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# FLEXI/O AND FLEX EX
## SELECTION GUIDE


ALLEN-BRADLEY • ROCKWELL SOFTWARE

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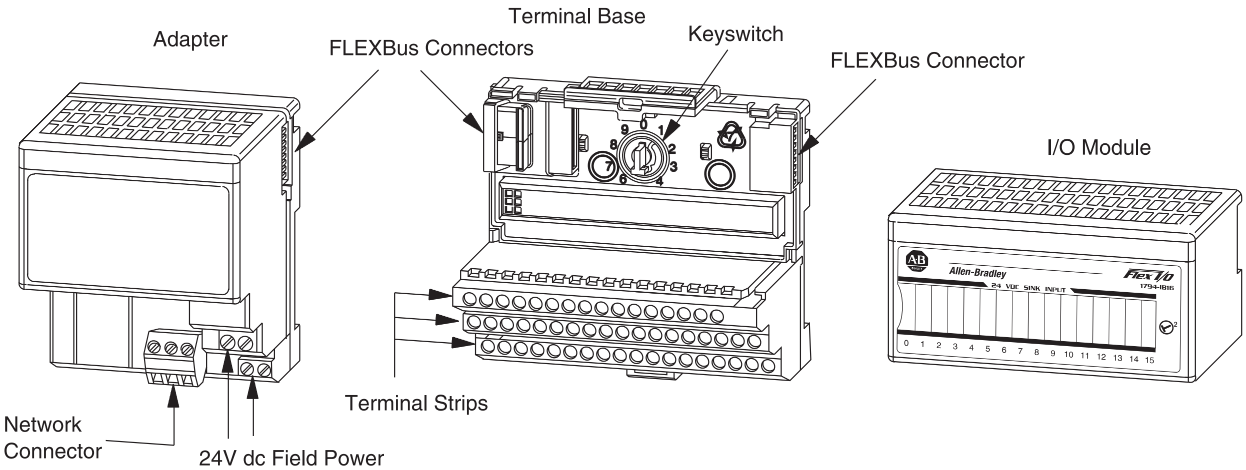
# FLEX I/O Overview

FLEX I/O offers:

**FLEX I/O complements all of our processor platforms** and acts as local I/O for FlexLogix controllers, creating a tightly integrated control and I/O solution.




**Flexible, low-cost, modular I/O for distributed applications.** FLEX I/O offers all the functions of larger, rack-based I/O without the space requirements. Independently select the I/O, termination style, and network to meet your application needs.

**Two separate connection terminals for field power** let you daisy-chain power connections to adjacent terminal bases.

**One adapter communicates with up to eight I/O modules.** Allows connection to:

- 256 digital input/output points, or
- 96 analog input/output points, or
- mix of I/O to meet your needs.

**Modularity of FLEX I/O system** provides choice of network and ease of expansion.

**The wiring terminations** are done almost entirely on the terminal base.

**Terminal base termination selection** includes screw-clamp, spring-clamp, and cage-clamp to wire directly to 2-, 3-, or 4-wire devices. Additional options of D-shell, knife disconnect, and fused are available.

**Adjustable keyswitch** prevents incorrect module insertion into a preconfigured terminal base.

**Terminal bases can be exchanged** without moving other bases in your system.

**If desired, connect individual power supplies** to each base to isolate modules.

**Plug the I/O module into the terminal base** to connect the I/O bus and field devices.

**Remove and insert modules under power.** No direct wiring to the module enables you to change modules without disturbing field wiring or system power.

**Mix and match I/O modules.** Wide variety of digital, analog, and specialty modules.

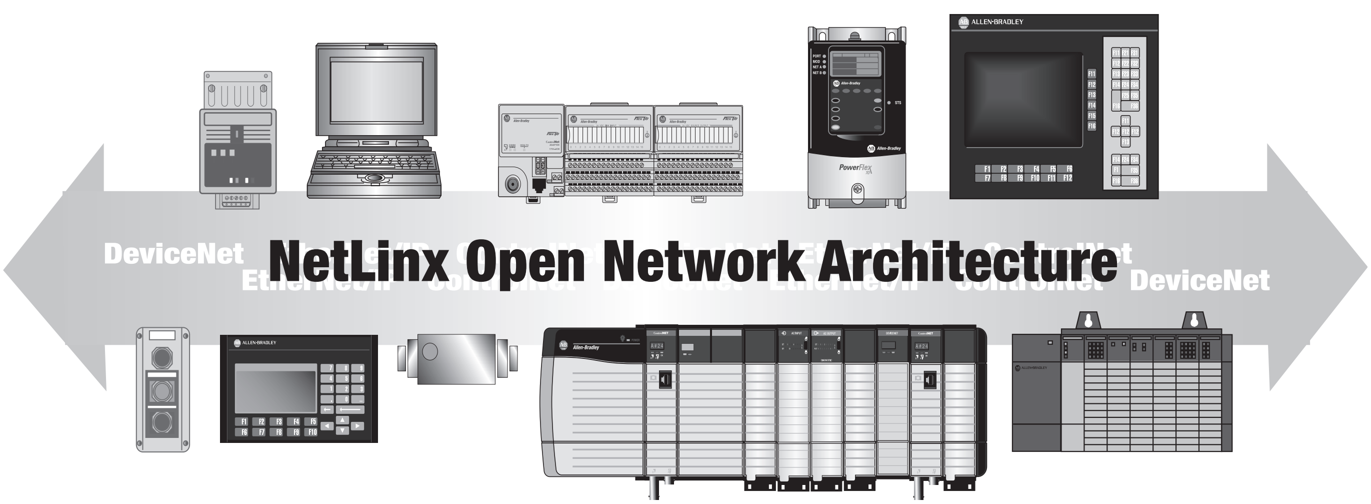
**Conformal coating available** in select FLEX I/O products.

Each FLEX I/O system contains at least one adapter, terminal base, and I/O module. You can power the system with a FLEX power supply (1794-PS13 or -PS3) or any other compatible power source. Use the terminal block on the terminal base to wire your field devices directly. Wiring directly saves you:

- installation and testing time
- multiple, long wiring runs and external terminal blocks
- control cabinet panel space

FLEX I/O provides additional savings if system problems develop. Combining your field-wiring terminations and the I/O interface into the same location saves you time and money by making your system easier to maintain and troubleshoot. Additionally, the full-featured FLEX I/O system lets you, in non-hazardous location, remove and insert modules under backplane power without disrupting your system.

Your FLEX I/O system can communicate on EtherNet/IP, ControlNet, DeviceNet, and many other open networks including, but not limited, to Remote I/O, PROFIBUS DP, and Interbus-S. Adapters and other components are available for adding to your system as your specific application requirements change.



# FLEX I/O General Specifications

The following specifications apply to all FLEX I/O adapters, modules, and terminal bases. For all other specifications, refer to the specific product catalog number sections in this selection guide.

✦

| | |
|---|---|
| Operating Temperature | 0…55 °C (32…131 °F) |
| Non-Operating Temperature | -40…85 °C (-40…185 °F) |
| Relative Humidity | 5…95% non-condensing |
| Shock, Operating⌘✶ | 30 g peak acceleration, 11(±1) ms pulse width✶ |
| Shock, Non-Operating⌘ | 50 g peak acceleration, 11(±1) ms pulse width |
| Vibration | Tested 5 g @ 10…500 Hz per IEC 68-2-6❄ |
| Wire Size | 22…12 AWG (0.34 $mm^2$…2.5 $mm^2$) stranded copper wire rated at 75 °C or higher<br>3/64 in (1.2 mm) insulation max.❄ |
| Certifications‡ | UL Listed Industrial Control Equipment<br>UL Listed for Class I, Division 2 Groups A, B, C, D Hazardous Locations<br>CE Marked for all applicable directives<br>CE / ATEXT<br>CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, D Hazardous Locations<br>C-Tick Marked for all applicable acts<br>Marine Certification<br>SIL 2 Certification<br>ODVA<br>ControlNet |

✶ 1794-OW8 = 12 g peak acceleration, 11(±1) ms pulse width.
❄ 1794-OW8 = Tested 2 g @ 10…500 Hz per IEC 68-2-6.
‡When product is marked.
§See the CE Marking - Declaration of Conformity (DoC) web site for details and a list of certified products.
♣See the Certification for Marine and Off-shore Applications web site for details and a list of certified products.
➤See the SIL 2 web site for details and a list of certified products.
⌘To maintain these specifications, you must use DIN Rail locks.
✦For all other specifications including environmetal, refer to the product sections in this Selection Guide.

# Conformal Coated Flex I/O

Selected products in the FLEX I/O product line are available conformally coated as standard, stocked product. Catalog numbers of conformally coated product will include the designation "K" in the last position before the series identifier.

For example: A 1794 IB16/A Module with conformal coating would have the catalog number 1794 IB16K/A.

FLEX I/O's Conformal Coating meets or exceeds the following standards:

- ANSI / ISA-S71.04-1985; Class G1, G2 and G3 Environments
- CEI IEC 6065A-4; Class 1 and 2 Environments
- UL 746E
- MIL-1-46058C to ASTM-G21; (Tropicalization and fungicide)

These standards specify common emissions and classify their concentration levels in a number of industrial processes. Just a few of the common reactive agents A-B's Conformal Coating protects against are:

$H_2S$ – Hydrogen sulfide

$SO_2$, $SO_3$ – Sulfur dioxide

$C_nH_n$ – Hydrocarbons

$NO_x$ – Oxides of nitrogen

$Cl_2$ – Wet Chlorine / Dry Chlorine

$NH_3$ – Ammonia

The following is a list of the conformally coated FLEX I/O products available:

- 1794-ACN15
- 1794-ACNR15
- 1794-ADN
- 1794-ASB
- 1794-IE8
- 1794-IB16
- 1794-IRT8
- 1794-IJ2
- 1794-OB16P
- 1794-OE4
- 1794-OW8
- 1794-TB3
- 1794-TB3G
- 1794-TBN
- 1794-IA8
- 1794-OA8
- 1794-OB8EP

# Specifying a FLEX I/O System

Follow these steps as you specify your FLEX I/O system:

| ✓ | Step | See Page |
|---|---|---|
| | **1 Select a communication adapter**<br><br>Choose the network for your operating system. |  |
| | **2 Select I/O modules based on field devices**<br><br>• location of the device<br>• your application<br>• number of points needed<br>• number of points available per module<br>• number of modules<br><br>Or use Integrated Architecture Builder available free at www.ab.com/logix/iab. |  |
| | **3 Select a terminal base**<br><br>Choose an appropriate terminal base for your modules. |  |
| | **4 Select power supplies and ensure sufficient power for the communication adapter and modules**<br><br>If power consumption exceeds the maximum for a single power supply, install additional power supplies. |  |
| | **5 Determine mounting requirements**<br><br>Determine whether to panel mount or DIN Rail mount the FLEX I/O system and at what orientation (horizontal or vertical). |  |
| | **6 Select software**<br><br>Based on the system design, determine the software products you need to configure and program your application. |  |

**Step 2 - Select:**

*• I/O modules*

# Selecting FLEX I/O Modules

The FLEX I/O module plugs into the terminal base, connecting to the I/O bus and field devices. Since there is no direct wiring to the I/O module, you can remove and insert modules under backplane power, enabling you to change modules without disturbing field wiring, other I/O modules, or FLEX backplane power. This eliminates costly downtime and the inefficiencies of restarting a system.

The choices and flexibility you have with I/O types range from digital and analog to temperature and motion control. FLEX I/O allows you to use as many as eight terminal bases per adapter which can provide a maximum of 256 digital I/O points or 96 analog channels per adapter. You can mix and match digital and analog I/O with mounting and wiring options, supplying you with a successful distributed system solution.

This flexibility gives you the following choices of I/O signal types:

- Digital: ac and dc voltage signals
- Analog: current or voltage
- Relay: normally open, 2 A capability
- Protected outputs: non-latching, latching, and with diagnostics
- Temperature: thermocouple or RTD
- Motion: high-speed counters, flow metering, and totalization
- Combo modules: combination of input and output capability
- Intrinsic Safety (IS): use FLEX Ex I/O in hazardous areas to connect to field devices

## Digital I/O Modules

Digital I/O modules interface with field devices such as:

- pushbutton and limit switches

- on/off actuators such as motor starters, pilot lights, and annunciators

- relay contacts

Features

- Modules are available in different densities ranging from 8 to 32 points.
- Digital I/O modules cover a wide electrical range:
  - 120V ac: Input/Output and Isolated Input/Output, 8 and 16 point
  - 220V ac: Input/Output, 8 point
  - 24V dc: Input/Output/Combination, Sink/Source, Protected, Electronically Fused, Diagnostic, 8, 16, and 32 point
  - 48V dc: Sink Input/Source Output, 16 point
  - Relay: Sink/Source, 8 point
- Isolated inputs and outputs can be used in applications such as motor control centers where individual control transformers are used.
- Protected outputs (P) have *electronic protection* which acts to shut the output down in reaction to a short circuit, overload, or over-temperature condition. Recovery from shutdown is automatic upon removal of the output fault. No fault status is provided to the processor.
- Electronic Fused (EP) module acts to open the output when a fault occurs. The "fuse" can be reset by operating a pushbutton, via software, or by cycling the input power. Fault status is provided to the processor.
- Diagnostic (D) modules detect, indicate, and report to the processor the following faults:
  - open input or output field devices or wiring
  - shorted output field devices
  - shorted input or output wiring
  - reverse polarity of user supply wiring
- Selectable input filter times from <1 to 60 ms.
- LED for each channel indicating status of:
  - corresponding input device
  - output signal

## Digital I/O Module Summary

| Cat. No. | Description | Number of Inputs | Number of Outputs | Terminal Base Unit |
|---|---|---|---|---|
| *AC Modules* | | | | |
| 1794-IA8 | FLEX I/O 120V ac 8 Input Module | 8 | | **1794-TBN,** 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD✶. |
| 1794-IA8I | FLEX I/O 120V ac 8 Isolated Input Module | 8 | — | **1794-TBN,** 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| 1794-IA16 | FLEX I/O 120V ac 16 Input Module | 16 | | **1794-TB3,** 1794-TB3S, 1794-TBN❄‡ |
| 1794-IM8 | FLEX I/O 220V ac 8 Input Module | 8 | | **1794-TBN**❄ |
| 1794-OA8 | FLEX I/O 120V ac 8 Output Module | | 8 | **1794-TBNF,** 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBN, 1794-TBKD❄ |
| 1794-OA8I | FLEX I/O 120V ac 8 Isolated Output Module | — | 8 | **1794-TBNF,** 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBN, 1794-TBKD❄ |
| 1794-OA16 | FLEX I/O 120V ac 16 Output Module | | 16 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TBN, 1794-TBKD❄§ |
| 1794-OM8 | FLEX I/O 220V ac 8 Output Module | | 8 | **1794-TBNF,** 1794-TBN❄ |
| *DC Modules* | | | | |
| 1794-IB8 | FLEX I/O 24V dc 8 Sink Input Module | 8 | | **1794-TB3,** 1794-TB3S❄ |
| 1794-IB16 | FLEX I/O 24V dc 16 Sink Input Module | 16 | | **1794-TB3,** 1794-TB3S❄ |
| 1794-IB16D | FLEX I/O 24V dc 16 channel digital input module with diagnostics | 16 | — | **1794-TB32,** 1794-TB32S❄ |
| 1794-IB32 | FLEX I/O 24V dc 32 Input Module | 32 | | **1794-TB32,** 1794-TB32S❄ |
| 1794-IV16 | FLEX I/O 24V dc 16 Source Input Module | 16 | | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| 1794-IB10XOB6 | FLEX I/O 24V dc 10 Input/6 2 A Output Combo Module | 10 | 6 | **1794-TB3,** 1794-TB3S❄ |
| 1794-IB16XOB16P | FLEX I/O 24V dc 16 Input/16 Protected Output Module | 16 | 16 | **1794-TB32,** TB32S❄ |
| 1794-IC16 | FLEX I/O 48V dc 16 Sink Input Module | 16 | — | **1794-TB3,** 1794-TB3S❄ |
| 1794-OB8 | FLEX I/O 24V dc 8 Source Output Module | | 8 | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| 1794-OB8EP | FLEX I/O 24V dc Electronically Protected 8 Output Module | | 8 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TBN, 1794-TBKD❄ |
| 1794-OB16 | FLEX I/O 24V dc 16 Source Output Module | | 16 | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| 1794-OB16D | FLEX I/O 24V dc 16 channel digital output module with diagnostics | | 16 | **1794-TB3,** 1794-TB3S, 1794-TBKD❄ |
| 1794-OB16P | FLEX I/O 24V dc 16 Protected Source Output Module | | 16 | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| 1794-OB32P | FLEX I/O 24V dc 32 Protected Source Output Module | — | 32 | **1794-TB32,** 1794-TB32S❄ |
| 1794-OV16 | FLEX I/O 24V dc 16 Sink Output Module | | 16 | **1794-TB3,** 1794-TB3S❄ |
| 1794-OV16P | FLEX I/O 24V dc 16 Protected Sink Output Module | | 16 | **1794-TB3,** 1794-TB3S❄ |
| 1794-OC16 | FLEX I/O 48V dc 16 Source Output Module | | 16 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TBKD❄ |
| *Relay Modules* | | | | |
| 1794-OW8 | FLEX I/O 24V dc 8 Relay Sink/Source Output Module | | 8 | **1794-TBNF,** 1794-TBN, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD❄ |

✶Recommended terminal base is in bold text
❄Recommended terminal base is in bold text.
‡Auxiliary terminal strips are required when using the 1794-TBN for the 1794-IA16 and 1794-IA16.
§Auxiliary terminal strips are required when using the 1794-TBN for the 1794-OA16 and 1794-IA16.

Conformal coated versions of standard modules have the letter K in the last position of the catalog number, before the series designation.

| | Conformal Coated Description |
|---|---|
| 1794-IA8K | ANSI / ISA-S71.04-1985, Class G1, G2, and G3 environments<br>CEI IEC 6065A-4 Class 1 and 2 environments<br>UL 746E |
| 1794-IB16K | |
| 1794-OA8K | |
| 1794-OB16PK | |
| 1794-OB8EPK | ANSI / ISA-S71.04-1985, Class G1, G2, and G3 environments<br>CEI IEC 6065A-4 Class 1 and 2 environments<br>UL 746E |
| 1794-ACN15 | — |
| 1794-ACNR15 | — |
| 1794-ADN | — |
| 1794-ASB | — |
| 1794-IE8 | — |
| 1794-IB16 | — |
| 1794-IRT8 | — |
| 1794-OB16 | — |
| 1794-OE4 | — |
| 1794-OW8 | — |
| 1794-TB3 | — |
| 1794-TB3G | — |
| 1794-TBN | — |
| 1794-IA8 | — |
| 1794-OA8 | — |
| 1794-OB8EP | — |
| 1794-IJ2 | — |

**Input Filter Times - AC Modules**

| Filter Times for Inputs | Maximum Times (ms) | | | |
|---|---|---|---|---|
| | OFF to ON | | ON to OFF | |
| | 1794-IA8, -IA8I | 1794-IA16, -IM8 | 1794-IA8, -IA8I | 1794-IA16, -IM8 |
| Filter Time 0 (default) | 8.4✶ | 7.5 | 26.4❄ | 26.5 |
| 1 | 8.6 | 8 | 26.6 | 27 |
| 2 | 9 | 9 | 27 | 28 |
| 3 | 10 | 10 | 28 | 29 |
| 4 | 12 | 12 | 30 | 31 |
| 5 | 16 | 16 | 34 | 35 |
| 6 | 24 | 24.5 | 42 | 44 |
| 7 | 40 | 42 | 58 | 60.5 |

✶OFF to ON filter is 8 ms.
❄ON to OFF filter is 26 ms.

## Selecting Input Filter Times for Digital Modules

Input filter times can be set to the following values (EtherNet I/P, ControlNet, and DeviceNet only):

**Input Filter Times - AC Modules**

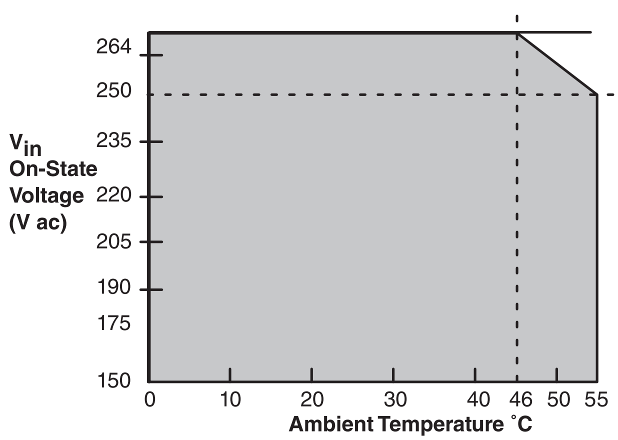
| Filter Times for Inputs | Maximum Times (ms) | | | |
|---|---|---|---|---|
| | OFF to ON | | ON to OFF | |
| | 1794-IA8, -IA8I | 1794-IA16, -IM8 | 1794-IA8, -IA8I | 1794-IA16, -IM8 |
| Filter Time 0 (default) | 8.4✶ | 7.5 | 26.4❄ | 26.5 |
| 1 | 8.6 | 8 | 26.6 | 27 |
| 2 | 9 | 9 | 27 | 28 |
| 3 | 10 | 10 | 28 | 29 |
| 4 | 12 | 12 | 30 | 31 |
| 5 | 16 | 16 | 34 | 35 |
| 6 | 24 | 24.5 | 42 | 44 |
| 7 | 40 | 42 | 58 | 60.5 |

✶OFF to ON filter is 8 ms.
❄ON to OFF filter is 26 ms.

**Input Filter Times - DC Modules**

| Filter Times for Inputs | Maximum Times (ms) |
|---|---|
| | OFF to ON and ON to OFF |
| | 1794-IB8, -IB16, -IB32, -IV16, -IC16, -IB10XOB6, -IB16XOB16P |
| Filter Time 0 (default) | 0.25 |
| 1 | 0.5 |
| 2 | 1 |
| 3 | 2 |
| 4 | 4 |
| 5 | 8 |
| 6 | 16 |
| 7 | 32 |

**Derating Curve**




The area within the curve represents the safe operating range for the module under various conditions of user supplied 220V ac supply voltages and ambient temperatures.

= All mounting positions (including normal horizontal, vertical, inverted horizontal) safe operating range.

# FLEX I/O Digital AC Input Modules

**1794-IA8** accepts 8 inputs from 120V ac field input devices that can have off-state leakage as high as 2.5 mA. For noisy input signals, all input modules can be programmed with filter times from 10…60 ms.

**1794-IA8I** provides 8 isolated inputs with the same specifications as the 1794-IA8.

**1794-IA16** is the 16 input version of the 1794-IA8.

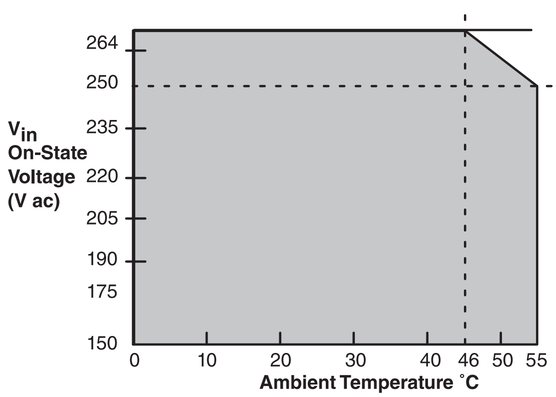
**1794-IM8** is the 220V ac version of the 1794-IA8.

| | 1794-IA8 | 1794-IA8I | 1794-IA16 | 1794-IM8 |
|---|---|---|---|---|
| Voltage, On-State Input, Nom. | 120V ac | 120V ac, isolated | 120V ac | 220V ac |
| Terminal Base Unit | **1794-TBN**, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD✶. | **1794-TBN**, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD❄ | **1794-TB3**, 1794-TB3S, 1794-TBN❄§ | **1794-TBN**❄ |
| Current, On-State Input, Nom. | 12 mA @ 120V ac, 60 Hz | 12 mA @ 120V ac, 60 Hz | 12 mA @ 120V ac, 60 Hz | 10 mA @ 220V ac, 60 Hz |
| Input Impedance, Nom. | 10.6 kΩ | 10.6 kΩ | 10 kΩ | 22.3 kΩ |
| Voltage, On-State Input, Min. | 65V ac | 65V ac | 74V ac | 159V ac |
| Voltage, Off-State Input, Max. | 43V ac | 43V ac | 20V ac | 40V ac |
| Current, On-State Input, Min.‡ | 7.1 mA♣➤⌘✦❖ | 7.1 mA♣➤⌘✦❖ | 5.5 mA @ 74V ac, 47 Hz♣➤⌘✦❖ | 5.3 mA @ 159V ac, 47 Hz♣➤⌘✦❖ |
| Current, Off-State Input, Max. | 2.9 mA | 2.9 mA | 2.9 mA | 2.6 mA |
| Power Dissipation, Max. | 4.5 W @ 132V ac | 4.5 W @ 132V ac | 6.4 W @ 132V ac | 4.7 W @ 264V ac |
| Thermal Dissipation, Max. | 15.3 BTU/hr @ 132V ac | 15.3 BTU/hr @ 132V ac | 21.8 BTU/hr @ 132V ac | 16.2 BTU/hr @ 264V ac |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in |
| Isolation Voltage | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, I/O to system<br>(No isloation between individual channels) | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, I/O to system<br>and I/O to I/O | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, I/O to system<br>(No isloation between individual channels) | Tested at 2600V dc for 1 s, I/O to system<br>(No isolation between individual channels) |

✶Recommended terminal base is in bold text
❄Recommended terminal base is in bold text.
§Auxiliary terminal strips are required when using the 1794-TBN for the 1794-IA16 and 1794-IA16.
♣AC inputs compatible with proximity switches with leakage ratings of I
➤leak
⌘ < 2.5 mA and I
✦on
❖ min = 5 mA.

### 1794-IM8 Derating Curve

**Derating Curve**




The area within the curve represents the safe operating range for the module under various conditions of user supplied 220V ac supply voltages and ambient temperatures.

= All mounting positions (including normal horizontal, vertical, inverted horizontal) safe operating range.

# FLEX I/O Digital AC Output Modules

**1794-OA8** provides 8 120V ac 1/2 Amp outputs that can be used up to 1 Amp with limitations.

**1794-OA8I** is the isolated version of the 1794-OA8.

**1794-OA16** provides 16 1/4 Amp outputs with specified limitations when used at 1/2 Amp.

**1794-OM8** provides 8 220V ac outputs rated at 1/2 Amp each.

These modules are not fused. External channel fusing or use of fused terminal bases (TBNF) is required with the - point modules.

| | 1794-OA8 | 1794-OA8I | 1794-OA16 | 1794-OM8 |
|---|---|---|---|---|
| Voltage, On-State Output, Nom. | 120V ac | 120V ac, isolated | 120V ac | 220V ac |
| Terminal Base Unit✶ | **1794-TBNF**, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBN, 1794-TBKD | **1794-TBNF**, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBN, 1794-TBKD | **1794-TB3**, 1794-TB2, 1794-TB3S, 1794-TBN, 1794-TBKD❄ | **1794-TBNF**, 1794-TBN |
| Current, On-State Output, Min. | 5 mA per output | 5 mA per output | 5 mA per output | 5 mA per output |
| Current, On-State Output, Max. | 500 mA per output @ 55 °C (sufficient to operate an A-B Bulletin 500 NEMA size 3 motor starter)<br>750 mA per output @ 35 °C<br>1.0 A on 4 nonadjacent outputs and 500 mA on the remaining 4 outputs @ 30 °C | 500 mA per output @ 55 °C (sufficient to operate an A-B Bulletin 500 NEMA size 3 motor starter)<br>750 mA per output @ 35 °C<br>1.0A on 4 nonadjacent outputs and 500 mA on the remaining 4 outputs @ 30 °C | 500 mA per output @ 55 °C‡♣ | 500 mA @ 55 °C❖ |
| Current, On-State Output, per Module | 4.0 A (8 outputs @ 500 mA) | 4.0 A (8 outputs @ 500 mA) | 4.0 A (16 outputs @ 250 mA) | 4.0 A (8 outputs @ 500 mA)❖ |
| Leakage Current, Off-State Output, Max | 2.25 mA | 2.25 mA | 2.25 mA | 2.5 mA |
| Voltage Drop, On-State Output, Max. | 1.0V @ 0.5 A | 1.0V @ 0.5 A | 1.5V @ 0.5 A | 1.5 V @ 0.5 A |
| Output Surge Current, Max. | 7 A for 45 ms, repeatable every 8 s | 7 A for 45 ms, repeatable every 8 s | 7 A for 40 ms, repeatable every 8 s | 7 A for 40 ms, repeatable every 8 s |
| Voltage, On-State Output, Min.✦ | 85V ac | 85V ac | 85V ac | 159V ac |
| Voltage, On-State Output, Nom.✦ | 120V ac | 120V ac | 120V ac | 220V ac |
| Voltage, On-State Output, Max.✦ | 132V ac | 132V ac | 132V ac | 264V ac |
| Power Dissipation, Max. | 4.1 W @ 0.5 A<br>6.3 W @ 0.75 A<br>6.3 W @ 1.0 A | 4.1 W @ 0.5 A<br>6.3 W @ 0.75 A<br>6.3 W @ 1.0 A | 4.7 W @ 0.5 A | 5 W @ 0.5 A |
| Thermal Dissipation | 14.0 BTU/hr @ 0.5 A<br>21.1 BTU/hr @ 0.75 A<br>21.4 BTU/hr @ 1.0 A | 14.0 BTU/hr @ 0.5 A<br>21.1 BTU/hr @ 0.75 A<br>21.4 BTU/hr @ 1.0 A | 16.1 BTU/hr @ 0.5 A | 17.1 BTU/hr @ 0.5 A |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in |
| Isolation Voltage | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, I/O to system<br>(No isolation between individual channels) | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, channel to channel, I/O to system | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, I/O to system<br>(No isolation between individual channels) | Tested at 2600V dc for 1 s, I/O to system<br>(No isolation between individual channels) |

✶Recommended terminal base is in bold text.
❄Auxiliary terminal strips are required when using the 1794-TBN for the 1794-OA16 and 1794-IA16.
‡If using 0.5 A outputs, alternate wiring so that no two 0.5 A outputs are adjacent. See the 1794-OA16 derating curve for mounting other than normal horizonal.
❖See the 1794-OM8 derating curve.
§Below 50 mA the voltage drop across the module will be higher and the voltage waveform may have some small oscillation (less than 5V).
♣If using 0.5 A outputs, alternate wiring so that no two 0.5 A outputs are adjacent. See the 1794-OA16 derating curve for mounting other than normal horizontal.
➤See the 1794-OM8 derating curve.
⌘1794-OA8I also tested for isolation between channels.
✦The external ac supply voltage must be capable of a 50 A surge for 1/2 cycle at power-up.
**Note:** The output signal delay, OFF to ON or ON to OFF is 1/2 cycle maximum.
Modules have a yellow status indicator for each channel. These indicators are driven from the logic-side circuitry.
Module outputs are not fused. Fusing of individual outputs is required. If applicable, the 1794-TBNF is recommended, otherwise you must provide external fusing. The following fuses are recommended:

- 1794-OA8, -OA8I - Use 1.6 A, 250V Slow-Blow, Littelfuse pt. no. 23901.6; San-o SD6-1.6 A; AB pt. no. 94171304. The 1794-TBNF comes with SD6-1.6 A fuses installed.
- 1794-OA16 - Use 2.5 A, 150V MQ2 normal fuse.
- 1794-OM8 - Use 0.8 A, 250V MQ4 normal fuse.

# FLEX I/O Digital AC Output Modules

**1794-OA8** provides 8 120V ac 1/2 Amp outputs that can be used up to 1 Amp with limitations.

**1794-OA8I** is the isolated version of the 1794-OA8.

**1794-OA16** provides 16 1/4 Amp outputs with specified limitations when used at 1/2 Amp.

**1794-OM8** provides 8 220V ac outputs rated at 1/2 Amp each.

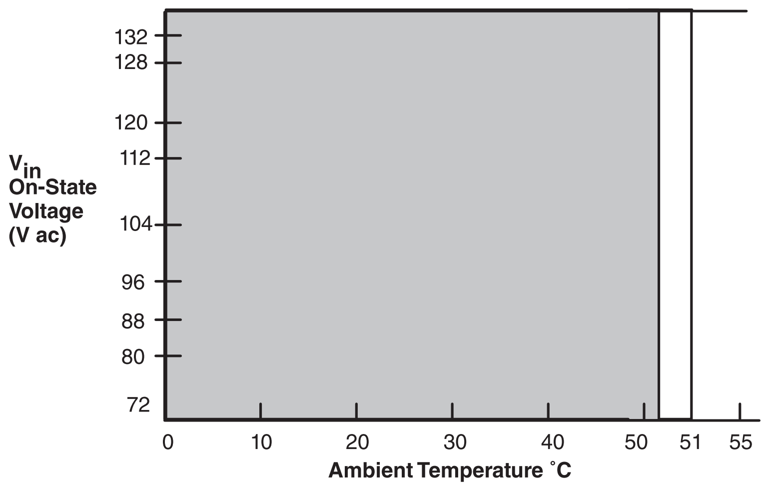
These modules are not fused. External channel fusing or use of fused terminal bases (TBNF) is required with the - point modules.

| | 1794-OA8 | 1794-OA8I | 1794-OA16 | 1794-OM8 |
|---|---|---|---|---|
| Voltage, On-State Output, Nom. | 120V ac | 120V ac, isolated | 120V ac | 220V ac |
| Terminal Base Unit✶ | **1794-TBNF**, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBN, 1794-TBKD | **1794-TBNF**, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBN, 1794-TBKD | **1794-TB3**, 1794-TB2, 1794-TB3S, 1794-TBN, 1794-TBKD❄ | **1794-TBNF**, 1794-TBN |
| Current, On-State Output, Min. | 5 mA per output | 5 mA per output | 5 mA per output | 5 mA per output |
| Current, On-State Output, Max. | 500 mA per output @ 55 °C (sufficient to operate an A-B Bulletin 500 NEMA size 3 motor starter)<br>750 mA per output @ 35 °C<br>1.0 A on 4 nonadjacent outputs and 500 mA on the remaining 4 outputs @ 30 °C | 500 mA per output @ 55 °C (sufficient to operate an A-B Bulletin 500 NEMA size 3 motor starter)<br>750 mA per output @ 35 °C<br>1.0A on 4 nonadjacent outputs and 500 mA on the remaining 4 outputs @ 30 °C | 500 mA per output @ 55 °C‡♣ | 500 mA @ 55 °C❖ |
| Current, On-State Output, per Module | 4.0 A (8 outputs @ 500 mA) | 4.0 A (8 outputs @ 500 mA) | 4.0 A (16 outputs @ 250 mA) | 4.0 A (8 outputs @ 500 mA)❖ |
| Leakage Current, Off-State Output, Max | 2.25 mA | 2.25 mA | 2.25 mA | 2.5 mA |
| Voltage Drop, On-State Output, Max. | 1.0V @ 0.5 A | 1.0V @ 0.5 A | 1.5V @ 0.5 A | 1.5 V @ 0.5 A |
| Output Surge Current, Max. | 7 A for 45 ms, repeatable every 8 s | 7 A for 45 ms, repeatable every 8 s | 7 A for 40 ms, repeatable every 8 s | 7 A for 40 ms, repeatable every 8 s |
| Voltage, On-State Output, Min.✦ | 85V ac | 85V ac | 85V ac | 159V ac |
| Voltage, On-State Output, Nom.✦ | 120V ac | 120V ac | 120V ac | 220V ac |
| Voltage, On-State Output, Max.✦ | 132V ac | 132V ac | 132V ac | 264V ac |
| Power Dissipation, Max. | 4.1 W @ 0.5 A<br>6.3 W @ 0.75 A<br>6.3 W @ 1.0 A | 4.1 W @ 0.5 A<br>6.3 W @ 0.75 A<br>6.3 W @ 1.0 A | 4.7 W @ 0.5 A | 5 W @ 0.5 A |
| Thermal Dissipation | 14.0 BTU/hr @ 0.5 A<br>21.1 BTU/hr @ 0.75 A<br>21.4 BTU/hr @ 1.0 A | 14.0 BTU/hr @ 0.5 A<br>21.1 BTU/hr @ 0.75 A<br>21.4 BTU/hr @ 1.0 A | 16.1 BTU/hr @ 0.5 A | 17.1 BTU/hr @ 0.5 A |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in |
| Isolation Voltage | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, I/O to system<br>(No isolation between individual channels) | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, channel to channel, I/O to system | 120V continuous<br>Tested to 2150V dc for 1 s and 1250V ac for 60 s, I/O to system<br>(No isolation between individual channels) | Tested at 2600V dc for 1 s, I/O to system<br>(No isolation between individual channels) |

✶Recommended terminal base is in bold text.
❄Auxiliary terminal strips are required when using the 1794-TBN for the 1794-OA16 and 1794-IA16.
‡If using 0.5 A outputs, alternate wiring so that no two 0.5 A outputs are adjacent. See the 1794-OA16 derating curve for mounting other than normal horizonal.
❖See the 1794-OM8 derating curve.
§Below 50 mA the voltage drop across the module will be higher and the voltage waveform may have some small oscillation (less than 5V).
♣If using 0.5 A outputs, alternate wiring so that no two 0.5 A outputs are adjacent. See the 1794-OA16 derating curve for mounting other than normal horizontal.
➤See the 1794-OM8 derating curve.
⌘1794-OA8I also tested for isolation between channels.
✦The external ac supply voltage must be capable of a 50 A surge for 1/2 cycle at power-up.
**Note:** The output signal delay, OFF to ON or ON to OFF is 1/2 cycle maximum.
Modules have a yellow status indicator for each channel. These indicators are driven from the logic-side circuitry.
Module outputs are not fused. Fusing of individual outputs is required. If applicable, the 1794-TBNF is recommended, otherwise you must provide external fusing. The following fuses are recommended:

- 1794-OA8, -OA8I - Use 1.6 A, 250V Slow-Blow, Littelfuse pt. no. 23901.6; San-o SD6-1.6 A; AB pt. no. 94171304. The 1794-TBNF comes with SD6-1.6 A fuses installed.
- 1794-OA16 - Use 2.5 A, 150V MQ2 normal fuse.
- 1794-OM8 - Use 0.8 A, 250V MQ4 normal fuse.

### 1794-OA16 Derating Curve

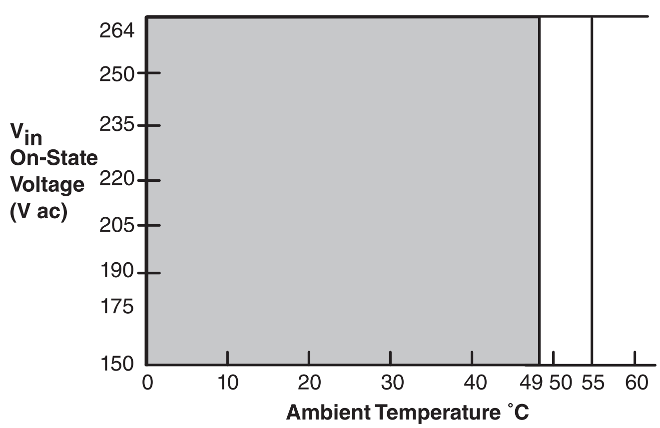



The area within the curve represents the safe operating range for the module under various conditions of user supplied 120V ac supply voltages and ambient temperature.

= Normal mounting safe operating range included

= Other mounting positions (including inverted horizontal, vertical) safe operating range

### 1794-OM8 Derating Curve




The area within the curve represents the safe operating range for the module under various conditions of user supplied 220V ac supply voltages and ambient temperatures.

= Normal mounting safe operating range included

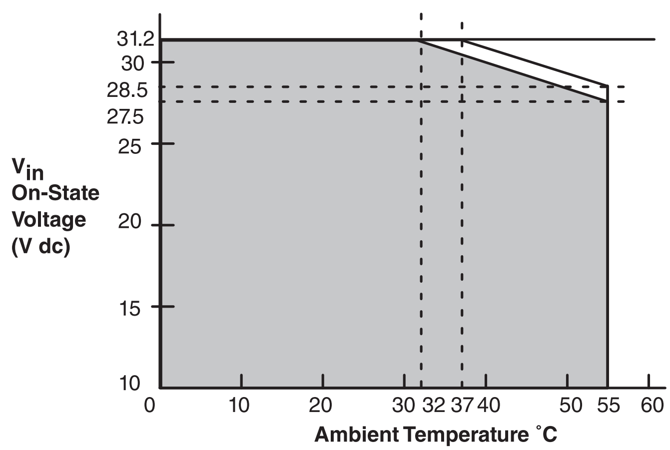
= Other mounting positions (including inverted horizontal, vertical) safe operating range

# FLEX I/O Digital DC Input Modules

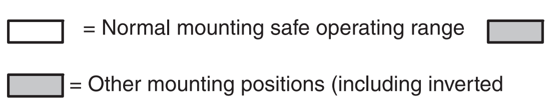
| | 1794-IB8 & 1794-IB16 | 1794-IB32 | 1794-IV16 | 1794-IC16 |
|---|---|---|---|---|
| Voltage, On-State Input, Min. | 10V dc, sinking | 19.2V dc, sinking | 10V dc, sourcing | 30V dc, sinking |
| Voltage, On-State Input, Nom. | 24V dc | 24V dc | 24V dc | 48V dc |
| Voltage, On-State Input, Max. | 31.2V dc | 31.2V dc | 31.2V dc | 60V dc |
| Terminal Base Unit | **1794-TB3**, 1794-TB3S✶ | **1794-TB32**, 1794-TB32S✶ | **1794-TB2**, 1794-TB3, 1794-TB3S, 1794-TBKD✶ | **1794-TB3**, 1794-TB3S✶ |
| Current, On-State Input, Nom. | 8 mA @ 24V dc | 4.1 mA @ 24V dc | 8 mA @ 24V dc | 5.0 mA at 48V dc |
| Current, On-State Input, Max. | 11 mA | 6.0 mA | 11 mA | 11.0 mA |
| Input Impedance, Max. | 4.6 kΩ | 6.0 kΩ | 4.7 kΩ | 11 kΩ |
| Voltage, On-State Input, Min. | 10V dc | 19.2V dc | 10V dc | 30V dc |
| Voltage, Off-State Input, Max. | 5.0V dc | 5.0V dc | 5.0V dc | 10.0V dc |
| Current, On-State Input, Min. | 2.0 mA | 2.0 mA | 2.0 mA | 2.0 mA |
| Current, Off-State Input, Max. | 1.5 mA | 1.5 mA | 1.5 mA | 1.5 mA |
| Power Dissipation, Max. | 3.1 W @ 31.2V dc❆ | 6.0 W @ 31.2V dc | 5.7 W @ 31.2V dc | 6.4 W @ 60V dc |
| Thermal Dissipation, Max. | 11.9 BTU/hr @ 31.2V dc‡ | 20.5 BTU/hr @ 31.2V dc | 19.4 BTU/hr @ 31.2V dc | 21.9 BTU/hr @ 60V dc |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm‡ | 45.7 x 94.0 x 53.3 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in‡ | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in |
| Isolation Voltage | Tested at 850V dc for 1 s, I/O to system (No isolation between individual channels) | Tested at 2121V dc for 1 s, I/O to system (No isolation between individual channels) | Tested at 2121V dc for 1 s, I/O to system (No isolation between individual channels) | Tested at 1900V dc for 1 s, I/O to system (No isolation between individual channels) |

✶Recommended terminal base is in bold text.
❆6.1 W @ 31.2V dc for 1794-IB16.
‡20.8 BTU/hr @ 31.2V dc for 1794-IB16.
**Note:** Do not put the 1794-IB8 module next to an output module in 8-point compact addressing with the 1794-ASB2/C or -ASB/D.
Modules have a yellow status indicator for each channel. These indicators are driven from the customer field-side input device.

## 1794-IB16 Derating Curve




The area within the curve represents the safe operating range for the module under various conditions of user supplied 24V dc supply voltages and ambient temperatures.



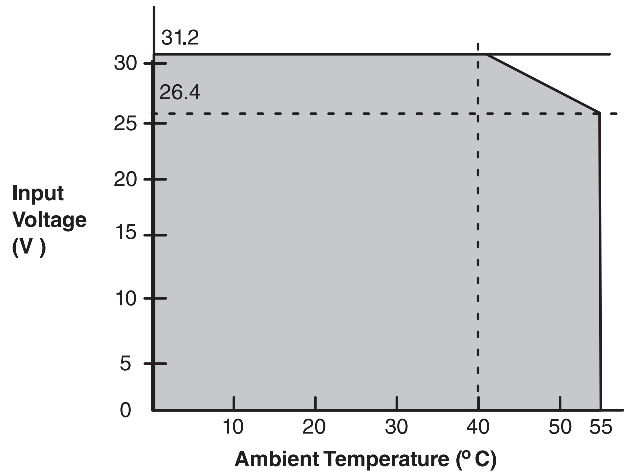
= Normal mounting safe operating range [grey box] included

= Other mounting positions (including inverted horizontal, vertical) safe operating range

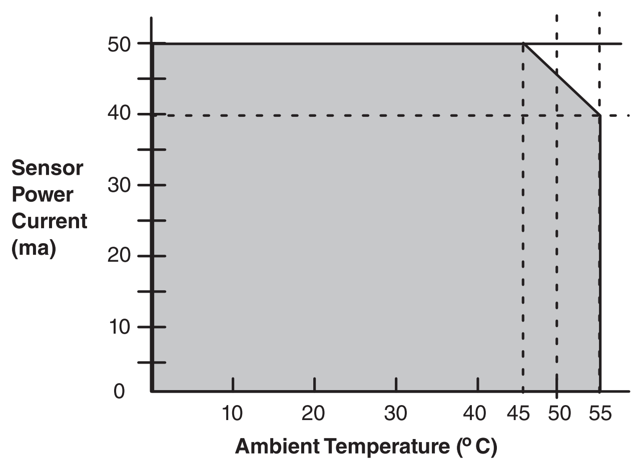
### 1794-IB16D Derating Curve

**Derating Curves**

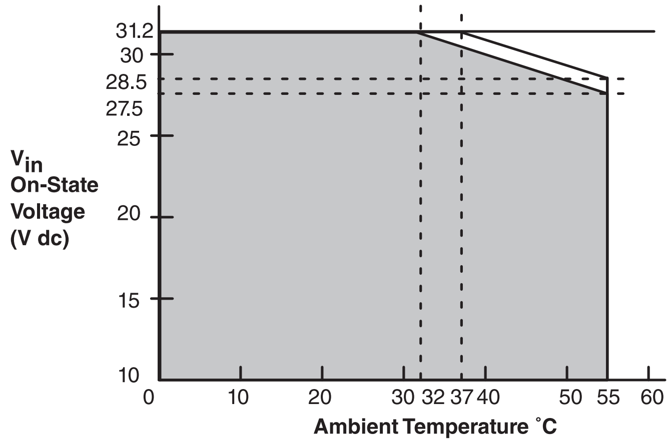
**1794-IB16D Input Voltage**




**Sensor Power**



### 1794-IB32 Derating Curve



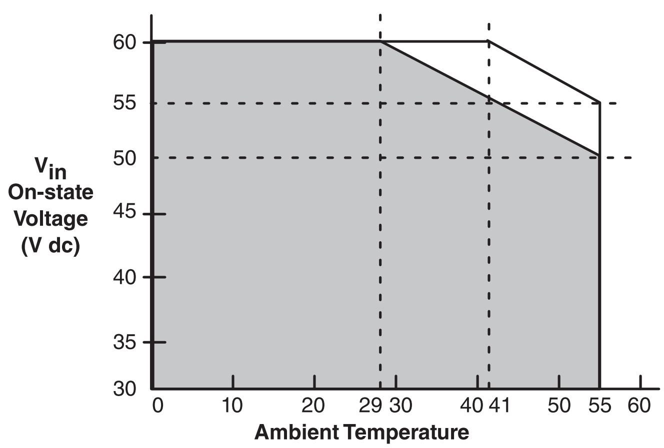

The area within the curve represents the safe operating range for the module under various conditions of user supplied 24V dc supply voltages and ambient temperatures.

= Normal mounting safe operating range [gray box] included

= Other mounting positions (including inverted horizontal, vertical) safe operating range

### 1794-IC16 Derating Curve

**Derating Curve**




The area within the curve represents the safe operating range for the module under various conditions of user supplied 48V dc supply voltages and ambient temperature.

= Normal mounting safe operating range included

= Other mounting positions (including inverted horizontal) safe operating range

# FLEX I/O Digital DC Output Modules

**1794-OB8 and 1794-OB16** provide 16 sourcing 1/2 Amp outputs (8 for the 1794-OB8) over a wide 10...31.2V dc input voltage range.

**1794-OV16** is the sinking version of the 1794-OB16.

**1794-OC16** is the 48V dc version of the 1794-OB16.

These modules are not fused. External fusing is strongly recommended or use protected output modules.

| | 1794-OB8§ | 1794-OB16§ | 1794-OV16§ | 1794-OC16§ |
|---|---|---|---|---|
| Voltage, On-State Output, Nom. | 24V dc, sourcing | 24V dc, sourcing | 24V dc, sinking | 48V dc, sourcing |
| Voltage, On-State Output, Min. | 10V dc | 10V dc | 10V dc | 30V dc |
| Voltage, On-State Output, Max. | 31.2V dc | 31.2V dc | 31.2V dc | 60V dc @ 45 °C<br>55V dc @ 55 °C |
| Voltage Drop, On-State Output, Max. | 0.5V dc | 0.5V dc | 0.2V dc | 1.0V dc @ 0.5A |
| Terminal Base Unit | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD✶ | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD✶ | **1794-TB3,** 1794-TB3S✶ | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TBKD✶ |
| Current, On-State Output, Min. | 1.0 mA per channel | 1.0 mA per channel | 1.0 mA per channel | 2.0 mA per channel |
| Current, On-State Output, Max. | 500 mA per channel, 4 A per module | 500 mA per channel, 8 A per module | 500 mA per channel, 8 A per module | 500 mA per channel, 8 A per module |
| Leakage Current, Off-State Output, Max | 0.5 mA | 0.5 mA | 0.5 mA | 1.0 mA |
| Output Surge Current, Max. | 2 A for 50 ms, repeatable every 2 s | 2 A for 50 ms, repeatable every 2 s | 2 A for 50 ms, repeatable every 2 s | 4A for 10 ms, repeatable every 2 s |
| Output Delay Time, OFF to ON, Max. | 0.5 ms | 0.5 ms | 0.5 ms | 0.5 ms❄ |
| Output Delay Time, ON to OFF, Max. | 1.0 ms | 1.0 ms | 1.0 ms | 1.0 ms @ 25 °C<br>2.0 ms @ 55 °C‡ |
| External DC Supply Voltage Range | 10…31.2V dc (5% ac ripple) | 10…31.2V dc (5% ac ripple) | 10…31.2V dc (5% ac ripple) | 30…60V dc (5% ac ripple) |
| External DC Supply Current Range | 10…35 mA | 20…65 mA | 20…65 mA | 13…27 mA |
| Power Dissipation, Max. | 3.3 W @ 31.2V dc | 5.3 W @ 31.2V dc | 4.2W @ 31.2V dc | 3.7 W @ 60V dc |
| Thermal Dissipation, Max. | 11.2 BTU/hr @ 31.2V dc | 18.1 BTU/hr @ 31.2V dc | 14.3 BTU/hr @ 31.2V dc | 12.6 BTU/hr @ 60V dc |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in |
| Isolation Voltage | 50V continuous, I/O to system<br>Tested to 850V dc for 1 s, I/O to system<br>(No isolation between individual channels) | 50V continuous, I/O to system<br>Tested to 850V dc for 1 s, I/O to system<br>(No isolation between individual channels) | 50V continuous<br>Tested 1770Vdc for 60 sec, I/O to system<br>(No isloation between individual channels) | 75V continuous, I/O to system<br>Tested to 1900V dc for 1 s, I/O to system<br>(No isolation between individual channels) |

✶Recommended terminal base is in bold text.
❄Off/On delay is the time from a valid output "on" signal to output energization.
‡On/Off delay is the time from a valid output "off" signal to output de-energization.§ Module outputs are not fused. Fusing of outputs is recommended. If fusing is desired, you must provide external fusing. For 1794-OB8, -OB16, and -OV16 use SAN-O MQ4-800 mA fuse.
For 1794-OC16 use 2 A, 150V ac MQ2 normal fuse.

## Digital DC Protected Output Modules

**1794-OB16P** provides 16 sourcing 1/2 Amp outputs self-protected against shorts, overloads, and over temperature. The faulted output will automatically return when the fault is removed. No feedback to the processor is provided.

**1794-OB8EP** provides 8 sourcing 2 Amp outputs with electronic fuse type of overload protection, which opens when overloaded. The fuse can be 'reset' several ways. Fault status is provided to the processor.

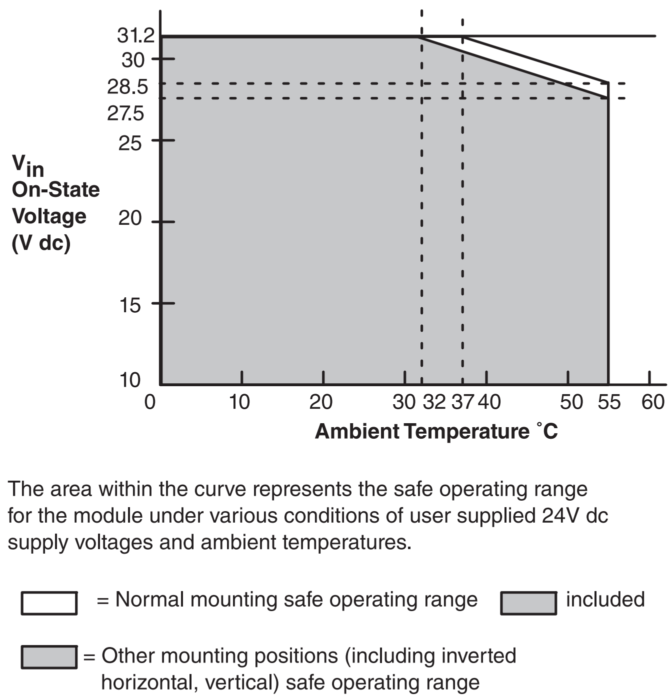
**1794-OB32P** provides 32 self-protected sourcing 1/2 Amp outputs in 2 groups of 16 outputs. Separate voltage sources can be used with each group.

**1794-OV16P** is the sinking version of the 1794-OB16P.

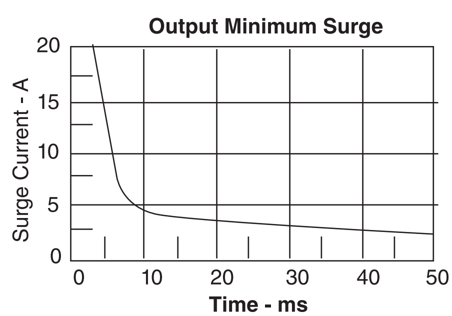
| | 1794-OB16P | 1794-OB8EP | 1794-OB32P | 1794-OV16P |
|---|---|---|---|---|
| Voltage, On-State Output, Nom. | 24V dc, sourcing | 24V dc, sourcing | 24V dc, sourcing | 24V dc, sinking |
| Voltage, On-State Output, Min. | 10V dc | 19.2V dc | 10V dc | 10V dc |
| Voltage, On-State Output, Max. | 31.2V dc✶ | 31.2V dc | 31.2V dc | 31.2V dc |
| Voltage Drop, On-State Output, Max. | 0.5V dc | 0.2V dc | 0.5V dc | 0.2V dc |
| Terminal Base Unit | **1794-TB2**, 1794-TB3, 1794-TB3S, 1794-TBKD❄ | **1794-TB3**, 1794-TB2, 1794-TB3S, 1794-TBN, 1794-TBKD❄ | **1794-TB32**, 1794-TB32S❄ | **1794-TB3**, 1794-TB3S❄ |
| Current, On-State Output, Min.§ | 1.0 mA per channel | 1.0 mA per channel | 1.0 mA per channel | 1.0 mA per channel |
| Current, On-State Output, Max. | 500 mA per channel, 8 A per module | 2.0 A per channel, 10 A per module | 500 mA per channel;<br>14 A per module (6 A total for channels 0…15; 8 A total for channels 16…31) | 500 mA per channel, 8 A per module |
| Leakage Current, Off-State Output, Max | 0.5 mA | 0.5 mA | 0.5 mA | 0.5 mA |
| Output Surge Current, Max. | 1.5 A for 50 ms, repeatable every 2 s | 4 A for 10 ms, repeatable every 3 s‡ | 2 A for 50 ms, repeatable every 2 s | 2 A for 50 ms, repeatable every 2 s |
| External DC Supply Voltage Range | 10…31.2V dc (5% ac ripple) | 19.2…31.2V dc (5% ac ripple) | 10…31.2V dc (5% ac ripple) | 10…31.2V dc (5% ac ripple) |
| External DC Supply Current Range | 25…75 mA | 20…35 mA | 103…273 mA | 20…65 mA |
| Power Dissipation, Max. | 5.0 W @ 31.2V dc | 5.5 W @ 31.2V dc | 5.3 W @ 31.2V dc | 4.2 W @ 31.2V dc |
| Thermal Dissipation, Max. | 17.0 BTU/hr @ 31.2V dc | 18.8 BTU/hr @ 31.2V dc | 18.1 BTU/hr @ 31.2V dc | 14.3 BTU/hr @ 31.2V dc |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm | 46 x 94 x 53 mm | 45.7 x 94.0 x 53.3 mm | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in |
| Isolation Voltage | 50V (continuous), Basic Insulation Type<br>Type tested at 2121V dc for 60 s, between field side and system<br>No isolation between individual channels | 50V continuous, I/O to system<br>Tested to 850V dc for 1 s, I/O to system<br>(No isolation between individual channels) | 50V continuous, I/O to system<br>Tested to 2150V ac for 1 s, I/O to system<br>(No isolation between individual channels) | 50V continuous<br>Tested 1770Vdc for 60 sec, I/O to system<br>(No isloation between individual channels) |

✶See 1794-OB16P Derating Curve
❄Recommended terminal base is in bold text.
‡See 1794-OB8EP Output Minimum Surge chart.

### 1794-OB16P Derating Curve




### 1794-OB8EP Output Minimum Surge



## FLEX I/O Digital DC Diagnostic Modules

**1794-IB16D** is the diagnostic version of the 1794-IB16.

**1794-OB16D** is the diagnostic version of the 1794-OB16.

The modules can detect open wire, short circuit, and reverse polarity of external power. When a fault is detected, the module turns on the module fault LED, the corresponding channel's red LED, and sets the corresponding module error bit (open wire, short circuit, or reverse power bit). The reporting function provides the results of the diagnostics as bits in the data table.

The modules can detect open wire, short-circuit, and reverse polarity of external power. When a fault is detected, the module turns on the module fault LED, the corresponding channel's red LED, and sets the module error open wire, short-circuit, or reverse power error bit. The reporting function provides the results of the diagnostics as bits in its data table.

The modules have 16 bi-color channel status indicators and one red module status indicator. These indicators are driven from the customer field side power.

| | 1794-IB16D |
|---|---|
| Voltage, On-State Input, Min. | 10V dc, sinking |
| Voltage, On-State Input, Nom. | 24V dc |
| Voltage, On-State Input, Max. | 31.2V dc✶ |
| Voltage, Off-State Input, Max. | 5.0V dc |
| Current, On-State Input, Nom. | 8.2 mA at 24V dc |
| Current, On-State Input, Max. | 12.1 mA @ 31.2V dc |
| Current, On-State Input, Max. | 12.1 mA @ 31.2V dc |
| Terminal Base Unit | **1794-TB32**, 1794-TB32S❄ |
| Input Impedance, Max. | 3.1 kΩ |
| Current, On-State Input, Min. | 2.0 mA at 10 dc |
| Current, Off-State Input, Max. | 1.5 mA |
| Power Dissipation, Max. | 8.5 W @ 31.2V dc |
| Thermal Dissipation, Max. | 29 BTU/hr @ 31.2V dc |
| Detect Reverse Polarity Voltage | =2,5100 |
| Sensor Voltage Drop | 2.2V dc max |
| Current, Sensor Source, Max. | 50 mA max |
| Dimensions (HxWxD), Imperial | =4,1070043 |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Isolation Voltage | Tested at 2121V dc for 1 s, I/O to system<br>(No isolation between individual channels) |

✶See 1794-IB16D Input Voltage Derating chart.
❄Recommended terminal base is in bold text.

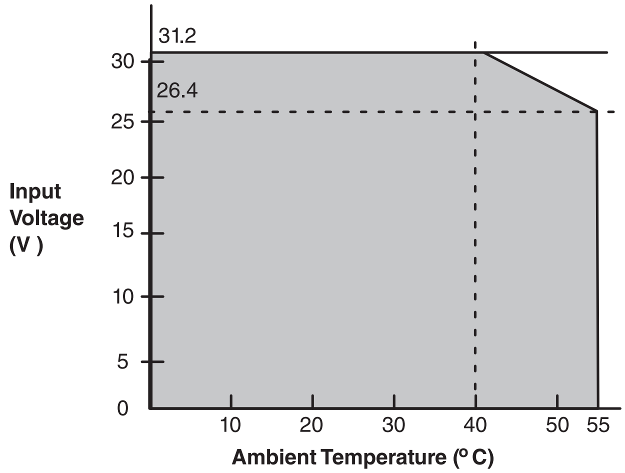
| | 1794-OB16D |
|---|---|
| Voltage, On-State Output, Min. | 10V dc, sourcing |
| Voltage, On-State Output, Max. | 31.2V dc |
| Voltage Drop, On-State Output, Max. | 0.5V dc @ 0.5 A |
| Terminal Base Unit | **1794-TB3**, 1794-TB3S, 1794-TBKD✶ |
| Current, On-State Output, Min.§ | 2.0 mA per channel |
| Current, On-State Output, Max. | 500 mA per channel<br>8 A per module |
| Leakage Current, Off-State Output, Max | 0.5 mA |
| Output Surge Current, Max. | 2 A for 50 ms, repeatable every 2 s |
| External DC Supply Voltage Range | 10…31.2V dc (5% ac ripple) |
| External DC Supply Current Range | 56…78 mA |
| Power Dissipation, Max. | 4.8 W @ 31.2V dc |
| Thermal Dissipation, Max. | 16.4 BTU/hr @ 31.2V dc |
| Short Circuit Protection | Thermal shutdown (auto reset)<br>Detection condition: when external power active, output signal active, and output port voltage less than 2V |
| Short Circuit Protection | Thermal shutdown (auto reset)<br>Detection condition: when external power active, output signal active, and output port voltage less than 2V |
| Open Wire Detect, Off-State Leakage Current | 0.1 mA - When external power active and output signal inactive |
| Detect Reverse Polarity Voltage | 10V min.: Module must detect if the reverse polarity external power supply voltage is greater than the value |
| Current, Sensor Source, Max. | Yes |
| Dimensions (HxWxD), Metric | =2,1070042 |
| Dimensions (HxWxD), Metric | 45.7 x 94.0 x 53.3 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Isolation Voltage | 50V continuous, I/O to system<br>Tested to 2121V dc for 1 s, I/O to system<br>(No isolation between individual channels) |

✶Recommended terminal base is in bold text.

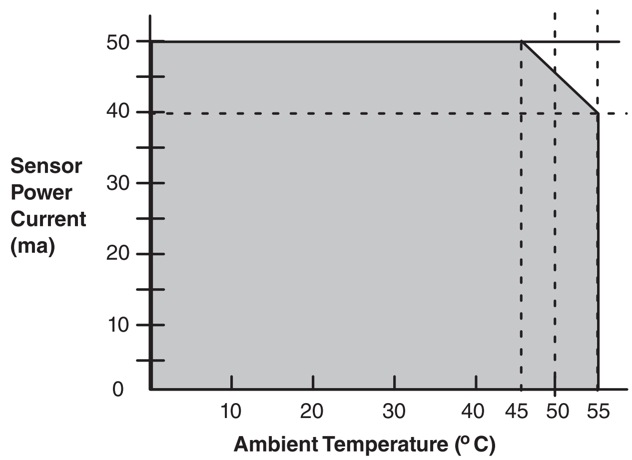
# Derating Curves 1794-IB16D Input Voltage

## Derating Curves

### 1794-IB16D Input Voltage




### Sensor Power



# FLEX I/O Digital DC Combination Modules

The 1794-IB16XOB16P has ouptputs that are self-protected against shorts, overloads, and over temperature similar to the OB16P. The 1794-IB10XOB6 requires the use of external fusing for individual outputs.

| | 1794-IB10XOB6♣ | 1794-IB16XOB16P➤ |
|---|---|---|
| Terminal Base Unit | **1794-TB3**, 1794-TB3S✶ | **1794-TB32**, TB32S✶ |
| Isolation Voltage | 50V (continuous), Basic Insulation Type<br>Type tested at 1250V ac for 60 s, between field side and system<br>Routine tested at 2121V dc for 1 s, between field side and system<br>No isolation between individual channels | 50V, Basic Insulation type<br>Tested to 2121V dc for 1 s, system to I/O and inputs to outputs |
| Power Dissipation, Max. | 6.0 W @ 31.2V dc | 7.0 W @ 31.2V dc |
| Thermal Dissipation, Max. | 20.3 BTU/hr @ 31.2V dc | 23.9 BTU/hr @ 31.2V dc |
| Number of Inputs | 10 | 16 |
| Voltage, On-State Input, Min. | 10V dc | 10V dc❆ |
| Voltage, On-State Input, Nom. | 24V dc | 24V dc |
| Voltage, On-State Input, Max. | 31.2V dc | 31.2V dc❆ |
| Current, On-State Input, Min. | 2.0 mA | 2.0 mA |
| Current, On-State Input, Nom. | 8.0 mA @ 24V dc | 8.8 mA @ 24V dc |
| Current, On-State Input, Max. | 11.0 mA | 12.1 mA |
| Voltage, Off-State Input, Max. | 5.0V dc | 5.0V dc |
| Current, Off-State Input, Max. | 1.5 mA | 1.5 mA |
| Input Impedance, Max. | 4.8 kΩ | 2.5 kΩ |
| Number of Outputs | 6 | 16 |
| Voltage, On-State Output, Min. | 10V dc | 10V dc‡ |
| Voltage, On-State Output, Nom. | 24V dc | 24V dc |
| Voltage, On-State Output, Max. | 31.2V dc | 31.2V dc‡ |
| Voltage Drop, On-State Output, Max. | 1V dc @ 2 A<br>0.5V dc @ 1 A | 0.5V dc @ 0.5 A |
| Current, On-State Output, Min. | 1.0 mA per channel | 1.0 mA per channel |
| Current, On-State Output, Max. | 2.0 A per channel<br>10 A per module | 0.5 A per channel<br>8 A per module |
| Voltage, Off-State Output, Max. | 31.2V dc | 31.2V dc |
| Leakage Current, Off-State Output, Max | 0.5 mA | 0.5 mA |
| Output Delay Time, OFF to ON, Max. | 0.5 ms§ | 0.5 ms |
| Output Delay Time, ON to OFF, Max. | 1.0 ms§ | 1.0 ms |
| Output Surge Current, Max. | 4 A for 50 ms, repeatable every 2 s | 1.5 A for 50 ms, repeatable every 2 s |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm | 45.7 x 94.0 x 53.3 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in | 1.8 x 3.7 x 2.1 in |
| External DC Supply Voltage Range | 10…31.2V dc (includes 5% ac ripple) | 10…31.2V dc (includes 5% ac ripple) |
| External DC Supply Current Range | 8 mA @ 10V dc<br>15 mA @ 19.2V dc<br>19 mA @ 24V dc<br>25 mA @ 31.2V dc | 78 mA @ 10V dc |

✶Recommended terminal base is in bold text.
❆Refer to derating curve.
‡Refer to the Derating Curve.
§Output off-to-on or on-to-off delay is the time from the module issuing an output on or off until the output actually turns on or off.♣ Module outputs are not fused. Fusing is recommended. If fusing is desired, you must supply external fusing. Use SAN-O MQ4-3A or Littelfuse 235-003.
➤ Outputs are electronically protected against overloads and shorts.

# FLEX I/O Digital Contact Output Module (Relay) — 1794-OW8

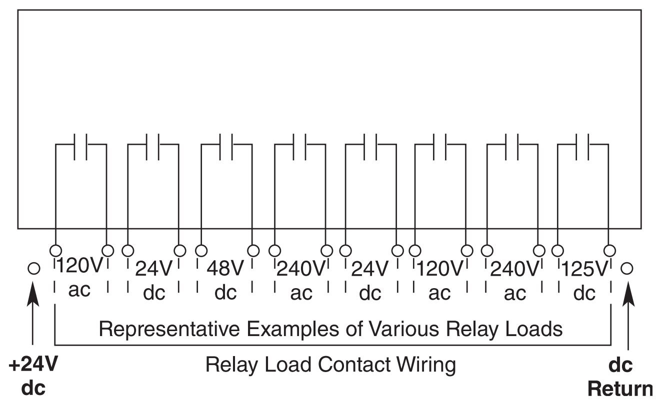
The 1794-OW8 module provides 8 isolated Form A (normally open) contacts capable of switching up to 2 A at up to 230V ac and 125V dc.

Do not attempt to increase load current or wattage capability beyond the maximum rating by connecting two or more outputs in parallel. The slightest variation in relay switching time may cause one relay to momentarily switch the total load current. Apply only +24V dc power to the power terminals on the terminal base. Make certain that all relay wiring is properly connected before applying any power to the module.

Total current draw through the terminal base unit is limited to 10 A. Separate power connections to the terminal base unit may be necessary.

The use of external fuses or a fused terminal base is required for individual outputs.

**Simplified Schematic of Relay Module**




Load power can be obtained from a variety of sources, and can range from +5V dc to 240V ac. Make certain that only 24V dc is applied to the module power terminals on the module terminal base.

| | 1794-OW8 |
|---|---|
| Number of Outputs | 8 |
| Terminal Base Unit | **1794-TBNF**, 1794-TBN, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD✶ |
| External DC Supply Voltage Range | 19.2…31.2V dc (includes 5% ac ripple) |
| External DC Supply Current Range | 125 mA, max |
| Leakage Current, Off-State Output, Max | 1 mA @ 240V ac (through a snubber) |
| Output Delay Time, OFF to ON, Max. | 10 ms❄ |
| Output Delay Time, ON to OFF | 10 ms‡ |
| Relay Output Current Rating, Resistive | 2.0 A @ 5…30V dc (at rated power)<br>0.5 A @ 48V dc (at rated power)<br>0.25 A @ 125V dc (at rated power)<br>2.0 A @ 125V ac (at rated power)<br>2.0 A @ 240V ac (at rated power) |
| Relay Output Current Rating, Inductive | 2.0 A @ 5…30V dc; L/R = 7 ms (at rated power)<br>0.5 A @ 48V dc; L/R = 7 ms (at rated power)<br>0.25 A @ 125V dc; L/R = 7 ms (at rated power)<br>2.0 A @ 125V ac; 15 A make; PF = cos Θ = 0.4 (at rated power)<br>2.0 A @ 240V ac; 15 A make; PF = cos Θ = 0.4 (at rated power) |
| Contact Resistance, Initial | 30 mΩ |
| Switching Frequency (Hz) | 0.3 Hz, (1 operation every 3 s) |
| Bounce Time, Mean | 1.2 ms |
| Contact Load, Min. | 100 µA @ 100 mV dc |
| Mechanical Life | 100,000 operations at rated loads |
| Power Dissipation, Max. | 5.5 W @ 31.2V dc |
| Thermal Dissipation, Max. | 18.8 BTU/hr @ 31.2V dc |
| Dimensions (HxWxD), Metric | 69 x 55 x 80 mm |
| Dimensions (HxWxD), Imperial | 2.72 x 2.17 x 3.15 in |
| Fusing | 3.0 A, 250V ac slow blow fuse (Littelfuse part number 239003) |

✶Recommended terminal base is in bold text.
❄Time from valid output on signal to relay energization by module.
‡Time from valid output off signal to relay deenergization by module.

## Analog, Thermocouple, and RTD I/O Modules

Choose analog, thermocouple, and/or RTD I/O modules when you need:

- **Individually configurable channels** allow the module to be used with a variety of sensors.
- **On-line configuration.** Modules can be configured in RUN mode using programming software or the control program. This allows you to change configuration while the system is operating.
- **Selectable input filters** on many modules allow you to select from several different filter frequencies for each channel that best meets the performance needs of your application. Lower filter settings provide greater noise rejection and resolution. Higher filter settings provide faster performance. *Note: Isolated analog modules have four filter selections; the thermocouple module has ten; and the combined RTD/thermocouple module has eight.*
- **Ability to direct output device operation during an abnormal condition.** Each channel of the output module can be individually configured to hold its last value or assume a user-defined value on either a run-to-program or run-to-fault condition. This feature allows you to set the condition of your analog devices, and therefore your control process, which may help to ensure a reliable shutdown.
- **Selectable response to broken input sensor.** This feature provides feedback to the controller that a field device is not connected. This allows you to specify corrective action based on the channel condition.
- **Single-ended or differential inputs depending on module.** Analog modules have single-ended inputs while isolated analog and temperature modules have differential inputs. Single-ended voltage sensors reduce costs. Differential inputs are more expensive, but are typically more noise immune.
- **Over- and under-range detection and indication** are available with most modules. This eliminates the need to test values in the control program. While standard analog modules have limited diagnostics, temperature and isolated analog modules provide over-range, under-range, and wire-off diagnostics with alarm bits.
- **On-board scaling** is performed by the temperature modules and is user configurable for either °C, °F, °K, Ohms, or mV. This eliminates the need to scale the data in the user program.
- **Accuracy and resolution varies by module** and the associated application. Specifications are given for each module at it's operational conditions.
- **Internal calibration is performed** in the analog modules (1794-IE8, -OE4, and -IE4XOE2). User calibration is recommended (yearly) for isolated analog and temperature modules. All modules come factory calibrated.

## Analog Module Summary

| Cat. No. | Description | Number of Inputs | Number of Outputs | Terminal Base Unit |
|---|---|---|---|---|
| 1794-IE8 | FLEX I/O 24V dc Selectable Analog 8 Input Module | 8 | N/A | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS✶ |
| 1794-IE8H | FLEX 1/O HART Enabled Analog 8 Input Module | 8 single-ended | | 1794-TB3G or 1794-TB3GS |
| 1794-IE12♠ | FLEX I/O 12 Input Analog Module❄ | 12 single-ended | | 1794-TB3G or 1794-TB3GS |
| 1794-IF4I | FLEX I/O 24V dc Source Isolated Analog 4 Input Module | 4 | | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS, 1794-TBN✶ |
| 1794-IR8 | FLEX I/O 24V dc RTD Input Module | 8 | | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS✶ |
| 1794-IRT8 | FLEX I/O 24V dc Thermocouple/RTD/mV Input Module | 8 | | **1794-TB3G,** 1794-TB3GS✶ |
| 1794-IT8 | FLEX I/O 24V dc Thermocouple/mV Input Module | 8 | | **1794-TB3T,** 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TB3TS✶‡ |
| 1794-IE4XOE2 | FLEX I/O 24V dc 4 Input/2 Output Analog Combo Module | 4 | 2 single-ended with selectable channel configuration | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS✶ |
| 1794-IE8XOE4♠ | FLEX I/O 24V dc 8 Input/4 Output Analog Combo Module❄ | 8 single-ended | 4 single-ended | 1794-TB3G or 1794-TB3GS |
| 1794-IF2XOF2I | FLEX I/O 24V dc 2 Input/2 Output Isolated Analog Combo Module | 2 | 2 isolated outputs with selectable channel configuration | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS, 1794-TBN✶ |
| 1794-OE4 | FLEX I/O 24V dc Selectable Analog 4 Output Module | NA | 4 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS, 1794-TBN✶ |
| 1794-OE8H♠ | FLEX I/O HART Enabled Analog Output Module | | 8 single-ended | 1794-TB3G or 1794-TB3GS |
| 1794-OE12 | FLEX I/O Output Analog Module❄ | | 12 single-ended | 1794-TB3G or 1794-TB3GS |
| 1794-OF4I | FLEX I/O 24V dc Source Isolated Analog 4 Output Module | | 4 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS, 1794-TBN✶ |

✶Recommended terminal base is in bold text.
❄Is not supported by 1747-SN or 1747-BSN for use on RIO with SLC's.
‡You can use a 1794-TB2, 1794-TB3, or 1794-TB3S for mV inputs only.
♠ Do not exceed length of 30 m (100 ft) for signal cabling.

Conformal coated versions of standard modules have the letter K in the last position of the catalog number, before the series designation. For more information, refer to the FLEX I/O Conformal Coating Brochure publication 1794-BR017.

# FLEX I/O Analog Input Modules

| Cat. No. | Input Signal Range | Accuracy Drift w/Temp. | External DC Supply Current, Nom. | Power Dissipation, Max. | Thermal Dissipation, Max. |
|---|---|---|---|---|---|
| 1794-IE8✶ | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V | Current Input: 0.0407% Full Scale/ºC<br>Voltage Input: 0.0428% Full Scale/°C | 60 mA @ 24V dc | 3 W @ 31.2V dc | 10.2 BTU/hr @ 31.2V dc |
| 1794-IE8H | 4…20 mA | 0.05%/°C of output signal range | 295 mA @ 24V dc | 3.9 W | 13.5 BTU/hr |
| 1794-IE12 | 4…20 mA (user configurable)<br>0…20 mA (user configurable) | Current Input: 0.004% Full Scale/°C<br>Voltage Input: 0.004% Full Scale/°C | 30 mA @ 24V dc; 45 mA @ 10.0V dc | 1.2 W @ 31.2V dc; 1.1 W @ 24V dc; 0.9 W @ 10.0V dc | — |
| 1794-IF4I✶ | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V<br>±5V<br>0…5V | Current Input: 0.0038% Full Scale/°C<br>Voltage Input: 0.0028% Full Scale/°C | 80 mA @ 24V dc | 2.0 W @ 31.2V dc | 6.9 BTU/hr @ 31.2V dc |
| 1794-IR8✶❆ | 1…433 Ω❆ | — | 140 mA @ 24V dc | 3 W @ 31.2V dc | 10.2 BTU/hr @ 31.2V dc |
| 1794-IRT8✶❆ | -40…+100 mV dc for thermocouples<br>0…325 mV dc for RTDs<br>0…500 Ω for resistance range❆ | | 85 mA @ 24V dc | 3 W @ 31.2V dc | 10.2 BTU/hr @ 31.2V dc |
| 1794-IT8✶❆ | ±76.5 mV❆ | | 150 mA @ 24V dc | 3 W @ 31.2V dc | 10.2 BTU/hr @ 31.2V dc |
| 1794-IE8XOE4 | 4…20 mA (user configurable)<br>0…20 mA (user configurable) | Current Input or Output: 0.004% Full Scale @ 25 °C<br>Voltage Input or Output: 0.004% Full Scale @ 25 °C | 140 mA @ 24V dc; 280 mA @ 10.0V dc | 3.0 W @ 31.2V dc; 2.3 W @ 24V dc; 2.0 W @ 10.0V dc | — |
| 1794-OE8H | — | 0.010% per °C of output signal range | 255 mA @ 24V dc | 6.1 W | 20.8 BTU/hr |
| 1794-IE4XOE2✶ | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V | Current Input: 0.0407% Full Scale/ºC<br>Voltage Input: 0.0428% Full Scale/°C<br>Current Output: 0.0069% Full Scale/°C<br>Voltage Output: 0.0045% Full Scale/°C | 70 mA @ 24V dc | 4.0 W @ 31.2V dc | 13.6 BTU/hr @ 31.2V dc |
| 1794-IF2XOF2I✶ | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V<br>±5V<br>0…5V | Current Input: 0.0038% Full Scale/°C<br>Voltage Input: 0.0028% Full Scale/°C<br>Current Output: 0.0025% Full Scale/°C<br>Voltage Output: 0.0012% Full Scale/°C | 150 mA @ 24V dc | 3.3 W @ 31.2V dc | 11 BTU/hr @ 31.2V dc |

✶ Each module's channel is individually selectable or as a group of four.
❆ For the accuracy calculation, refer to the module's user manual.

## 1794-IE8 24V dc Selectable Analog 8 Input Module

The 1794-IE8 is a voltage/current measurement module that works with a variety of input sensors to measure input voltage in ±10V range or input current in the 0 to 20 mA range. Each channel is individually configurable for the desired input range. Use the 1794-IE8 with 2-, 3-, and 4-wire input sensor field devices.

Only connect either a voltage input or a current input per channel, not both.

Use caution to prevent ground loops when using a common ground, since the channels are not isolated.

| | 1794-IE8 |
|---|---|
| Current Input, Maximum Overload | 32 mA, single channel, continuous |
| Voltage Input, Maximum Overload | 30V, single channel, continuous |
| Input Resolution | 12 bits - Unipolar, 11 bits + sign - Bipolar<br>5.13 µA/Cnt<br>2.56 mV/Cnt - Unipolar<br>5.13 mV/Cnt - Bipolar |
| Input Impedance | Current Input: 238 Ω<br>Voltage Input: 100 kΩ |
| Input Resistance | Current Input: 238 Ω<br>Voltage Input: 200 kΩ |
| Data Format | 16-bit 2's complement, left-justified |
| Input Conversion Type | Successive approximation |
| Input Conversion Rate | 256 µs all channels |
| Normal Mode Rejection Ratio | Current Input:<br>-3 dB @ 9 Hz; -20 dB/decade<br>-15.3 dB @ 50 Hz<br>-16.8 dB @ 60 Hz<br>Voltage Input:<br>-3 dB @ 17 Hz; -20 dB/decade<br>-10 dB @ 50 Hz<br>-11.4 dB @ 60 Hz |
| Calibration | None required |
| Step Response to 63% of FS, Input | Current Input: 18.2 ms<br>Voltage Input: 9.4 ms |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Accuracy | Current Input: 0.20% Full Scale @ 25 °C<br>Voltage Input: 0.20% Full Scale @ 25 °C✶ |

✶Includes offset, gain, non-linearity and repeatability error terms

## 1794-IE8H HART Enabled Analog 8 Input Module

The 1794-IE8H is a HART enabled analog input module that works with HART enabled input sensors with input current in the 0 to 20 mA range. Use the 1794-IE8H with 2 or 3 wire tramsmitters. This module provides wire-off detection on a per-channel basis. The HART analog modules can only be used on ControlNet or EtherNet/IP networks with one HART field device per channel.

| | 1794-IE8H |
|---|---|
| Voltage Input, Maximum Overload | — |
| Current Input, Maximum Overload | — |
| Isolation Voltage | 50V (continuous), Basic Insulation Type<br>Routine tested at 850V dc for 1 s, between field side and system<br>No isolation between individual channels |
| Input Resolution | 16 bits |
| Input Resistance | — |
| Data Format | Configurable |
| Input Conversion Type | — |
| Input Conversion Rate | 10 ms (50 Hz) / 8.33 ms (60 Hz) |
| Normal Mode Rejection Ratio | — |
| Step Response to 63% of FS, Input | 80 ms to 99% of FS |
| Calibration | — |
| Dimensions (HxWxD), Metric | 46 x 94 75 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.95 in |
| Resolution | 16 bit unipolar<br>15 bit + bipolar |
| Accuracy | Current Input: 0.1% Full Scale @ 20 °C (68 °F) |

# 1794-IE12 24V dc Selectable Analog 12 Input Module

The 1794-IE12 is a voltage or current measurement module that measures inupt voltage in a ±10V range or current in the 0-20 MA range. Each channel is individually configurable and the out-of-range notification is by channel.

| | 1794-IE12 |
|---|---|
| Voltage Input, Maximum Overload | 30V continuous, single channel |
| Current Input, Maximum Overload | 32 mA continuous, single channel |
| Isolation Voltage | 50V (continuous), Basic Insulation Type<br>Type tested at 850V dc for 60 s, between field side and system<br>No isolation between individual channels |
| Input Resolution | 320 µV/cnt<br>0.641 µA/cnt |
| Input Resistance | — |
| Data Format | 16 bit, 2's complement |
| Input Conversion Type | Successive Approximation |
| Input Conversion Rate | 8.0 ms all channels |
| Normal Mode Rejection Ratio | Voltage/Current Terminal:<br>-3 dB @ 0.05 Hz; -20 db/decade<br>-52 db @ 50 Hz; -54 db @ 60 Hz<br>Voltage/Current Terminal with Quick Step:<br>-3 dB @ 1.5 Hz; -20 db/decade<br>-29 db @ 50 Hz; -31 db @ 60 Hz |
| Step Response to 63% of FS, Input | Current or Voltage Input: 1.3 s (0.09 s with Quick Step) |
| Calibration | — |
| Dimensions (HxWxD), Metric | — |
| Dimensions (HxWxD), Imperial | — |
| Resolution | 16 bit unipolar<br>15 bit + bipolar |
| Accuracy | Current Input: 0.1% Full Scale @ 25 °C<br>Voltage Input: 0.1% Full Scale @ 25 °C✶ |

✶Includes offset, gain, nonlinearity, and repeatability error terms.

## 1794-IF4I 24V dc Source Isolated Analog 4 Input Module

The 1794-IF4I is an input module with channel-to-channel isolation that works with a variety of input sensors to measure input voltage in ±10V range or input current in the 0 to 20 mA range. Each channel is individually configurable for the desired input range. Use the 1794-IF4I with 2-, 3-, and 4-wire input sensor field devices.

Only connect either a voltage input or a current input per channel, not both.

| | 1794-IF4I |
|---|---|
| Voltage Input, Maximum Overload | 30V, single channel, continuous |
| Current Input, Maximum Overload | 32 mA, single channel, continuous |
| Isolation Voltage | 120V (continuous, when used with 1794-TB2, -TB3, -TB3S, -TB3T, or -TB3TS), Basic Insulation Type<br>250V (continuous, when used with 1794-TBN), Basic Insulation Type<br>Tested to 1500Vac for 60s and 2550Vdc for 1s between channel to channel, channel to user, channel to system, and user power to system |
| Input Resolution | 16 bits - Unipolar, 15 bits + sign - Bipolar<br>0.320 μA/Cnt - Unipolar<br>0.640 μA/Cnt - Bipolar<br>0.156 mV/Cnt - Unipolar<br>0.313 mV/Cnt - Bipolar |
| Input Resistance | Current Input: <100 Ω✶Voltage Input: >10 MΩ |
| Data Format | 2's complement<br>2's complement percent<br>binary<br>offset binary |
| Input Conversion Type | Sigma Delta |
| Input Conversion Rate | 2.5/5.0/7.5 ms all channels |
| Normal Mode Rejection Ratio | -3 dB @ 12 Hz (300 Hz conversion rate)<br>-80.0 dB @ 50 Hz (300 Hz conversion rate) |
| Step Response to 63% of FS, Input | Current or Voltage Input:<br>1200 Hz conversion rate = 0.6 ms<br>600 Hz conversion rate = 6.7 ms<br>300 Hz conversion rate = 13.4 ms<br>150 Hz conversion rate = 26.7 ms |
| Calibration | Factory calibrated |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Resolution | 16 bit unipolar<br>15 bit + bipolar |
| Accuracy | Current Input: 0.1% Full Scale @ 25 °C<br>Voltage Input: 0.1% Full Scale @ 25 °C❄ |

✶If 24V dc is removed from the module, input resistance = 10 kΩ.

❄Includes offset, gain, non-linearity and repeatability error terms.

## 1794-IR8 24V dc RTD Input Module

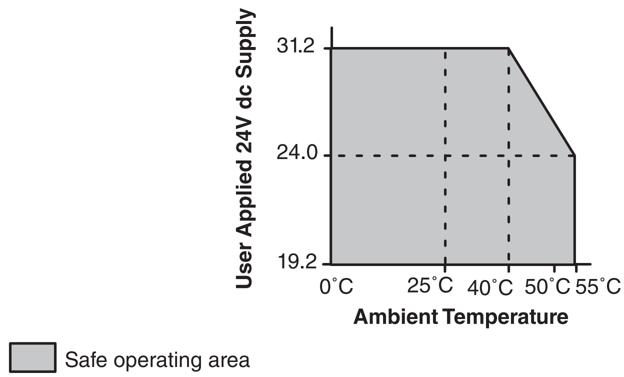
The 1794-IR8 is a temperature-measuring module that accepts 2-, and 3-wire RTDs. Use the 1794-IR8 in applications where channel fast-update rate is not required. If you need channel fast-update rates, use the 1794-IRT8 module.

| | 1794-IR8 |
|---|---|
| Input Resolution | 16 bits across 435 Ω |
| Normal Mode Rejection Ratio | 60 dB @ 60 Hz for A/D filter cutoff @ 15 Hz |
| Sensors Supported | Resistance:<br>100 Ω Pt μ = 0.00385 Euro (-200…+870 °C)<br>100 Ω Pt μ = 0.003916 U.S. (-200…+630 °C)<br>200 Ω Pt μ = 0.00385 Euro (-200…+630 °C)<br>500 Ω Pt μ = 0.00385 U.S. (-200…+630 °C)<br>100 Ω Nickel μ = 0.00618 (-60…+250 °C)<br>120 Ω Nickel μ = 0.00672 (-60…+250 °C)<br>200 Ω Nickel μ = 0.00618 (-60…+250 °C)<br>500 Ω Nickel μ = 0.00618 (-60…+250 °C)<br>10 Ω Copper μ = 0.00427 (-200…+260 °C) |
| Data Format | Left justified 16-bit 2's complement or offset binary |
| Settling Time | 100% of final value available at system throughput rate |
| Accuracy✶ | Enhanced Mode (typical): 0.01% Full Scale (low humidity) without calibration<br>Normal Mode (max): 0.05% Full Scale (low humidity) without calibration |
| Common Mode Rejection Ratio | -120 db @ 60 Hz<br>-100 db @ 50 Hz with A/D filter cutoff @ 10 Hz |
| Common Mode Voltage | 0V between channels (common return) |
| System Throughput | Enhanced Mode:<br>Programmable from 56 ms/channel to 650 ms/channel<br>650 ms (1 channel scanned)<br>2.925 s (8 channels scanned)<br>Normal Mode:<br>Programmable from 28 ms/channel to 325 ms/channel<br>325 ms (1 channel scanned)<br>2.6 s (8 channels scanned) |
| Settling Time | 100% of final value available at system throughput rate |
| Open RTD Detection | Out of range upscale reading |
| Open Circuit Detection Type | Available at system throughput rate |
| Overvoltage Capability | 35V dc, 25V ac continuous @ 25 °C<br>250V peak transient |
| Channel Bandwidth | dc to 2.62 Hz (-3 dB) |
| RTD Excitation Current | 718.39 μA |
| RFI Immunity | Error of <1% of range at 10V/m, 27…1000 MHz |
| Dimensions (HxWxD), Metric | 49 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Input Offset Drift with Temperature | 1.5 mΩ /°C max |
| Gain Drift with Temperature | Normal mode: 20 ppm/ °C max.<br>Enhanced mode: 10 ppm/ °C max. |

✶ This number is based on the hardware of the module only. Additional errors are introduced depending on the sensor used, environment, and other factors. Contact tecnical support for more information.

## 1794-IR8 Derating Curve

**Derating Curve**




The area within the curve represents the safe operating range for the module under various conditions of user supplied 24V dc supply voltages and ambient temperatures.

## 1794-IRT8 24V dc Thermocouple/RTD Input Module

The 1794-IRT8 is a high-speed, high-accuracy temperature/mV measuring module that accepts thermcouple inputs, 2-, 3-, and 4-wire RTD inputs, and mV source inputs.

The 1794-IRT8 offers the following:

- wire-off, over-range, and under-range detection
- good common mode rejection
- usage with long thermocouple wiring
- effective in noisy environments
- usage with grounded or ungrounded thermocouples
- more stability with ambient temperature changes than with the 1794-IR8 and the 1794-IT8

Release of Series B version provides capability to work with grounded thermocouples

Use cold junction compensators (cat. no. 1794-CJC2) in thermocouple mode. Two cold junction compensators are shipped with the 1794-IRT8.

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- more stability with ambient temperature changes than with the 1794-IR8 and the 1794-IT8

Release of Series B version provides capability to work with grounded thermocouples

Use cold junction compensators (cat. no. 1794-CJC2) in thermocouple mode. Two cold junction compensators are shipped with the 1794-IRT8.

| | 1794-IRT8 |
|---|---|
| Input Resolution | 14 bits |
| Supported RTD Types | Resistance:<br>100 Ω Pt µ = 0.00385 Euro (-200…+870 °C)<br>100 Ω Pt µ = 0.003916 U.S. (-200…+630 °C)<br>200 Ω Pt µ = 0.00385 Euro (-200…+400 °C)<br>200 Ω Pt µ = 0.003916 U.S. (-200…+400 °C)<br>100 Ω Nickel µ = 0.00618 (-60…+250 °C)<br>120 Ω Nickel µ = 0.00672 (-80…+320 °C)<br>200 Ω Nickel µ = 0.00618 (-60…+200 °C)<br>10 Ω Copper µ = 0.00427 (-200…+260 °C) |
| Supported Thermocouple Types | Type B: 300…1800 °C (572…3272 °F)<br>Type E: -270…1000 °C (-454…1832 °F)<br>Type J: -210…1200 °C (-346…2192 °F)<br>Type K: -270…1372 °C (-454…2502 °F)<br>Type TXK/XK (L):-200…800 °C (-328…1472 °F)<br>Type N: -270…1300 °C (-454…2372 °F)<br>Type R: -50…1768 °C (-58…3214 °F)<br>Type S: -50…1768 °C (-58…3214 °F)<br>Type T: -270…400 °C (-454…752 °F) |
| Accuracy | 0.05% of full range in mV mode with filtering selected<br>Hardware only = 0.10% of full range in mV mode |
| Common Mode Rejection Ratio | -80 dB @ 5V peak-to-peak 50-60 Hz |
| Common Mode Input Range | Series A: ±4V<br>Series B: ±15V |
| System Throughput | 7.4 ms - mV<br>8.0 ms - Ω - 2-wire<br>10.0 ms - Ω - 3-wire<br>10.4 ms - Ω - 4-wire<br>8.0 ms - 2-wire RTD ( °F)<br>10.4 ms - 4-wire RTD ( °F)<br>8.8 ms - 2-wire RTD ( °C), ( °K)<br>10.8 ms - 4-wire RTD ( °C), ( °K)<br>9.8 ms - 3-wire RTD ( °F)<br>10.0 ms - 3-wire RTD ( °C), ( °K)<br>8.0 ms - Thermocouples ( °F)<br>8.8 ms - Thermocouples ( °C), ( °K)✶ |
| Open Circuit Detection Type | Series A: RTD and TC modes - Open Input - Module defaults to max value<br>Series B: RTD mode - Open Input - Module defaults to max value<br>Series B: TC mode - Open Input - Module defaults to min value |
| Excitation Current | 630 µA |
| Overvoltage Capability | Series A: 7V dc continuous @ 25 °C<br>Series B: 15V dc continuous @ 25 °C |
| Open Input Detection Time | 0…3.8 s for Series A revision D or earlier<br>Immediate detection (max 2 scans) for Series A revision E or later<br>immediate detection (max 2 scans) for Series B |

✶For max throughput short circuit all unused channels.

| | 1794-IRT8 |
|---|---|
| Cold Junction Compensation Range | 0…70 °C for firmware Series A revision D or earlier<br>-20…100 °C for firmware Series A revision E or later<br>-20…100 °C for firmware Series B |
| Cold Junction Compensation | A-B Cold Junction Compensator Kit, 1794-CJC2✶ |
| Data Format | °C (implied decimal point XXX.X)<br>°F (implied decimal point XXX.X)<br>°K (implied decimal point XXX.X)<br>-32767…+32767<br>0…65535<br>0…5000 (Ω mode) (implied decimal point XXX.X)<br>-4000…+10000 (mV mode) (implied decimal point XXX.XX) |
| RFI Immunity | — |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Overall Drift with Temperature, Max. | Series A: 150 ppm/°C of span<br>Series B: 50 ppm/°C of span |

✶Kit supplied with the module and contains 2 compensators.

## 1794-IT8 24V dc Thermocouple/mV Input Module

The 1794-IT8 module is a temperature/mV measuring module that accepts inputs from a variety of thermcouples and from the mV source in the range of ±76.5 mV. Choose the 1794-IT8 module when you need the following:

- A cost effective module.

Applications that don't require high accuracy or high speed.

Support for grounded or ungrounded thermocouples.

Use cold junction compensators (cat. no. 1794-CJC2) in thermocouple mode. Two cold junction compensators are shipped with the 1794-IT8 module. This module is suitable to work with grounded thermocouples, if certain guidelines are followed. Refer to the module's user manual for more information.

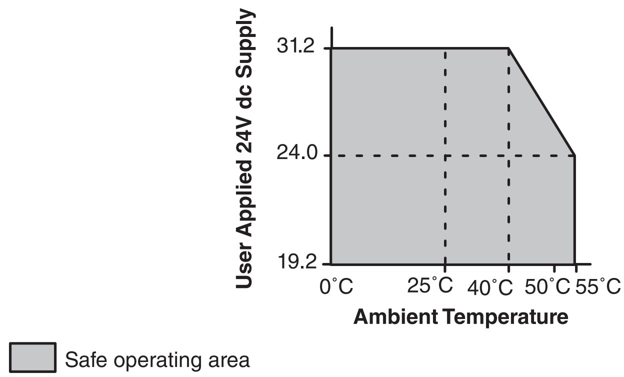
The FLEX I/O cold junction compensator kit, containing two compensators, is included with the 1794-IT8 modules. You can order additional compensators using the above catalog number.

| | 1794-IT8 |
|---|---|
| Input Resolution | 16 bits (2.384 µV typical) |
| Supported Thermocouple Types | Type B: 300…1800 °C (572…3272 °F)<br>Type C: 0…2315 °C (32…4199 °F)<br>Type E: -270…1000 °C (-454…1832 °F)<br>Type J: -210…1200 °C (-346…2192 °F)<br>Type K: -270…1372 °C (-454…2502 °F)<br>Type N: -270…1300 °C (-454…2372 °F)<br>Type R: -50…1768 °C (-58…3214 °F)<br>Type S: -50…1768 °C (-58…3214 °F)<br>Type T: -270…400 °C (-454…752 °F)<br>Type TXK/XK (L): -200…800 °C (-328…1472 °F) |
| Data Format | 16-bit 2's complement or offset binary (unipolar) |
| Accuracy✶ | With Filter (max): 0.025% Full Scale @ 24 °C (±0.5 °C)<br>Without Filter (max): 0.05% Full Scale @ 24 °C (±0.5 °C) |
| Common Mode Rejection Ratio | -115 dB @ 60 Hz; -100 dB @ 50 Hz |
| Normal Mode Rejection Ratio | 60 dB @ 60 Hz |
| Common Mode Input Range | ±10V |
| System Throughput | 325 ms (1 channel scanned), programmable to 28 ms<br>2.6 s (8 channels scanned), programmable to 224 ms |
| Settling Time | 100% of final value available at system throughput rate |
| Open Circuit Detection Type | Out of range reading (upscale) |
| Open Input Detection Time | Available at system throughput rate |
| Overvoltage Capability | 35V dc, 25V ac continuous @ 25 °C<br>250V peak transient |
| Channel Bandwidth | 0…2.62 Hz (-3 dB) |
| RFI Immunity | Error of <1% of range at 10V/m, 27…1000 MHz |
| Input Offset Drift with Temperature | +6 µV/°C max |
| Gain Drift with Temperature | 10 ppm/°C max |
| Overall Drift with Temperature, Max. | 50 ppm/°C of span |
| Dimensions (HxWxD), Metric | 1.8 x 3.7 x 2.1 mm |
| Dimensions (HxWxD), Imperial | 46 x 94 x 53 in |
| Cold Junction Compensation Range | 0…70 °C |
| Cold Junction Compensation | A-B Cold Junction Compensation Kit, 1794-CJC2❄ |

✶ This accuracy is based on the hardware of the module only. Refer to the user manual for the complete error calculation procedure.
❄Kit supplied with the module and contains 2 compensators.

## 1794-IT8 Derating Curve

**Derating Curve**




The area within the curve represents the safe operating range for the module under various conditions of user supplied 24V dc supply voltages and ambient temperatures.

# 1794-IE4XOE2 24V dc 4 Input/2 Output Analog Combo Module

The 1794-IE4XOE2 is a combination module with 4 inputs and 2 outputs. Inputs can be configured individually for different modes. Inputs accept signals from a variety of inputs sensors (2-, 3-, and 4-wire) in the range of ±10V or 0 to 20 mA. Outputs are also individually configurable for different modes. Outputs produce signals in the range of ±10V or 0 to 20 mA.

| | 1794-IE4XOE2 |
|---|---|
| Calibration | None required |
| Input Conversion Type | Successive approximation |
| Input Conversion Rate | 256 µs all channels |
| Input Resolution | 12 bits - Unipolar, 11 bits + sign - Bipolar<br>5.13 µA/Cnt<br>2.56 mV/Cnt - Unipolar<br>5.13 mV/Cnt - Bipolar |
| Data Format | 16-bit 2's complement, left-justified |
| Step Response to 63% of FS, Input | Current Input: 18.2 ms<br>Voltage Input: 9.4 ms |
| Accuracy | Current Input: 0.20% Full Scale @ 25 °C<br>Voltage Input: 0.20% Full Scale @ 25 °C<br>Current Output: 0.425% Full Scale @ 25 °C<br>Voltage Output: 0.133% Full Scale @ 25 °C✶ |
| Accuracy Drift w/Temp. | Current Input: 0.0407% Full Scale/ºC<br>Voltage Input: 0.0428% Full Scale/°C<br>Current Output: 0.0069% Full Scale/°C<br>Voltage Output: 0.0045% Full Scale/°C |
| Normal Mode Rejection Ratio | Current Input:<br>-3 dB @ 9 Hz; -20 dB/decade<br>-15.3 dB @ 50 Hz<br>-16.8 dB @ 60 Hz<br>Voltage Input:<br>-3 dB @ 17 Hz; -20 dB/decade<br>-10 dB @ 50 Hz<br>-11.4 dB @ 60 Hz |
| Input Impedance | Current Input: 238 Ω<br>Voltage Input: 100 kΩ |
| Voltage Input, Maximum Overload | 30V, single channel, continuous |
| Output Resolution | 12 bits + sign<br>5.13 µA/Cnt<br>2.56 mV/Cnt |
| Data Format | 16-bit 2's complement, left-justified |
| Output Conversion Type | Pulse Width Modulation |
| Output Conversion Rate | 1.024 ms all channels |
| Step Response to 63% of FS, Output | Current or Voltage Output: 24 ms |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Current Load on Voltage Output, Max. | 3 mA |
| Resistive Load on Current Output | 15…750 Ω |

✶Includes offset, gain, non-linearity and repeatability error terms

# 1794-IE8XOE4 24V dc 8 Input/4 Output Analog Combo Module

The 1794-IE8XOE4 is a combination module with 8 inputs and 4 outputs. Inputs can be configured individually for different modes, as can outputs. Inputs accept signals from 2, 3, and 4 wire input sensors in the ranges of ±10V or 0 to 20 mA. Outputs produce signals in the range of ±10V or 0 to 20 mA.

| | 1794-IE8XOE4 |
|---|---|
| Calibration | None required |
| Input Conversion Type | Successive Approximation |
| Input Conversion Rate | 8.0 ms all channels |
| Input Resolution | stbUCString::convert: Character with charcode: "913" met |
| Data Format | 16 bit, 2's complement |
| Step Response to 63% of FS, Input | Current or Voltage Input: 1.3 s (0.09 s with Quick Step) |
| Accuracy | Current Input or Output: 0.1% Full Scale @ 25 °C<br>Voltage Input or Output: 0.1% Full Scale @ 25 °C✶ |
| Accuracy Drift w/Temp. | Current Input or Output: 0.004% Full Scale @ 25 °C<br>Voltage Input or Output: 0.004% Full Scale @ 25 °C |
| Normal Mode Rejection Ratio | Voltage/Current Terminal:<br>-3 dB @ 0.05 Hz; -20 db/decade<br>-52 db @ 50 Hz; -54 db @ 60 Hz<br>Voltage/Current Terminal with Quick Step:<br>-3 dB @ 1.5 Hz; -20 db/decade<br>-29 db @ 50 Hz; -31 db @ 60 Hz |
| Input Impedance | Voltage Input: Greater than 1 megohm<br>Current Input: Less than 100 ohms❄ |
| Voltage Input, Maximum Overload | 30V, single channel, continuous |
| Output Resolution | stbUCString::convert: Character with charcode: "913" met |
| Data Format | 16 bit, 2's complement |
| Output Conversion Type | Digital-to-Analog Converter |
| Output Conversion Rate | — |
| Step Response to 63% of FS, Output | ~70% 1st convert; 96% 2nd convert; 100% 3rd convert |
| Dimensions (HxWxD), Metric | 94.0 x 94.0 x 53.3 mm (with module installed in base) |
| Dimensions (HxWxD), Imperial | 3.7 x 3.7 x 2.1 in (with module installed in base) |
| Current Load on Voltage Output, Max. | 3 mA max |
| Resistive Load on Current Output | 0…750 Ω over full power supply range |

✶Includes offset, gain, non-linearity and repeatability error terms
❄If 24V dc is removed from the module, input resistance = 10 K ohms.

# 1794-IF2XOF2I 24V dc 2 Input/2 Output Isolated Analog Combo Module

The 1794-IF2XOF2I is a combination module with 2 inputs and 2 outputs with isolated, individually-configurable channels. Inputs accept signals from a variety of input sensors (2-, 3-, and 4-wire) in the range of ±10V or ±20 mA. Outputs produce signals in the range of ±10V or 0 to 20 mA.

Only connect either a voltage input or a current input per channel, not both.

| | 1794-IF2XOF2I |
|---|---|
| Calibration | Factory calibration |
| Input Conversion Type | Sigma Delta |
| Isolation Voltage | 120V continuous (when used with 1794-TB3, 1794-TB3S, 1794-TB2, 1794-TB3T, or 1794-TB3TS)<br>250V continuous (when used with -TBN)<br>Tested at 1500V ac for 60 s and 2550V dc for 1 s, channel to channel, I/O to system. |
| Input Conversion Rate | 2.5/5.0/7.5 ms all channels |
| Input Resolution | 16 bits - Unipolar, 15 bits + sign - Bipolar<br>0.320 µA/Cnt - Unipolar<br>0.640 µA/Cnt - Bipolar<br>0.156 mV/Cnt - Unipolar<br>0.313 mV/Cnt - Bipolar |
| Data Format | 2's complement<br>2's complement percent<br>binary<br>offset binary |
| Step Response to 63% of FS, Input | Current or Voltage Input:<br>1200 Hz conversion rate = 0.6 ms<br>600 Hz conversion rate = 6.7 ms<br>300 Hz conversion rate = 13.4 ms<br>150 Hz conversion rate = 26.7 ms |
| Accuracy | Current Input: 0.1% Full Scale @ 25 °C<br>Voltage Input: 0.1% Full Scale @ 25 °C<br>Current Output: 0.1% Full Scale @ 25 °C<br>Voltage Output: 0.1% Full Scale @ 25 °C✶ |
| Accuracy Drift w/Temp. | Current Input: 0.0038% Full Scale/°C<br>Voltage Input: 0.0028% Full Scale/°C<br>Current Output: 0.0025% Full Scale/°C<br>Voltage Output: 0.0012% Full Scale/°C |
| Normal Mode Rejection Ratio | -3 dB @ 12 Hz (300 Hz conversion rate)<br>-80.0 dB @ 50 Hz (300 Hz conversion rate) |
| Voltage Input, Maximum Overload | 30V, single channel, continuous |
| Output Resolution | 15 bits + sign<br>0.656 µA/Cnt<br>0.320 mV/Cnt |
| Data Format | 2's complement<br>2's complement percent<br>binary<br>offset binary |
| Output Conversion Type | Digital to analog converter |
| Output Conversion Rate | 2.5/5.0 ms |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Current Load on Voltage Output, Max. | 3 mA |
| Resistive Load on Current Output | 0…750 Ω |

✶Includes offset, gain, non-linearity and repeatability error terms.

# FLEX I/O Analog Output Modules

| Cat. No. | Number of Outputs | Output Signal Range | External DC Supply Current, Nom. | Power Dissipation, Max. | Thermal Dissipation, Max. |
|---|---|---|---|---|---|
| 1794-OE4 | 4 single-ended with selectable channel configuration | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V | 70 mA @ 24V dc✶ | 4.5 W @ 31.2V dc | 15.3 BTU/hr @ 31.2V dc |
| 1794-OE8H | 8 single-ended isolated with selectable channel configuration | 4…20 mA (user configurable)<br>0…20 mA (user configurable) | 255 mA @ 24V dc | 6.1 W | 20.8 BTU/hr |
| 1794-OE12 | 12 single-ended isolated with selectable channel configuration | 0 mA output until module is configured<br>4…20 mA (user configurable)<br>0…20 mA (user configurable) | 320 mA @ 24V dc; 720 mA @ 10.0V dc | 4.0 W @ 31.2V dc; 4.3 W @ 24V dc; 4.0 W @ 10.0V dc | — |
| 1794-OF4I | 4 isolated with selectable channel configuration | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V<br>±5V<br>0…5V | 210 mA @ 24V dc | 4.7 W @ 31.2V dc | 16 BTU/hr @ 31.2V dc |
| 1794-IE8XOE4 | 4 single-ended isolated with selectable channel configuration | — | 140 mA @ 24V dc; 280 mA @ 10.0V dc | 3.0 W @ 31.2V dc; 2.3 W @ 24V dc; 2.0 W @ 10.0V dc | — |
| 1794-IE4XOE2 | 2 single-ended with selectable channel configuration | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V | 70 mA @ 24V dc | 4.0 W @ 31.2V dc | 13.6 BTU/hr @ 31.2V dc |
| 1794-IF2XOF2I | 2 isolated outputs with selectable channel configuration | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V<br>±5V<br>0…5V | 150 mA @ 24V dc | 3.3 W @ 31.2V dc | 11 BTU/hr @ 31.2V dc |

✶Not including outputs.

## 1794-OE4 24V dc Selectable Analog 4 Output Module

The 1794-OE4 module has 4 output, non-isolated, individually-configurable channels. Outputs are capable of driving the field devices that require a voltage of ±10V or a current of 0 to 20 mA.

| | 1794-OE4 |
|---|---|
| Output Resolution | 12 bits + sign<br>5.13 µA/Cnt<br>2.56 mV/Cnt |
| Output Resolution | 12 bits + sign<br>5.13 µA/Cnt<br>2.56 mV/Cnt |
| Data Format | 16-bit 2's complement, left-justified |
| Output Conversion Type | Pulse Width Modulation |
| Output Conversion Rate | 1.024 ms all channels |
| Step Response to 63% of FS, Output | Voltage Output: 24 ms |
| Current Load on Voltage Output, Max. | 3 mA |
| Resistive Load on Current Output | 15…750 Ω |
| Accuracy | Current Output: 0.425% Full Scale @ 25 °C<br>Voltage Output: 0.133% Full Scale @ 25 °C✶. |
| Accuracy Drift w/Temp. | Current Output: 0.0069% Full Scale/°C<br>Voltage Output: 0.0045% Full Scale/°C |
| Calibration | None required |
| Isolation Voltage | 50V continuous, I/O to system<br>Tested to 850V dc for 1 s, I/O to system<br>(No isolation between individual channels) |
| Power Dissipation, Max. | 4.5 W @ 31.2V dc |
| Thermal Dissipation, Max. | 15.3 BTU/hr @ 31.2V dc |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Wire Size | 0.34... 2.5 $mm^2$ (22...12 AWG) solid or stranded shielded copper wire rated at 75 °C (167 °F ) or greater 1.2 mm (3/64 in.) insulation max |
| Wiring Category | 2 - on signal ports<br>2 - on power ports❄ |

✶Includes offset, gain, non-linearity and repeatability error terms
❄Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

# 1794-OF4I 24V dc Source Isolated Analog 4 Output Module

The 1794-OF4I modules provides 4 isolated outputs for 2-, 3-, and 4-wire output devices that use voltage in the range of ±10V or 0 to 20 mA current.

| | 1794-OF4I |
|---|---|
| Output Resolution | 15 bits + sign<br>0.656 µA/Cnt<br>0.320 mV/Cnt |
| Isolation Voltage | 120V continuous (when used with 1794-TB2, -TB3, -TB3S, -TB3T, or -TB3TS)<br>250V continuous (when used with 1794-TBN)<br>Tested to 1500V ac for 60 s and 2550V dc for 1 s, channel to channel, I/O to system |
| Output Signal Range | 4…20 mA<br>0…20 mA<br>±10V<br>0…10V<br>±5V<br>0…5V |
| Data Format | 2's complement<br>2's complement percent<br>binary<br>offset binary |
| Output Conversion Type | Digital to analog converter |
| Output Conversion Rate | 2.5/5.0 ms |
| Step Response to 63% of FS, Output | Current or Voltage Output: < 25 µs |
| Current Load on Voltage Output, Max. | 3 mA |
| Resistive Load on Current Output | 0…750 Ω |
| Accuracy | Current Output: 0.1% Full Scale @ 25 °C<br>Voltage Output: 0.1% Full Scale @ 25 °C✶ |
| Accuracy Drift w/Temp. | Current Output: 0.0025% Full Scale/°C<br>Voltage Output: 0.0012% Full Scale/°C |
| Calibration | Factory calibrated |
| Power Dissipation, Max. | 4.7 W @ 31.2V dc |
| Thermal Dissipation, Max. | 16 BTU/hr @ 31.2V dc |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Wire Size | 0.34... 2.5 $mm^2$ (22...12 AWG) solid or stranded shielded copper wire rated at 75 °C (167 °F ) or greater 1.2 mm (3/64 in.) insulation max |
| Wiring Category | 2 - on signal ports<br>3 - on power ports❆ |

✶Includes offset, gain, non-linearity and repeatability error terms.
❆Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

## 1794-OE8H HART Enabled Analog 8 Ouput Module

The 1794-OE8H is a HART enabled analog output module that works with HART enabled field devices that use current in the 0 to 20 mA range. Use with 2 or 3 wire devices. This module provides wire-off detection on a per-channel basis. This module can only be used on ControlNet or EtherNet/IP networks. One HART field device per channel.

| | **1794-OE8H** |
|---|---|
| Output Resolution | 13 bits |
| Isolation Voltage | 50V (continuous), Basic Insulation Type<br>Routine tested at 850V dc for 1 s, between field side and system<br>No isolation between individual channels |
| Output Signal Range | 4…20 mA (user configurable)<br>0…20 mA (user configurable) |
| Data Format | Configurable |
| Output Conversion Type | — |
| Output Conversion Rate | 10 ms for all channels |
| Step Response to 63% of FS, Output | 13 ms to 99% of FS / 115 ms during HART comms |
| Current Load on Voltage Output, Max. | 0…22 mA @ > 15V |
| Resistive Load on Current Output | 0…680 Ω @ 22 mA, 0…770 Ω @ 20 mA |
| Accuracy | 0.1% Full Scale @ 20 °C (68 °F) |
| Accuracy Drift w/Temp. | 0.010% per °C of output signal range |
| Calibration | — |
| Power Dissipation, Max. | 6.1 W |
| Thermal Dissipation, Max. | 20.8 BTU/hr |
| Dimensions (HxWxD), Metric | 46 x 94 x 75 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.95 in |
| Wire Size | 0.34... 2.5 mm² (22...12 AWG) solid or stranded shielded copper wire rated at 75 °C (167 °F ) or greater 1.2 mm (3/64 in.) insulation max |
| Wiring Category | 2 - on signal ports<br>2 - on power ports✶ |

✶Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

## 1794-OE12 24V dc Selectable Analog 12 Output Module

1794-OE12 module is a High Density analog output module, capable of providing current in the range of 0 to 20mA or voltage in the range of +/-10V, depending on the user configuration. Out of Range status bit exists for each channel.

| | **1794-OE12** |
|---|---|
| Output Resolution | stbUCString::convert: Character with charcode: "913" met |
| Isolation Voltage | 50V (continuous), Basic Insulation Type<br>Type tested at 850V dc for 60 s, between field side and system<br>No isolation between individual channels |
| Output Signal Range | 0 mA output until module is configured<br>4…20 mA (user configurable)<br>0…20 mA (user configurable) |
| Data Format | Configurable |
| Output Conversion Type | Digital-to-Analog Converter |
| Output Conversion Rate | — |
| Step Response to 63% of FS, Output | ~70% 1st convert; 96% 2nd convert; 100% 3rd convert |
| Current Load on Voltage Output, Max. | 3 mA max |
| Resistive Load on Current Output | 0…750 Ω over full power supply range |
| Accuracy | Current Output: 0.1% Full Scale @ 25 °C<br>Voltage Output: 0.1% Full Scale @ 25 °C |
| Accuracy Drift w/Temp. | Current Output: 0.004% Full Scale/°C<br>Voltage Output: 0.004% Full Scale/°C |
| Calibration | None required |
| Power Dissipation, Max. | 4.0 W @ 31.2V dc; 4.3 W @ 24V dc; 4.0 W @ 10.0V dc |
| Thermal Dissipation, Max. | — |
| Dimensions (HxWxD), Metric | 94.0 x 94.0 x 53.3 mm (with module installed in base) |
| Dimensions (HxWxD), Imperial | 3.7 x 3.7 x 2.1 in (with module installed in base) |
| Wire Size | 0.34... 2.5 mm² (22...12 AWG) solid or stranded shielded copper wire rated at 75 °C (167 °F ) or greater 1.2 mm (3/64 in.) insulation max |
| Wiring Category | 2 - on signal ports<br>2 - on power ports✶ |

✶Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

# FLEX I/O Counter Modules

Ask these three questions when deciding on which counter module would best fit your application:

What is the application?

What field devices, signal levels, and signal type are being connected to the counter module?

What is the desired counter module?

**Choosing the Correct Counter Module for Your Application**

| Cat. No. | Description | Applications | Network Compatibility | Number of Inputs — Number of Outputs | External DC Supply Current, Nom. | Power Dissipation, Max. | Thermal Dissipation, Max. |
|---|---|---|---|---|---|---|---|
| 1794-IJ2 | FLEX I/O 24V dc 2 Input Frequency Module | Any application requiring rotational control including turbine generators, motors, drives, gears, shafts, etc. | All networks supported by FLEX I/O | 2 — 2 | 220 mA @ 19.2V dc; 180 mA @ 24V dc; 140 mA @ 31.2V dc | 4.6 W @ 31.2V dc | 15.6 BTU/hr @ 31.2V dc |
| 1794-VHSC | FLEX I/O 24V dc 2 Channel Very High Speed Counter Module | Typical applications include packaging, material handling, flow monitoring, cut-to-length, motor speed control and monitoring. | Supported on ControlNet (1794-ACN15, -ACNR15) or EtherNet I/P (1794-AENT) networks only. Also supported on FlexLogix. | 2 — 2 | 100 mA @ 24V dc✶ | 5 W @ 31.2V dc | 17.1 BTU/hr @ 31.2V dc |
| 1794-ID2 | FLEX I/O 24V dc 2 Input Pulse Counter Module | Typical applications include quantity counting, positioning, and speed calculations. | All networks supported by FLEX I/O | 2 Inputs Only | 150 mA @ 12V dc 75 mA @ 24V dc | 5 W @ 26.4V dc | 17.1 BTU/hr @ 26.4V dc |
| 1794-IP4 | FLEX I/O 12/24V dc 4 Input Pulse Counter Module | Typical applications include counting pulses from flow meters and density meters. Quantity counting and speed calculations are examples of other applications. | | 4 Inputs Only | 150 mA @ 12V dc 75 mA @ 24V dc | 5 W @ 26.4V dc | 17.1 BTU/hr @ 26.4V dc |

✶Does not represent power required to supply the inputs or outputs.

| | Conformal Coated Description |
|---|---|
| 1794-IJ2K | ANSI / ISA-S71.04-1985, Class G1, G2, and G3 environments<br>CEI IEC 6065A-4 Class 1 and 2 environments<br>UL 746E |

## 1794-IJ2 24V dc 2 Input Frequency Module

The 1794-IJ2 is essentially a tachometer with the capability of reporting frequency, acceleration, and direction. Outputs are activated by alarms. Input devices range from magnetic pickup to flowmeters, to incremental encoders to proximity detectors.
This intelligent I/O module is designed to perform high-speed frequency algorithms. The module provides 2 frequency inputs, 2 gate inputs, and 2 outputs. The frequency inputs are capable of accepting frequencies up to 32KHz. The module accepts and returns binary data.
The 1794-IJ2 measures frequency over a user-specified time interval. A frequency calculation can start *before* the time interval has elapsed, if a user-specified number of frequency input pulses have occurred.
The module's primary target is high-speed, accurate frequency measurement. As such, a high-speed internal clock is synchronized with the frequency input to count over a user-selected sampling time or a user-defined number of frequency input pulses.
Power to the module is supplied from the external power supply. All power for input devices (24V dc) is supplied by the I/O module. Outputs are used to set alarms depending on the input conditions.

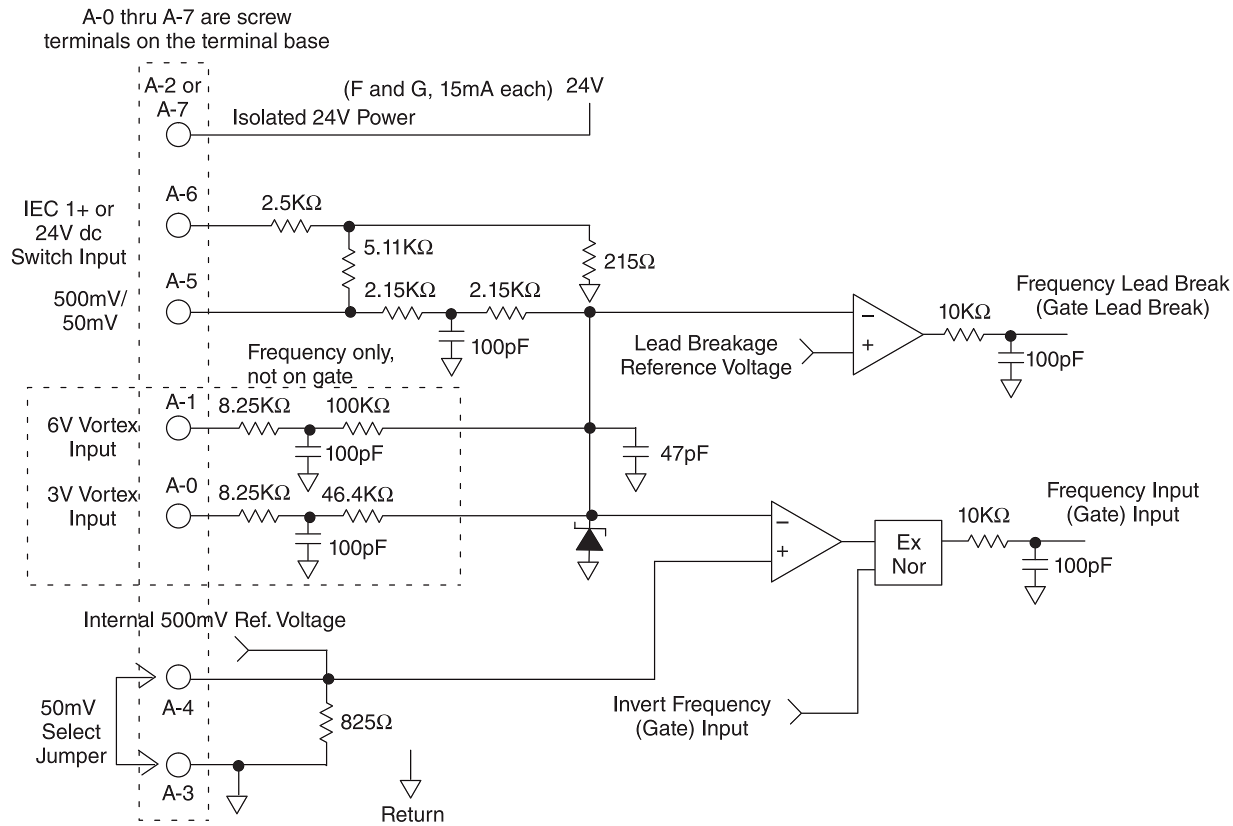
The 1794-IJ2 module accepts the following frequency inputs:

- 24V dc IEC1+ proximity switch as defined by standard IEC 1131-2
- 24V dc contact switch with wire off capability
- 500 mV ac magnetic pickup
- 50 mV ac magnetic pickup
- 6V ac vortex
  - 3V ac vortex

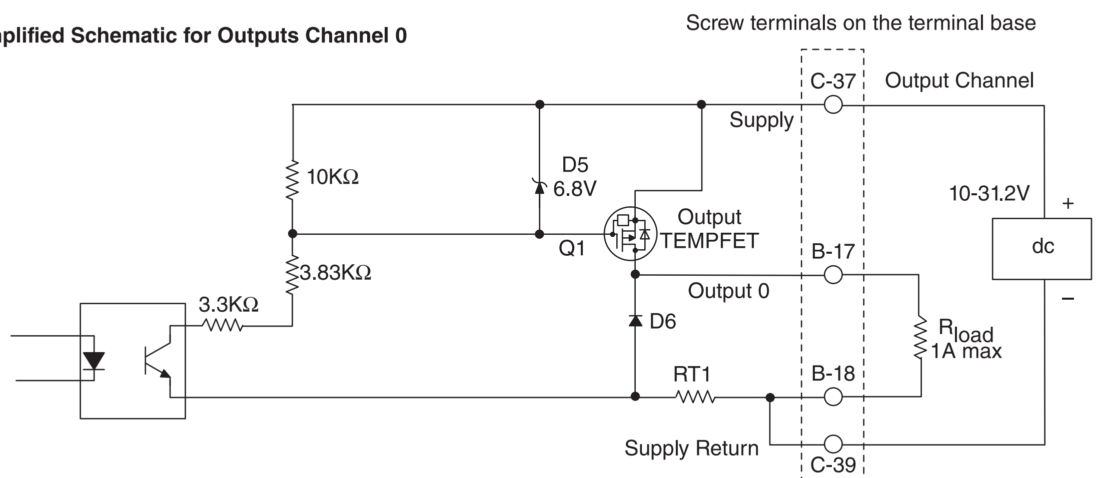
The 1794-IJ2 module accepts the following gate inputs:

- 24V dc IEC1+ proximity switch as defined by standard IEC 1131-2
- 24V dc contact switch
- 500 mV ac magnetic pickup
- 50 mV ac magnetic pickup

**Simplified Schematic for Frequency Input Channel 0**

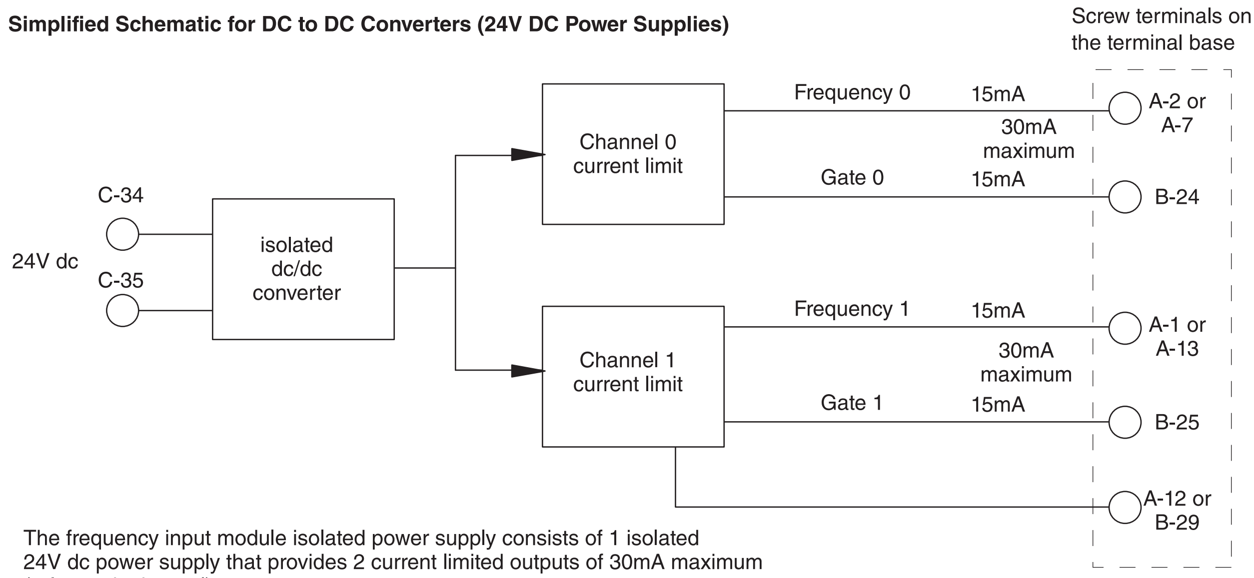



**Simplified Schematic for Outputs Channel 0**




Customer supplied power, ranging from +10V to +31.2V dc, is connected internally to the power output transistor. When an output is turned on, current flows into the source out of the drain, through the load connected to the ground of the customer supply (customer return). Diode D6 protects the power output transistors from damage due to inductive loads. Output Q1 is a thermally protected FET and will turn off @ 3A (approximately). After an output goes into thermal shutdown, you must fix the cause of the shutdown and toggle the outputs ON and OFF to reenergize the output. RT1 protects D6 and Q1 if power supply polarity is reversed.

**Simplified Schematic for DC to DC Converters (24V DC Power Supplies)**




The frequency input module isolated power supply consists of 1 isolated 24V dc power supply that provides 2 current limited outputs of 30mA maximum (1 for each channel).

| | 1794-IJ2 |
|---|---|
| Processing Time | ≤4 ms |
| Input Frequency, Max. | 1…32 kHz w/sine wave; 1…32 kHz w/square wave input |
| Frequency Value, Max. | 32,767 or 3,276.7 (dependent on range) |
| Input Pulse Width | 20 µs min |
| Voltage, On-State Input, Min. | 10V (24V IEC+1 proximity, encoder input or switch inputs) |
| Voltage, On-State Input, Nom. | 24V dc |
| Voltage, On-State Input, Max. | Limited to isolated 24V dc power supply |
| Current, On-State Input, Min. | 2.0 mA |
| Current, On-State Input, Nom. | 9.0 mA |
| Current, On-State Input, Max. | 10.0 mA |
| Voltage, Off-State Input, Max. | 5.0V dc on 24V dc IEC1+ Terminal |
| Current, Off-State Input, Max. | 1.5 mA into 24V dc IEC1+ Terminal |
| Wire-Off Detection | 0.4 mA for proximity, encoder, or contact switch with 50 kW shunt resistor |
| Impedance, Frequency Input | >5 kΩ for 50 mV extended magnetic pickup<br>>5 kΩ for 500 mV magnetic pickup<br>>10 kΩ for 3V vortex flowmeter<br>>10 kΩ for 6V vortex flowmeter<br>>2.5 kΩ for 24V dc IEC1+ proximity or encoder input<br>>2.5 kΩ for 24V dc contact switch input |
| Impedance, Gate Input | >5 kΩ for 50 mV extended magnetic pickup<br>>5 kΩ for 500 mV magnetic pickup<br>>2.5 kΩ for 24V dc IEC1+ proximity or encoder input<br>>2.5 kΩ for 24V dc contact switch input |
| Output Voltage Source | Customer supplied |
| Voltage, On-State Output, Min. | 10V dc |
| Voltage, On-State Output, Nom. | 24V dc |
| Voltage, On-State Output, Max. | 31.2V dc |
| Current, On-State Output, Min. | 1.0 mA per output |
| Current, On-State Output, Max. | 1.0 A per channel sourced out of module✶ |
| Output Surge Current, Max. | 2 A for 50 ms, repeatable every 2 s |
| Voltage Drop, On-State Output, Max. | 0.9V dc @ 1 A |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Output Control | Outputs individually assignable to:<br>Frequency,% full scale, or acceleration alarm |
| Output Switching Time | Triggered by frequency alarm or acceleration alarm<br>Turn On: < 0.5 ms<br>Turn Off: < 1 ms |

✶Current Limited: All outputs can be on simultaneously without derating.

## 1794-VHSC 24V dc 2 Channel Very High Speed Counter Module

A counter module has two incremental quadrature encoder interfaces each with three inputs (A, B, and Z). Each input module has ± inputs for connection to pulse transmitters with complementary or non-complementary signals.
The counter can count pulses of one or two pulse trains for up/down counting and detection of a selectable number of edges (X1, X2, X4). Each of the two counters has an upper limit of 1MHz, a 24-bit counter register, a preset register, and a latch register.
Power to the module is supplied from an external 24V power supply. The 1794-VHSC has two outputs that can be configured for overlapping, multiple windows, and/or pulse width modulation.

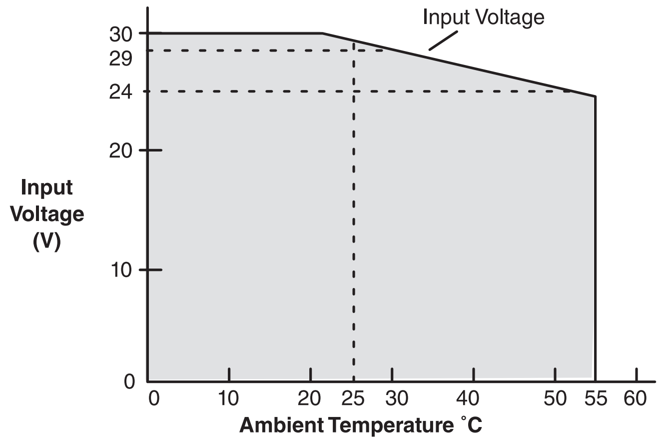
When using ControlNet systems, this module must be used with 1794-ACN15 or -ACNR15 Series B or later ControlNet adapters. When using EtherNet/IP systems, this module must be used with a 1794-AENT/A module with firmware at revision 2.xx or later, along with a FlexLogix local controller.

| | 1794-VHSC |
|---|---|
| Input Groups | 2 groups of A/A, B/B, and Z/Z pairs with 5V dc or 15…24V dc terminations |
| Input Frequency, Max. | 1.0 MHz counter and encoder X1 (no filters)<br>500 kHz encoder X2 (no filters)<br>250 kHz encoder X4 (no filters) |
| Voltage, On-State Input, Min. | 5V dc terminations: >2.6V dc<br>15…24V dc terminations: >12.5V dc |
| Voltage, On-State Input, Max. | 5V dc terminations: ±6V<br>15…24V dc terminations: Refer to derating curve |
| Voltage, Off-State Input, Min. | 5V dc terminations: ≤1.25V dc<br>15…24V dc terminations: ≤1.8V dc |
| Current, On-State Input, Min. | >5 mA |
| Current, Off-State Input, Max. | ≤0.250 mA |
| Input Filter Selections | 5: Off, 10 µs, 100 µs, 1.0 ms, 10.0 ms per A/B/Z group |
| Output Control | Outputs can be tied to 8 compare windows |
| Output Supply Voltage Range | 5…7V dc or 10…31V dc |
| Leakage Current, Off-State Output, Max | ≤0.3 mA |
| Voltage Drop, On-State Output, Max. | 5V operation - 0.5 A<br>12…24V operation - 1.0 A |
| Current, On-State Output, Max. | 5V operation - 0.5 A<br>12…24V operation - 1.0 A |
| Current per Output Pair, Max. | 5V operation - 0.9 A<br>12…24V operation - 4.0 A |
| Short Circuit Current | 5V operation - 0.9V dc @ 0.5 A✶<br>12…24V operation - 0.9V dc @ 1.0 A |
| Dimensions (HxWxD), Metric | 45.7 x 94.0 x 53.3 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Output Delay Time, OFF to ON | 25 µs (load dependent) |
| Output Delay Time, ON to OFF | 150 µs (load dependent) |

✶Outputs are short circuit protected and turned off until power is cycled.

## 1794-VHSC Derating Curve

### Derating Curve




The area within the curve represents the safe operating range for the module under various conditions of user supplied 24V dc supply voltages and ambient temperatures. This includes all possible mounting positions, including inverted horizontal.

## 1794-ID2 24V dc 2 Input Pulse Counter Module

The 1794-ID2 module is a 2-channel counter used in applications where pulse counting is required. Typical input devices include quadrature incremental encoders with or without reference and/or gate function and pulse transmitters. You can use one or two pulse trains.

| | 1794-ID2 |
|---|---|
| Input Pulse Width | Each signal condition must be stable for at least 2 ms to be recognized |
| Input Groups | 2 groups of A, B, Z, G inputs |
| Counting Frequency (kHz), Max. | 100 |
| Cable Type | Input: Belden 8761 |
| Wiring Category | 2✶ |
| Conductor Length, Max | 1000 ft (304.8 m) |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Input Signal Range | 3 mA @ 6V dc<br>9 mA @ 12V dc<br>15 mA @ 24V dc |

✶Use this conductor category information for planning conductor routing. Refer to publication 1770-4.1, Industrial Automation Wiring and Grounding Guidelines.

## 1794-IP4 12/24V dc 4 Input Pulse Counter Module

The pulse counter modules perform high-speed scaling, calculation operations for various industrial applications. Some sample applications include:

- quantity counting
- speed calculation
- flow monitoring

All the input devices for the pulse counter module should be able to provide the input signal of 6V amplitude. The 1794-IP4 has a 6V minimum threshold for an input ON condition and a maximum 3V threshold for an input OFF condition. The region between 3V and 6V is a transitional one and therefore requires input signals to pass cleanly through that region, otherwise module operation cannot be guaranteed.

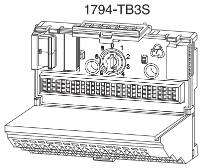
| | 1794-IP4 |
|---|---|
| Counting Frequency (kHz), Max. | 100✶ |
| Input Frequency, Max. | 100 |
| Input Signal Range | 3 mA @ 6V dc<br>9 mA @ 12V dc<br>15 mA @ 24V dc |
| Dimensions (HxWxD), Metric | 46 x 94 x 53 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.1 in |
| Overflow | Max. period is 65 ms when 1 MHz internal clock selected; Max. period = 6.5 ms when 10 MHz internal clock selected |

✶Each signal condition must be stable for at least 2 ms to be recognized.

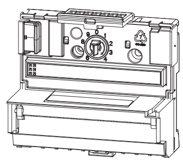
**Step 3 - Select:**

- *the appropriate terminal base unit for your module and system*

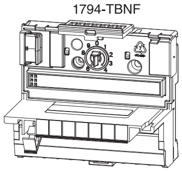
1794-TB3S



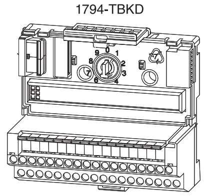
1794-TBN



1794-TBNF



1794-TBKD



# Selecting a Terminal Base Unit

Each FLEX I/O module requires a terminal base unit that snaps onto the DIN Rail to the right of the I/O adapter. The terminal bases provide terminal connection points for I/O wiring and plug together to form the backplane. They are available with screw or spring terminations.

## General Specifications

| Cat. No.❄ | Description | Purpose |
|---|---|---|
| 1794-TB2 | FLEX I/O 2-Wire Cage-Clamp Terminal Base Unit | A generic version of the 1794-TB3 below |
| 1794-TB3 | FLEX I/O 3-Wire Cage-Clamp Terminal Base Unit | Primarily intended for use with input modules when using 3-wire input proximity switches — can also be used with output modules |
| 1794-TB3S | FLEX I/O 3-Wire Spring-Clamp Terminal Base Unit | A spring clamp version of the cage clamp 1794-TB3 above — provides faster, simpler wire installation |
| 1794-TB32 | FLEX I/O 32-Point Cage-Clamp Terminal Base Unit | A 32-point version of the 1794-TB3 to be used with 32-point digital modules and 1794-IB16D |
| 1794-TB32S | FLEX I/O 32-Point Spring-Clamp Terminal Base Unit | A spring clamp version of the 1794-TB32 |
| 1794-TB3G | FLEX I/O 3-Wire Grounded Cage-Clamp Terminal Base Unit | A screw clamp terminal base unit with individual grounding used with certain analog modules |
| 1794-TB3GS | FLEX I/O 3-Wire Grounded Spring-Clamp Terminal Base Unit | A spring clamp version of the 1794-TB3G |
| 1794-TB3T | FLEX I/O Cage-Clamp Temperature Terminal Base Unit | Required with the 1794-IT8 module (when used in thermocouple mode) — also provides chassis ground connections for the 1794-IR8 and analog modules |
| 1794-TB3TS | FLEX I/O Spring-Clamp Temperature Terminal Base Unit | A spring clamp version of the 1794-TB3T |
| 1794-TBKD | Proposed Product: FLEX I/O Cage-Clamp Terminal Base Unit | A spring clamp version of the 1794-TB3T |
| 1794-TBN | FLEX I/O Screw-Clamp Terminal Base Unit | Provides screw terminals to accept larger gauge wires plus cover for I/O wiring |
| 1794-TBNF✶ | FLEX I/O Screw-Clamp Fused Terminal Base Unit | Provides eight 5 x 20 mm fuses, screw terminals, plus a cover for I/O wiring — shipped with fuses for the 1794-OA8 module; can be used to fuse the 1794-OM8 and -OW8 modules with a replacement fuse (see the installation instructions) |

✶Contains eight 5x20 mm fuses (one for each even-numbered terminal - 0 through 14 on row B). Shipped with 1.6 A, 250V ac Slow Blow fuses suitable for 1794-OA8 ac output module. Refer to individual installation instructions for fusing recommendations for other modules. Littelfuse PN23901.6, A-B PN94171304, SAN-O PNSD6-1.6A.
❄Isolation Voltage, Channel to Channel is determined by the inserted module.

Conformal coated versions of standard modules have the letter K in the last position of the catalog number, before the series designation.

| | Conformal Coated Description |
|---|---|
| 1794-TB3K | ANSI / ISA-S71.04-1985, Class G1, G2, and G3 environments<br>CEI IEC 6065A-4 Class 1 and 2 environments<br>UL 746E |
| 1794-TB3GK | |
| 1794-TBNK | |

The following table illustrates the recommended FLEX I/O terminal base unit(s) for each module. Many terminal base units can be used with most modules, but auxiliary terminal strips may be required.

| FLEX I/O Product | Cat. No. | Terminal Base Unit |
|---|---|---|
| 120V ac Input Modules | 1794-IA8 | **1794-TBN,** 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD✶. |
| | 1794-IA8I | **1794-TBN,** 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| | 1794-IA16 | **1794-TB3,** 1794-TB3S, 1794-TBN❄‡ |
| 220V ac Input Module | 1794-IM8 | **1794-TBN**❄ |
| 120V ac Output Modules | 1794-OA8 | **1794-TBNF**, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBN, 1794-TBKD❄ |
| | 1794-OA8I | **1794-TBNF**, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBN, 1794-TBKD❄ |
| | 1794-OA16 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TBN, 1794-TBKD❄§ |
| 220V ac Output Module | 1794-OM8 | **1794-TBNF**, 1794-TBN❄ |
| 24V dc Input Modules | 1794-IB8 | **1794-TB3,** 1794-TB3S❄ |
| | 1794-IB16 | **1794-TB3,** 1794-TB3S❄ |
| | 1794-IB16D | **1794-TB32,** 1794-TB32S❄ |
| | 1794-IB32 | **1794-TB32,** 1794-TB32S❄ |
| | 1794-IV16 | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| 24V dc Input/Output Modules | 1794-IB10XOB6 | **1794-TB3,** 1794-TB3S❄ |
| | 1794-IB16XOB16P | **1794-TB32,** TB32S❄ |
| 48V dc Input Module | 1794-IC16 | **1794-TB3,** 1794-TB3S❄ |
| 24V dc Output Modules | 1794-OB8 | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| | 1794-OB8EP | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TBN, 1794-TBKD❄ |
| | 1794-OB16 | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| | 1794-OB16D | **1794-TB3,** 1794-TB3S, 1794-TBKD❄ |
| | 1794-OB16P | **1794-TB2,** 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| | 1794-OB32P | **1794-TB32,** 1794-TB32S❄ |
| | 1794-OV16 | **1794-TB3,** 1794-TB3S❄ |
| | 1794-OV16P | **1794-TB3,** 1794-TB3S❄ |
| 48V dc Output Module | 1794-OC16 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TBKD❄ |
| Relay Module | 1794-OW8 | **1794-TBNF**, 1794-TBN, 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TBKD❄ |
| 24V dc Analog Input Modules | 1794-IE8 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS❄ |
| | 1794-IF4I | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS, 1794-TBN❄ |
| | 1794-IR8 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS❄ |
| | 1794-IRT8 | **1794-TB3G,** 1794-TB3GS❄ |
| | 1794-IT8 | **1794-TB3T,** 1794-TB2, 1794-TB3, 1794-TB3S, 1794-TB3TS❄♣ |
| 24V dc Analog Input/Output Modules | 1794-IE4XOE2 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS❄ |
| | 1794-IF2XOF2I | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS, 1794-TBN❄ |
| 24V dc Analog Output Modules | 1794-OE4 | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS, 1794-TBN❄ |
| | 1794-OF4I | **1794-TB3,** 1794-TB2, 1794-TB3S, 1794-TB3T, 1794-TB3TS, 1794-TBN❄ |
| Counter Modules | 1794-IJ2 | **1794-TB3G,** 1794-TB3GS❄ |
| | 1794-VHSC | **1794-TB3G,** 1794-TB3GS❄➤❄ |
| | 1794-ID2 | **1794-TB3,** 1794-TB3S, 1794-TBN, 1794-TBNF❄⌘ |
| | 1794-IP4 | **1794-TB3,** 1794-TB3S, 1794-TBN, 1794-TBNF❄⌘ |
| SCANport Module | 1203-FB1 | 1203-FB1 |

✶Recommended terminal base is in bold text
❄Recommended terminal base is in bold text.
‡Auxiliary terminal strips are required when using the 1794-TBN for the 1794-IA16 and 1794-IA16.
§Auxiliary terminal strips are required when using the 1794-TBN for the 1794-OA16 and 1794-IA16.
♣You can use a 1794-TB2, 1794-TB3, or 1794-TB3S for mV inputs only.
➤For use with 1794-ACN15, 1794-ANCR15, and 1794-AENT only.
⌘Auxiliary terminal strips are required when using the 1794-TBN or 1794-TBNF for this catalog number.

## General Specifications

| Cat. No.❄ | Connections | Ternination Type | Used in Applications | Current Capacity, Max. | Dimensions (HxWxD), Metric Dimensions (HxWxD), Imperial | Wire Size | Wiring Category | Certifications |
|---|---|---|---|---|---|---|---|---|
| 1794-TB2 | 16 I/O; 18 common; 2 +V | | Up to 132V ac/156V dc | 10 | 94 x 94 x 69 mm<br>3.7 x 3.7 x 2.7 in | 22…12 AWG (0.34 mm²…2.5 mm²) stranded copper wire rated at 75 °C or higher 3/64 in (1.2 mm) insulation max. | 2‡ | UL, CSA, CE:<br>Class I Division 2 certified Groups A, B, C, D certified<br>Class I Zone 2 Group IIC certified |
| 1794-TB3 | 16 I/O; 18 common; 18 +V | | | | | | | |
| 1794-TB3S | | | | | | | Module dependent‡ | |
| 1794-TB32 | 32 I/O; 8 common; 8 +V | | Up to 31.2V dc | | | | | |
| 1794-TB32S | | | | | | | | |
| 1794-TB3G | 36 I/O; 2 common; 2 +V; 10 chassis ground | | | | | | | |
| 1794-TB3GS | | | | | | | 2‡ | |
| 1794-TB3T | 16 I/O; 10 common; 4 +V; 8 chassis ground; 2 sets of CJC to be used with temperature modules | | Up to 132V ac/156V dc | | | | Module dependent‡ | |
| 1794-TB3TS | | | | | | | 2‡ | |
| 1794-TBN | 16 I/O; 2 common; 2 +V❄ | | 264V ac/dc | | | | Module dependent‡ | |
| 1794-TBNF✶ | | | | | | | | |

✶Contains eight 5x20 mm fuses (one for each even-numbered terminal - 0 through 14 on row B). Shipped with 1.6 A, 250V ac Slow Blow fuses suitable for 1794-OA8 ac output module. Refer to individual installation instructions for fusing recommendations for other modules. Littelfuse PN23901.6, A-B PN94171304, SAN-O PNSD6-1.6A.

❄Isolation Voltage, Channel to Channel is determined by the inserted module.‡Use this conductor category information for planning conductor routing. Refer to publication 1770-4.1, "Industrial Automation Wiring and Grounding Guidelines."

**Step 2 - Select:**

• *I/O modules*

# Selecting FLEX Ex I/O Modules

FLEX Ex follows a producer/consumer model for remote I/O. Input modules produce data for the system. Controllers, output modules, and intelligent modules produce and consume data. The producer/consumer model multicasts data. This means that multiple nodes can consume the same data at the same time from a single device.

FLEX Ex I/O modules offer 4 through 16 I/O each. You can plug together a maximum of eight FLEX Ex I/O modules with a FLEX Ex I/O adapter, for a maximum of 128 I/O per assembly.

Mix and match digital and analog I/O to meet your application needs.

## Digital I/O Modules

Digital I/O modules have digital I/O circuits that interface to on/off sensors (pushbottons and limit switches) and actuators (motor starters, pilot lights, and annunciators).

These outputs are controlled by the PLC controller while the inputs control the state of corresponding bits in the PLC.

Features

• Modules detect, indicate, and report the following faults:
  - open input or output field devices or wiring
  - shorted output field devices
  - shorted input or output wiring

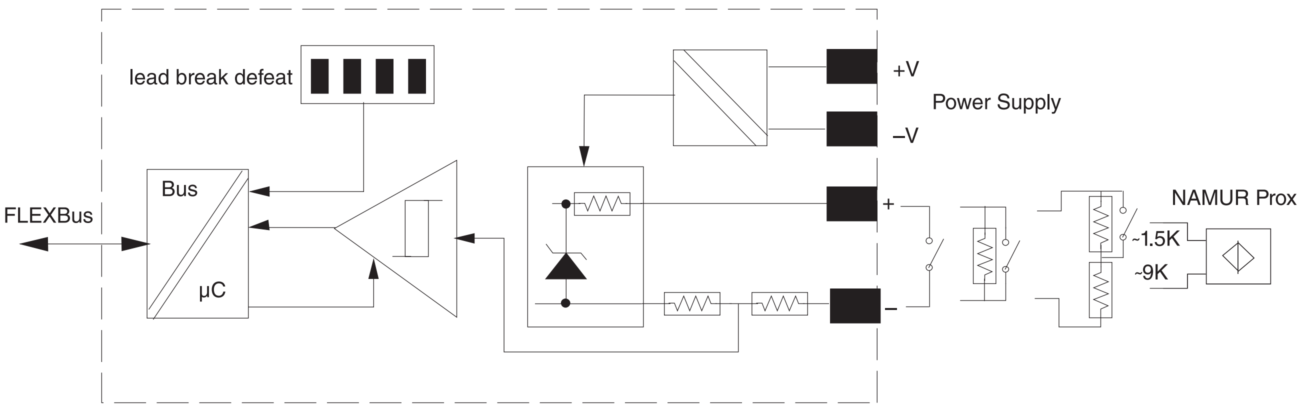
• Selectable input filter times from <1 to 33 ms.

• LED for each channel indicating status of:
  - corresponding input device
  - output signal

| Cat. No. | Description | Number of Inputs | Number of Outputs | Terminal Base Unit |
|---|---|---|---|---|
| 1797-IBN16 | 16 pt Non-Isolated NAMUR Input Module | 16 | — | 1797-TB3, 1797-TB3S |
| 1797-OB4D | 24V dc 4 pt Non-Isolated Source Output Module | — | 4 | |

# 1797-IBN16 16 pt Non-Isolated NAMUR Input Module

- Fault detection, fault bits in data table and LED (per channel) blinking red (1 Hz)
- Lead brekage defeat on four-channel group basis via module DIP switch selection
- Fault detection can be disabled via data table
- Programmable digital input filtering 1…33 ms (OFF to ON and ON to OFF)
- All modules updated to flexbus ≤ 500 μs
- Compatible with NAMUR sensors and dry contacts

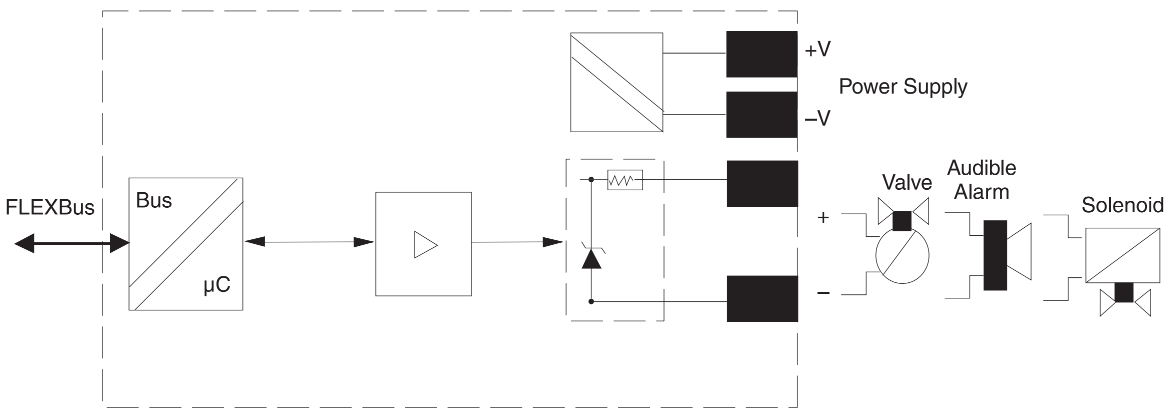



| | 1797-IBN16 |
|---|---|
| Number of Inputs | 16 |
| Input Type | DIN19234, NAMUR compatible |
| Current, On-State Input, Min. | 2.1 mA |
| Current, Off-State Input, Max. | 1.2 mA |
| Hysteresis | 0.2 mA |
| Input Frequency, Max. | 1000 Hz |
| Input Pulse Width | > 500 μs, on or off |
| Load Voltage, Max. | U/V = 7.5V dc |
| Short Circuit Current | 7.5 mA |
| Short Circuit Threshold Current | > 6 mA |
| Lead Breakage Threshold Current | < 0.35 mA |
| Input Delay Time, OFF to ON | 1 ms, 2 ms, 3 ms, 5 ms, 9 ms, 17 ms, 33 ms✶ |
| Input Delay Time, ON to OFF | 1 ms, 2 ms, 3 ms, 5 ms, 9 ms, 17 ms, 33 ms❄ |
| Intrinsically Safe Input Type | EEx ia IIB/IIC T4, AEx ia IIC T4, Class I, II, III Division 1<br>Groups A…G T4 |
| Intrinsically Safe Input Characteristics | 16 pin male and female FlexBus connector:<br>Ui ≤ 5.8V dc<br>Ii ≤ 400 mA<br>Li = Negligible<br>Ci = Negligible |
| Noxious Gas Exposure | Tested to severity level G3, ISA-S71.04-1985 |
| FLEX Ex Power Consumption (W) at 24V | 2.8 |
| Power Dissipation | 2.8 W |
| Dimensions (HxWxD), Metric | 46 x 94 x 75 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.95 in |
| Weight, Metric | 0.2 kg |
| Thermal Dissipation, Max. | 9.6 BTU/hr |

✶1 ms default - selectable through output image table (see "Setting Input Filter Times").
❄1 ms default - selectable through output image table.

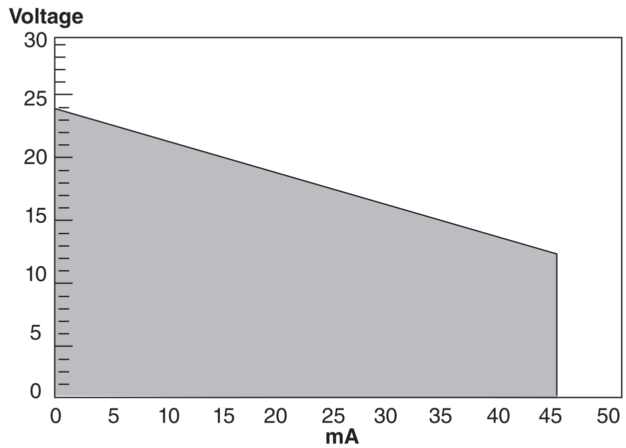
# 1797-OB4D 24V DC 4 pt Non-Isolated Source Output Module

- 4 output channels referenced to a single supply
- Yellow LED to indicate output state, output ON = LED ON
- Fault indication, signal to the backplane and LED (per channel) blinking red for fault
- Output wire-off detection
- Output wire-off detection on per channel basis via module data bit
- Electronically short-circuit protected, fault reported to controller
- All channels updated from the backplane every 2 ms
- Output fault state programmable




| | 1797-OB4D |
|---|---|
| Number of Outputs | 4 |
| Output Load Range | 30…5000 Ω |
| Fault Detection | Fault bits in data table and LED (per channel) blinking red (1 Hz) |
| Protection | Lead break, overload, short circuit |
| Output Delay Time, OFF to ON, Max. | ≤ 1.2 ms |
| Output Delay Time, ON to OFF, Max. | ≤1.2 ms |
| Intrinsically Safe Output Type | EEx ia IIB/IIC T4,<br>AEx ia IIC T4,<br>Class I, II, III Division 1 & 2 Groups A…G T4 |
| Intrinsically Safe Output Characteristics | 16 pin male and female FlexBus connector:<br>Ui ≤ 5.8V dc<br>Ii ≤ 400 mA<br>Li = Negligible<br>Ci ≤ 1.35 µF |
| Noxious Gas Exposure | Tested to severity level G3, ISA-S71.04-1985 |
| FLEX Ex Power Consumption (W) at 24V | 7.5 |
| Power Dissipation | 5 W |
| Dimensions (HxWxD), Metric | 46 x 94 x 75 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.95 in |
| Weight, Metric | 0.2 kg |
| Thermal Dissipation, Max. | 17.07 BTU/hr |

**1797-OB4D Output Voltage/Current Capability**



# Analog I/O Modules

Choose analog I/O modules when you need:

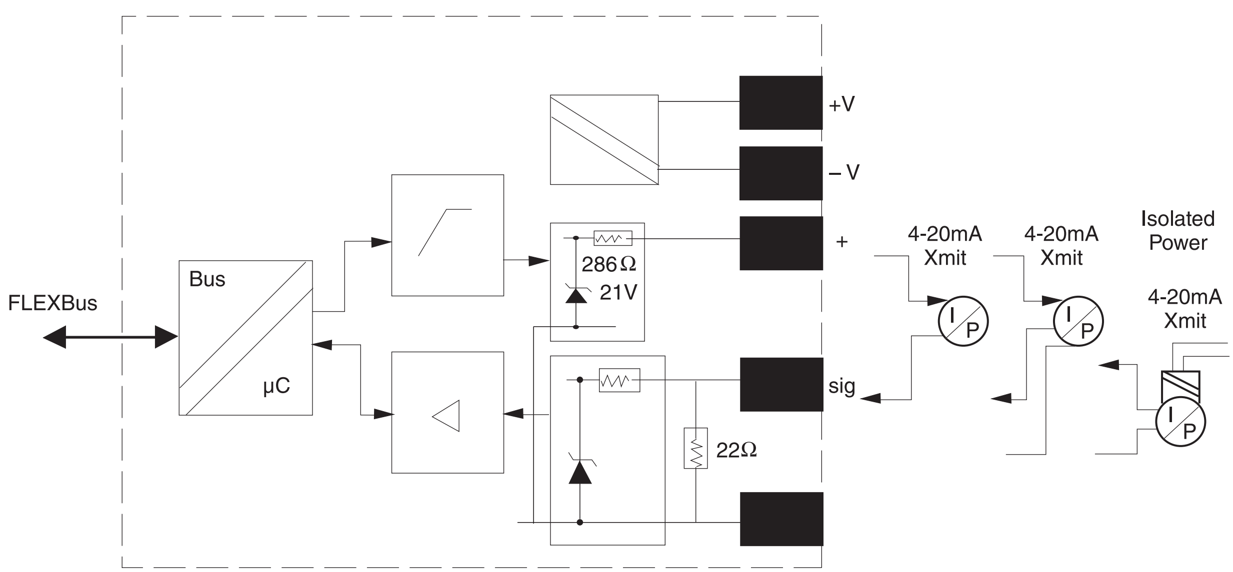
- **Configurable channels** allow the module to be used with a variety of sensors.
- **On-board scaling** eliminates the need to scale the data in the controller. Controller processing time and power are preserved for more important tasks, such as I/O control, communications, or other user-driven functions.
- **On-line configuration.** Modules can be configured in the RUN mode using the programming software or the control program. This allows you to change configuration while the system is operating. For example, the input filter for a particular channel could be changed, or a channel could be disabled based on a batch condition.
- **Over- and under-range detections and indications** eliminates the need to test values in the control program, saving valuable processing power of the controller. In addition, since alarms are handled by the module, the response is faster and only a single bit needs to be monitored to determine if an error condition has occurred.
- **Ability to direct output device operation during an abnormal condition.** Each channel of the output module can be individually configured to hold its last value or assume a user-defined value on either a run-to-program or run-to-fault condition. This feature allows you to set the condition of your analog devices, and therefore your control process, which may help to ensure a reliable shutdown.
- **Selectable input filters** allows you to select from several different filter frequencies for each channel that best meets the performance needs of your application based on environmental limitations. Lower filter settings provide greater noise rejection and resolution. Higher filter settings provide faster performance.
- **Selectable response to broken input sensor.** This feature provides feedback to the controller that a field device is not connected or operating properly. This allows you to specify corrective action based on the bit or channel condition.

<table>
<tr><th>Cat. No.</th><th>Description</th><th>Number of Inputs</th><th>Number of Outputs</th><th>Terminal Base Unit</th></tr>
<tr><td>1797-IE8</td><td>8 pt 16 bit Single-Ended Non-Isolated Analog Input Module</td><td rowspan="4">8</td><td rowspan="4">—</td><td rowspan="6">1797-TB3, 1797-TB3S</td></tr>
<tr><td>1797-IE8H</td><td>8 pt 16 bit Single-Ended Non-Isolated Analog Input Module with HART capability</td></tr>
<tr><td>1797-IE8NF</td><td>8 pt 16 bit Single-Ended Non-Isolated Analog Input Module with Noise Filter</td></tr>
<tr><td>1797-IRT8</td><td>8 pt 16 bit Non-Isolated RTD Thermocouple/mV Input Module</td></tr>
<tr><td>1797-OE8</td><td>8 pt 13 bit Single-Ended Non-Isolated Analog Output Module</td><td rowspan="2">—</td><td rowspan="2">8</td></tr>
<tr><td>1797-OE8H</td><td>8 pt 16 bit Single-Ended Non-Isolated Analog Input Module with HART capability</td></tr>
</table>

# FLEX Ex I/O Analog Input Modules

## 1797-IE8, -IE8H (HART), and -IE8NF (With Noise Filter) 8 pt 16 Bit Single-Ended Non-Isolated Analog Input Modules

- Eight single-ended input channels referenced to a single common
- 3-wire input for 2- and 3-wire transmitters
- Functional data: normal input
  input current = 4…20 mA, full-current range
  0…22 mA to allow for over and underrange indication
- Wire-off detection, signal to the backplane and LED (per channel) blinking red for fault
- Wire-off detection on per channel basis via module data bits
- Input filter cutoff programmable
- Resolution: 16 bits
- Accuracy: 0.1%
- The 1797-IE8 is typically used to act on change-of-state and high-speed applications. It is not compatible with HART handheld devices.
- The 1797-IE8NF has additional hardware filtering that damps out spurious signals and can be used for slower changing, steady-state processes. It has slower sampling than the 1797-IE8 (100 ms versus 1 ms). It is compatible with HART handheld devices.
- The 1797-IE8H is similar to the 1797-IE8NF with real time data table updates. It also supports pass-through of HART commands as unscheduled ControlNet messages. It is compatible with FDT software packages.



| | 1797-IE8 | 1797-IE8H | 1797-IE8NF |
|---|---|---|---|
| Input Resolution | 16 bits | 16 bits | 16 bits |
| Input Signal Range | 0…20 mA | 0…20 mA | 0…20 mA |
| Transfer Characteristics, Accuracy | 0.1% of output signal range at 20 °C (68 °F) | 0.1% of output signal range at 20 °C (68 °F) | 0.1% of output signal range at 20 °C (68 °F) |
| Transfer Characteristics, Temperature Drift | 0.005%/°C of output signal range | 0.05%/°C of output signal range | 0.005%/°C of output signal range |
| Functional Data Range | > 15V @ 22 mA<br>> 21.5V @ 0 mA | > 17V @ 22 mA<br>> 23V @ 0 mA | > 15V @ 22 mA<br>> 21.5V @ 0 mA |
| Data Format | Configurable | Configurable | Configurable |
| Step Response to 99% of Full Scale | 4 ms | 80 ms | 80 ms |
| Update Time, Module from Adapter | 200…1600 µs | 200…1600 µs | 200…1600 µs |
| Noxious Gas Exposure | Tested to severity level G3, ISA-S71.04-1985 | Tested to severity level G3, ISA-S71.04-1985 | Tested to severity level G3, ISA-S71.04-1985 |
| FLEX Ex Power Consumption (W) at 24V | 7.5 | 7.1 | 7.5 |
| Power Dissipation | 5.2 W | 5.2 W | 5.2 W |
| Thermal Dissipation, Max. | 17.75 BTU/hr | 17.75 BTU/hr | 17.75 BTU/hr |
| Dimensions (HxWxD), Metric | 46 x 94 x 75 mm | 46 x 94 x 75 mm | 46 x 94 x 75 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.95 in | 1.8 x 3.7 x 2.95 in | 1.8 x 3.7 x 2.95 in |
| Weight, Metric | 0.2 kg | 0.2 kg | 0.2 kg |
| Intrinsically Safe Input Type | Uo ≤ 23.7V<br>Io ≤ 93.5 mA<br>Po ≤ 555 mW<br>EEx ia IIB/IIC (CENELEC)<br>AEx ia IIC (US)<br>Ex ia IIC (Canada)<br>Class I, Zone 0, Groups IIC, IIB, IIA<br>Class I, Division 1, Groups A, B, C, D<br>Class II, Division 1, Groups E, F, G<br>Class III, Division 1 | Uo ≤ 24.4V<br>Io ≤ 92.5 mA<br>Po ≤ 565 mW<br>EEx ia IIB/IIC T4 | Uo ≤ 23.7V<br>Io ≤ 93.5 mA<br>Po ≤ 555 mW<br>EEx ia IIB/IIC (CENELEC)<br>AEx ia IIC (US)<br>Ex ia IIC (Canada)<br>Class I, Zone 0, Groups IIC, IIB, IIA<br>Class I, Division 1, Groups A, B, C, D<br>Class II, Division 1, Groups E, F, G<br>Class III, Division 11 |
| Intrinsically Safe Input Characteristics | 16 pin male and female FlexBus connector:<br>Ui ≤ 5.8V dc<br>Ii ≤ 400 mA<br>Li = Negligible<br>Ci ≤ 1.35 µF | 16 pin male and female FlexBus connector:<br>Ui ≤ 5.8V dc<br>Ii ≤ 400 mA<br>Li = Negligible<br>Ci ≤ 1.35 µF | 16 pin male and female FlexBus connector:<br>Ui ≤ 5.8V dc<br>Ii ≤ 400 mA<br>Li = Negligible<br>Ci ≤ 1.35 µF |

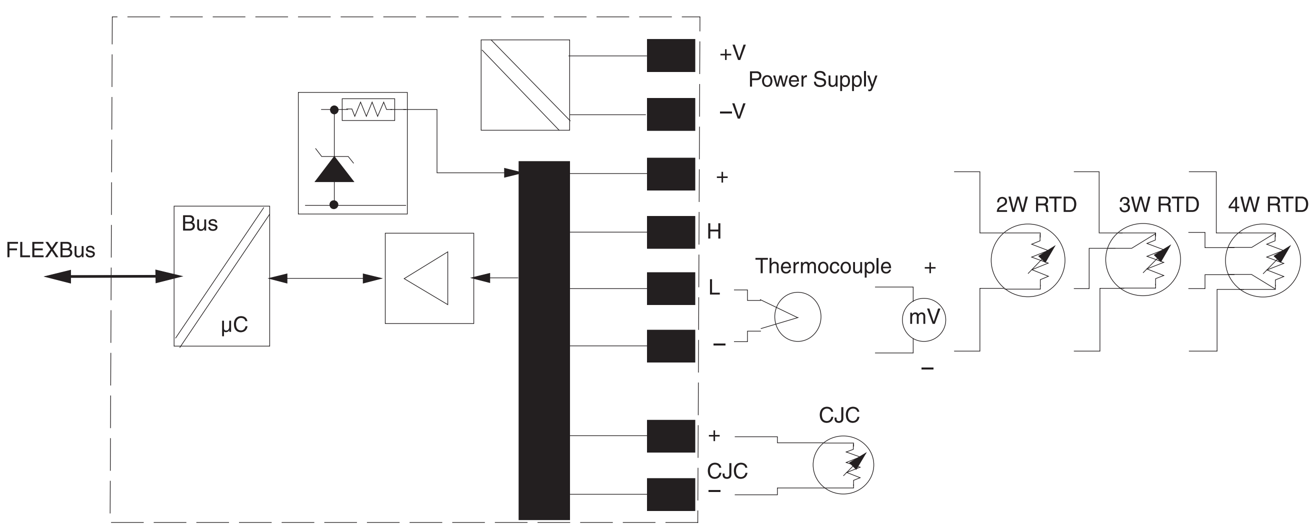
## HART Interface Modules

FLEX and FLEX Ex HART analog modules (IE8H and OE8H) are ideal for use in applications that need connection with FDT (Field Device Tool) compatible asset management software, such as Rockwell Software FieldCare HART Communication bundle or Endress + Hauser Fieldcare. For HART Device Type Management (DTM) programs and drivers, go to http://www.ab.com/io, and select Configurations Files, DTM files for HART.

- FLEX HART analog modules can be used on ControlNet or EtherNet/IP. The FLEX Ethernet adapter requires firmware v3.1 or later, which is flash upgradeable, to support these modules.
- Each HART field device is wired to its own input or output channel:
  - 8 single-ended channels
    does not support multi-drop
    2 or 3 wire devices
- For use with FlexLogix, the modules must be used on a distributed rail with a ControlNet adapter and not on a local rail.
- HART commands cand be transmitted by unscheduled message:
  - sample RLL subroutines are available.
    currently limited to one instance of RLL subroutine per module, one channel at a time.

## 1797-IRT8 8 pt 16 Bit Non-Isolated RTD Thermocouple/mV Input Module

- input channels referenced to a single common
- RTD mode
  - 2-, 3-, and 4-wire connection
  - sensor lead breakage and short circuit detection all 4 leads
  - measuring resistance 0 to 500Ω
  - accuracy: 0.1% of span at 20°C, filter cutoff < 1 Hz
- mV mode
  - input voltage -40 to 100 mV differential sensing
  - sensor breakage detection
- thermocouple mode
  - types B, E, J, K, TXK/XK (L), N, R, S, T
  - cold junction compensation (CJC)
  - external reference junction (programmable)
  - sensor breakage detection
  - accuracy: 0.1% of span, filter cutoff < 1 Hz
  - accuracy of CJC: ± 1 C/K

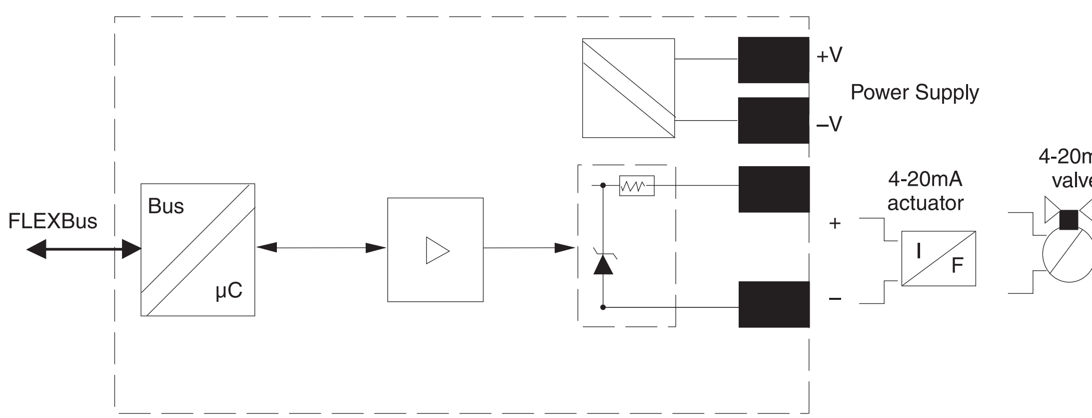


| | 1797-IRT8 |
|---|---|
| Input Type | Suitable for Pt 100, Pt200, Ni 100, Ni120, Ni200, 10Cu<br>RTD, Thermocouple Type B, E, J, K, N, R, S, T, XK/XK (L)<br>Configuration via internal bus |
| Input Signal Range | 0…500 Ω<br>-40…100 mV<br>TC<br>RTD |
| Settling Time | 8 ms to 99% of final value (mV mode, °F thermocouple) |
| Open RTD Detection | Out of range upscale reading |
| Lead Resistance Compensation | <15 Ω total |
| Transfer Characteristics, Accuracy | RTDs: 0.1% of span @ 20 °C, filter cutoff < 1 Hz<br>Thermocouples: 0.1% of span @ 20 °C, filter cutoff < 1 Hz |
| Transfer Characteristics, Temperature Drift | Cold junction compensation = +1 °C<br>150ppm/ °C (primary range) |
| Data Organization | Overrange Alarm - Individually for each channel<br>Lead Breakage Alarm - Individually for each channel<br>Fault State - Individually for each channel (includes overrange, lead breakage and short circuit)<br>Sensor Mode RTD 2, 3, or 4-wire - Common to groups of 4 channels (ch 0-3, ch 4-7)<br>TC Sensor Type (e.g. TC, Type B, E, J..., RTD or mV) - Common to groups of 4 channels (ch 0-3, ch 4-7)<br>Internal Reference Junction (TC mode) - Common to all channels (0 °C, 20 °C, 25 °C, 30 °C, 40 °C, 50 °C, 60 °C, 70 °C selectable |
| Noxious Gas Exposure | Tested to severity level G3, ISA-S71.04-1985 |
| FLEX Ex Power Consumption (W) at 24V | 1.6 |
| Power Dissipation | 1.6 W |
| Thermal Dissipation, Max. | 5.46 BTU/hr |
| Dimensions (HxWxD), Metric | 46 x 94 x 75 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.95 in |
| Weight, Metric | 0.2 kg |
| Intrinsically Safe Input Characteristics | 16 pin male and female FlexBus connector:<br>Ui ≤ 5.8V dc<br>Ii ≤ 400 mA<br>Li = Negligible<br>Ci ≤ 1.35 µF |

# FLEX Ex I/O Analog Output Modules

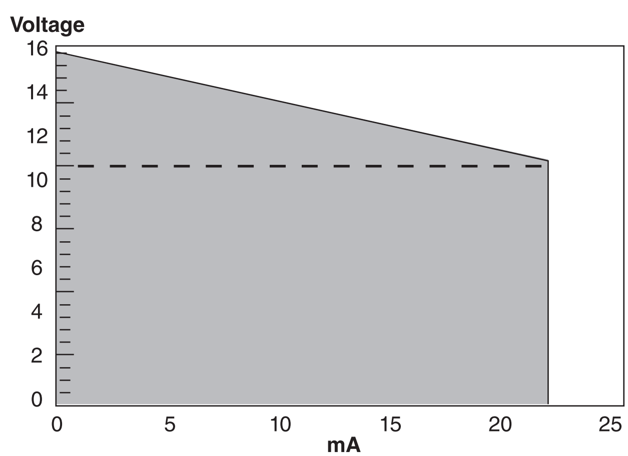
## 1797-OE8 and -OE8H (HART) 8 pt 13 Bit Single-Ended Non-Isolated Analog 4 Output Module

- Eight dual-ended output channels referenced over sense resistors to a single common
- Functional data:
  normal output
  current = 4…20 mA, full current
  range = 0…22 mA to allow for over- and under-range indication
- Output wire-off detection, LED (per channel) blinking red for fault, threshold < 2 mA
- Output wire-off detection on per channel basis via module data bits
- All channels updated to the backplane every ≤ 4 ms
- Resolution: 13 bits
- Accuracy: 0.1%
- One power supply loop for one module
- Output fault state programmable
- The 1797-OE8 can be used in digital mode for low energy digital field devices.
- The 1797-OE8H is similar to the 1797-OE8 with real time data table updates. It also supports pass-through of HART commands as unscheduled ControlNet messages. It is compatible with FDT software packages.



| | 1797-OE8 | 1797-OE8H |
|---|---|---|
| Output Resolution | 13 bits | 13 bits |
| Transfer Characteristics, Accuracy | 0.1% of output signal at 20 °C (68 °F) | 0.1% of output signal at 20 °C (68 °F) |
| Transfer Characteristics, Temperature Drift | 0.010%/C of output signal range | 0.010%/C of output signal range |
| Output Load Range | 0…500 Ω @ 22 mA<br>>11V @ 22 mA | 0…500 Ω @ 22 mA<br>>11V @ 22 mA |
| Step Response to 99% of Full Scale | 4 ms | 4 ms |
| Intrinsically Safe Output Type | EEx ia IIB/IIC T4, (CENELEC)<br>AEx ia IIC T4 (US),<br>Class I, II, III Division 1 Groups A…G T4 (Canada)<br>Class I, Zone 0, Groups IIC, IIB, IIA<br>Class I, Division 1, Groups A, B, C, D<br>Class II, Division 1, Groups E, F, G<br>Class III, Division 1 | EEx ia IIB/IIC T4 |
| Intrinsically Safe Output Characteristics | Ch 0…7<br>Terminals: 0…1; 4…5; 8…9; 12…13; 17…18; 21…22; 25…26; 29…30<br>Uo ≤ 21V<br>Io ≤ 100 mA<br>Po ≤ 520 mW | Ch 0…7<br>Terminals: 0…1; 4…5; 8…9; 12…13; 17…18; 21…22; 25…26; 29…30<br>Uo ≤ 21.6V<br>Io ≤ 92 mA<br>Po ≤ 500 mW |
| Noxious Gas Exposure | Tested to severity level G3, ISA-S71.04-1985 | Tested to severity level G3, ISA-S71.04-1985 |
| FLEX Ex Power Consumption (W) at 24V | 6.3 | 6.1 |
| Power Dissipation | 5.4 W | 6.1 W |
| Dimensions (HxWxD), Metric | 46 x 94 x 75 mm | 46 x 94 x 75 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.95 in | 1.8 x 3.7 x 2.95 in |
| Weight, Metric | 0.2 kg | 0.2 kg |
| Thermal Dissipation, Max. | 18.4 BTU/hr | 20.8 BTU/hr |

## 1797-OE8 and -OE8H Output Voltage/Current Capability



# Counter I/O Module

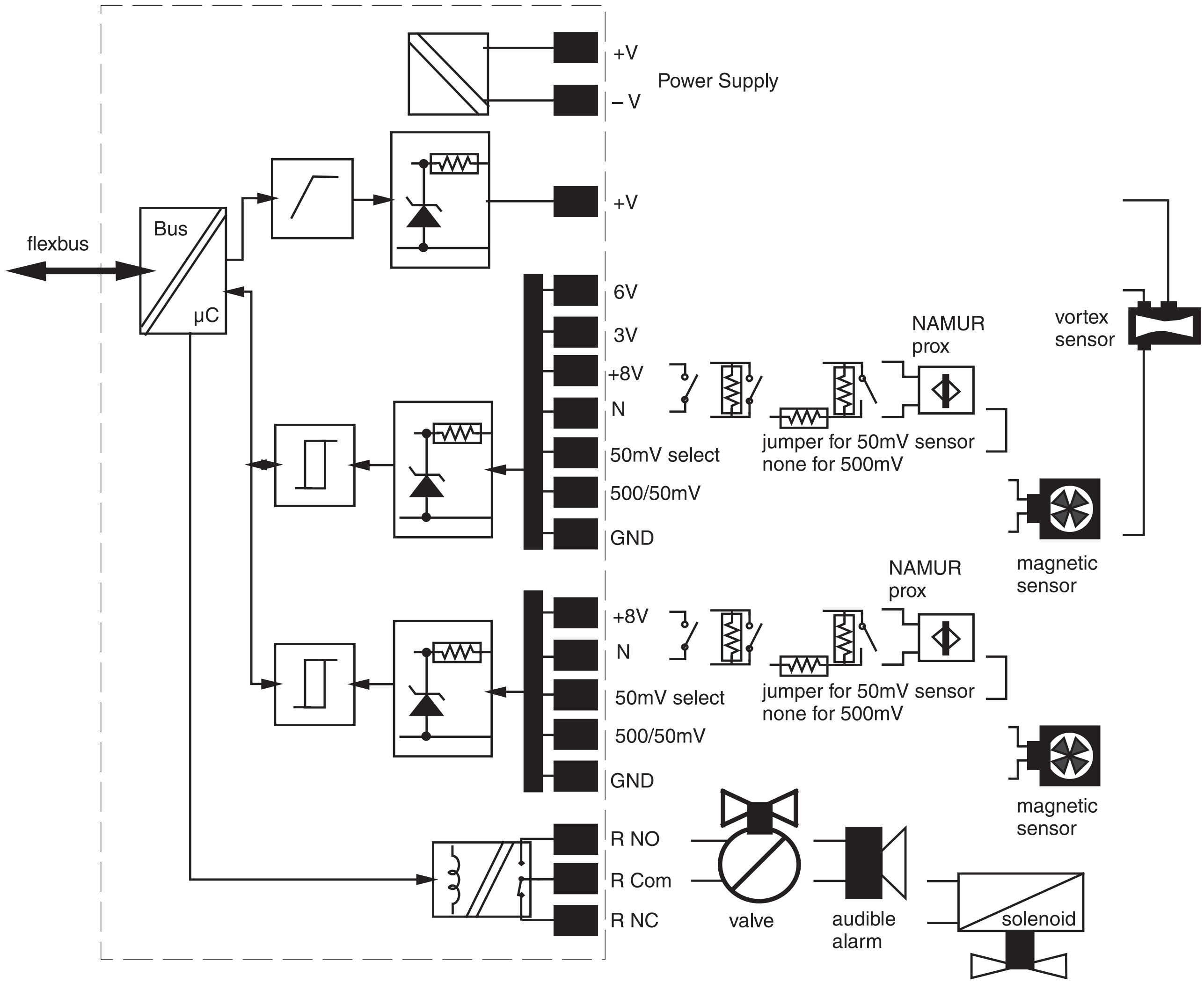
Ideal for applications requiring rotational control, the FLEX Ex counter is essentially a tachometer with the capability of reporting frequency, acceleration, and direction. Outputs are activated by alarms. Input devices range from magnetic pickup to flowmeters, to incremental encoders to proximity detectors.

This intelligent I/O module is designed to perform high-speed frequency algorithms. The module provides two frequency inputs, two gate inputs, and two outputs. The frequency inputs are capable of accepting frequencies up to 32 KHz. The module accepts and returns binary data.

The counter measures frequency over a user-specified time interval. A frequency calculation can start **before** the time interval clock is synchronized with the frequency input to count over a user-selected sampling time or a user-defined number of frequency input pulses. All power for input devices (24V dc) is supplied by the module.

## 1797-IJ2 2 Input Frequency Counter Module

- Software configurable frequency operating mode, with independent selections per frequency input
- Frequency inputs, two gate inputs, and two outputs
- Functional data: four selectable ranges: 50 mV; 500 mV (magnetic pickup); flowmeter; and NAMUR
- Provides IS power to drive up to two NAMUR and two flowmeter frequency inputs and/or contact switches and NAMUR gate inputs
- NAMUR lead breakage indication for any lead, signal to the backplane and LED (per channel) blinking red for fault
- NAMUR lead breakage defeat on per channel basis via module data table (NAMUR inputs only)
- Frequency count range up to 32 kHz
- Calculate frequency on time interval or input count
- Programmable scaling
- Acceleration value calculated
- Maximum frequency or acceleration alarms
- All channels updated to the backplane every ≤4 ms (according to sampling time)



+V
Power Supply
– V
+V
flexbus
Bus
µC
6V
3V
+8V
N
50mV select
500/50mV
GND
NAMUR
prox
vortex
sensor
jumper for 50mV sensor
none for 500mV
magnetic
sensor
+8V
N
50mV select
500/50mV
GND
NAMUR
prox
jumper for 50mV sensor
none for 500mV
magnetic
sensor
R NO
R Com
R NC
valve
audible
alarm
solenoid

| | 1797-IJ2 |
|---|---|
| Number of Inputs | 2 |
| Flowmeter Input Signal Threshold | 3V or 6V selectable |
| Flowmeter Input Voltage Available | > 15V @ 20 mA |
| Magnetic Pickup Input Signal | 50 mV or 500 mV, selectable |
| Processing Time | ≤ 4 ms |
| Input Frequency Range | 1.0…32,767 Hz |
| Frequency Resolution, Min. | Sampling Time - Accuracy<br>2 ms - 0.043%<br>4 ms - 0.033%<br>5 ms - 0.031%<br>10 ms - 0.027%<br>20 ms - 0.025%<br>50 ms - 0.023%<br>100 ms - 0.023%<br>200 ms - 0.023%<br>500 ms - 0.023%<br>1000 ms - 0.023% |
| Frequency Input, Characteristics | Magnetic pickup: 50 mV, 500 mV<br>NAMUR: 8V, 8 mA<br>Flowmeter: low ≥ 3V, high ≤ 6V |
| Impedance, Frequency Input | > 5 kΩ magnetic pickup<br>> 10 kΩ flowmeter |
| Intrinsically Safe Input Type | EEx ia IIB/IIC T4,<br>AEx ia IIC T4,<br>Class I, II, III Division 1 Groups A…G T4 |
| Intrinsically Safe Input Characteristics | DIN19234 (NAMUR) |
| Number of Outputs | 2 |
| Noxious Gas Exposure | Tested to severity level G3, ISA-S71.04-1985 |
| FLEX Ex Power Consumption (W) at 24V | 4.25 |
| Power Dissipation | 4.25 W |
| Dimensions (HxWxD), Metric | 46 x 94 x 75 mm |
| Dimensions (HxWxD), Imperial | 1.8 x 3.7 x 2.95 in |
| Weight, Metric | 0.2 kg |
| Thermal Dissipation, Max. | 14.5 BTU/hr |

**Step 3 - Select:**

- *the appropriate terminal base unit for your module and system*

# Selecting a Terminal Base Unit

Each FLEX Ex I/O module requires a FLEX Ex terminal base unit that snaps onto the DIN Rail to the right of the I/O adapter. The terminal bases provide terminal connection points for I/O wiring and plug together to form the backplane. They are available with screw and spring terminations.

| Cat. No. | Number of Terminals | Wire Size | Dimensions (HxWxD), Metric | Dimensions (HxWxD), Imperial | Weight, Metric | Terminal Base Screw Torque, Imperial |
|---|---|---|---|---|---|---|
| 1797-TB3 | 1 row of 16<br>2 rows of 18 | 22…12 AWG (0.34 $mm^2$…2.5 $mm^2$) stranded copper wire rated at 75 °C or higher 1.2 mm (3/64 in) insulation max. | 94 x 94 x 69 mm | 3.7 x 3.7 x 2.7 in∗ | 0.2 kg | 7…9 lb•in |
| 1797-TB3S | | | | | | — |