APPLICATION NOTES

Universal Input Output Module: 3902X (16 Channels)

AND

GMI Termination Board: TB-D5016-TRI-010 (16 Slots) through I/O CABLE: 4X00224-3xx

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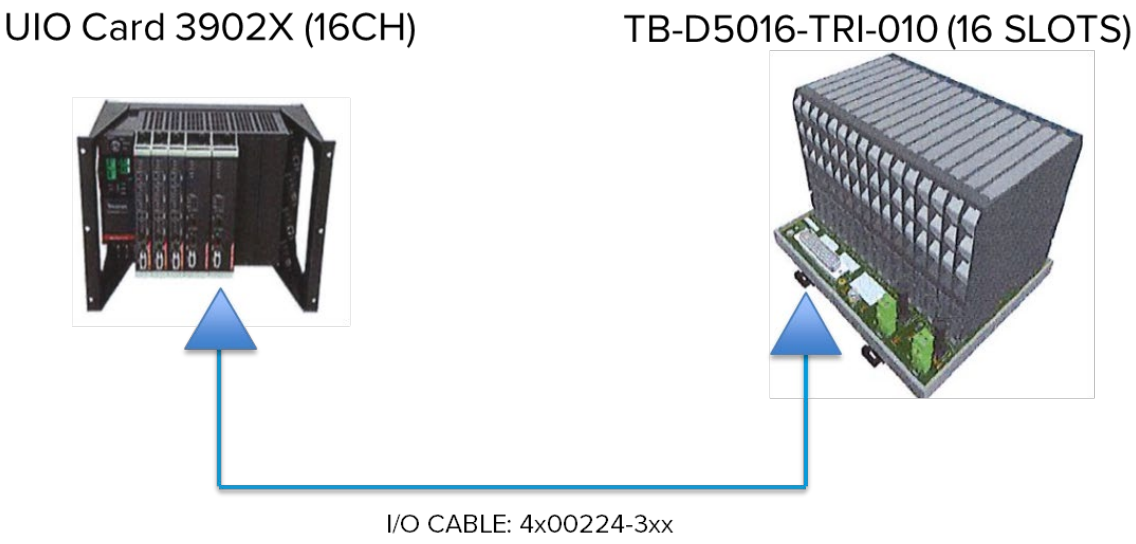
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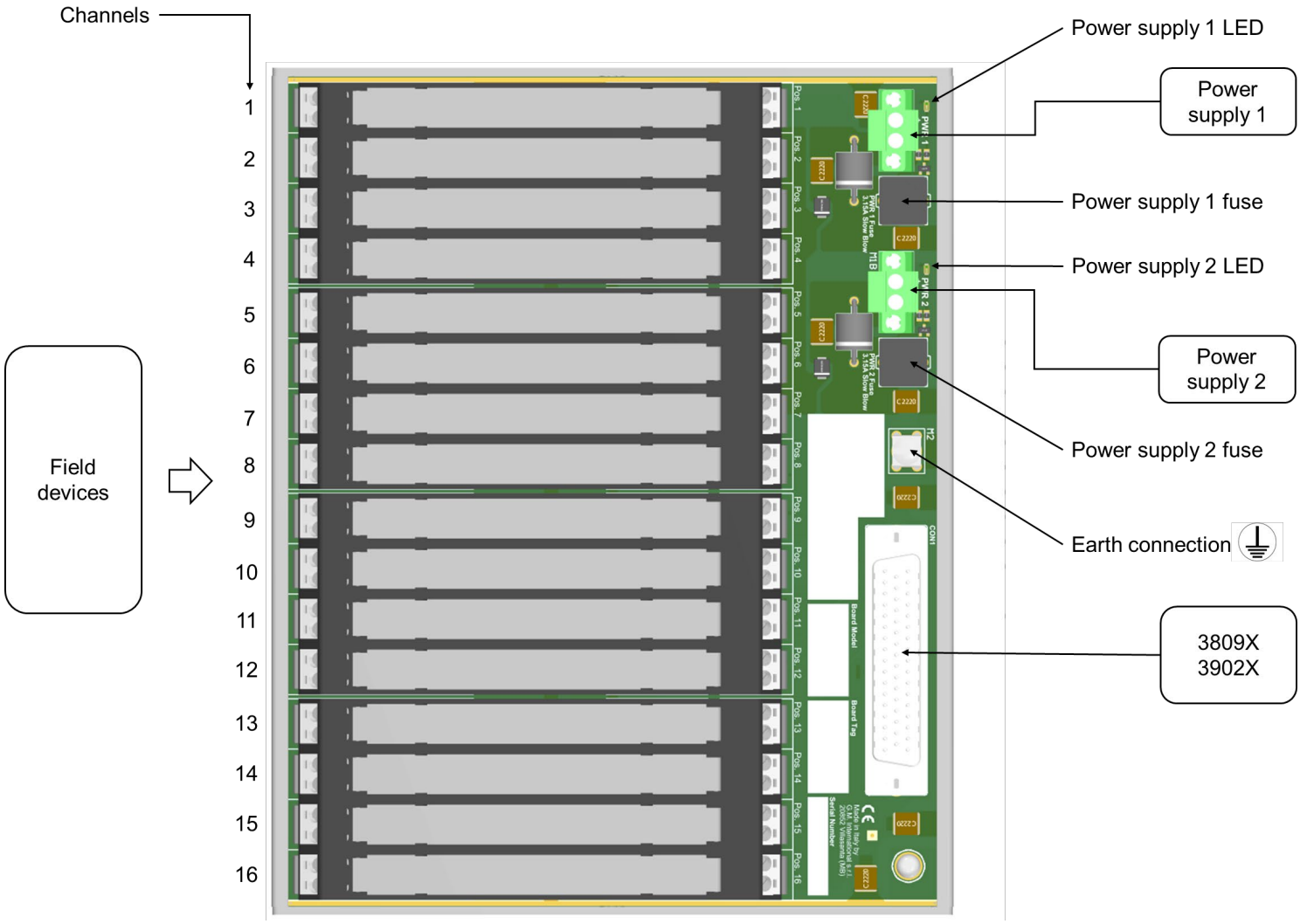
1. INTRODUCTION

WITH SINGLE CHANNEL GMI MODULES



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TB-D5016-TRI-010 has 16 slots available for GMI modules



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2. EQUIPMENT TO BE USED

2.1 Tricon CX I/O Module

3902X –Universal Input Output Module, 16 Channels

2.2 GMI Termination Boards

TB-D5016-TRI-010 SIL3 Termination Board 16 Positions for Tricon CX 3902X (Single Channels).

2.3 GMI Interface Modules

2.3.1 ANALOG INPUT– AI IS

MOD.	DESCRIPTION	L.F. DET.	L.F. TRANSP.	FIELD	SIL	HART	REMARKS	ZONE2/ DIV2
D5014S	TRANSMITTER POWER SUPPLY	YES	YES	ACTIVE/PASSIVE	3	YES		YES
D5015SK	TRANSMITTER POWER SUPPLY	YES	YES	ACTIVE/PASSIVE	2	YES		YES
D5016SK	TRANSMITTER POWER SUPPLY	YES	YES	ACTIVE TRANSMITTER	3	YES	FUTURE	YES
D5072S-099	TEMPERATURE SIGNAL CONVERTER, MULTIFUNCTION	YES	YES	TC/RDT/POT	2	NO		YES

2.3.2 ANALOG OUTPUT – AO IS

MOD.	DESCRIPTION	L.F. DET.	L.F. TRANSP.	FIELD	SIL	HART	REMARKS	ZONE2/ DIV2
D5020S	ISOLATING DRIVER	YES	NO	4-20 MA	2	YES		YES

2.3.3 DIGITAL INPUT – DI IS

MOD.	DESCRIPTION	L.F. DET.	OUTPUT	SIL	REMARKS	ZONE2/ DIV2
D5031S	SWITCH/PROXIMITY DETECTOR/REPEATER	YES	SOLID STATE	3		YES
D5032S	SWITCH/PROXIMITY DETECTOR/REPEATER	YES	RELAY	3		YES
D5037S	SWITCH/PROXIMITY DETECTOR/REPEATER	YES	SOLID STATE	2		YES
D5093S	24 TO 220 VAC/VDC SWITCH REPEATER	NO	SOLID STATE	3		YES

2.3.4 SUPERVISED DIGITAL INPUT – SDI IS

MOD.	DESCRIPTION	L.F. DET.	L.F. TRANSP.	OUTPUT	SIL	REMARKS	ZONE2/ DIV2
D5038SB	SWITCH/PROXIMITY DETECTOR REPEATER	YES	YES	SOLID STATE	3		YES
D5039SB	SWITCH/PROXIMITY DETECTOR REPEATER	YES	YES	SOLID STATE	2		YES

2.3.5 SUPERVISED DIGITAL OUTPUT – DO IS

MOD.	DESCRIPTION	L.F. DET.	L.F. TRANSP.	FIELD	SIL	REMARKS	ZONE2/ DIV2
D5049S	DIGITAL OUTPUT DRIVER – LOOP POWERED	YES	YES	SOLENOID VALVE / LED	3	1/3 FIELD SELECTABLE OUTPUTS	YES

2.3.6 ANALOG INPUT – AI NIS

MOD.	DESCRIPTION	L.F. DET.	L.F. TRANSP.	FIELD	SIL	HART	REMARKS	ZONE2/DIV2
D6014S	TRANSMITTER POWER SUPPLY	YES	YES	ACTIVE/PASSIVE	3	YES		NO
D6015SK	TRANSMITTER REPEATER POWER SUPPLY	YES	YES	ACTIVE/PASSIVE	2	YES		NO
D6016SK	TRANSMITTER REPEATER POWER SUPPLY	YES	YES	ACTIVE TRANSMITTER	2	YES	FUTURE	NO
D6017SK	TRANSMITTER REPEATER POWER SUPPLY	YES	YES	2/3/4 WIRE TRANSMITTER	3	YES		YES
D6072S-099	TEMPERATURE SIGNAL CONVERTER, MULTIFUNCTION	YES	YES	TC/RTD/POT	2			YES
D6001S	PASS THROUGH MODULE	YES	YES	PASS THROUGH	3	YES		YES
D6004S	PASS THROUGH MODULE	YES	YES	PASS THROUGH - SUITABLE FOR 2/3/4-WIRE TRANSMITTERS	3	YES		YES

2.3.7 ANALOG OUTPUT – AO NIS

MOD.	DESCRIPTION	L.F. DET.	L.F. TRANSP.	FIELD	SIL	HART	REMARKS	ZONE2 /DIV2
D6020S	ISOLATING DRIVER	YES	NO	4-20 MA	2	YES		NO
D6001S	PASS THROUGH MODULE	YES	YES	PASS THROUGH	3	YES		YES

2.3.8 DIGITAL INPUT– DI NIS

MOD.	DESCRIPTION	L.F. DET.	OUTPUT	SIL	REMARKS	ZONE2 /DIV2
D6031S	SWITCH/PROXIMITY DETECTOR/REPEATER	YES	SOLID STATE	3		NO
D6032S	SWITCH/PROXIMITY DETECTOR/REPEATER	YES	RELAY	3		NO
D6037S	SWITCH/PROXIMITY DETECTOR/REPEATER	YES	SOLID STATE	2		NO
D6001S	PASS THROUGH MODULE	YES	PASS THROUGH	3		YES

2.3.9 SUPERVISED DIGITAL INPUT– SDI NIS

MOD.	DESCRIPTION	L.F. DET.	L.F. TRANSP.	OUTPUT	SIL	REMARKS	ZONE2 / DIV2
D6038SB	SWITCH/PROXIMITY DETECTOR REPEATER	YES	YES	SOLID STATE	3	LINE MONITORING MIRRORED TO DI	NO
D6039SB	SWITCH/PROXIMITY DETECTOR REPEATER	YES	YES	SOLID STATE	2	LINE MONITORING MIRRORED TO DI	NO
D6001S	PASS THROUGH MODULE	YES	YES	PASS THROUGH	3		YES

2.3.10 DIGITAL OUTPUT– DO NIS

MOD.	DESCRIPTION	RELAY STATUS	LOAD STATUS	NO/NC CONTACT	HIGH AVAILABILITY	SIL	REMARKS	ZONE2 /DIV2
D5090S-102	RELAY OUTPUT MODULE	NE	NE	NO	/	3		YES
D5091S-103	RELAY OUTPUT MODULE	NE/ND	ND	NO/NC	/	3		YES
D5094S-104	RELAY OUTPUT MODULE	NE/ND	NE/ND	NO	YES	3		YES
D5095S-105	RELAY OUTPUT MODULE	NE/ND	ND/NE	NC	YES	3		YES
D6001S	PASS THROUGH MODULE	-	-	-	-	3		YES

2.3.11 SUPERVISED DIGITAL OUTPUT– SDO NIS

MOD.	DESCRIPTION	RELAY STATUS	LOAD STATUS	NO/NC CONTACT	HIGH AVAILABILITY	SIL	REMARKS	ZONE2 /DIV2
D5096S-106	RELAY OUTPUT MODULE	NE/ND	NE/ND	NO	YES	3	LINE MONITORING MIRRORED TO DO	YES
D5097S-107	RELAY OUTPUT MODULE	NE/ND	ND/NE	NC	YES	3	LINE MONITORING MIRRORED TO DO	YES

3. TRICON CX – System Configuration and Remarks

- Install the 3902X in proper slot.
- Connect the I/O cable(s) between FET and GMI Termination Board.

- Power Monitor supported on 3902X using TB-D5016-TRI-010 and I/O cable 4X00224-3xx
  - Field Power Monitor 1 = Enabled
  - Field Power Monitor 2 = Enabled

- Configuration for AI channels :
  - Data Type = DINT
  - Point Type = INPUT
  - Point Option = Used
  - Field Fault Monitor = Enable

- Configuration for AO channels :
  - Data Type = DINT
  - Point Type = OUTPUT
  - Point Option = Used
  - Field Fault Monitor = Disable

- Configuration for DI channels :
  - Data Type = BOOL
  - Point Type = INPUT
  - Point Option = Not Used

- Configuration for SDI channels :
  - Data Type = BOOL
  - Point Type = INPUT
  - Point Option = Supervised

- Configuration for DO channels :
  - DO Select Switch on the FET = ON
  - Data Type = BOOL
  - Point Type = OUTPUT
  - Point Option = Not Used

- Configuration for SDO channels :
  - DO Select Switch on the FET = ON
  - Data Type = BOOL
  - Point Type = OUTPUT
  - Point Option = Supervised
    - For D5049S (resistor to be installed – see chapter 5.2)
      - Shorted Threshold = 130
      - Open Threshold = 1400
    - For D5090S-102, D5091S-103, D5094S-104, 5095S-105
      - Shorted Threshold = 130
      - Open Threshold = 2400
    - For D5096S-106, D5097S-107
      - Shorted Threshold = 130
      - Open Threshold = 640

4. TERMINATION BOARD CONNECTION & SETUP

- **TB-D5016-TRI-010** has NO Hardware Switch Setting.
- Connect the I/O Cable between FET and GMI termination board.
- Connect the Power Supply 24VDC to Terminals Supply 1 (+,-) and Supply 2 (+,-).

5. GMI MODULE SETTINGS AND CONFIGURATION

5.1 GMI Modules Switch Settings

TB-D5016-TRI-010	NO Hardware Setting
D5031S	SW1, Factory Default, 1-to-8 OFF, No LFD, In/Out Direct
D5032S	SW1, Factory Default, 1-to-8 OFF, No LFD, In/Out Direct
D5038SB	SW1, 1 ON, 2-3-4 OFF, LFD Enabled, In/Out Direct
D5039SB	SW1, 1 ON, 2-3-4 OFF, LFD Enabled, In/Out Direct
D5037S	SW1, Factory Default, 1-to-4 OFF, No LFD, In/Out Direct
D5093S	SW1, 1 ON, 2-to-5 OFF, In 24Vdc
D5049S	SW1, Factory Default, 1-to-4 ON, LFD Enabled SW2, Factory Default, 1-2 ON, 3-4 OFF, In/Out Direct, Fault Output Contact
D5090S-102	SW1, Factory Default, 1-to-6 OFF, 7-8 ON, Normal Operation
D5091S-103	SW1, Factory Default, 1-to-6 OFF, 7-8 ON, Normal Operation
D5094S-104	SW1, Factory Default, 1-to-4 OFF, Normal Operation
D5095S-105	SW1, Factory Default, 1-to-4 OFF, Normal Operation
D5096S-106	SW1, Factory Default, 1-to-4 OFF, Normal Operation
D5097S-107	SW1, Factory Default, 1-to-4 OFF, Normal Operation
D5014S	SW1, 3 ON, 1-2-4- OFF, Output Sink Mode
D5015SK	NO Hardware Setting
D5072S-099	SW Configurable, Configured 0-100mV In, 4-20mA Out Sink
D5020S	SW1, Factory Default, 2 ON, 1-3-4 OFF, Short Circuit Fault Detection < 50 Ohm
D6001S	No setting
D6004S	No setting

Above switch settings refer to the interface between GMI Modules and Triconex CX I/O module. Additional settings might be considered depending on field specific requirements; please refer to GMI Data Sheets and Instruction Manuals for further details.

5.2 GMI Configurations and Remarks

5.2.1 MULTIFUCTION TEMPERATURE CONVERTER

The Multifunction Temperature Converter D5072-099 (D6072-099) accepts a low-level dc signal from millivolt, thermocouple or 2-3-4 wire resistance/RTD or transmitting potentiometer sensor, located in Hazardous Area, and converts, with isolation, the signal to drive a Safe Area load
The module shall be programmed by using Programmable USB serial line Kit PPC5092 + SWC5090.

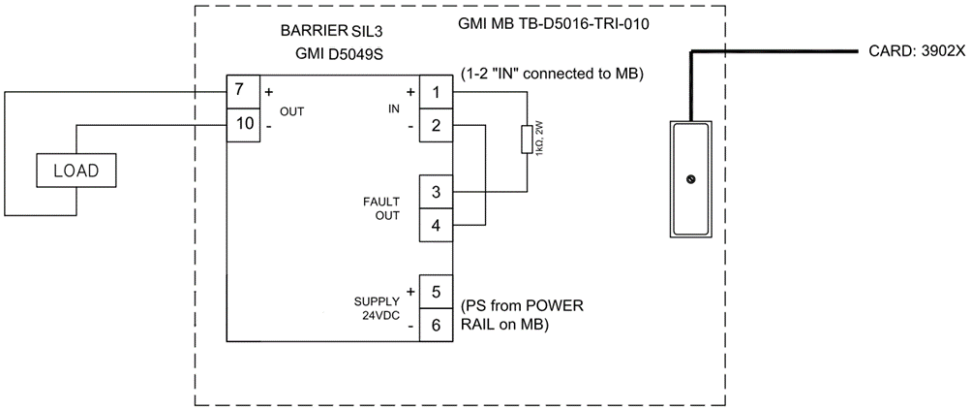
5.2.2 LINE FAULT DETECTION (LFD)

Load Fault (Open and Short Circuit) is detected by the module D5020s (D6020S) but not transferred to the AO channel of 3809X. Field fault alarm is available at terminals 3-4 of the GMI module; Load Fault (Open circuit) is detected by AO Channel of the 3809X.

GMI Barrier D5049S and Relays D5096S-106, D5097S-107 provide Line or Load open/short circuit diagnostic. Load Fault Detection contact (transistor) is available at barrier terminals 3-4, to be connected to digital input cards for alarming. For models D5049S, D5096S-106, D5097S-107, the Line/Load Fault Detection (LFD) can be transferred to the DO channel of the UIO Card 3902X, using the Supervised function of the card, avoiding connecting the alarm contacts to digital input cards. For barrier D5049S, this functionality can be achieved with the following set-up:

Install a resistor 1KOhm between terminals 3-4 and 1-2 of the barrier/relay

See below schematic



For relays D5096S-106 and D5097S-107, this functionality can be achieved without any additional wiring.

5.2.3 VOLTAGE CONSIDERATIONS ON DO/SDO RELAYS

Current consumption for DO/SDO Relays is considerably high on the input coil: 30mA for D5090S-102 and D5091S-103; 40mA for D5094S-104 and D5095S-105; 45mA for D5096S-106 and D5097S-107. The series resistors on the circuit of the UIO 3902X result in a voltage drop on the command to the relays, proportional to the current consumption. With DO Select closed (UP), the equivalent resistance is about 50 ohm.
R1 = 200 + 49,9 = 249,9 ohm
R2 = 62,5 ohm
R = (R1 * R2) / (R1 + R2)
R = (249,9 * 62,5) / (249,9 + 62,5) = 50 ohm

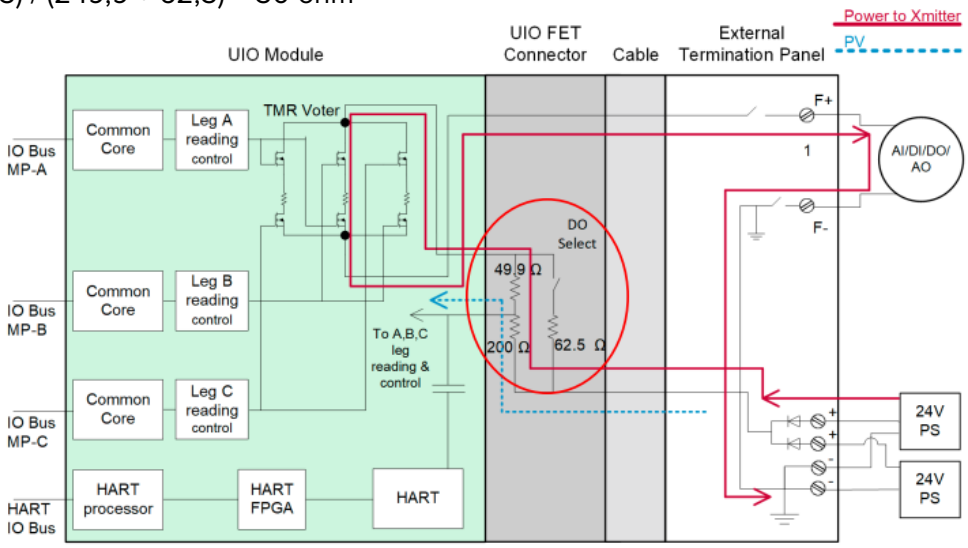


Figure 32: Simplified Schematic of a 3902X UIO Module with a 9960X-610* ETP

The DO/SDO Relays have been tested at power supply voltage range between 22,0V and 28,8V. Relays D5090S-102, D5091S-103, D5094S-104, D5095S-105, D5096S-106 and D5097S-107 work correctly both at 22,0V and 28,8V power supply. Below the measured voltage at input coils for each relay, respectively at 22,0V and 28,8V.

Model	Power Supply 22,0 V	Power Supply 28,8 V
D5090S-102	20,18 V	26,56 V
D5091S-103	20,19 V	26,57 V
D5094S-104	19,73 V	25,96 V
D5095S-105	19,74 V	25,97 V
D5096S-106	19,57 V (*)	25,8 V (*)
D5097S-107	19,59 V (*)	25,77 V (*)

(*) = For relays D5096S-106 and D5097S-107 (Supervised relays) the coil voltage has been measured at worst condition (No field faults).

The measured voltage is in the range of the nominal input voltage of relays D5090S-102, D5091S-103, D5096S-106 and D5097S-107. For what concerns relays D5094S-104 and D5095S-105, the measured voltage at 22,0V is below the nominal input voltage (20V), although the tests were passed with positive results.
For this reason, it is advisable to increase the minimum power supply voltage level at 22,5 V.

6. REFERENCE DOCUMENTS

6.1 Triconex

Document No.	Title
9791042-002	Tricon™ CX Products Addendum to Tricon User Guides

6.2 G.M. International

Document No.	Title
DTS0811	TB-D5016-TRI-010 Datasheet
DTS0283	D5031 Datasheet
ISM0107	D5031 Instruction Manual
ISM0364	D5031 Safety Manual
DTS0284	D5032 Datasheet
ISM0108	D5032 Instruction Manual
ISM0365	D5032 Safety Manual
DTS0827	D5038 Datasheet
ISM0427	D5038 Instruction Manual
ISM0429	D5038 Safety Manual
DTS0818	D5039 Datasheet
ISM0428	D5039 Instruction Manual
ISM0430	D5039 Safety Manual
DTS0616	D5037 Datasheet
ISM0270	D5037 Instruction & Safety Manual
DTS0420	D5093 Datasheet
ISM0175	D5093 Instruction Manual
DTS0287	D5049 Datasheet
ISM0120	D5049 Instruction & Safety Manual
DTS0857	D5090-102 Datasheet
ISM0456	D5090-102 Instruction Manual
ISM0458	D5090-102 Safety Manual
DTS0858	D5091-103 Datasheet
ISM0457	D5091-103 Instruction Manual
ISM0459	D5091-103 Safety Manual
DTS0871	D5094-104 Datasheet
ISM0460	D5094-104 Instruction Manual
ISM0464	D5094-104 Safety Manual
DTS0872	D5095-105 Datasheet
ISM0461	D5095-105 Instruction Manual
ISM0465	D5095-105 Safety Manual
DTS0873	D5096-106 Datasheet
ISM0462	D5096-106 Instruction Manual
ISM0466	D5096-106 Safety Manual
DTS0874	D5097-107 Datasheet
ISM0463	D5097-107 Instruction Manual
ISM0467	D5097-107 Safety Manual
DTS0280	D5014 Datasheet
ISM0103	D5014 Instruction Manual

Document No.	Title
ISM0382	D5014 Safety Manual
DTS0629	D5015 Datasheet
ISM0397	D5015 Instruction Manual
DTS0813	D5072-099 Datasheet
ISM0389	D5072-099 Instruction Manual
ISM0390	D5072-099 Safety Manual
DTS0281	D5020 Datasheet
ISM0118	D5020 Instruction & Safety Manual
DTS0810	D6001 Datasheet
ISM0386	D6001 Instruction Manual
ISM0384	D6001 Safety Manual
DTS0848	D6004 Datasheet
ISM0447	D6004 Instruction Manual
ISM0451	D6004 Safety Manual