Honeywell

Technical Information

Experion Series-C I/O Specification

EP03-490-520

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Revision History

Revision	Date	Description
1.0	March 2017	Original R500
1.1	July 2018	CC-PUIO01 and CC-PUIO31 update
1.2	Jan 2019	Section 4: IOM size update table
1.3	Jan 2019	Notes Update
1.4	Sep 2020	CC-PUIO31 Digital Output update
1.5	Dec 2021	CC-PUIO01 and CC-PUIO31 Electronic Short Circuit Protection update

Table of Contents

1. Product Introduction Summary

1.1. Overview

This document provides technical information to configure the Experion® Series C I/O and the C300 Controller, released starting with Experion R300.

1.2. Scope

The following Series C I/O items are included in this document.

- Digital Input 24 VDC
- Digital Input 110 VAC / 125VDC
- Digital Input 220 VAC
- Digital Output (24 VDC bussed)
- Digital Output Relay
- High Level Analog Input with HART
- High Level Analog Input without HART
- Analog Output with HART
- Analog Output without HART
- Low Level Multiplexer – RTD & TC
- Low Level Input – RTD & TC
- Pulse Input
- Universal Input Output

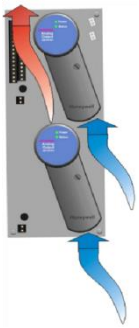
1.3. Definitions

- **Input Output Termination Assembly (IOTA):** An assembly that holds the IOM and the connections for field wiring,
- **Input Output Module (IOM):** A device that contains most of the electronics required to perform a specific I/O function. The IOM plugs onto the IOTA.

2. Features

All Series C components feature an innovative design that supports enhanced heat management. This unique look provides a significant reduction in overall size for the equivalent function.

The unique features of Series C I/O include:



- I/O Module and field terminations are combined in the same area. The I/O Module is plugged into the IOTA to eliminate the need for a separate chassis to hold the electronics assemblies.
- Two level “detachable” terminals for landing the field wiring in the enclosure, providing easier plant installation and maintenance.
- Field power is supplied through the IOTA, with no need for extra power supplies and the associated craft wired marshalling.
- Redundancy is available directly on the IOTA without any external cabling or redundancy control devices, by simply adding a second IOM to an IOTA.
- The Series C innovative styling is one of its unique features. This styling includes features to facilitate the effective use of control hardware in a systems environment. These features include:
- Vertical mounting for more effective wiring since most field wiring applications require entry from the top or bottom of the systems cabinet.
- An “information circle” for a quick visual cue to draw the Maintenance Technician’s eye to important status information.
- “Tilted” design for effective heat management within the cabinet enclosure. Since Series C allows for a significant increase in cabinet density, an effective heat management system is critical for high systems availability.
- Input and output circuits are protected from shorts to alleviate the need for in-line fusing, reducing installation and maintenance costs.

Series C IOTAs combine multiple functions into a single piece of equipment:

- Single and redundant configurations.
- On-board termination of process signals.
- On-board signal conditioning.
- On-board connection to appropriate networks (FTE, I/O LINK).
- Field power distribution without external marshalling.
- IOM plugs into the IOTA and receives power from the IOTA.
- The IOTA receives its power from a 24 VDC bus that is part of the IOTA carrier – the IOTA is screwed into the bussed power.

3. Series C I/O Sizing

In virtually all configurations, the C300 controller and Series C I/O provides useful, maintainable process equipment connections in a smaller footprint than existing competitors and Honeywell equivalent products. Installing Series C I/O modules contributes to overall total installed cost savings.

IOTA sizes vary based on the application. In general, an analog module has 16 points and resides on a 6 inch (152mm) IOTA for non-redundant applications and a 12 inch (304mm) IOTA for redundant applications. A discrete module has 32 points and resides on a 9-inch (228mm) IOTA for non-redundant applications and a 12 inch (304mm) IOTA for redundant applications. Specific information on the size of a particular module is described in the Model Number Table.

3.1. I/O Module Functions

- **High Level Analog Input /HART Input Module (16pt)** – The High Level Analog Input Module supports both high level analog and HART inputs. Analog inputs are typically 4-20mA DC for both traditional and HART devices. HART data can be used for status and configuration. HART data, such as the secondary and tertiary variables, can also be used as process control variables. Two versions are available.
- **High Level Analog Input w/o HART (16pt)** - The High Level Analog Input Module supports high level analog inputs Analog inputs are typically 4-20mA DC for traditional devices.
- **Analog Output/HART Output Module (16pt)** – The Analog Output Module supports both standard 4-20mA DC outputs and HART transmitter outputs. Two versions are available.
- **Analog Output w/o HART (16pt)** – The Analog Output Module supports standard 4-20mA DC outputs.
- **Digital Input 24 VDC (32pt)** – Digital input sensing for 24V signals. Two versions are available.
- **Digital Input High Voltage (32pt)** – Digital input sensing for 110 VAC, 220 VAC, 125VDC.
- **Digital Output 24 VDC (32 pt)** – Current sourcing digital outputs. Outputs are electronically short-circuit protected. Two versions are available.
- **Relay Digital Output (32 pt)** – Digital output with NO or NC dry contacts. Can be used for low power or high power applications.
- **Temperature Multiplexer (64 pt)** – Provides thermocouple (TC) and resistance temperature device (RTD) inputs. The Multiplexer supports up to four, field proven PMIO FTAs.
- **Temperature Multiplexer (64 pt)** – Provides thermocouple (TC) and resistance temperature device (RTD) inputs. The Multiplexer supports up to four, field proven PMIO FTAs
- **Pulse Input (8pt)** – Provide linear counting, PV generation, and Quaduature Input for Custody Transfer
- **Universal Input Output (32 pt)** - Supports 32 channels of user configurable IO. Choices available – analog input, analog output, digital input, and digital output.

Series C field connectors accept up to 12ga AWG / 2.5mm stranded wire.

4. I/O Module Sizes

IOTA Sizing is nominal (6in = 152mm, 9in =228mm, 12in =304mm, 18in = 457mm)I/O modules are associated with their respective IOTAs in the table below. An I/O Module is supported by one or more IOTAs.

I/O Module	IOTA	Description	Circuits	Size (in ")	Red.
CC-PAIH01		High-Level AI HART	16		√
	CC-TAIX01	AI IOTA		6	
	CC-TAIX11	AI IOTA Red		12	√
CC-PAIH02 CC-PAIX01 / 02		High-level AI HART High-level AI w/o HART	16		√
	CC-TAIX01	AI IOTA		6	
	CC-TAIX11	AI IOTA Red		12	√
	CC-TAID01	AI IOTA – 16 Channel Differential		9	
	CC-TAID11	AI IOTA Red – 16 Channel Differential		12	√
CC-PAIH51		High-level AI HART	16		√
	CC-TAIX51	AI IOTA		6	
	CC-TAIX61	AI IOTA Red		12	√
CC-PAIN01		High-level AI w/o HART	16		√
	CC-TAIN01	AI IOTA		6	
	CC-TAIN11	AI IOTA Red		12	√
CC-PPIX01		Pulse Input w/ Fast Cut-off	8		√
	CC-TPIX11	PI IOTA Red		12	√
CC-PAIM01		PMIO LL Mux	64		
	CC-TAIM01	PMIO LL Mux IOTA		6	
	FTA				
	Mx-TAMT04	LL Mux TC FTA	16	12	
	Mx-TAMT14	LL Mux TC FTA w/Remote CJR	16	12	
	Mx-TAMR04	LL Mux RTD FTA	16	12	
CC-PAIL51	CC-TAIL51	Low-level AI	16	9	
CC-PPIX01	CC-TPIX01	Pulse Input	8	12	√

CC-PAOH01 CC-PAOX01		Analog Output 16pt HART Analog Output 16pt w/o HART	16		√
	CC-TAOX01	AO IOTA		6	
	CC-TAOX11	AO IOTA Red.		12	√
CC-PAOH51		Analog Output 16pt HART	16		√
	CC-TAOX51	AO IOTA		6	
	CC-TAOX61	AO IOTA Red		12	√
CC-PAON01		Analog Output 16pt w/o HART	16		√
	CC-TAON01	AO IOTA		6	
	CC-TAON11	AO IOTA Red		12	√
CC-PDIL01 CC-PDIS01		Digital Input 24V Digital Input Sequence of Events	32		√
	CC-TDIL01	DI 24V IOTA		9	
	CC-TDIL11	DI 24V IOTA Red.		12	√
CC-PDIL51		Digital Input 24V	32		√
	CC-TDIL51	DI 24V IOTA		9	
	CC-TDIL61	DI 24V IOTA Red.		12	√
CC-PDIH01		Digital Input High Voltage	32		√
	CC-TDI110	DI 110V IOTA		9	
	CC-TDI120	DI 110V IOTA Red.		12	√
	CC-TDI220	DI 220VAC IOTA		9	
	CC-TDI230	DI 220VAC IOTA Red.		12	√
CC-PDOB01		DO - 24V Bussed Out	32		√
	CC-TDOB01	DO 24V Buss IOTA		9	
	CC-TDOB11	DO 24V Buss IOTA Red.		12	√
	CC-TDOR01	DO Relay IOTA		6	
	CC-TDOR11	DO Relay IOTA Red.		12	√
	CC-SDOR01	DO Relay Extension Board		12	
CC-PUIO01		Universal Input Output	32		√
	CC-TUIO01	Universal Input Output IOTA		12	
	CC-TUIO11	Universal Input Output IOTA Red.		18	√
CC-PUIO31		Universal Input Output	32		√

	CC-TUIO31	Universal Input Output IOTA		9	
	CC-TUIO41	Universal Input Output IOTA Red.		12	√

5. Specifications

Specifications for Series-C I/O modules are shown below.

For information on environmental specifications, please refer to the Series-C Platform Specification and Technical data sheet EP03-520-xxx.

5.1. Analog Input with HART – CC-PAIH01 / 02

Function

The Analog Input Module accepts high level current or voltage inputs from transmitters and sensing devices.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- Open Wire Detection
- Supplies non-incendive field power
- Non-incendive Power
- HART-capable, multivariable instruments and multiple modems for fast collection of control variables
- Fast loop scan
- PV protection through an open wire detection diagnostic
- Open-wire Bad PV Detection

Detail Specifications – Analog Input with HART

Parameter	Specification	
Input / Output Model	CC-PAIH02 - High-Level Analog Input with HART	
IOTA Models	Non-Redundant	Redundant
	CC-TAIX01	CC-TAIX11
	CC-GAIX21	CC-GAIX11
	CC-TAID01	CC-TAID11
Input Type	Voltage, current (2-wire or self-powered transmitters)	
Input Channels [1]	16 Channels (12 Single Ended / 4 Differential)	
Common Mode Rejection Ratio, dc to 60 Hz (500 Ω source imbalance)	70 dB	
Common Mode Voltage, dc to 60 Hz	-6 to +5 V peak	
A/D Converter Resolution	16 bits	
Input Range [1]	0 to 5 V, 1 to 5 V, 0.4 to 2 V, 4-20 mA (through 250 Ω)	
Normal Mode Rejection Ratio, at 60 Hz	19 dB	

Parameter	Specification
Normal Mode Filter Response	Single-pole RC, -3 dB @ 6.5 Hz
Maximum Normal Mode Input (differential inputs, no damage)	± 30 Volts
Crosstalk, dc to 60 Hz (channel-to-channel)	-60 dB
Input Impedance (voltage inputs)	> 10 M Ω powered
Input Scan Rate	50 ms
Hardware Accuracy (@ CMV = 0 V)	± 0.075% of full-scale (23.5°± 2°C) ± 0.15% of full-scale (0 to 60°C)
Transmitter Field Power Conditioning	Individually Protected Current Limiting Circuits for Class 1, Div 2 non-incendive interfacing. No fusing required
Note 1: CC-PAIH01 supports voltage inputs for channels 13-16 CC-PAIH02 supports voltage inputs for channels 1-16 when used with CC-TAIDx1 IOTA. Each channel's 250-Ohm load resistor is connected to the input terminal through a wire jumper on the IOTA. This jumper should be cut by the user on channels to be used with voltage transmitters. For channels 13-16 the low-side input connection is normally connected to system common by a wire jumper on the IOTA. This jumper may be cut by the user to enable differential operation subject to operating within the CMV specification.	

5.2. Analog Input with HART – CC-PAIH51

Function

The Analog Input Module accepts high level current inputs from transmitters and sensing devices.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- Supplies non-incendive field power (No external user supplied power)
- Suitable for Configure / Status for HART devices
- HART-capable, multivariable instruments for fast collection of control variables
- Fast loop scan
- Non-Incendive Power

Detail Specifications – Analog Input with HART

Parameter	Specification		
Input / Output Model	CC-PAIH51 - High-Level Analog Input with HART		
IOTA Models	CC-TAIX51	Non Redundant	6”
	CC-TAIX61	Redundant	12”
Input Type	Current (2-wire or self-powered transmitters)		
Input Channels [1]	16 Channels (ALL Single Ended).		
Common Mode Rejection Ratio, dc to 60 Hz (500 Ω source imbalance)	70 dB		
Common Mode Voltage, dc to 60 Hz	-6 to +5 V peak		
A/D Converter Resolution	16 bits		
Input Range [1]	4-20 mA only (through 200 Ω)		
Normal Mode Rejection Ratio, at 60 Hz	19 dB		
Normal Mode Filter Response	Single-pole RC, -3 dB @ 6.5 Hz		
Maximum Normal Mode Input	± 30 Volts		
Crosstalk, dc to 60 Hz (channel-to-channel)	-60 dB		
Input Scan Rate	50 ms		
Hardware Accuracy (@ CMV = 0 V)	± 0.075% of full-scale (23.5°± 2°C) ± 0.15% of full-scale (0 to 60°C)		
Transmitter Field Power Conditioning	Individually Protected Current Limiting Circuits for Class 1, Div 2 non-incendive interfacing. No fusing required		
Note 1: No differential / voltage inputs are supported.			

5.3. Analog Input – CC-PAIX01 / 02

Function

The Analog Input Module accepts high level current or voltage inputs from transmitters and sensing devices.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- Supplies non-incendive field power
- Non-Incendive Power
- Fast loop scan

Detail Specifications –Analog Input

Parameter	Specification	
Input / Output Model	CC-PAIX02 - High-Level Analog Input	
IOTA Models	Non-Redundant	Redundant
	CC-TAIX01	CC-TAIX11
	CC-GAIX21	CC-GAIX11
	CC-TAID01	CC-TAID11
Input Type [1]	Voltage, current (2-wire or self-powered transmitters)	
Input Channels [1]	16 Channels (12 Single Ended / 4 Differential)	
Common Mode Rejection Ratio, dc to 60 Hz (500 Ω source imbalance)	70 dB	
Common Mode Voltage, dc to 60 Hz	-6 to +5 V peak	
A/D Converter Resolution	16 bits	
Input Range [1]	0 to 5 V, 1 to 5 V, 0.4 to 2 V, 4-20 mA (through 250 Ω)	
Normal Mode Rejection Ratio, at 60 Hz	19 dB	
Normal Mode Filter Response	Single-pole RC, -3 dB @ 6.5 Hz	
Maximum Normal Mode Input (differential inputs, no damage)	± 30 Volts	
Crosstalk, dc to 60 Hz (channel-to-channel)	-60 dB	
Input Impedance (voltage inputs)	> 10 M Ω powered	
Input Scan Rate	50 ms	
Hardware Accuracy (@ CMV = 0 V)	± 0.075% of full-scale (23.5°± 2°C) ± 0.15% of full-scale (0 to 60°C)	
Transmitter Field Power Conditioning	Individually Protected Current Limiting Circuits for Class 1, Div 2 non-incendive interfacing. No fusing required	

Parameter	Specification
Note 1: CC-PAIH01 supports voltage inputs for channels 13-16. CC-PAIH02 supports voltage inputs for channels 1-16 when used with CC-TAIDx1 IOTA. Each channel's 250-Ohm load resistor is connected to the input terminal through a wire jumper on the IOTA. This jumper should be cut by the user on channels to be used with voltage transmitters. For channels 13-16 the low-side input connection is normally connected to system common by a wire jumper on the IOTA. This jumper may be cut by the user to enable differential operation subject to operating within the CMV specification.	

5.4. Analog Input – CC-PAIN01

Function

The Analog Input Module accepts high level current input from sensing devices.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- Supplies non-incendive field power
- Fast loop scan

Non-Incendive Power

Non-incendive power is provided with no external marshalling to support the 4-20mA loop and still provide for channel power protection. This protection supports the Division 2 hazardous protection non-incendive power rating.

Detail Specifications –Analog Input

Parameter	Specification		
Input / Output Model	CC-PAIN01 - High-Level Analog Input		
IOTA Models	CC-TAIN01	Non Redundant	6”
	CC-TAIN11	Redundant	12”
Input Type	Current (2-wire or self-powered transmitters)		
Input Channels	16 Channels (16 Single Ended)		
Common Mode Rejection Ratio, dc to 60 Hz (500 Ω source imbalance)	70 dB		
A/D Converter Resolution	16 bits		
Input Range	4-20 mA (through 200 Ω)		
Normal Mode Rejection Ratio, at 60 Hz	20 dB		
Normal Mode Filter Response	Single-pole RC, -3 dB @ 6.0 Hz		
Maximum Normal Mode Input	± 30 Volts		
Crosstalk, dc to 60 Hz (channel-to-channel)	-60 dB		
Input Scan Rate	50 ms		
Hardware Accuracy (@ CMV = 0 V)	± 0.075% of full-scale (23.5°± 2°C) ± 0.15% of full-scale (0 to 60°C)		
Transmitter Field Power Conditioning	Individually Protected Current Limiting Circuits for Class 1, Div 2 non-incendive interfacing. No fusing required		

5.5. Low Level Analog (Temperature) Input – LLMUX – CC-PAIM01

Function

The LLMUX IOP module supports up to 64 channels of temperature inputs. Low level inputs use the Honeywell PMIO LLMUX FTA. Each FTA supports 16 channels. Two types of LLMUX FTA are supported. One provides 16 RTD inputs. The other provides 16 TC or MV inputs. Any combination of FTAs may be used to provide the mix of TC, mV or RTD points required.

Notable Features

- TC and RTD operation
- Remote cold junction capability
- 1 Second PV scanning with OTD protection
- Configurable OTD protection (See below)
- Temperature points can be added in 16 point increments

Temperature Support

The Temperature Input LLMUX supports the existing solid state PMIO LLMUX FTA. The PMIO LLMUX FTA supports RTD and Thermocouple (TC) inputs. The Temperature variable is collected from all points at a 1 second rate. The 1 second update includes a configurable check for Open Thermocouple Detection (OTD) (see below) before propagation of the temperature variable. All TC inputs are compensated using a Cold Junction Compensation (CJT) device.

Sampling and Open Sensor Detect

The Temperature multiplexer supports RTD and Thermocouples with Open Sensor Detect before PV delivered if so configured. With the OTD configuration active, the PV is sampled and held while an OTD cycle is performed within the same measurement window. If the OTD is negative, the PV is propagated up through the system. If the OTD is positive, the PV is set to NAN and the input channel soft failure is set. In this way, no inappropriate control action occurs for PV values that are invalid due to an open thermocouple. PV sampling/reporting incurs no added delays from OTD processing.

Detailed Specs – Low Level Input Multiplexer

Parameter		Specification
Input / Output Model		CC PAIM01
PMIO FTA Models [1]		MU-TAMR04, TAMT04, TAMT14
Input Type		Thermocouple and / or RTD
Input channels		64 fully-isolated channel-to-channel, channel-to-PM, and channel-to-power supply common in 16 channel increments.
Input scan rate		1 Second fixed by IOM (up to 64 channels/sec max.)
Channel bandwidth		0 to 4.7 Hz (-3 dB)
Nominal input range (TC only)		-20 to +100 millivolts
Maximum normal mode continuous input non-damaging (any thermocouple type configured)		-10 to +10 volts (TC) -1 to +2 Volts @ 100 milliamps (RTD)
Gain error (-20 to +100 millivolt range)		0.050% full scale max
Temperature stability	TC, millivolt inputs	+/-20 ppm per deg C max
	RTD inputs	+/-20 ppm per deg C max
Long term drift		500 ppm

Parameter	Specification	
Input impedance	1 megohm at dc (TC only)	
CMV with respect to Power System common, dc to 60 Hz	+/-250 VDC or VAC RMS	
CMRR, 50 or 60 Hz (with 1000 ohms source impedance max.)	120 dB min	
Voltage, channel-to-channel, dc to 60 Hz	+/-250 VDC or VAC RMS	
Crosstalk, dc to 60 Hz	80 dB (120 dB at 50 and 60 Hz)	
NMRR at 50/ 60 Hz	60 dB min	
Line frequency integration	Fixed selection of 50 Hz or 60 Hz	
RTD sensor excitation current	1 milliamp	
Cold Junction Reference (CJR) Accuracy	0 to +50 deg C - +/-1.0 deg C Max -20 to +60 deg C - +/-1.5 deg C Max	
TC Linearization Accuracy [2]	± 0.05 Ω / deg C	
Open Thermocouple Detection	Each conversion qualified, ≤ 1000 Ω = guaranteed no-trip ≥ 1500 Ω guaranteed trip.	
RTD Max Lead Resistance	15 Ω	
Surge protection (sensor terminals)	EN 61000-4-5 (for Industrial locations, 1kV line to line, 2kV line to gnd.)	
Surge protection (power/serial link with cable adapter option)	EN 61000-4-5 (for Industrial locations, 1kV line to line, 2kV line to gnd.)	
Maximum cable distance IOTA to FTA using cable adapter	1000 feet 16 gauge wire, two twisted pair per FTA	
Supported types (RTD)	Pt: 100 ohm DIN 4376	-180 to +800 deg C
	Pt: 100 ohm JIS C-1604	-180 to +650 deg C
	Ni: 120 ohm ED #7	-45 to +315 deg C
	Cu: 10 ohm SEER	-20 to +250 deg C
Supported thermocouple types	ANSI specification J	-200 to +1200 deg C
	ANSI specification K	-100 to +1370 deg C
	ANSI specification E	-200 to +1000 deg C
	ANSI specification T	-230 to +400 deg C
	ANSI specification B	+100 to +1820 deg C
	ANSI specification S	0 to +1700 deg C
	ANSI specification R	0 to +1700 deg C

Parameter	Specification	
	JAPAN TYPE R'	0 to +1770 deg C
Supported millivolt types	-20 to +100 millivolts	
FTA dimensions [1]	2.5 D x 4.9 W x 12.1 L (inches) 63.5 D x 124.46 W x 307.34 L (millimeters)	
Note 1: FTAs are PMIO FTAs. These must be installed in FTA channels. These are similar to but not identical to Series C channels. The TPC will support this configuration. Refer to PM20-660 for FTA power, environmental and approval certifications details not covered in this document. Note 2: Linearization polynomials are 4th order and based on NIST Monograph 175, ITS90 and JIS C-1602-1995.		

5.6. Low Level Analog (Temperature) Input – CC-PAIL51

Function

The Low Level IOP module supports up 16 channels of temperature inputs. Any single channel can support either Thermocouple or Resistance Temperature Device (RTD) inputs. Unlike the LLMUX (CC-PAIM01), 16 channels are supported directly on the Series-C IOTA. No external Process Manager FTA is required.

Notable Features

- TC and RTD operation
- Cold junction compensation
- 1 Second PV scanning with OTD protection
- Configurable OTD protection (See below)

Detailed Specs – Low Level Input 16 Channel

Parameter	Specification	
Input / Output Model	CC-PAIL51	
IOTA (16pt)	CC-TAIL51	9”
Input Type	Thermocouple or RTD (configurable per channel)	
Temperature	Operating Temperature	-40 to +70
	Storage Temperature	-40 to +85
Input Channels	Fully isolated Channel to Channel and Channel to Power System	
Input scan rate	1 Second	
Channel bandwidth	0 to 4.7 Hz (-3 dB)	
Nominal input range (TC only)	-20 to +100 millivolts	
Maximum normal mode continuous input (non-damaging)	-10 to +10 volts (TC) -1 to +2 Volts @ 100 milliamps (RTD)	
Gain error	0.050% full scale max	
Temperature stability	TC, Millivolt inputs	+/-20 ppm per max
	RTD inputs	+/-20 ppm per max
Long term drift	500 ppm	
Input impedance	1 megohm at dc (TC only)	
CMV with respect to Power System common, dc to 60 Hz	+/-250 VDC or VAC RMS	
CMRR, 50 or 60 Hz (with 1000 ohms source impedance max.)	120 dB min	
Voltage, channel-to-channel, dc to 60 Hz	+/-250 VDC or VAC RMS	
Crosstalk, dc to 60 Hz	80 dB (120 dB at 50 and 60 Hz)	

Parameter	Specification	
NMRR at 50/ 60 Hz	60 dB min	
Line frequency integration	Fixed selection of 50 Hz or 60 Hz	
RTD sensor excitation current	1 milliamp	
Cold junction compensation range	-20 to +60 ℃ (+/-0.5 ℃ typical)	
TC Linearization Accuracy (2)	± 0.05 Ω / ℃	
Open Thermocouple Detection	Each conversion qualified, ≤ 1000 Ω = guaranteed no-trip 1500 Ω guaranteed trip.	
RTD Max Lead Resistance	15 Ω	
Supported types (RTD)	Pt: 100 ohm DIN 4376	-180 to +800 ℃
	Pt: 100 ohm JIS C-1604	-180 to +650 ℃
	Ni: 120 ohm ED #7	-45 to +315 ℃
	Cu: 10 ohm SEER	-20 to +250 ℃
	Cu: 50 ohm SEER	-50 to +150 ℃
Supported types (Thermocouple)	ANSI specification J	-200 to +1200 ℃
	ANSI specification K	-100 to +1370 ℃
	ANSI specification E	-200 to +1000 ℃
	ANSI specification T	-230 to +400 ℃
	ANSI specification B	+100 to +1820 ℃
	ANSI specification S	0 to +1700 ℃
	ANSI specification R	0 to +1700 ℃
Supported millivolt types	-20 to +100 millivolts	

5.7. Pulse Input – CC-PPIX01

Function

The Pulse Input Module (PIM) provides the Experion C300 controller with the ability to monitor various pulse input field values. The PI module processes signals from pulse-generating devices and provides a calculated rate and an accumulated total. The PI supports a “fast cutoff” capability to stop dosing operations when the threshold has been met. High-accuracy and repeatable measurement capability make the PIM well suited for metering and custody transfer applications.
This module is specifically engineered to support the MeterSuite Custody Transfer Application including support for dual pulse per ISO6551. Implementation of ISO-6551/API 5.5 for dual pulse inputs, including Level A, pulse integrity.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- High Accuracy Frequency, Period and Pulse Width Measurement
- Supports the MeterSuite Application
- ISO 6551 Fidelity

Detail Specifications –Pulse Input

Parameter	Specification		
Input / Output Model	CC-PPIX01 - Pulse Input		
IOTA Model	CC-TPIX11	Redundant	12”
Number of Inputs	8 (Single) or 4 (Dual) Supports Mixed Combination of Single/Dual Input Channels		
Number of Outputs	2		
Input type	High-impedance, differential voltage , optically isolated (1000 VDC)		
Frequency Range	0 - 100 KHz Single Channel 0 – 10 KHz Dual Pulse Channel		
Frequency Accuracy (0.5 Hz – 100 KHz)	+/- 0.001% of Reading		
Input Voltage (Independent of Input Voltage Range)	0 to 35 VDC		
Input Voltage Trip Points	High Setting: Low to High: 8.4V ; High to Low: 7.7V Low Setting: Low to High: 2.8V ; High to Low: 2.0V		
Input Edge Selection	Configurable: Rising Edge (Default) or Falling Edge		
Channel Input Impedance	Greater than 70 K Ohms		
Input Channel Function	Frequency (PV), Accumulated Value (AV), Pulse Width High, Pulse Width Low, Period		
Isolated / Bussed Input Jumper Option	Isolated or bussed configuration selection per channel		
Internal / External Excitation	Power connection can support internal 24V operation or an external (user supplied) excitation voltage +5 to +30Vdc		

Minimum Pulse Width (3)	3us (Pulse Width Rejection Off), 20us (Pulse Width Rejection On)
Fast Cutoff Output Type (Channels 7 and 8 only)	Optically isolated (1500 Vrms) solid state relay with integral user replaceable fuse (2.5 A)
Fast Cutoff Latency	1ms (max)
Fast Cutoff Relay Output Characteristics (1)	Voltage: 5V to 60VDC Current: 0.001A to 2A
Off State Leakage Current	100uA max at 60Vdc
MeterSuite Specifications (2)	Supported
Prover Pulse Output Function	Provides “Good Pulses” from selected dual channel pair to support Prover applications. Supports up to 5 Pulse IOTAs bussed together.
Prover Electrical Characteristics	Open Emitter source driver – Referenced to System Ground Open Circuit Voltage: 22V Short Circuit Current Limit : 35mA
Pulse Data Fidelity Compliance	Level A Fidelity per ISO 6551:1995

Note 1: An optional AC relay (51190516-332) can be substituted for the supplied DC relay to provide an AC Cutoff Signal. Cutoff Time is extended to one line cycle of the AC mains signal.

Note 2: Requires MeterSuite Application

Note 3: For Dual Channel operations, the minimum detectable required pulse width is 10us. (the dual stream configuration has a “built-in” 10us pulse width rejection feature)

5.8. Analog Output with HART – CC-PAOH01

Function

The Analog Output (AO) Module delivers high-level constant current to actuators and recording/indicating devices.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- HART-capable, multivariable instruments
- Multiple modems for fast collection of control variables
- Safe-state (FAILOPT) behaviors configurable on a per channel basis
- Output read-back and alarm on discrepancy
- Non-incendive output

FAILOPT

Series C AO module supports the FAILOPT parameter on a per channel basis. The user can configure each channel to either HOLD LAST VALUE, or SHED to a SAFE VALUE. The Output will always go to zero, the safe state, if the IOM device electronics fails.

Open-wire Detection

This Series C IO function will be able to detect and annunciate open field wire with a Channel Soft Failure indication.

Detail Specifications –Analog Output with HART

Parameter	Specification		
Input / Output Model	CC-PAOH01 - High-Level Analog Output with HART		
IOTA Models	CC-TAOX01	Non-Redundant	6”
	CC-TAOX11	Redundant	12”
	CC-GAOX11	Redundant	12”
	CC-GAOX21	Non-Redundant	6”
Output Type	4-20 mA		
Output Channels	16		
Output Ripple	< 100 mV peak-to-peak at power line frequency, across 250 Ω load		
Output Temperature Drift	0.005% of Full Scale/°C		
Output Readback Accuracy	±4% of Full Scale		
Output Current Linearity	± 0.05% of Full Scale nominal		
Resolution	± 0.05% of Full Scale		
Calibrated Accuracy	± 0.35% of Full Scale (25ºC) including linearity		
Directly Settable Output Current Range	0 mA, 2.9 mA to 21.1 mA		
Maximum Resistive Load (24 V supply = 22 VDC through 28 VDC)	800 ohms		

Parameter	Specification
Maximum Output Compliant Voltage (24 V supply = 22 VDC through 28 VDC)	16 V
Maximum Open Circuit Voltage	22 V
Response Time (DAC input code to output)	settles to within 1% of final value within 80 ms
Gap (0 mA) of Output to Field on Switchover	10 ms maximum (applies to Redundancy only)

5.9. Analog Output with HART – CC-PAOH51

Function

The Analog Output (AO) Module delivers high-level constant current to actuators and recording/indicating devices.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- HART-capable for Status and Configuration
- Safe-state (FAILOPT) behaviors configurable on a per channel basis
- Non-incendive output

FAILOPT

Series C AO module supports the FAILOPT parameter on a per channel basis. The user can configure each channel to either HOLD LAST VALUE, or SHED to a SAFE VALUE. The Output will always go to zero, the safe state, if the IOM device electronics fails.

Open-wire Detection

This Series C IO function will be able to detect and annunciate open field wire with a Channel Soft Failure indication.

Detail Specifications – Analog Output with HART

Parameter	Specification		
Input / Output Model	CC-PAOH51 - High-Level Analog Output with HART		
IOTA Models	CC-TAOX51	Non-Redundant	6”
	CC-TAOX61	Redundant	12”
Output Type	4-20 mA		
Output Channels	16		
Output Ripple	< 100 mV peak-to-peak at power line frequency, across 250 Ω load		
Output Temperature Drift	0.005% of Full Scale/°C		
Output Readback Accuracy	±4% of Full Scale		
Output Current Linearity	± 0.05% of Full Scale nominal		
Resolution	± 0.05% of Full Scale		
Calibrated Accuracy	± 0.35% of Full Scale (25ºC) including linearity		
Directly Settable Output Current Range	0 mA, 2.9 mA to 21.1 mA		
Maximum Resistive Load (24 V supply = 22 VDC through 28 VDC)	800 ohms		
Maximum Output Compliant Voltage (24 V supply = 22 VDC through 28 VDC)	16 V		
Maximum Open Circuit Voltage	22 V		

Parameter	Specification
Response Time (DAC input code to output)	settles to within 1% of final value within 80 ms
Gap (0 mA) of Output to Field on Switchover	10 ms maximum (applies to Redundancy only)

5.10. Analog Output – CC-PAOX01

Function

The Analog Output (AO) Module delivers high-level constant current to actuators and recording/indicating devices.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- Safe-state (FAILOPT) behaviors configurable on a per channel basis
- Output read-back and alarm on discrepancy
- Non-incendive output

FAILOPT

Series C AO module supports the FAILOPT parameter on a per channel basis. The user can configure each channel to either HOLD LAST VALUE, or SHED to a SAFE VALUE. The Output will always go to zero, the safe state, if the IOM device electronics fails.

Open-wire Detection

This Series C IO function will be able to detect and annunciate open field wire with a Channel Soft Failure indication.

Detail Specifications – High Level Analog Output

Parameter	Specification		
Input / Output Model	CC-PAOX01 - High-Level Analog Output		
IOTA Models	CC-TAOX01	Non-Redundant	6”
	CC-TAOX11	Redundant	12”
	CC-GAOX11	Redundant	12”
	CC-GAOX21	Non-Redundant	6”
Output Type	4-20 mA		
Output Channels	16		
Output Ripple	< 100 mV peak-to-peak at power line frequency, across 250 Ω load		
Output Temperature Drift	0.005% of Full Scale/°C		
Output Readback Accuracy	±4% of Full Scale		
Output Current Linearity	± 0.05% of Full Scale nominal		
Resolution	± 0.05% of Full Scale		
Calibrated Accuracy	± 0.35% of Full Scale (25ºC) including linearity		
Directly Settable Output Current Range	0 mA, 2.9 mA to 21.1 mA		
Maximum Resistive Load (24 V supply = 22 VDC through 28 VDC)	800 ohms		
Maximum Output Compliant Voltage (24 V supply = 22 VDC through 28 VDC)	16 V		

Parameter	Specification
Maximum Open Circuit Voltage	22 V
Response Time (DAC input code to output)	settles to within 1% of final value within 80 ms
Gap (0 mA) of Output to Field on Switchover	10 ms maximum (applies to Redundancy only)

5.11. Analog Output – CC-PAON01

Function

The Analog Output (AO) Module delivers high-level constant current to actuators and recording/indicating devices.

Notable Features

- Extensive self-diagnostics
- Optional redundancy
- Safe-state (FAILOPT) behaviors configurable on a per channel basis
- Output read-back and alarm on discrepancy
- Non-incendive output

FAILOPT

Series C AO module supports the FAILOPT parameter on a per channel basis. The user can configure each channel to either HOLD LAST VALUE, or SHED to a SAFE VALUE. The Output will always go to zero, the safe state, if the IOM device electronics fails.

Open-wire Detection

This Series C IO function will be able to detect and annunciate open field wire with a Channel Soft Failure indication

Detail Specifications – High Level Analog Output

Parameter	Specification		
Input / Output Model	CC-PAON01 - High-Level Analog Output		
IOTA Models	CC-TAON01	Non-Redundant	6”
	CC-TAON11	Redundant	12”
Output Type	4-20 mA		
Output Channels	16		
Output Ripple	< 100 mV peak-to-peak at power line frequency, across 250 Ω load		
Output Temperature Drift	0.005% of Full Scale/°C		
Output Readback Accuracy	±4% of Full Scale		
Output Current Linearity	± 0.05% of Full Scale nominal		
Resolution	± 0.05% of Full Scale		
Calibrated Accuracy	± 0.35% of Full Scale (25ºC) including linearity		
Directly Settable Output Current Range	0 mA, 2.9 mA to 21.1 mA		
Maximum Resistive Load (24 V supply = 22 VDC through 28 VDC)	800 ohms		
Maximum Output Compliant Voltage (24 V supply = 22 VDC through 28 VDC)	16 V		
Maximum Open Circuit Voltage	22 V		
Response Time(DAC input code to output)	Settles to within 1% of final value within 80 ms		

Parameter	Specification
Gap (0 mA) of Output to Field on Switchover	10 ms maximum (applies to Redundancy only)

5.12. Digital Input 24VDC – CC-PDIL01

Function

The Digital Input 24VDC accepts 24VDC signals as discrete inputs.

Notable Features

- Extensive internal diagnostics for data integrity
- Open wire detection
- Optional redundancy
- Internal or external field power selection
- On board excitation power (no need for marshalling power)
- Supplies Non-incendive field power
- Direct / Reverse Input Indication
- Galvanic isolation

Open-wire Bad PV Detection

This Series C IO function will be able to detect and annunciate Open field wire. In addition, a seemingly-valid PV from a channel diagnosed as having a Open-wire will provide a status of “invalid” (thus preventing incorrect control action).

Detail Specifications – DI 24VDC

Parameter	Specification		
Input / Output Model	CC-PDIL01 - 24Volt Digital Input		
IOTA Models	CC-TDIL01	Non Redundant	9”
	CC-TDIL11	Redundant	12”
	CC-GDIL11	Redundant	12”
	CC-GDIL21	Non Redundant	6”
	CC-GDIL01	Redundant for exp.	12”
	CC-SDXX01	GI-IS I/O Expander	12”
Input Channels	32		
Galvanic Isolation (any input terminal voltage referenced to common)	1500 VAC RMS or ±1500 VDC		
Isolation Technique	Optical (in IOM)		
DI Power Voltage Range	18 to 30 VDC		
ON Sense Voltage/Current	13 VDC (min) or 3 mA (min)		
OFF Sense Voltage/Current	5 VDC (max) or 1.2 mA (max)		
Input Impedance	4.2 KΩ		
Absolute Delay Across Input Filter and Isolation	5 ms ± 20%		
Field Resistance for Guaranteed ON Condition	300 Ωmax @ 15 VDC		
Field Resistance for Guaranteed OFF Condition	30 KΩmin @ 30 VDC		

5.13. Digital Input 24VDC – CC-PDIL51

Function

The Digital Input 24VDC accepts 24VDC signals as discrete inputs.

Notable Features

- Extensive internal diagnostics for data integrity
- NO Open wire detection
- Optional redundancy
- Internal or external field power selection
- On board excitation power (no need for marshalling power)
- Supplies Non-incendive field power
- Direct / Reverse Input Indication
- Galvanic isolation

Detail Specifications – DI 24VDC

Parameter	Specification		
Input / Output Model	CC-PDIL51 - 24Volt Digital Input		
IOTA Models	CC-TDIL51	Non Redundant	9”
	CC-TDIL61	Redundant	12”
Input Channels	32		
Galvanic Isolation (any input terminal voltage referenced to common)	1000 VAC RMS		
Isolation Technique	Optical (in IOM)		
DI Power Voltage Range	18 to 30 VDC		
ON Sense Voltage/Current	13 VDC (min) or 3 mA (min)		
OFF Sense Voltage/Current	5 VDC (max) or 1.2 mA (max)		
Input Impedance	4.2 KΩ		
Absolute Delay Across Input Filter and Isolation	5 ms ± 20%		
Field Resistance for Guaranteed ON Condition	300 Ωmax @ 15 VDC		
Field Resistance for Guaranteed OFF Condition	30 KΩmin @ 30 VDC		

5.14. Digital Input Sequence of Events – CC-PDIS01

Function

The Digital Input Sequence of Events (DISOE) accepts 24VDC discrete signals as discrete inputs. The inputs can be time tagged to support 1ms resolution Sequence of Events.

Notable Features

- Three modes of operation:
- Normal (20ms PV scan)
- Sequence of Events (1ms resolution SOE, 20ms PV scan)
- Low Latency (5ms PV scan)
- Extensive internal diagnostics for data integrity
- Open Wire Detection (in Normal mode only)
- Optional redundancy
- Internal or external field power selection
- On board excitation power (no need for marshalling power)
- Supplies Non-incendive field power
- Direct / Reverse Input Indication
- Galvanic Isolation

Open-Wire Bad PV Detection

This Series C IO function will be able to detect and annunciate an open field wire. In addition, a seemingly valid PV from a channel diagnosed as having an open wire will provide a status of “invalid” (thus preventing incorrect control action).

Detail Specifications – DISOE

Parameter	Specification		
Input / Output Model	CC-PDIS01 - Digital Input Sequence of Events		
IOTA Models	CC-TDIL01	Non Redundant	9”
	CC-TDIL11	Redundant	12”
	CC-GDIL11	Redundant	12”
	CC-GDIL21	Non Redundant	6”
	CC-GDIL01	Redundant for exp.	12”
	CC-SDXX01	GI-IS I/O Expander	12”
Input Channels	32		
Input Channel Scanning (PV)	Normal = 20ms ; Fast = 5ms		
Digital Input Resolution for Sequence of Events (SOE)	1ms		
Galvanic Isolation (any input terminal voltage referenced to common)	1500 VAC RMS or ±1500 VDC		
Isolation Technique	Optical (in IOM)		
DI Power Voltage Range	18 to 30 VDC		
ON Sense Voltage/Current	13 VDC (min) or 3 mA (min)		
OFF Sense Voltage/Current	5 VDC (max) or 1.2 mA (max)		
Input Impedance	4.2 KΩ		
Absolute Delay Across Input Filter and Isolation	5 ms ± 20%		

Field Resistance for Guaranteed ON Condition	300 Ωmax @ 15 VDC
Field Resistance for Guaranteed OFF Condition	30 KΩmin @ 30 VDC

5.15. Digital Input High Voltage- CC-PDIH01

Function

The Digital Input High Voltage accepts 120VAC / 125VDC (CC-TDI110, 120), 120VAC (CC-TDI151 PROX) or 250VAC (CC-TDI2xx) signals as discrete inputs. The same IOM but different IOTA is used for both the 120VAC / 125VDC and 250VAC models. This reduces the number of spares required to support Series C system maintenance.

Notable Features

- Extensive internal diagnostics to ensure data integrity
- Optional redundancy (except CC-TDI151)
- Input direct/reverse
- Galvanic isolation

Detail Specifications – Digital Input High Voltage

Parameter	Specification					
Input / Output Model	CC-PDIH01 – Digital Input High Voltage					
Input Channels	32			32		
Galvanic Isolation (field to logic common)	1500 VAC RMS or ±1500 VDC			1500 VAC RMS or ±1500 VDC		
Isolation Technique	Optical			Optical		
	120 VAC IOTA			240 VAC IOTA		
IOTA Models	CC-TDI110	Non Redundant	9"	CC-TDI220	Non Redundant	9"
	CC-TDI120	Redundant	12"	CC-TDI230	Redundant	12"
	CC-TDI151	Non Redundant	12"			
IOTA Specific Specifications	**CC-TDI151**	**CC-TDI110 & CC-TDI120**		**CC-TDI220 & CC-TDI230**		
Nominal Voltage	120 VAC (PROX)	120VAC	125 VDC	240VAC		
Digital Input Pwr. Range	90-132 V AC RMS	90-132 V AC RMS	100-138 V DC	180-264 V AC RMS		
Sense Current (ON condition) minimum	7.5 mA RMS at 90V RMS 10 mA RMS at 132V RMS	1.0 mA	1.2 mA	1.11 mA RMS		
Sense Current (OFF condition) maximum	2.0 mA RMS	0.32 mA	0.32 mA	0.32 mA RMS		
Pick Up Voltage (ON condition) minimum	90 VAC RMS	90 VAC RMS	100 VDC	180 VAC RMS		
Drop Out Voltage (OFF condition) maximum	20 VAC RMS	25 VAC RMS	25 VDC	50 VAC RMS		
Absolute Delay Across Input Filter and Isolation (Bounceless Input to logic level change)	25 ms maximum	25 ms maximum	10 ms maximum	25 ms maximum		
Frequency Range	47-63 Hz	47-63 Hz	NA	47-63 Hz		

5.16. Digital Output - Bussed 24VDC – CC-PDOB01

Function

The Digital Output bussed 24VDC (DO24V) module provides reliable 24V digital output signals to control other process equipment as well as solenoid valves and interposing relays. The DO24V can support high energy outputs to reduce the number of external components in the output loop.

Notable Features

- Extensive internal diagnostics to ensure data integrity
- Optional redundancy
- Direct/Reverse output support
- Safe-state (FAILOPT) behaviors
- "Fuse-less" short circuit protection
- Latched, pulsed or pulse-width modulated output (per channel)
- Galvanic isolation

Bussed 24VDC DO

The Digital Output Bussed 24VDC has provisions for both internal and external field power excitation. As a bussed output device, all of the outputs share a common return (ground). All outputs get their power from the same source, which can be either the system power supply or an externally connected 24V power supply. When selection is from an external source, outputs can be galvanically isolated from the Series C power system.

Fuse-less Short Circuit Protection

This unique feature allows a short circuit to exist without blowing any fuses. When a particular channel is shorted, internal circuits detect this and remove power to the field connection. The channel remains de-energized until the short circuit is repaired.

FAILOPT

Series C DO module will support FAILOPT parameter on a per channel basis. The output can be directed by configuration to either HOLD THE LAST VALUE, or SHED to a SAFE VALUE. The safe value can be configured by the user.

Detail Specifications - Bussed 24VDC DO

Parameter	Specification			
Input / Output Model	CC-PDOB01 - 24Volt Digital Output , Field Isolated, Bussed output			
IOTA Model Numbers	CC-TDOB01	Non Redundant	9"	
	CC-TDOB11	Redundant	12"	
Output Channels	32			
Output Type	Source			
Load Voltage 15	30 VDC Maximum			
Load Current (A group of 8 channels consists of channels: 1-8, 9-16, 17-24, and 25-32)	(Absolute Maximum)	Per Channel	Per 8 Channels	Per Module
	No Short Condition(1)	0.5A	4A	6A
	One Short Condition(1)	0.5A	3A	6A
	Two Short Condition(1)	0.5A	1.5A	6A
Galvanic Isolation	1500 VAC RMS or ±1500 VDC			

Parameter	Specification
On-State Voltage	24 V (typ), load current @ 0.5A
Off-State Voltage	0v VDC (max) (3.3VDC (max) indicated under no-load condition)
Off-State Leak Current	5.0 µA (max)
Turn-On/Turn-Off Time	10 ms (max)
Gap (0 current) of Output to Field on Switchover	None (0ms) (applies to Redundancy only)
Output voltage will be the Source Voltage – 150mV maximum.	
Note 1: One / Two Short Condition parameter denotes the maximum current that can be passed through the DO with the short condition indicated before the short protection mechanism disables the function.	

5.17. Digital Output – Relay IOTA – Uses CC-PDOB01 IOM

Function

The Digital Output Relay provides a dry contact for isolated low voltage / low current or high voltage / high current discrete output applications. Each relay supports a Form-A or Form-B output based on jumper configuration. The Relay IOTA uses the Digital Output 24V (DO24V) IOM with a special IOTA to support the Relay IOTA. All characteristics of the DO24V IOM are incorporated here.

Notable Features

- Galvanic isolation
- Socketed relays
- Isolated Dry Contact
- Jumper selection between NO and NC contacts
- Counter EMF Snubbing Circuit
- LED indication for each channel ON condition

Detail Specifications - Relay DO IOTA

Parameter	Specification		
Input / Output Model	CC-PDOB01 - 24Volt Field Isolated, Bussed output		
IOTA Model Numbers	CC-TDOR01	Non Redundant	6"
	CC-TDOR11	Redundant	12"
	CC-SDOR01	Relay Extension	12"
Output Channels	32 isolated Form A (SPST/NO) or Form B (SPST/NC) contacts (jumper selectable per output)		
Contact Type	$AgSnO_2$		
Maximum Load Voltage	250 VAC (RMS)/125 VDC		
Maximum Steady State Load Current per Output	Current →Voltage 3 A → 125 / 250 VAC (resistive) 3 A → 30 VDC (resistive) 1 A → 48 VDC (resistive) 0.2 A → 125 VDC (resistive) 2 A → 125 / 250 VAC (inductive = 0.4 power factor) 1 A → 30 VAC (inductive L/R = 100 ms) 0.3 A → 48 VAC (inductive L/R = 100 ms) 0.1 A → 125 VAC (inductive L/R = 100 ms)		
Minimum Load Voltage	12 VDC		
Minimum Load Current	100mA		
Inrush Current (Max)	10A for 4s at a 10% duty cycle		
Isolation (Channel-to-channel, and channel-to-logic common)	1500 VAC RMS or ±1500 VDC		
Turn On Time	20 ms maximum		

Parameter	Specification
Turn Off Time	20 ms maximum
Contact Life	Mechanical : 5,000,000 cycles (@ 180 cycles/min) Electrical : 50,000 cycles @ 6 A (6 cycles/min)
Surge Absorber for Coil	120Ω + 0.033uF for each channel

5.18. Digital Output – SINKTYPE 24VDC – CC-PDOD51

Function

The Digital Output bussed 24VDC (DO24V) module can switch reliable 24V digital output signals to control other process equipment as well as solenoid valves and interposing relays.

Notable Features

- Extensive internal diagnostics to ensure data integrity
- Optional redundancy
- Electronic Overcurrent protection
- Configurable Safe-state (FAILOPT)
- Latched, pulsed or pulse-width modulated output (per channel)

Bussed 24VDC DO

The Digital Output Bussed 24VDC has provisions for both internal and external field power excitation. As a bussed output device, all of the outputs share a common return (ground). All outputs get their power from the same source, which can be either the system power supply or an externally connected 24V power supply. When selection is from an external source, outputs can be galvanically isolated from the Series C power system. A wiring option on the IOTA determines if outputs are referenced to the Series C system power or an external field power source.

FAILOPT

Series C DO module will support FAILOPT parameter on a per channel basis. The output can be directed by configuration to either HOLD THE LAST VALUE, or SHED to a SAFE VALUE. The safe value can be configured by the user.

Detail Specifications – SINK TYPE 24 V DC

Parameter	Specification		
Input / Output Model	CC-PDOD51 - 24Volt Digital Output , Field Isolated, Bussed output, Coated		
IOTA Model Numbers	CC-TDOD51	Non Redundant	9”
	CC-TDOD61	Redundant	12”
Output Channels	32		
Output Type	SINK (Open Drain)		
Load Voltage 15	30 VDC Maximum		
Load Current	0.1 A per channel (Max)		
Galvanic Isolation	1000 VAC RMS for System – to – Field isolation (user supplied field Power)		
On-State Voltage	0v VDC (load current @ 0.1A max)		
Off-State Voltage	24 V (typ),		
Off-State Leak Current	100 µA (max)		
Turn-On/Turn-Off Time	10 ms (max)		
Gap (0 current) of Output to Field on Switchover	None (0ms) (applies to Redundancy only)		

5.19. Universal Input Output – CC-PUIO01

Function

The Universal Input Output module interfaces with analog input, analog output, digital input, and digital output field devices.

Notable Features

- Each channel user configurable as:
- Analog Input
- Analog Output
- Digital Input
- Digital Output
- Pulse Input (channels 15-18)
- Open Wire Detection
- Fast Scan (Priority I/O Module Scan)
- Electronic short circuit protection[1]
- Safe-state (FAILOPT) behaviors configurable on a per channel basis for Digital / Analog Output
- HART 7 support (analog IO)
- Extended Temperature Range -40 to +70°C module ambient

Parameter	Specification		
Universal Process IO Module	CC-PUIO01		
IOTA Model Numbers	CC-TUIO01	Non Redundant	12”
	CC-TUIO11	Redundant	18”
Note 1: Each signal can be shorted in the field with no damage to the IOM or IOTA. Other channels on the same IOM will not be affected. AI, AO and DI channels are further protected and certified to support energy limited / nonincendive field wiring connections to Zone 2 / Division 2 hazardous locations.			

Detail Specifications – Analog Input with HART

Parameter	Specification
Input type	Current (2, 3, or 4 wire devices)
Input Channels	32 Maximum per module (with or without open wire detect)
A/D Converter Resolution	16 bit
Input Range	0-20 mA or 4-20 mA
Normal Mode Rejection Ratio, at 60 Hz	12 dB
Normal Mode Filter Response	Single pole, -3 dB @ 16 Hz
Crosstalk, dc to 60 Hz (channel-to-channel)	60 dB
Input Impedance	250 Ω nominal
Maximum Input Voltage (any input referenced to common, no damage)	+36 VDC to -1.1 VDC (1)
Input Scan Rate	50 ms
Hardware accuracy	0.1% of full-scale (23.5 ± 2°C) 0.17% of full-scale (-40 to +70°C)
Transmitter Field Power Conditioning	Current limited to 24 mA
Input Filter	First-order low-pass 16 Hz
Note 1: Return terminal is connected directly to Common (Ground)	

Detail Specifications – Pulse Input

Parameter	Specification
Channels	15, 16, 17, 18
Frequency	0-10KHz
Minimum Pulse Width	50 µs
Duty Cycle	Any Duty Cycle that meets the Minimum Pulse Width specification above.

Detail Specifications – Analog Output with HART

Parameter	Specification
Output Type	4-20 mA current loop
Output Channels	32 Maximum per module [1] (with or without open wire detect)
Output Ripple	< 125 mV peak-to-peak at power line frequency, across 250 Ω load
Output Temperature Drift	0.001% of Full Scale/°C
Output Readback Accuracy	0.25% of full scale
Output Current Linearity	± 0.05% of Full Scale nominal
Resolution	12 bit
Calibrated Accuracy	<0.5% of Full Scale (25°C) including linearity
Directly Settable Output Current Range	0 mA to 23 mA
Maximum Resistive Load (24 V supply = 22 VDC through 28 VDC)	700 ohms
Maximum Output Compliant Voltage (24 V supply = 22 VDC through 28 VDC)	14 VDC
Maximum Open Circuit Voltage	24 VDC
Response Time (DAC input code to output)	2 ms
Gap (0 mA) of Output to Field on Switchover	0 ms (both partners continuously active)
Note 1: Please refer to the User's Guide for calculation method to determine channel usage versus operating temperature.	

Detail Specifications – Digital Input with OWD

Parameter	Specification
Open Voltage	24 VDC
Short Circuit Current	7 mA
Open Contact	15 kΩ > 0.1 W
Closed Contact	5 kΩ > 0.25 W
Closed contact detection	1.8mA < I < 6 mA [1]
Open contact detection	0.7 mA < I < 1.8 mA [2]
Open wire detect	I < 0.7 mA
Input filter	First-order low-pass 16 Hz
Note 1: At 24 VDC, equates to 8.57 KΩ > R > 4 KΩ (where R = total loop resistance) Note 2: At 24 VDC, equates to 26.7 KΩ > R > 10 KΩ	

Detail Specifications – Digital Input without OWD

Parameter	Specification
Open Voltage	24 VDC
Closed contact current	7 mA ± 5%, after open state detection
	3.5 mA ± 5%, after closed state detection
Closed contact detection	I > 2.81mA [1]
Open contact detection	I < 1.8mA [2)]
Input filter	First-order low-pass 16 Hz
Note 1: At 24 VDC, equates to R < 8.57 KΩ (where R = total loop resistance) Note 2: At 24 VDC, equates to 26.7 KΩ > R > 10 KΩ	

Detail Specifications – Digital Output

Parameter	Specification
Output Channels	32 Maximum per module (with or without open wire detect) [4]
Output Type	Solid state source, short circuit proof [3]
Load Current Off Load Current On	0mA 1mA Minimum to 0.5A Maximum per channel [2] 9 A Maximum per module [1]
On-State Voltage	24 V (typ), load current @ 0.5A
Off-State Voltage	0v VDC (max)
Off-State Leak Current	< 0.1 mA
Gap (0 current) of Output to Field on Switchover	None (0ms) (applies to Redundancy only)

Note 1: Dependent on actual channel configuration for the module and the environment. Please refer to the User's Guide for calculation method.

Note 2: A Universal IO Channel configured for Digital Output can incorrectly report a Line Monitoring or "OP Fail" failure if the load current is less than 20mA.

Note 3: Short circuit will be limited to less than 1.4 Amps within 2 microseconds, and to 750 mA within 10 microseconds. If the short period persists more than 10 mili seconds, the DO channel will be shutoff

Note 4: Please refer to the User's Guide for calculation method to determine channel usage versus operating temperature.

5.20. Universal Input Output – CC-PUIO31

Function

The Universal Input Output module interfaces with analog input, analog output, digital input, and digital output field devices.

Notable Features

- Each channel user configurable as:
  - Analog Input
  - Analog Output
  - Digital Input
    - DISOE - Sequence of Events (1ms resolution SOE, 20ms PV scan)
  - Digital Output
  - Pulse Input (any four channels)
- Open Wire Detection
- Electronic short circuit protection[1]
- Fast Scan (Priority I/O Module Scan)
- Safe-state (FAILOPT) behaviors configurable on a per channel basis for Digital / Analog Output
- HART 7 support (Analog I/O)
- HART Modem per Channel for Fast Performance
- Extended Temperature Range -40 to +70°C module ambient

Model Specifications

Parameter	Specification		
Universal Process IO Module	**CC-PUIO31**		
IOTA Model Numbers	**CC-TUIO31**	Non Redundant	9”
	CC-TUIO41	Redundant	12”
Note 1: Each signal can be shorted in the field with no damage to the IOM or IOTA. Other channels on the same IOM will not be affected. AI, AO and DI channels are further protected and certified to support energy limited / nonincendive field wiring connections to Zone 2 / Division 2 hazardous locations.			

Detail Specifications – Analog Input

Parameter	Specification
Input type	Current (2, 3, or 4 wire devices)
Input Channels	32 Maximum per module (with or without open wire detect)
A/D Converter Resolution	16 bit
Input Range	0-20 mA or 4-20 mA
Normal Mode Rejection Ratio	18 dB at 50 Hz, 20 dB at 60 Hz
Input Filter Response	Single pole, -3dB @ 6 Hz
Crosstalk, dc to 60 Hz (channel-to-channel)	60 dB
Input Impedance	250 Ω
Input Voltage Range (any input referenced to common, no damage)	+33 VDC to -1 VDC (1)
Input Scan Rate	10 ms
Hardware accuracy	0.1% of full-scale (23.5 ± 2°C) 0.175% of full-scale (0 to +70°C) 0.25% of full-scale (-40 to +70°C)
Short Circuit Current Limit	25 mA
Note 1: Return terminal is connected directly to Common (Ground)	

Detail Specifications – Pulse Input

Parameter	Specification
Channels	Any 4 channels
Frequency	0-15 kHz
Minimum Pulse Width	25 µs
Duty Cycle	Any Duty Cycle that meets the Minimum Pulse Width specification

Detail Specifications – Analog Output with HART[1]

Parameter	Specification
Output Type	4-20 mA
Output Channels	32 Maximum per module [2]
Output Temperature Drift	0.007% of Full Scale/°C
Output Readback Diagnostic	± 4% of Full Scale
Output Current Linearity	± 0.05% of Full Scale (nominal)
Resolution	12 bit
Calibrated Accuracy	< 0.35% of Full Scale (25ºC) including linearity
Directly Settable Output Current Range	0 mA, 2.9 mA to 21.1 mA
Maximum Resistive Load (24 V supply)	825 ohms @ 20 mA
Maximum Output Compliant Voltage (24 V supply)	16.5 VDC @ 20 mA
Open Circuit Voltage	Supply Voltage (26 VDC maximum)
Response Time, DAC input code to output (within 3% of final value)	80 ms in HART mode 0.25 ms in non-HART mode
Gap (0 mA) of Output to Field on Switchover	0 ms (both partners continuously active)

Note 1: If an AO channel's configuration is changed from non-HART to HART, and the analog OP remains energized, there will be a disturbance of the output of no more than 65ms while the channel is reloaded. Changing an AO channel from HART to non-HART will not produce any OP disturbance.

Note 2: Please refer to the User's Guide for calculation method to determine channel usage versus operating temperature.

Detail Specifications – Digital Input with OWD[1]

Parameter	Specification
Open Circuit Voltage	Supply Voltage (26 VDC maximum)
Closed contact current	7 mA (maximum)
Closed contact detection	3.1 mA < I < 7 mA
Open contact detection	0.9 mA < I < 2.0 mA
Open wire detect	I < 0.9 mA
Digital Input Resolution for Sequence of Events (SOE)	1ms (any /all Channels)
Note 1 Please refer to the User's Guide for appropriate field resistor configuration for OWD function.	

Detail Specifications – Digital Input without OWD

Parameter	Specification
Open Circuit Voltage	Supply Voltage (26 VDC maximum)
Closed contact current	7 mA (maximum)
Closed contact detection	I > 3.2 mA
Open contact detection	I < 2.0 mA
Digital Input Resolution for Sequence of Events (SOE)	1ms (any /all Channels)

Detail Specifications – Digital Output

Parameter	Specification
Output Channels	32 Maximum per module [2] (with or without open wire detect)
Output Type	Solid state source, short circuit protected [3]
Load Current Off Load Current On	< 0.1 mA 1 mA Minimum to 0.5 A Maximum per channel 9 A Maximum per module [1]
On-State Voltage	24 V (typ), load current @ 0.5 A
Off-State Leak Current	0 V
Off-State Leak Current	< 0.1 mA
Gap (0 current) of Output to Field on Switchover	0 ms

Note 1: Dependent on actual channel configuration for the module and the environment. Please refer to the User's Guide for calculation method.

Note 2: Please refer to the User's Guide for calculation method to determine channel usage versus operating temperature.

Note 3: Short circuit will be limited to less than 1.4 Amps within 2 microseconds, and to 750 mA within 10 microseconds. If the short period persists more than 10 mili seconds, the DO channel will be shutoff

6. Function Matrix

The following tables assist in selecting I/O Modules and IOTAs with similar functional characteristics

AI Function Matrix

Series-C IO			Function							
IOM	NR IOTA	Red IOTA	AI 4-20ma	HART Conf / Status	HART on CTL	HART Fast Ctl	AI 0-5V 1-5V	Int. IS	NR IOTA Size	Differential Inputs
CC-PAIH01 CC-PAIH02	CC-TAIX01	CC-TAIX11	♦	♦	♦	♦	♦		6"	13 - 16
CC-PAIH02	CC-TAID01	CC-TAID11	♦	♦	♦	♦	♦		9"	1 - 16
CC-PAIH01 CC-PAIH02	CC-GAIX21	CC-GAIX11	♦	♦	♦			♦	6"	NA
CC-PAIH51	CC-TAIX51	CC-TAIX61	♦	♦					6"	NA
CC-PAIX01 CC-PAIX02	CC-GAIX21	CC-GAIX11	♦			♦	♦	♦	6"	NA
CC-PAIX01 CC-PAIX02	CC-TAIX01	CC-TAIX11	♦			♦	♦		6"	13 - 16
CC-PAIX02	CC-TAID01	CC-TAID11	♦			♦	♦		9"	1 - 16
CC-PAIN01	CC-TAIN01	CC-TAIN11	♦						6"	None
CC-PUIO31	CC-TUIO31	CC-TUIO41	♦	♦	♦				9”	None

AO Function Matrix

Series-C IO				Function						
IOM	NR IOTA	Red IOTA	AO 4-20ma	HART Conf / Status	HART on CTL	HART Fast CTL	Output Vali-dation	Open Wire Det.	NR IOTA Size	Int IS
CC-PAOH01	CC-TAOX01	CC-TAOX11	♦	♦	♦		♦	♦	6"	
CC-PAOH01	CC-GAOX21	CC-GAOX11	♦	♦	♦		♦	♦	9"	♦
CC-PAOH51	CC-TAOX51	CC-TAOX61	♦	♦				♦	6"	
CC-PAOX01	CC-TAOX01	CC-TAOX11	♦				♦	♦	6"	
CC-PAOX01	CC-GAOX21	CC-GAOX11	♦				♦	♦	9"	♦
CC-PAON01	CC-TAON01	CC-TAON11	♦				♦	♦	6"	
CC-PUIO31	CC-TUIO31	CC-TUIO41	♦	♦	♦	♦	♦	♦	9”	

DI Function Matrix

			Function						
IOM	NR IOTA	Red IOTA	24V	HV	SOE	Fast Scan	Open Wire	Isolation	IS
CC-PDIL01	CC-TDIL01	CC-TDIL11	♦			♦	♦	1500V	
CC-PDIL51	CC-TDIL51	CC-TDIL61	♦			♦		1000V	
CC-PDIS01	CC-TDIL01	CC-TDIL11	♦		♦	♦	♦	1500V	
CC-PDIL01	CC-GDIL21	CC-GDIL11	♦			♦	♦	Inf.	♦
CC-PDIH01	CC-TDI110	CC-TDI120		110V			♦	1500V	
CC-PDIH01	CC-TDI220	CC-TDI230		220V			♦	1500V	
CC-PUIO31	CC-TUIO31	CC-TUIO41	♦		♦	♦	♦	None	

DO Function Matrix

				Function					
IOM	**NR IOTA**	**Red IOTA**	**Support IOTA**	**Open Wire Det**	**Short Prot.**	**Output Type**	**Out. I**	**Isolation**	**IS**
CC-PDOB01	CC-TDOB01	CC-TDOB11		♦	♦	Source	0.5A	1500V	
CC-PDOB01	CC-TDOR01	CC-TDOR11	CC-SDOR01	♦		Dry Contact	3A	Inf.	
CC-PDOB01	----	CC-GDOL11	CC-SDXX01	♦	♦	Source	48ma	Inf.	♦
CC-PDOD51	CC-TDOD51	CC-TDOD61		♦	♦	Sink	0.1A	1000V	
CC-PUIO31	CC-TUIO31	CC-TUIO41	♦	♦	♦	Source	0.5A	None	

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