
The Tricon supports a comprehensive range of modules to meet customers' needs.

Product Specifications

The Triconex product family includes a comprehensive range of modules. This section includes: a summary of the system components and their uses, a table that lists standard products and their model numbers, and a summary of specifications for each standard product in the Tricon family

See the *Tricon Planning and Installation Guide* for complete information.

Summary of Tricon Components

Chassis

- *Main Chassis*—houses Main Processors, memory back-up batteries, communication modules and I/O modules.
- *Expansion Chassis*—for additional I/O modules up to 100 feet (30 meters) away from the Main Chassis. In restricted applications, operation up to 1,000 feet (300 meters) is supported.
- *RXM Chassis*—for I/O modules up to 7.5 miles (12 kilometers) away from the Main Chassis.
- *Mechanical Keying*—Each slot in the Tricon is mechanically keyed to correspond with a specific type of module. This prevents the installation of modules into improper slots.

For chassis mounting and enclosure specifications, see [page 25](#).

Power Supply Modules

- Provide logic power to modules in the Main, Expansion or RXM Chassis. Available in 24 VDC, 115 VAC and 230 VAC versions. The power rating of each power supply is 175 watts at 140 ° F (60° C).

Main Processors

The Main Processors execute the system diagnostics and the user-written control program.

Communication Modules

- *Tricon Communication Modules (TCM)* support a number of Triconex protocols and applications and user-written applications on Ethernet (802.3) networks, including TriStation, Modbus TCP and OPC. It also supports RS-232 and RS-485 serial communication with Modbus devices, TriStation 1131, and GPS for time synchronization.
- *Enhanced Intelligent Communication Modules (EICM)* support RS-232, RS-422 and RS-485 serial communication with Modbus devices and TriStation 1131.
- *Network Communication Modules (NCM)* support a number of Triconex protocols and applications and user-written applications on Ethernet (802.3) networks, including TriStation 1131.
- *Safety Manager Modules (SMM)* act as an interface between a Tricon controller and a Honeywell Universal Control Network (UCN), one of three principal networks of the TDC-3000 DCS.
- *Hiway Interface Modules (HIM)* act as an interface between a Tricon controller and a Honeywell TDC-3000 Hiway Gateway and Local Control Network (LCN).
- *Advanced Communication Modules (ACM)* allow a Tricon controller to interface with a Foxboro Industrial

Automation (I/A) Series DCS and TriStation 1131.

Fiber-Optic Remote Extender Modules (RXM)

For operation of Expansion Chassis up to 7.5 miles (12 kilometers) away from the Main Chassis, with exceptional immunity against electro-static and electro-magnetic interference.

Interface Modules

- *HART Analog Input Interface Modules* act as an interface between 4-20 mA analog input points from HART smart devices in the field and HART Host software running on a PC.
- *HART Analog Output Interface Modules* act as an interface between 4-20 mA analog output points from HART smart devices in the field and HART Host software running on a PC.

I/O Modules

- *Digital Input Modules* receive discrete signals of these nominal voltages: 115 VAC/VDC, 48 VAC/VDC, and 24 VAC/VDC. All voltages are available in TMR modules. Non-TMR modules are available in 24 VDC and 48 VDC only. Speed input and totalization modules are also available.
- *Supervised Digital Output Modules* produce discrete output signals of these nominal voltages, with diagnostic coverage of the field circuit and load device: 115 VAC, 120 VDC, 48 VDC, and 24 VDC.
- *Digital Output Modules* produce discrete output signals of these nominal voltages: 115 VAC, 120

Voltage	Description	Type	Model No.	Points	For Details, See
Analog Input Modules					
0-5 VDC	Differential, DC Coupled	TMR	3700A	32	page 43
0-10 VDC	Differential, DC Coupled	TMR	3701	32	page 43
0-5, 0-10 VDC	Differential, Isolated	TMR	3703E	16	page 43
0-5, 0-10 VDC	High-Density, Differential, DC Coupled	TMR	3704E	64	page 43
Thermocouple	Differential, DC Coupled	TMR	3706A	32	page 46
Thermocouple	Differential, Isolated	TMR	3708E	16	page 46
0-5 VDC	Single-Ended	TMR	3720	64	page 43
0 to 5 or -5 to +5 VDC	Differential, DC Coupled	TMR	3721	32	page 43
Analog Output Modules					
4-20 mA	Current Loop, DC Coupled	TMR	3805E/3805H	8	page 44
4-20 mA and 20-320 mA	Current Loop, DC Coupled	TMR	3806E	6 and 2	page 44
-60 to 60 mA	BiPolar, Commoned Return, DC Coupled	TMR	3807	4	page 44

General Environmental and EMC Specifications

Other than the optional conformal coating of all PCB assemblies, the Tricon is not explicitly protected against dust, corrosive atmospheres or falling debris. Atmospheric and airborne-particle protection must be provided by housing the Tricon in an appropriate NEMA-rated enclosure.

Operating Temperature	32° to 140° F (0° to 60° C), ambient, as measured at the bottom of the chassis, per IEC 60068-2-1 Test Nb
Storage Temperature	-40° to 167° F (-40° to 75° C), per IEC 60068-2-14, Test Na
Relative Humidity	5% to 95%, non-condensing, per IEC 60068-2-2, Test Bb, and IEC 60068-2-3 test Db
Sinusoidal Vibrations per Axis	2 G @ 10 to 150 Hz, per IEC 60068-2-6, Test Fc
Shock	15 G for 6-11 ms in each axis, per IEC 60068-2-27
Electrostatic Discharge	IEC 61000-4-2, 8 kV air, 4 kV contact
Conducted Susceptibility	IEC 61000-4-4, Fast Transient/Burst, 2 kV power, 1 kV signal lines and IEC 61000-4-5, Surge Withstand, 2 kV CM AC power lines, etc. IEC 61000-4-6, RFI, 0.15-80 MHz, 10V
Radiated Susceptibility	IEC 61000-4-3, 26-1000 MHz, 10 V/m and IEC 61000-4-8, 50-60 Hz, 30 A/m
Conducted Emissions	CISPR 16, Class A, 0.15-30 MHz, 73-79 db when installed per the guidelines of the P&I Guide
Radiated Emissions	CISPR 11, Class A, 30-1000 MHz @ 10 m, 4-47 db when installed per the guidelines of P&I Guide
Cable Flame Test Rating ¹	Interface cables (connect external termination panels to I/O modules): FT4 Vertical Flame Test-Cables in Cable Trays per C.S.A. C22.2 No. 0.3-92 Para 4.11.4 ² I/O bus cables (connect chassis): FT6 Horizontal Flame & Smoke Test-per C.S.A. C22.2 No. 0.3-92 Appendix B ³

1. Applies to cables shipped after April 1, 2009.

2. Cables will be marked with FT4 or CMG rating, but they all actually meet the more stringent FT4 rating.

3. Cables will be marked with FT6 or CMR rating, but they all actually meet the more stringent FT6 rating.

Product Specifications

Thermocouple Input Modules

Thermocouple Input (TC) modules include three independent input channels. Each input channel receives variable voltage signals from each point, performs thermocouple linearization and cold-junction compensation, and converts the result to degrees Celsius or Fahrenheit. Each channel then transmits 16-bit signed integers representing 0.125 degrees per count to the three Main Processors on demand. In TMR mode, a value is then selected using a mid-value selection algorithm to ensure correct data for every scan.

Each Thermocouple Input Module is programmable to support one thermocouple type, selected from J, K and T for standard Thermocouple Input Modules and from J, K, T and E for

isolated Thermocouple Input Modules. The isolated module allows users to select upscale or downscale burnout detection with TriStation 1131. For non-isolated modules, upscale or downscale burnout detection depends on the field termination selected.

Triplicated temperature transducers residing on the field termination panel support cold-junction compensation. Each channel of a Thermocouple Input Module performs auto-calibration using internal precision voltage references. On the isolated module, a faulting cold-junction transducer is annunciated by a cold-junction indicator on the front panel.

Each module performs complete ongoing diagnostics on each channel. Failure of any diagnostic on any

channel activates the Fault indicator, which in turn activates the chassis alarm signal. The module Fault indicator merely reports a channel fault, not a module failure. The module continues to operate properly with as many as two faulty channels.

Thermocouple Input Modules support hot-spare capability, which allows online replacement of a faulty module. Thermocouple Input Modules require a separate external termination panel (ETP) with a cable interface to the Tricon backplane.

Each module is mechanically keyed to prevent improper installation in a configured chassis.

Thermocouple Input Module Specifications

Model Number	3706A	3708E
Type	TMR, thermocouple	TMR, thermocouple
Number of input signals	32 differential, DC coupled	16 differential, isolated
Isolated points	No	Yes
Input update rate	50 ms, maximum ¹	50 ms
Thermocouple types supported ²	J, K, T	J, K, T, E
Accuracy/temp range	See Table A	See Table B
Input resistance (load)	22 M Ω (DC), typical	30 M Ω (DC), minimum
Noise rejection		
Common mode	-85 dB @ 0-60 Hz, minimum -95 dB @ DC, typical	-90 dB @ 0-60 Hz, minimum -100 dB @ DC, minimum
Normal mode	-17 dB @ 60 Hz	-3 dB @ 8 Hz, typical -17 dB @ 60 Hz, typical
Common mode range	± 10 VDC max. (channel-to-channel or channel-to-ground)	± 200 VDC, max (channel-to-channel or channel-to-ground)
Leg-to-leg isolation	200 K Ω , typical	20 K Ω , typical
Input point protection	110 VAC, continuous	110 VAC, continuous
Reference junction compensation range	32°-140°F (0°-60°C)	32°-140°F (0°-60°C)
Diagnostic indicators	PASS, FAULT, ACTIVE	PASS, FAULT, ACTIVE, CJ FAULT
Color code	Tan	Deep yellow

1. Inputs frozen for one second upon insertion of spare module.

2. Selected using TriStation 1131.

Accuracy of Thermocouple Types for Model 3706A

TC Type	Temperature Range	Accuracy ¹ (TC Termination Module @ 32-140°F [0-60°C])	
		T _a = 77°F (25°C) (Typical)	T _a = 32-140°F (0-60°C) (Maximum)
J	-250 to 32°F (-157 to 0°C)	± 5.0°F (2.8°C)	± 7.0°F (3.9°C)
	>32 to 2000°F (0 to 1093°C)	± 4.0°F (2.3°C)	± 5.0°F (2.8°C)
K	-250 to 32°F (-157 to 0°C)	± 6.0°F (3.4°C)	± 9.0°F (5.0°C)
	>32 to 2500°F (0 to 1371°C)	± 4.0°F (2.3°C)	± 6.0°F (3.4°C)
T	-250 to 32°F (-157 to 0°C)	± 5.0°F (2.8°C)	± 9.0°F (5.0°C)
	>32 to 752°F (0 to 400°C)	± 3.0°F (1.7°C)	± 5.0°F (2.8°C)

Accuracy of Thermocouple Types for Model 3708E

TC Type	Temperature Range	Accuracy ¹ (TC Termination Module @ 32-140°F [0-60°C])	
		T _a = 77°F (25°C) (Typical)	T _a = 32-140°F (0-60°C) (Maximum)
J	-238 to 32°F (-150 to 0°C)	± 3.0°F (1.7°C)	± 9.0°F (5.0°C)
	>32 to 1400°F (0 to 760°C)		± 5.5°F (3.1°C)
K	-238 to 32°F (-150 to 0°C)	± 4.0°F (2.3°C)	± 8.0°F (4.5°C)
	>32 to 2284°F (0 to 1370°C)		± 7.0°F (3.9°C)
T	-250 to 32°F (-161 to 0°C)	± 3.0°F (1.7°C)	± 8.5°F (4.8°C)
	>32 to 752°F (0 to 400°C)		± 4.5°F (2.5°C)
E	-328 to 32°F (-200 to 0°C)	± 3.0°F (1.7°C)	± 8.0°F (4.5°C)
	>32 to 1830°F (0 to 999°C)		± 5.0°F (2.8°C)

1. Accuracy specifications account for errors related to reference-junction compensation, but do not account for errors caused by temperature gradients between the temperature transducers and the TC terminations. The user is responsible for maintaining a uniform temperature across the TC Termination Module.

nals for redundant +24 VDC power sources. Each input point contains an On status indicator and a position for a user-defined label. Each bypass termination panel comes with one or two 10-foot cables for connecting the termination panel to a Tricon backplane.

Termination Panels for Use with Signal Conditioners

Termination panels which use industry-standard analog signal conditioners provide a flexible, user-configurable interface to resistive thermal devices (RTDs), thermocouples, and 4-20 mA transmitters. Each termination panel supports 16 points and each analog module can support up to 2 panels.

These termination panels are compatible with any signal conditioners in the 1 to 5 volt output range. For example, the 7B series of signal conditioners from Analog Devices are known to work well.

These signal conditioners can be purchased from Triconex, or directly from Analog Devices at:

- <http://www.analog.com/IOS>
- 1-800-426-2564 in the USA
- 781-461-3100 from anywhere in the world

Fanned-Out Cables

Fanned-out cables are a low-cost alternative to using external termination panels. Fanned-out cables allow you to marshal field signals in a separate enclosure up to 99 feet (30 meters) from a Tricon. One end of a fanned-out cable has a female connector that connects to a Tricon chassis backplane. The other end of the cable contains 50 fanned-out leads, each individually labeled with its corresponding connector pin number.

Each fanned-out cable has the following characteristics:

- PVC outer covering
- 56-pin connector at one end
- 50 stranded, stripped, tinned and labeled 22-gauge leads at opposite end

Fanned-out cables should only be used with digital input and digital output modules. They are not certified for use with analog signals. Contact the IPS Global Client Support (GCS) center if you need a fanned-out cable for handling analog signals.

Although the normal length of all cables is 10 feet (3 meters), any length cable can be ordered up to 99 feet (30 meters) in 10-foot increments, using the last two digits of the cable model number to specify the length in feet. For example, the model number 9101-050F specifies a 50-foot cable instead of the normal 10-foot cable.

Termination Configuration Options

Terminations are available in various factory configurations:

- *Non-commoned* Terminations can accommodate individual power supplies for each point.
- *Commoned* Terminations can support one power supply which is shared by multiple points. Points can be commoned in groups of 8 and groups of 16.
- Analog signals can be read as *3-wire transmitter inputs*, *voltage inputs* or *current inputs*.
- Thermocouple terminations provide cold-junction temperature sensors and are available for either *upscale* or *downscale burnout detection*. For Model 3706A, upscale or downscale burnout detection depends on which

termination panel is installed. For Model 3708E, upscale or downscale burnout detection is configured with TriStation 1131.

The “Termination Options” table (on the next two pages) shows the available termination choices for each I/O module and gives the correct model number for each choice.

Over-Current Protection

Non-basic termination panels offer over-current protection in various ways:

- Fuses for individual points and/or field power sources
- Series resistors
- Self-protection for digital output and analog output modules

If you are using basic termination panels, you must supply your own components for over-current protection.