Honeywell

Technical Information

Triconex Communication Module Interface Specification

TCMI01-004

TPN Release R688
April 2019, Version 4.0

Revision History

Revision	Date	Description
1	February 2017	First Issue
2	February 2018	Updated
3	April 2018	Updated with TCMI front access
4	April 2019	Add TCM interface requirement with TCMI

Table of Contents

1. Acronyms and Definitions

ACRONYM	DESCRIPTION
AM	Application Module
CE	Conformite (or Communaute) Europeene
CM	Computing Module
CSA	Canadian Standards Association
EHPM	Enhanced High Performance Process Manager
EMC	Electromagnetic Compatibility
ENIM	Enhanced Network Interface Module
ES-T	Experion Station -TPS
ESVT	Experion Server TPS
EUCN	Enhanced Universal Control Network
FTE	Fault Tolerant Ethernet
HM	History Module
KCC	Korea Communications Commission
LCN	Local Control Network
SCTP	Screened Twisted Pair
SM	Safety Manager
SOE	Sequence Of Event
TCM	Tricon Communication Module
TCMI	Triconex Communication Module Interface
TPS	Total Plant Solution/System
TSAA	Triconex System Access Application
UEA	Universal Embedded Appliance

2. Product Introduction

2.1. Triconex Communication Interface Module (TCMI)

The TCMI is a standard Honeywell product that provides interface between the Fault Tolerant Ethernet (FTE) based Enhanced Universal Control Network (EUCN) and Triconex TRICON Safety Manager System.

The TCMI is a redundant device capable of:
- Bi-directional communication with Triconex systems 10.3 and above.
- Execution of data mapping of TRICON memory tables to EUCN format
- Data conversion to EUCN data types (Tag. Parameter), engineering unit and EUCN communication functions.
- Execution of read and write function to TRICON memory tables
- Definition of signal alarm conditioning and messaging on the EUCN for alarm handling, annunciation and diagnostic status reporting
- Direct peer-to-peer communication with other EUCN connected devices as Enhanced High-Performance Process Managers (EHPM), Enhanced Logic Managers (ELMM) or Honeywell Safety Manager (SM)
- Communication with operators, engineers, and maintenance personnel at the Universal Stations, ES-T & ESVT via ENIM.
- Support of higher level strategies through communication with Application Modules and host computers on the Local Control Network via ENIM.
- Database restoration of TCMI Module from the History Module via ENIM.
- Available in two hardware mounting form, front and rear cabinet access mounting (MC-ZTCMIR or MC-TCMIR1), Front only cabinet access mounting (MC-ZTCMI2 or MC-TCMIR2)

The TCMI connects directly to an Ethernet port of the Tricon Communication Module (TCM) in the Tricon Safety Manager. The TCM implements the TSAA communication protocol on Ethernet networks for communication with the Tricon controller. TSAA Protocol is a messaging protocol used in application programs that read and write data to the Triconex controllers and is utilized by the TCMI.

The TCMI requires the use of a pair (two; one-part number 4351A and one part number 4351B) of TCMs in the Triconex system. The TCMs connecting to the TCMI must reside in a single Triconex System logical slot and shall occupy the left and right module physical slots (which comprise a single logical slot). At least 1 port on each of the TCMs is required to configure a redundant TCMI pair. If empty ports are not available in existing installed TCMs, then new TCMs must be installed.

Note: Up to four logical slots can be configured for TCMs. Matched pairs of TCMs can be installed in the left and right positions of each logical slot.

For detailed specifications and technical data on the Triconex TRICON™ version 10.3 and version 11.x system and TCM interface hardware, please refer to Triconex documentation.

2.2. Architecture Overview

The TCMI is part of the TPS/TPN product lines as shown in Figure 1. TCMI is connected to the EUCN and provides interface with the supplied by Schneider Electric Tricon Safety System. TCMI doesn't required CF9 switch for FTE network connection and can be directly connect with level 2 switch, firewall features is in-built into TCMI.
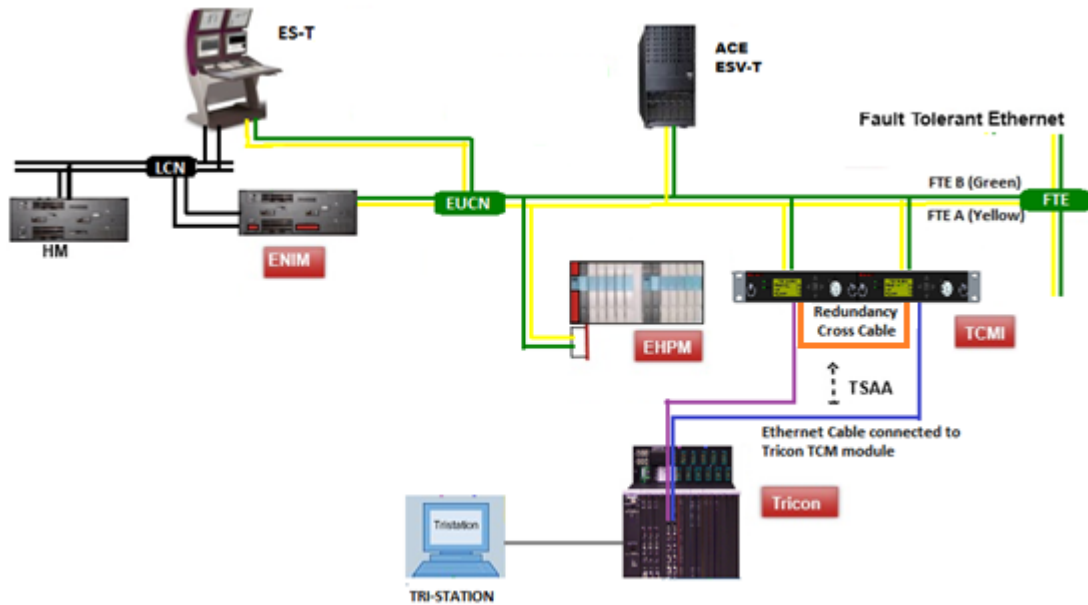
Figure 1 – EUCN Architecture with TCMI & Triconex Safety System

2.3. TCMI hardware

The TCMI hardware is available in two different hardware form factors

1. TCMI for Front and Rear Cabinet Access as shown on Figure 2. This form factor is suitable mounting into dual side LCN or Auxiliary cabinets.

Figure 2 – Redundant TCMI (front and rear access) mounting

2. TCMI for Front Only Cabinet Access as shown on Figure 3. This form factor is suitable for front mounting inside a Triconex cabinet.
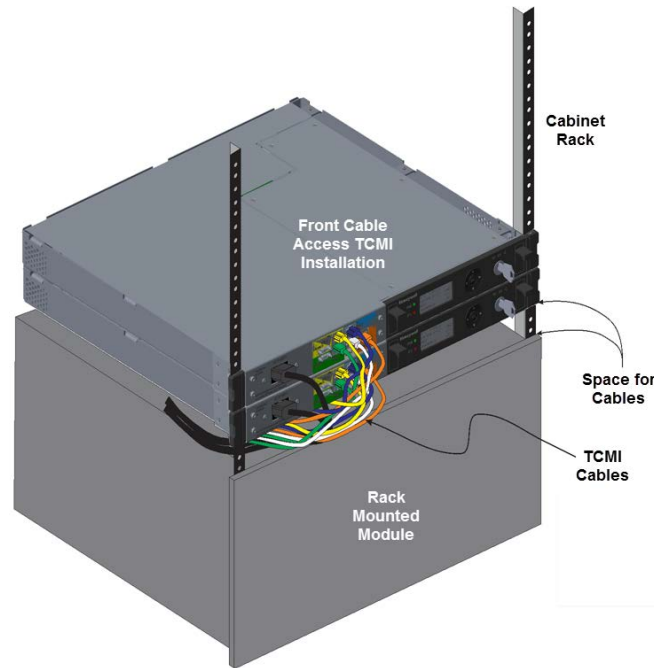
Figure 3 – Redundant TCMI (front only access) mounting

3. TCMI License Requirements

Each redundant TCMI pair requires a connection license to EUCN for Triconex data communication. Depending on the control system configuration the connection license can be for standalone TPN/TPS system or Hybrid EPKS-TPN/TPS system.

3.1. Standalone TPN/TPS System Software Requirements

TCMI can operate on a standalone TPN system. In order to properly handle network error messages. New Maintenance displays were added for TCMI fault diagnosis. The TPN/TPS software requirements and minimum release levels to use the TCMIs is shown in the table below.

Honeywell Software System	Minimum Software Release Level
TPN	R687.1
TCMI License (TPN/TPS system)	One Usage license per Redundant TCMI

3.2. Hybrid Experion - TPN/TPS System Software Requirements

In addition to the independent operation within a standalone TPN system, the TCMI can also be used with hybrid Experion - TPS/TPN system. The following minimum EPKS software requirement and software release level shall be applied:

Honeywell Software System	Minimum Software Release Level
EPKS	R432.2
TPN	R687.1
TCMI License (EPKS system)	One Usage license per Redundant TCMI

4. Functional Overview

The TCMI performs the same functions as the Honeywell Safety Manager Module (SMM) in the Tricon, but across the EUCN.

The TCMI converts Triconex data to EUCN data types (Tag. Parameter), performing engineering unit conversion, alarm handling, annunciation, diagnostic status reporting, and EUCN communication functions.

The standard TCMI scan cycle is 0.5 second.

Operator and application access to TCMI is executed by use of the Local Control Network (LCN) and the Enhance Network Interface Module (ENIM).

The TCMI Module database is configured from the TPN Native Window environment using the TPN Data Entity Builder. Once loaded into the TCMI node, this TCMI configuration data can be saved on the History Module, and downloaded over the EUCN to the TCMI. The ladder logic program for the Triconex TRICON™ is developed using the Triconex TRISTATION workstation. Once loaded in the memory of the TRICON™ Enhanced main processors, the control programs are saved in the TRISTATION database, which can save multiple ladder logic programs under separate file names. In addition to integration of Triconex system data points into standard TPN/TPS operating/engineering environment, some additional maintenance displays have been created to provide TRICON™ diagnostic information.
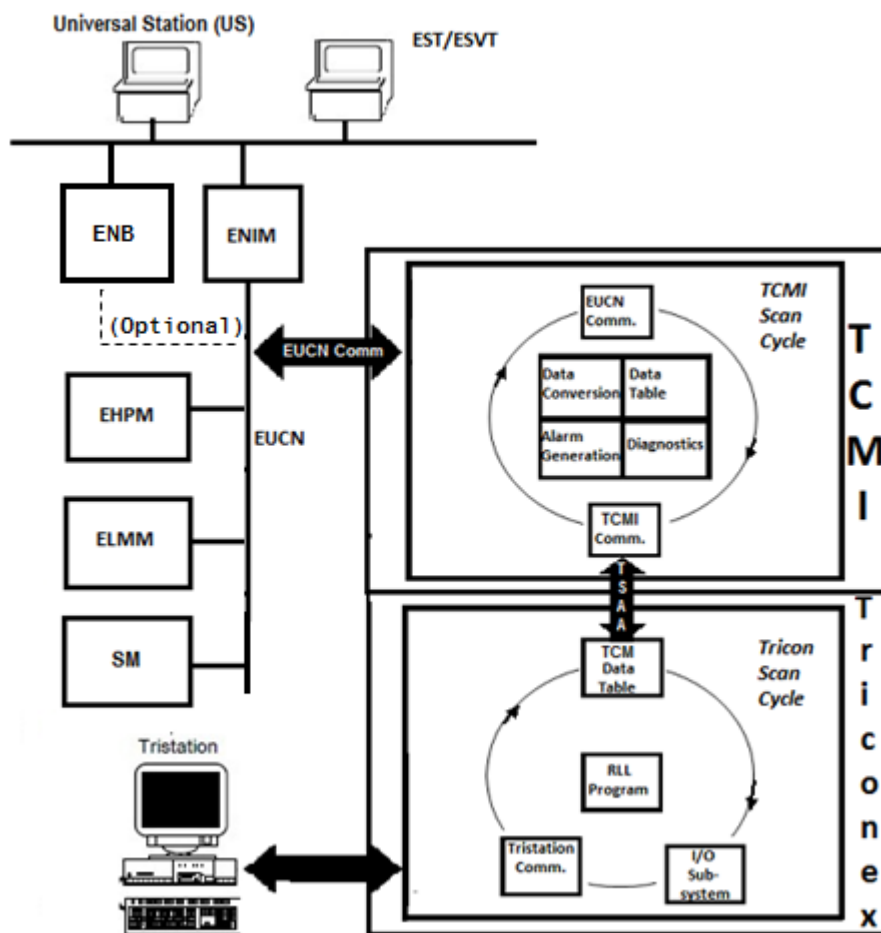

Figure 2 – TCMI Architecture

All parameters associated with the TRICON system are maintained in tables within the TCMI.
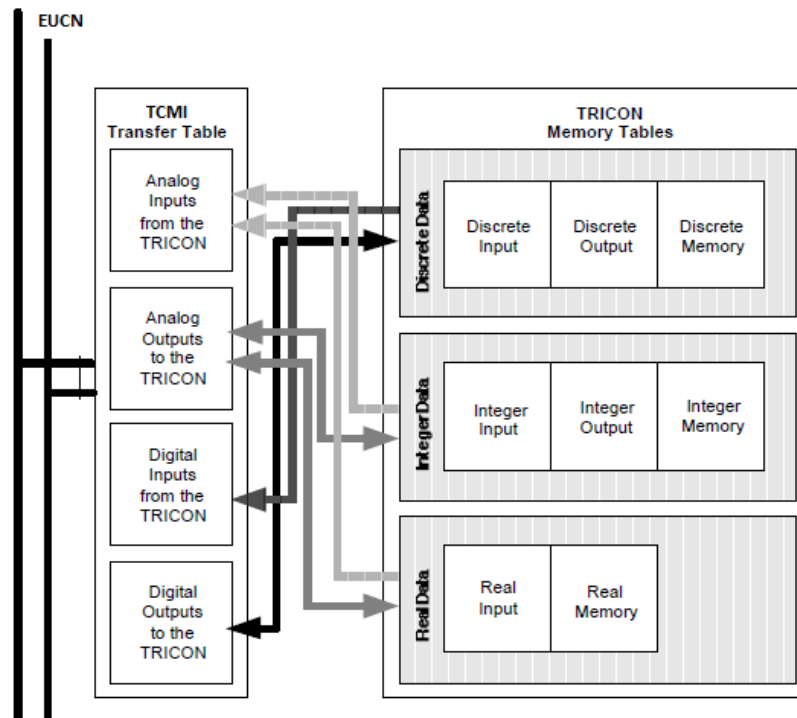
Figure 3 - Database Relationships

All data being transferred between the TCMI and the TRICON™ can be configured to be updated with either a 0.5 or 1 second scan cycle.

The maximum capacity of the TCMI is 6000 Processing Units (PU's).
The PU usage depends on the point type and their scan rates as shown on Table 1.

Table 1 — Maximum Number of Each Data Point Type per TCMI with PU Loading

Point Type	Maximum #	PUs/Pt. 1 sec. scan rate	PUs/Pt. 0.5 sec. scan rate
Analog Input	1000	5.25	10.2*
Analog Output	1000	4.25	8.5
Digital Input	2000	1.25	2.5
Digital Output	2000	0.6	1.2
Digital Composite	650	11.1	11.1
Timer	1500	3.1	3.1
Linkage Point	30	Not applicable	200.0
Flags	2000	0	0
Numerics	1000	0	0

* Max 600 Analog Input for 0.5 sec scan rate support.
An example below indicates a selection of point types with their scan cycles to meet the maximum processing unit's requirement for TCMI of 6000 PU's

Table 2 — TRICON Memory Allocation for version >10.3 and 11.x Tricon system

As a standard feature, a TCMI uses dual redundant communication channels to the EUCN.
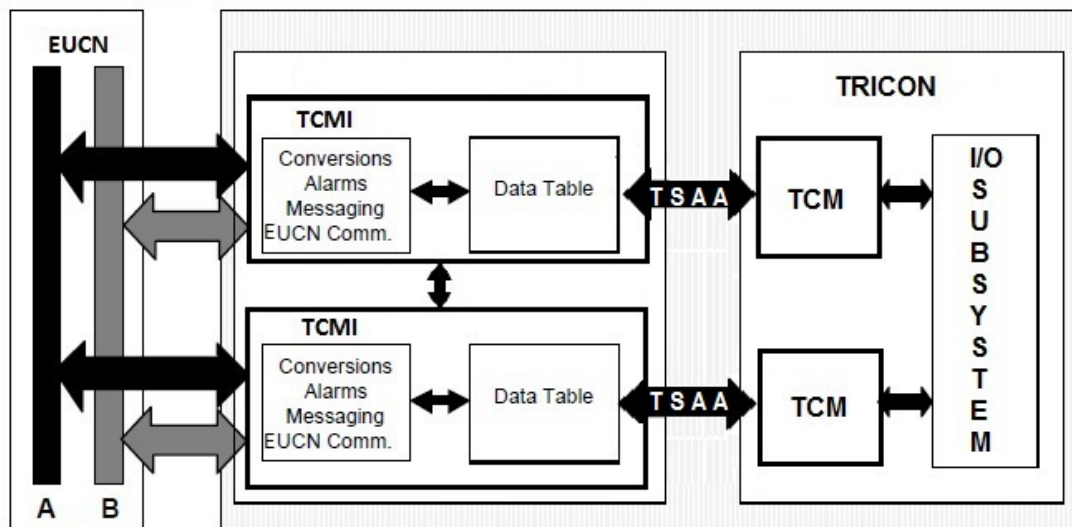
Figure 4– TCMI Redundancy

The TCMI basic functions are:
- exchange data between its own tables and the tables of the TRICON
- collect and process information from the TRICON and its ladder logic control program
  - ➢ convert the information to TPS data types,
  - ➢ perform engineering unit conversions, alarm handling, annunciation, diagnostic status

5-Digit Legacy Range Equivalent (Tricon 10.x System)[1]	Full 6-Digit Range (Tricon 11.2 & later only)[2]	6-Digit True Extended Range (Tricon 11.2 & later only)[3]	TRICON Data Type	TRICON Area	TCMI Access Rights
1 - 2000	010001 - 014096	012001 - 014096	Discrete	Output	Read Only
2001 - 4000*	020001 - 024096	022001 - 024096	Discrete	Memory/Output	Read/Write
10001 - 12000*	110001 - 114096	112001 - 114096	Discrete	Input	Read Only
12001 - 14000*	120001 - 124096	122001 - 124096	Discrete	Memory/Input	Read Only
30001 - 31000	310001 - 312048	311001 - 312048	Integer	Input	Read Only
31001 - 31382	320001 - 322048	321001 - 322048	Integer	Memory/Input	Read Only
32001 - 32120	330001 - 332048	330121 - 332048	Real	Input	Read Only
33001 - 34000	325001 - 327048	326001 - 327048	Real	Memory/Input	Read Only
40001 - 40250	410001 - 411024	326001 - 327048	Integer	Output	Read Only
40251 - 40632	415001 - 417048	415751 - 417048	Integer	Memory/Output	Read/Write
41001 - 42000	420001 - 422048	421001 - 422048	Real	Memory/Output	Read/Write

Alias ranges available for DISOE time stamping.
1. *This Range is limited to Triconex 10.x version Triconex hardware.*
2. *Extended range alias numbers are supported only if your Tricon 11.2 system has only TCMs installed and user can use optionally this extended alias range.*
3. *In each extended alias range, the first part of the range includes the Legacy aliases. Aliases 022001-024096 are the true extended aliases available only in Tricon 11.2 or later systems with only TCMs installed and user can use optionally this extended alias range.*

  - reporting, peer-to-peer communications, and other EUCN functions,
  - ➢ pass the converted information to the appropriate devices on the EUCN; and
- collect and process information received over the EUCN
  - ➢ convert the information to the appropriate formats,
  - ➢ Pass the converted information to the TRICON.

The TCMI provides the ability to implement inter-node process control strategies between the TCMI and other EUCN nodes, such as EHPM, ELMM or another TCMI. These transactions are initiated via the Linkage Point.

5. TCMI Specification

Table 3 TCMI Specification

Processor	
TCMI	Xilinx ZYNQ Platform
TCMI standard scan cycle	0.5 sec
Analog Input points	1000
Analog Output points	1000
Digital Input points	2000
Digital Output points	2000
Digital Composite points	650 max
Flags points	2000
Numerics points	1000
Timer points	1500
Scan rate selection for points processing	1 sec. 0.5 sec. (standard scan cycle)
Linkage points	30 (0.5 sec scan rate only)
Maximum EUCN reads per TCMI scan cycle	50 for all configurable links
Maximum EUCN writes per TCMI scan cycle	50 for all configurable links
Configurable links per Linkage point	Up to 12
Minimum Configurable Sequence of Event Scan Time	40 milliseconds** (Scan time must be equal to or exceed TRICON control program scan time)
Supported Input/output signals	Analog Input Analog Output Digital Input Digital Output Digital Composite
EUCN Parameter Access	800 read requests per second* 100 control writes per second
Database Synchronization	2 seconds for a maximum database of 150 Kbyte
Self-diagnostics	Every 60 seconds
Failover	5 seconds
Primary/Secondary Switchover and Point Process Priming	2 seconds
SOE Resolution	User program scan time
Minimum Supported TPN version	R687
Minimum Supported Triconex Version	version 10.3
Mechanical Specifications – Redundant TCMI – front & rear access	
Overall dimensions	19.21 X 19.0 X 1.75 inch (L X W X H) 487.9 X 482.6 X 44.45 mm (L X W X H)
Approximate weight	8.8 Kg (19.4 lbs)
Mechanical Specifications – Non-Redundant TCMI – front only access	
Overall dimensions	16.46 X 19.0 X 1.75 inch (L X W X H) 418.1 X 482.6 X 44.45 mm (L X W X H)
Approximate weight	9.3 Kg (20.4 lbs)
Mechanical Specifications – Redundant TCMI – front only access	
Overall dimensions	16.46 X 19.0 X 3.5 inch (L X W X H) 418.1 X 482.6 X 88.9 mm (L X W X H)
Approximate weight	18.6 Kg (40.8 lbs)
Communication Cable Interface	
FTE Cable A & B	SCTP Type
Down-link Ethernet Cable	Ethernet cable (802.3)
Redundancy Cross cable	SCTP Type (ANSI/TIA/EIA-568-B.1-2001, ET SEQ)
Maximum Ethernet Cable distance supported from TCMI to TCM	100m
Electrical Specification	
Input AC Voltage Requirement	90~264VAC @47~63Hz
AC Power for Redundant TCMI pair	24W @ 80% efficiency

Environmental Specifications						
Item	**Specification**					
Mounting	19 inches Shelf					
Operating Temperature	Operating Temperature (Cabinet- External)		0~50 ºC			
	Operating Temperature (Cabinet- Internal)		0~70 ºC			
	Operational Transient (0.25C/Min. for 1hr. Max)		15 ºC			
Storage/Shipment Temperature	-35~70 ºC					
Humidity(R-H) (All classes)	5-95%					
	Max Wet Bulb	32				
Altitude (Feet) (All Classes)	Operating – Maximum Shipping/Storage Maximum	7500 ft 35000 ft				
Dust (All Chasses)	Filters are effective down to	10 Microns				
Operating Vibration (Sinusoidal)		Equipment mounted/set on the floor		Equipment mounted/set other than on the floor		
	(5-20Hz)	0.3mm/.012in		0.7mm/0.28in		
	(20-150Hz)	0.25g		0.5g		
	All three axes, 60 minutes each axis, 5 minutes/range (Six sweeps: 5-150-5) (20 Hz is approximate, extract crossover frequency is determined by the intersection of displacement and acceleration.)					
Shipping Vibration (Random)	(10-500Hz)	See curves All three axes, 60minutes each axis, random spectrum				
Shock	Site Induced	4g @25ms	4g @25ms			
	Shipping/Storage	0-10kg	10-20kg	20-30kg	30-50kg	>50kg
	Not packaged for shipping Least of rotational drop height from intended installed orientation of 45 degrees about all edges	100mm	100m	100mm	100mm	100mm
	Packaged for shipping Vertical drop height	900mm	750mm	600mm	450mm	200mm

- **MC-ZTCMIR or MC-TCMIR1:** A pair of TCMI (front and rear access), 90~264VAC @47~63Hz
- **MC-ZTCMI2 or MC-TCMIR2:** A pair of TCMI (front only access), 90~264VAC @47~63Hz
- **MC-TCMIS2:** Single TCMI unit spare (front only access), 90~264VAC @47~63Hz

The TCMI Electronics require an AC power source. It may be possible to connect with the same AC power source used in the Triconex cabinet. However, if the redundant TCMI is expected to maintain communication through disruption in AC power then some arrangement must be made to supply each TCMI module from a different AC power source or from redundant AC power.

* Represents a combined load of LCN (US, HM, AM, CM) and EUCN (peer-to-peer) initiated request.
** The smallest increment of real time that can separate two consecutive SOE time-stamped events.

CE LVD and EMC Compliance Standard

LVD directive		
Title	**Number**	**Issue Date**
Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements	EN 61010-1	2010
EMC directive		
Title	**Number**	**Issue**
Electrical equipment for measurement, control and laboratory use - EMC requirements -- Part 1: General requirements	EN 61326-1	2013
Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement.	CISPR 11: 2009+A1 30 MHz to 1000 MHz @ 3m 150 KHz to 30 MHZ @ L/N	2015
Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16A per phase)	IEC 61000-3-2	2014
Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection	IEC 61000-3-3	2013
Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	IEC 61000-4-2 ±8 kV air, ±4 kV contact	2008
Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test	IEC 61000-4-3: 2006+A1:2007+A2 10 V/m (80 MHz to 1 GHz) 3 V/m (1,4 GHz to 2 GHz) 3 V/m (2,0 GHz to 2,7 GHz)	2010
Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test	IEC 61000-4-4: 2004+A1 Pwr: ±2 kV(5/50 ns, 5 kHz) Sig/Con: ±1 KV	2012
Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test	IEC 61000-4-5 Pwr: ±1 kV/2 kV Sig/Con: ±1 KV	2005
Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	IEC 61000-4-6 3 V (150 kHz to 80 MHz)	2008
Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test	IEC 61000-4-8 30A/m (50Hz,60Hz)	2009
Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests	IEC 61000-4-11 0 % during 1 cycle 40 % during 10/12 cycle 70 % during 25/30 cycles 0 % during 250/300 cycles	2004
International Standards & Safety Codes		
CE Standard Canadian Standards Association (CSA) - CSA certified to fulfill requirements of these two standards: CSA Standard C22.2 No. 0-M982 General Requirements - Canadian Electrical Code, Part II CSA Standard C22.2 No. 142-M1987 for Process Control Equipment KCC Standard		

6. TCMI Hardware Model and Part Numbers

6.1. TCMI for Front and Rear Cabinet Access

Model Number	Description
MC-ZTCMIR*	UPG, HW T-SMM TO TCMI, REDUNDANT CE
MC-TCMIR1	TCMI HARDWARE, REDUNDANT CE

Attention: Honeywell does not supply Ethernet downlink cables (802.3) or hubs; Customer must purchase them from a third party. Examples of dependable manufacturers are Black Box Network Services and Hewlett-Packard.

*The SMM to TCMI upgrade is one to one replacement. TCMI required one to one

6.2. TCMI for Front Only Cabinet Access

Model Number	Description
MC-ZTCMI2*	UPG,HW T-SMM TO TCMI FRONT ACCESS,RED
MC-TCMIR2	TCMI FRONT ACCESS, RED, MNTG, CBL SET
MC-TCMIS2	TCMI FRONT ACCESS, SPARE

Attention: Honeywell does not supply Ethernet downlink cables (802.3) or hubs; Customer must purchase them from a third party. Examples of dependable manufacturers are Black Box Network Services and Hewlett-Packard.

*The SMM to TCMI upgrade is one to one replacement.

7. TCMI Licenses

License for enlarged level of TCMI integration in Experion PKS and TPN based Network.

Model # of Software License Part	Description	Remark
MP-ZTCMIL	UPG, SW T-SMM TO TCMI, 1 USAGE LICENSE	This License is used for Standalone TPS/TPN Network for SMM to TCMI Upgrade
MP-TCMI00	TCMI ON EUCN SOFTWARE,1 NEW USAGE LICENSE	This License is used for Standalone TPS/TPN Network for TCMI new Installation
EP-ZTCMIL	UPG SW, T-SMM TO EPKS EUCN-TCMI, 1xTCMI	This License is used for EPKS based Network for SMM to TCMI Upgrade
EP-TCMI00	EPKS EUCN-TCMI SW,1 NEW TCMI LICENSE	This License is used for EPKS based Network for TCMI new Installation
MP-TCMICD	TPN EUCN-TCMI SOFTWARE MEDIA CD	"TPN only" software media CD
Note1: A TCMI license is required for every TCMI controller, or controller pair *Note2: Each Experion Server, or redundant pair, needs to be licensed for the number of TCMI controllers that will be connected* *Note 3: "TPN only" systems require EUCN-TCMI software media CD for license installation*		

Attention: TCMI can be configure with TPS R687.1 or above release and Triconex version 10.3 or above with TCM hardware.

8. Spare Part of TCMI Hardware

Universal Embedded Appliance (UEA) represents the field replaceable parts for a TCMI.

Model/Part Number	Description
51454832-100	UNIVERSAL EMBEDDED APPLIANCE (UEA)
51454833-100	UEA CONNECTOR BOX ASSEMBLY
EH-UMT010	UEA MOUNT 19 IN RACK
51307693-802	CROSSOVER CABLE, ETHERNET 2METER ORANGE
51307739-200	AC POWER CABLE, LENGTH 78.8 INCH
51308093-600	CBL AC PWR 72IN
51308094-600	PWR CBL 240V 72IN CLASSIC FURN
51305451-600	TPS-100 MOD AC PWR CBL Z
51508216-200	UEA BOX KEY
51307693-100	UEA REDUNDANCY CABLE
51203168-100	UEA BLANK FRONT FACE ASSY
51307738-200	TERMINATION BLANK FRONT COVER ASSY
51508535-124*	AC-DC24V POWER SUPPLY MODULE
51203174-100*	FAN ASSY
MC-TCMIS2	TCMI FRONT ACCESS, SPARE
These spare parts are not field replaceable; these parts can be replaced from UEA processor module only at Honeywell Factory.	

Attention: *UEA need to be flashed with TCMI software image before installation as a replacement part.*

9. Ordering Information

Contact your local Honeywell sales representative or visit www.honeywellprocess.com

For More Information

To learn more about Honeywell's products or solutions visit our website www.honeywell.com/ps or contact your Honeywell account manager.

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