA	>15V	
Inputs to magnetic pickup input signal	50 mV or 500 mV selectable	
Processing time	\leq 4 ms	
Input frequency	1.0...32,767 Hz	
Resolution and accuracy	Minimum Frequency Sampling Time (ms)	Resolution Accuracy (%)
	2	0.043
	4	0.033
	5	0.031
	10	0.027
	20	0.025
	50	0.023
	100	0.023
	200	0.023
	500	0.023
	1000	0.023

Specifications continued on next page.

Frequency input characteristics	Magnetic pickup: 50 mV, 500 mV NAMUR: 8V, 8 mA Flowmeter: low $\leq 3V$, high $\geq 6V$
Frequency input impedance rating	$>5\text{ k}\Omega$ magnetic pickup $>10\text{ K}\Omega$ flowmeter
Outputs	2 relay outputs
Output switching time	$<10\text{ ms}$
Gate inputs	2
Input (intrinsically safe) to DIN19234 (NAMUR)	
No load voltage short	8V dc/8 mA
Circuit current	
Switching point/	1.2...2.1 mA/0.2 mA
Switching hysteresis	
Input pulse length/	$>20\text{ }\mu\text{s}/>20\text{ }\mu\text{s}$
Pulse pause	
Lead breakage monitoring	Breakage current $<0.35\text{ mA}$
Indicators	6 yellow status indicators 4 red fault indicators 1 green module power indicator
Output (intrinsically safe) (16 pin male and female Flexbus connector)	$U_0 \leq 5.8V$ $I_0 \leq 400\text{ mA}$ $L_i \leq \text{Negligible}$ $C_i \leq 2.64\text{ }\mu\text{F}$
Isolation path	Isolation Type
Input to power supply	Galvanic to DIN EN 60079-11
Input to Flexbus	Galvanic to DIN EN 60079-11
Input to input	None
Output to power supply	Galvanic to DIN EN 60079-11
Output to Flexbus	Galvanic to DIN EN 60079-11
Output to output	Galvanic to DIN EN 60079-11
Power supply (+V, -V intrinsically safe)	$U_i \leq 9.5V\text{ dc}$ $I_i \leq 1\text{ A}$ $L_i = \text{Negligible}$ $C_i = \text{Negligible}$
Module field-side power consumption	4.25 W
Power dissipation	4.25 W

Specifications continued on next page.

18 FLEX Ex Frequency Input Module

Thermal dissipation, max	14.5 BTU/hr
Module location	Cat. No. 1797-TB3 or 1797-TB3S Terminal Base Unit
Conductor wire size	4 mm ² (12 gauge) stranded max 1.2 mm (3/64 in.) insulation max
Dimensions, approx. (HxWxD)	46 x 94 x 75 mm (1.8 x 3.7 x 2.95 in.)
Weight, approx.	200 g
Keyswitch position	1
Environmental conditions	
Operational temperature	-20...70 °C (-4...158 °F)
Storage temperature	-40...85 °C (-40...185 °F)
Relative humidity	5...95% noncondensing
Shock	Operating Tested to 15 g peak acceleration, 11(+1) ms pulse width Nonoperating Tested to 15 g peak acceleration, 11(+1) ms pulse width
Vibration	Tested 2 g @ 10...500 Hz per IEC68-2-6
Agency certification	
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.
FM	Class I, Zone 1, AEx ib[ia] IIC T4. Intrinsically safe Class I, Div 1, Groups A, B, C, D, T4. Associated Apparatus with intrinsically safe connections Class I, II, III, Div 1, Groups A--G
INMETRO IECEX	Intrinsically safe Class I, Zone 1, AEx ib[ia] IIC T4. BR-Ex ia/ib IIB/IIC T4 [Zone 0] Ex ib[ia] IIC T4 [Ex iaD]
Certificate of conformity	
CENELEC	DMT 98 ATEX 033 X
UL, C-UL	UL, C-UL File Number E197983
FM	FM Certificate Number 3009806
INMETRO	05/UL-BRAE-0014X
IECEX	IECEX BVS 09.0028X

CE/CENELEC I/O Entity Parameters

Channel 0 Frequency Input

Field devices may only be connected to the terminals of one of the five following circuits. The terminals of the remaining four circuits must not be connected.

Namur/ Contact (Terminals 6...7)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 15 mA$ $P_0 = 30 mW$	Ex ia	IIB	3.86 μF	300 mH	2.6 mH/ Ω
		IIC	620 nF	80 mH	0.65 mH/ Ω

Magnetic 500 mV (Terminals 5...3)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 10 mA$ $P_0 = 18 mW$	Ex ia	IIB	3.86 μF	600 mH	4.15 mH/ Ω
		IIC	620 nF	150 mH	1.03 mH/ Ω

Magnetic 50 mV (Terminals 5...3, 6...4)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 10 mA$ $P_0 = 18 mW$	Ex ia	IIB	3.86 μF	600 mH	4.15 mH/ Ω
		IIC	620 nF	150 mH	1.03 mH/ Ω

Vortex 6V (Terminals 1, 2...3)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 26.5V$ $I_0 = 82 mA$ $P_0 = 520 mW$	Ex ia	IIB	730 nF	8 mH	0.26 mH/ Ω
		IIC	95 nF	2 mH	0.06 mH/ Ω

Vortex 3V (Terminals 0, 2...3)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 26.5V$ $I_0 = 82 mA$ $P_0 = 520 mW$	Ex ia	IIB	730 nF	8 mH	0.26 mH/ Ω
		IIC	95 nF	2 mH	0.06 mH/ Ω

Channel 1 Frequency Input

Field devices may only be connected to the terminals of one of the five following circuits. The terminals of the remaining four circuits must not be connected.

Namur/ Contact (Terminals 9...8)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 15 mA$ $P_0 = 30 mW$	Ex ia	IIB	3.86 μF	300 mH	2.6 mH/ Ω
		IIC	620 nF	80 mH	0.65 mH/ Ω

Magnetic 500 mV (Terminals 10...12)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 10 mA$ $P_0 = 18 mW$	Ex ia	IIB	3.86 μF	600 mH	4.15 mH/ Ω
		IIC	620 nF	150 mH	1.03 mH/ Ω

Magnetic 50 mV (Terminals 10...12, 9...11)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 10 mA$ $P_0 = 18 mW$	Ex ia	IIB	3.86 μF	600 mH	4.15 mH/ Ω
		IIC	620 nF	150 mH	1.03 mH/ Ω

Vortex 6V (Terminals 14, 13...12)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 26.5V$ $I_0 = 82 mA$ $P_0 = 520 mW$	Ex ia	IIB	730 nF	8 mH	0.26 mH/ Ω
		IIC	95 nF	2 mH	0.06 mH/ Ω

Vortex 3V (Terminals 15, 13...12)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 26.5V$ $I_0 = 82 mA$ $P_0 = 520 mW$	Ex ia	IIB	730 nF	8 mH	0.26 mH/ Ω
		IIC	95 nF	2 mH	0.06 mH/ Ω

Channel 0 Gate Input

Field devices may only be connected to the terminal of one of the three following circuits. The terminals of the remaining two circuits must not be connected.

Namur/ Contact (Terminals 23...24)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_oR_o Ratio
$U_o = 14.7V$ $I_o = 15 mA$ $P_o = 30 mW$	Ex ia	IIB	3.86 μF	300 mH	2.6 mH/ Ω
		IIC	620 nF	80 mH	0.65 mH/ Ω

Magnetic 500 mV (Terminals 22...20)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_oR_o Ratio
$U_o = 14.7V$ $I_o = 10 mA$ $P_o = 18 mW$	Ex ia	IIB	3.86 μF	600 mH	4.15 mH/ Ω
		IIC	620 nF	150 mH	1.03 mH/ Ω

Magnetic 50 mV (Terminals 22...20, 23...21)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_oR_o Ratio
$U_o = 14.7V$ $I_o = 10 mA$ $P_o = 18 mW$	Ex ia	IIB	3.86 μF	600 mH	4.15 mH/ Ω
		IIC	620 nF	150 mH	1.03 mH/ Ω

Channel 1 Gate Input

Field devices may only be connected to the terminals of one of the three circuits. The terminals of the remaining two circuits must not be connected.

Namur/ Contact (Terminals 26...25)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 15 mA$ $P_0 = 30 mW$	Ex ia	IIB	3.86 μF	300 mH	2.6 mH/ Ω
		IIC	620 nF	80 mH	0.65 mH/ Ω

Magnetic 500 mV (Terminals 27...29)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 10 mA$ $P_0 = 18 mW$	Ex ia	IIB	3.86 μF	600 mH	4.15 mH/ Ω
		IIC	620 nF	150 mH	1.03 mH/ Ω

Magnetic 50 mV (Terminals 27...29, 26...28)	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0R_0 Ratio
$U_0 = 14.7V$ $I_0 = 10 mA$ $P_0 = 18 mW$	Ex ia	IIB	3.86 μF	600 mH	4.15 mH/ Ω
		IIC	620 nF	150 mH	1.03 mH/ Ω

Relay Output Parameters

Relay Output (Terminals 17, 18, 37, or 31, 32, 46)	Protection	Group	Internal Capacitance	Internal Inductance
$U_1 = 28V$ $I_1 = 93 mA$ $P_1 = 651 mW$	Ex ia	IIB	Negligible	Negligible
		IIC	Negligible	Negligible

UL, C-UL I/O Entity Parameters

If the 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-Incandive 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

Table 1

Wiring Method	Channel	Terminals	V _{OC} (V)	I _{SC} (mA)	V _t (V)	I _t (mA)	Groups	C _a (μF)	L _a (mH)
1 and 2	Any one channel	6, 7; 9, 8; 23, 24 26, 25	14.7	15.0	-	-	A, B	0.62	80.0
							C, E	1.82	320.0
							D, F, G	4.96	640.0
1 and 2	Any one channel	5, 3; 10, 12; 22, 20; 27, 29	14.7	10.0	-	-	A, B	0.62	150.0
							C, E	1.82	600.0
							D, F, G	4.96	1200.0
1 and 2	Any one channel	5, 3, 6, 4; 10, 12, 9, 11; 22, 20, 21, 23; 27, 29, 26, 28	14.7	10.0	-	-	A, B	0.62	150.0
							C, E	1.82	600.0
							D, F, G	4.96	1200.0
1 and 2	Any one channel	0, 2, 3; 1, 2, 3; 14, 12, 13; 15, 12, 13	26.5	82.0	-	-	A, B	0.095	2.0
							C, E	0.285	8.0
							D, F, G	0.76	16.0

Wiring Method	Channel	Terminals	V _{max} (V)	I _{max} (mA)	Groups	C _i (μF)	L _i (mH)
1 and 2	Any one channel	17, 18, 37 or 31, 32, 46	28	93.0	A, B	0.0	0.0
					C, E	0.0	0.0
					D, F, G	0.0	0.0

Wiring Methods

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

Table 2

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

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

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

③ Wiring methods must be in accordance with the National Electrical Code, ANSI/NFPA 70, Article 504 and 505 or the Canadian Electrical Code CSA C22.1, Part 1, Appendix F. For additional information refer to ANSI/ISA RP12.6.

④ This module, 1797-IJ2, must be used with terminal base 1797-TB3 or 1797-TB3S.

⑤ Terminals 19, 30, 36, 38, 39, and 47...49 shall not be connected.

⑥

WARNING

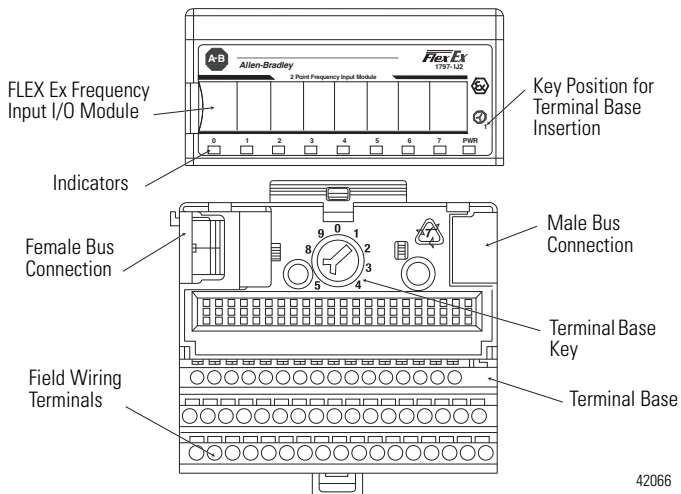
Substitution of components may impair intrinsic safety

**AVERTISSEMENT**

La substitution de composant peut compromettre la sécurité intrinsèque.

**IMPORTANT**

For detailed certification information, refer to the FLEX Ex System Certification Reference Manual, publication [1797-RM001](#).



IMPORTANT

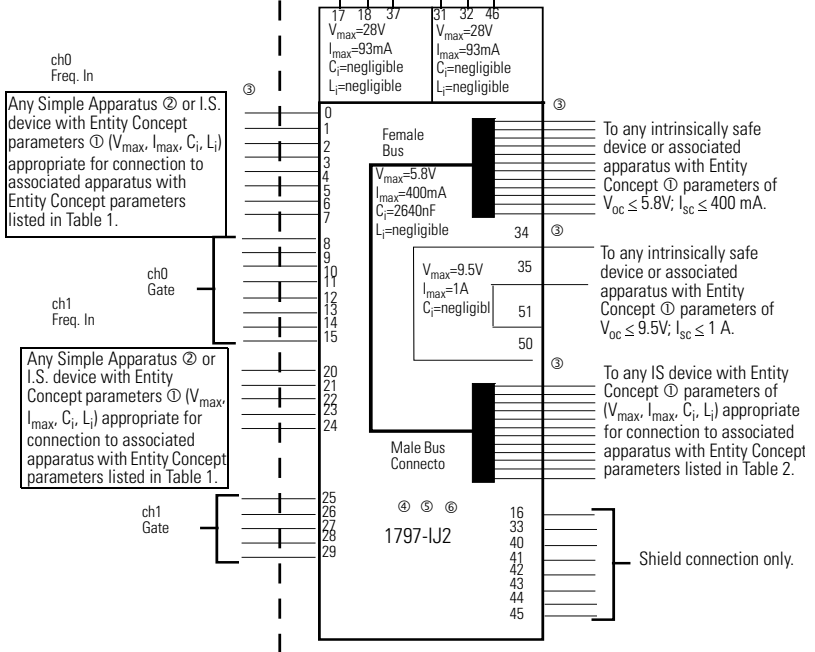
The terminal base unit may or may not have an I/O module installed

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

To any intrinsically safe device
 or associated apparatus with
 Entity Concept ① parameters
 of $V_{oc} \leq 28V$; $I_{sc} \leq 93\text{ mA}$.

To any intrinsically safe device
 or associated apparatus with
 Entity Concept ① parameters
 of $V_{oc} \leq 28V$; $I_{sc} \leq 93\text{ mA}$.



FM Input 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 Electrical Code (NEC).

Table 1

Wiring Method	Channel	Terminals	V _{OC} (V)	I _{SC} (mA)	V _t (V)	I _t (mA)	Groups	C _a (μF)	L _a (mH)
1 and 2	Any one channel	6, 7; 9, 8; 23, 24 26, 25	14.7	15.0	-	-	A, B	0.65	130.0
							C, E	1.95	390.0
							D, F, G	5.20	1040.0
1 and 2	Any one channel	5, 3; 10, 12; 22, 20; 27, 29	14.7	10.0	-	-	A, B	0.65	300.0
							C, E	1.95	900.0
							D, F	5.20	2400.0
1 and 2	Any one channel	5, 3, 6, 4; 10, 12, 9, 11; 22, 20, 21, 23; 27, 29, 26, 28	14.7	10.0	-	-	A	0.65	300.0
							C, E	1.95	900.0
							D, F, G	5.20	2400.0
1 and 2	Any one channel	0, 2, 3; 1, 2, 3; 14, 12, 13; 15, 12, 13	26.5	82.0	-	-	A, B	0.13	4.5
							C, E	0.39	13.5
							D, F, G	1.04	36.0

Wiring Method	Channel	Terminals	V_{\max} (V)	I_{\max} (mA)	Groups	C_i (μ F)	L_i (mH)
1 and 2	Any one channel	17, 18, 37 or 31, 32, 46	28	93.0	A, B	Negligible	Negligible
					C, E	Negligible	Negligible
					D, F, G	Negligible	Negligible

Table 2

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

① The entity concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of V_{oc} and I_{sc} or V_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, 0.1 A, 20 μ J, 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-IJ2, must be used with terminal base 1797-TB3 or 1797-TB3S.

⑤ Terminals 19, 30, 36, 38, 39, and 47...49 shall not be connected.

⑥

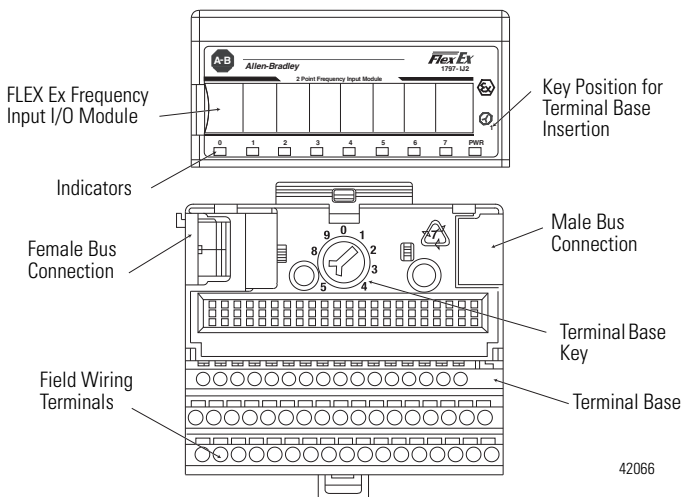
WARNING

Substitution of components may impair intrinsic safety



AVERTISSEMENT

La substitution de composant peut compromettre la sécurité intrinsèque.



IMPORTANT

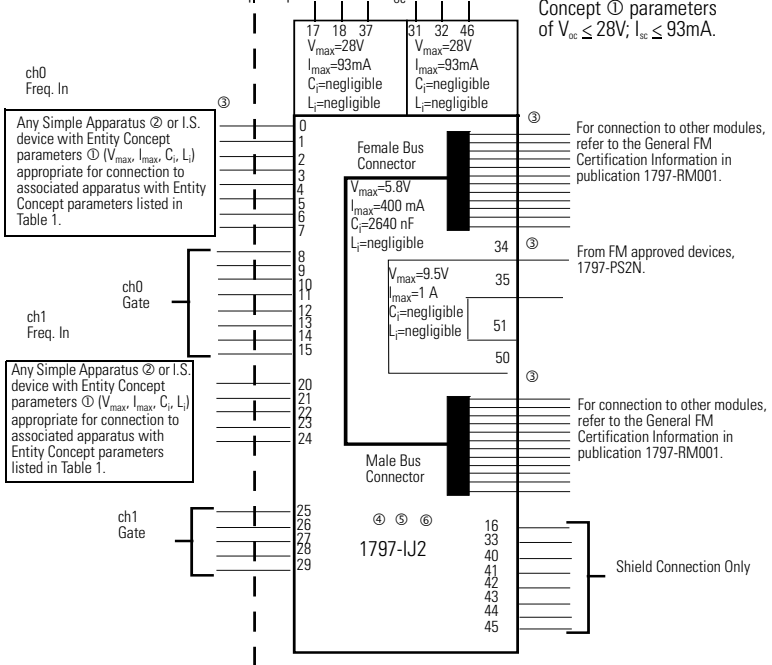
A terminal base may or may not have an I/O module installed.

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

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

To any intrinsically safe device or associated apparatus with Entity Concept ① parameters of $V_{oc} \leq 28V$; $I_{sc} \leq 93mA$.

To any intrinsically safe device or associated apparatus with Entity Concept ① parameters of $V_{oc} \leq 28V$; $I_{sc} \leq 93mA$.



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

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