

1. Introduction

1.1. Overview

This document provides technical information to configure the Experion® Series 8 I/O and the C300 Controller.

1.2. Scope

The following Series 8 hardware items are included in this document.

- Series 8 C300 Controller
- Analog Input with HART – Differential
- Analog Input with HART – Single Ended
- Analog Input – Single Ended
- Low Level Analog (Temperature) Input LLAI
- Analog Output with HART
- Analog Output
- Digital Input, 24 VDC
- Digital Input Sequence of Events (SOE)
- Digital Input Pulse Accumulation
- Digital Output, 24 VDC
- DO Relay Extension Board

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. Platform Environmental Specifications

2.1. General Environmental Characteristics

This section relates to the physical characteristics applicable to Series 8 C300 controller and all Series 8 I/O components. Where applicable, specifications state limits within an approved cabinet and to the cabinet skin.

Consideration	Operating Limit ¹	Transportation and Storage Limits ^{1a}
Ambient Temp Range	External: 0 to 50°C ² Internal : 0 to 60°C ³	-40 to 85°C
Temp. Rate of Change	<= 1°C/min	<=5°C/min
Relative Humidity ³	5 to 95% (non-condensing) ⁴	5 to 95% (non-condensing) ⁴
Barometric Pressure Altitude	-300 to +3000 m	Any
Corrosives	G3 Standard (ISA S71.04) - Denoted by "8C-" model number in this doc	G3 Standard (ISA S71.04) - Denoted by "8C-" model number in this doc
Vibration (3 axes)	Sinusoidal (5 to 10 Hz) 2.54mm/0.100in Max (10 to 150 Hz) 0.5 g max. (0-Pk)	Random Vertical Shipping Axis 5 to 300 Hz 1.07 g (rms) Longitudinal and Transverse 10 to 500 Hz, 0.74 g (rms) 60 Minutes each axis
Mechanical Shock (3 Axes)	Site Induced: Terminal Peak Sawtooth waveform 4g max. @25ms	N/A

Note 1 – Operating Limits define the range of operating conditions within which the system is designed to operate. Performance characteristics are defined when operating in this state. Please see ANSA/ISA D 51.1 Process Instrumentation Terminology for more information.

Note 1a – Transportation and Storage Limits define the range of conditions to which the system may be subjected without permanent damage to the equipment. Performance is not guaranteed in this state. Please see ANSA/ISA D 51.1 Process Instrumentation Terminology for more information.

Note 2 – This rating applies to the external ambient temperature of the Standard 2000mm enclosure with doors closed.

Note 3 – This rating applies to the internal ambient temperature of the Standard 2000mm enclosure with the doors closed. New version of the C300 controller(8C-PCNT05) and Memory Backup Assembly module (50182539-001) support an extended temperature range from 0°C to 70°C.

Note 4 – The maximum relative humidity spec applies up to 40°C. Above 40°C the RH spec is de-rated to 55% to maintain constant moisture content.

A note on the transportation of Batteries:

Some Government agencies have regulations that may prohibit air transport of Lithium Batteries.

4. Series 8 I/O Hardware

4.1. Overview and Features

Series 8 features an innovative design that supports enhanced heat management. This unique look provides a significant reduction in overall size for the equivalent function.

Both Series 8 IOM and IOTA are available with Conformal Coated feature. The term 'Coated' stands for hardware with conformal coating material applied to electronic circuitry for protection against moisture, dust, chemicals, and temperature extremes. Coated IOM and IOTA are recommended when electronics must withstand harsh environments and need to have added protection.

The unique features of the Series 8 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 can be 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 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 8 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 through cables from header board



4.2. 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 Single ended and Differential type 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.
- **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
- **Digital Input Sequence of Events (32pt)** – Accepts 24VDC discrete signals as discrete inputs. The inputs can be time tagged to support 1ms resolution Sequence of Events.
- **Digital Input Pulse Accumulation (32pt)** – Accepts 24VDC discrete signals as discrete inputs. The first 16 channels can be configured as Pulse accumulation to support Pulse Accumulation and frequency measurement on per channel basis. Channels 17 – 32 can be configured as DI.
- **Digital Output 24 VDC (32pt)** – Current sinking digital outputs. Outputs are electronically short-circuit protected.
- **DO Relay Extension Board (32pt)** – Digital output with NO or NC dry contacts. It can be used for low power or high power applications.
- **Low Level Analog Input – RTD & TC (16pt)** – Provides thermocouple (TC) and resistance temperature device (RTD) inputs.

4.3. Series 8 I/O Sizing

In virtually all configurations, the C300 controller and Series 8 I/O provides useful, maintainable process equipment connections in a smaller footprint than existing competitors and Honeywell equivalent products. Installing Series 8 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.

4.3.1. Series 8 Field connections

Series 8 Field connections use a standard modular connector. The connector modularity allows for removal and insertion of the field wiring. This significantly reduces installation and maintenance procedures and can assist in field check out. Series 8 field connectors accept up to 12 AWG / 2.5 mm² stranded wire.

4.3.2. I/O Module Sizes

IOTA Sizing is nominal (6in = 152mm, 9in =228mm, 12in =304mm). I/O modules are associated with their respective IOTAs in the table below. The I/O Module is supported by one or more IOTAs. Below section also provides an overview of various available IO modules, IOTA, IOTA size and redundancy features.

I/O Module (Coated)	IOTA (Coated)	Description	Circuits	Size (in “)	Red.
8C-PAIH54		High-level AI HART, Differential	16		✓
	8C-TAIDA1	AI IOTA		9	
	8C-TAIDB1	AI IOTA Redundant		12	✓
8C-PAIHA1		High-level AI HART, Single-ended	16		✓
8C-PAINA1		High-level AI w/o HART, Single-ended	16		✓
8C-TAIXA1		AI IOTA	6		
8C-TAIXB1		AI IOTA Redundant	12	✓	
8C-PAIMA1		Low-level AI – RTD & TC	16		
	8C-TAIMA1	Low-level AI IOTA		9	
8C-PAOHA1		Analog Output HART	16		✓
8C-PAONA1		Analog Output w/o HART	16		✓
8C-TAOXA1		AO IOTA	6		
8C-TAOXB1		AO IOTA Redundant	12	✓	
8C-PDILA1		Digital Input 24V	32		✓
8C-PDISA1		Digital Input Sequence of Events	32		✓
8C-PDIPA1		Digital Input 24V Pulse Accumulation	32		✓
8C-TDILA1		DI 24V IOTA	9		
8C-TDILB1		DI 24V IOTA Redundant	12	✓	
8C-PDODA1		DO 24V Bussed Out	32		✓
	8C-TDODA1	DO 24V Bussed IOTA		9	
	8C-TDODB1	DO 24V Bussed IOTA Redundant		12	✓
	8C-SDOX01	DO Relay Extension ¹		15	✓

Note 1- DO Relay Extension board is used along with DO IO module with IOTA (Redundant or non-redundant). Refer Section [4.4.11](#) for more details.

4.4.5. Analog Output with HART

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 devices
- Safe-state (FAILOPT) behaviors configurable on a per channel basis

Safe-state Behavior (FAILOPT)

Series 8 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 8 IO function can detect and annunciate open field wire with a Channel Soft Failure indication.

Detailed Specification- Analog Output with HART (8C-PAOHA1)

Parameter	Specification		
Input / Output Module	8C-PAOHA1 - Analog Output with HART, Coated		
IOTA Modules	8C-TAOXA1	Non-Redundant, Coated	6"
	8C-TAOXB1	Redundant, Coated	12"
Output Type	4-20 mA		
Output Channels	16		
Output Ripple	< 100 mV peak-to-peak at power line freq, across 250 Ω load		
Output Temperature Drift	0.005% of Full Scale/ $^{\circ}$ C		
Output Current Linearity	\pm 0.05% of Full Scale nominal		
Load Resistance (24 V supply = 22 VDC through 28 VDC)	50-800 Ω		
Voltage Rating	24 VDC		
Module current rating	205 mA		
Resolution	\pm 0.05% of Full Scale		
Calibrated Accuracy	\pm 0.2% of Full Scale (25 $^{\circ}$ C) including linearity		
Directly Settable Output Current Range	2.9 mA to 21.1 mA		
Maximum Output Compliant Voltage (24 V supply = 22 VDC through 28 VDC)	16 V		

4.4.6. Analog Output

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

Safe-state Behavior (FAILOPT)

Series 8 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 8 IO function can detect and annunciate open field wire with a Channel Soft Failure indication.

Detailed Specification- Analog Output (8C-PAONA1)

Parameter	Specification		
Input / Output Module	8C-PAONA1 - Analog Output, Coated		
IOTA Modules	8C-TAOXA1	Non-Redundant, Coated	6"
	8C-TAOXB1	Redundant, Coated	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/ $^{\circ}$ C		
Output Current Linearity	\pm 0.05% of Full Scale nominal		
Load Resistance (24 V supply = 22 VDC through 28 VDC)	50-800 Ω		
Voltage Rating	24 VDC		
Module current rating	190 mA		
Resolution	\pm 0.05% of Full Scale		
Calibrated Accuracy	\pm 0.2% of Full Scale (25 $^{\circ}$ C) including linearity		
Directly Settable Output Current Range	2.9 mA to 21.1 mA		
Maximum Output Compliant Voltage (24 V supply = 22 VDC through 28 VDC)	16 V		

4.5. Series 8 IO Function Matrix

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

AI Function Matrix

IOM	NR IOTA	Red IOTA	Function	
			AI 4-20 mA	HART
8C-PAIHA1	8C-TAIXA1	8C-TAIXB1	◆	◆
8C-PAINA1	8C-TAIXA1	8C-TAIXB1	◆	
8C-PAIH54	8C-TAIDA1	8C-TAIDB1	◆	◆

TC/RTD Function Matrix

IOM	NR IOTA	Red IOTA	Function	
			TC	RTD
8C-PAIMA1	8C-TAIMA1	NA	◆	◆

AO Function Matrix

IOM	NR IOTA	Red IOTA	Function	
			AIO 4-20 mA	HART
8C-PAOHA1	8C-TAOXA1	8C-TAOXB1	◆	◆
8C-PAONA1	8C-TAOXA1	8C-TAOXB1	◆	

DI Function Matrix

IOM	NR IOTA	Red IOTA	Function		
			DI	SOE	PA
8C-PDILA1	8C-TDILA1	8C-TDILB1	◆		
8C-PDISA1	8C-TDILA1	8C-TDILB1		◆	
8C-PDIPA1	8C-TDILA1	8C-TDILB1			◆

DO Function Matrix

IOM	NR IOTA	Red IOTA	Relay Extension	Source
8C-PDODA1	8C-TDODA1	8C-TDODB1	8C-SDOX01	◆