Honeywell

Technical Information

Experion Series-C I/O Specification

EP03-490-520

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Dec 2021, Version 1.5

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

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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.	

5.16. 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

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	