Honeywell

Technical Information

Series 8 Controller and I/O Specification

S803-150-520

Release 520

March 2022, Version 1.0

Revision History

Revision	Date	Description
1.0	March 2022	Release version for Experion R520

Table of Contents

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.

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.

2.2. Approval Bodies

Approval Body	Certification Category	Description
Factory Manual	Division 2 Approvals	All models are approved as non-incendive for use in Class I, Division 2, Group A, B, C, D hazardous (classified) locations.
	Zone 2 Approvals	All models are approved as normally non-sparking apparatus for use in Class I, Zone 2, AEx nA IIC hazardous (classified) locations. Temperature rating of all individual models as well as cabinet configurations is rated T4.
Canadian Standards Association (CSA)	Division 2 Certifications	All models are certified as suitable for use in Class I, Division 2, Group A, B, C, D hazardous locations.
	Zone 2 Certifications	All models are certified as normally non-sparking apparatus, Ex nA IIC, for use in Zone 2 hazardous locations. Temperature rating of all individual models as well as cabinet configurations is not to exceed T4.
ATEX	Zone 2 Certifications	All models are certified as normally non-sparking apparatus, II 3G Ex nA IIC T4 GC, for use in Zone 2 hazardous locations. Temperature rating of all individual models as well as cabinet configurations are rated T4.
IECEx	Zone 2 Certifications	All models are certified as normally non-sparking apparatus, Ex nA IIC T4 GC, for use in Zone 2 hazardous locations. Temperature rating of all individual models as well as cabinet configurations are rated T4.
European Compliance (CE)	EMC, LVD	• European EMC Directive 2014/30/EU • EN 61326-1 2013 Electrical equipment for measurement, control and laboratory use - EMC requirements. • European LVD Directive 2014/35/EU • IEC/EN 61010-1:2010 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use. Part 1: General Requirements
Others		C-Tick

2.3. Detailed Specification- Approvals

Consideration	Approval
Agency Approvals	**Cabinet:** Class I, Division 2, Grp. ABCD, T4 Class I, Zone 2, AEx/Ex nA IIC T4 GC ATEX II 3G Ex nA IIC T4 GC IECEx Ex nA IIC T4 GC

Item	Specification		
CE Conformity	This product is in conformity with the protection requirements of the following European Council Directives: 2014/35/EU, the Low Voltage Directive, and 2014/30/EU, the EMC Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.		
	LVD Directive:		
	Title	Number	Issue date
	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements	EN 61010-1	2010
	EMC directive:		
	Title	Number	Issue date
	Electrical equipment for measurement, control and laboratory use - EMC requirements -- Part 1: General requirements	EN 61326-1	2006
	Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement	CISPR 11:2009+A1	2010
	Electromagnetic compatibility (EMC) – Part 3-2: Limits –Limits for harmonic current emissions (equipment input current ≤ 16A per phase)	IEC 61000-3-2	2009
	Electromagnetic compatibility (EMC) – Part 3-3: Limits –Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection	IEC 61000-3-3	2005
	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	IEC 61000-4-2	2008
	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test	IEC 61000-4-3:2006 +A1:2007 +A2	2010
	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test	IEC 61000-4-4	2004
	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test	IEC 61000-4-5	2005
	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	IEC61000-4-6	2008

	Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test	IEC61000-4-8	2009
	Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests	IEC61000-4-11	2004
FM[1]	Electrical Equipment for Use in Hazardous (Classified) Locations, General Requirements	FM 3600	2011
	Non-incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Division 1 and 2, Hazardous (Classified) Locations	FM 3611	2004
	Electrical and Electronic Test, Measuring and Process Control Equipment	FM 3810	2005
	Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements	ANSI/ISA-60079-0	2013
	Explosive atmospheres Part 15: Equipment protected by type of protection “n”	ANSI/ISA-60079-15	2012
CSA[1]	Non-incendive Electrical Equipment for use in Hazardous Locations	CAN/CSA C22.2 No. 213 – M1987	1987 (2013)
	Electrical and Electronic Test, Measuring and Process Control Equipment	CAN/CSA-C22.2 No. 61010-1-12	2004
	Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements	CAN/CSA E60079-0	2011
	Explosive atmospheres Part 15: Equipment protected by type of protection “n”	CAN/CSA E60079-15	2012
ATEX[1]	Non-incendive Electrical Equipment for use in Hazardous Locations	CAN C22.2 No. 213 - M1987	1987 (2013)
	Electrical and Electronic Test, Measuring and Process Control Equipment	C22.2 No. 1010.1	2004
	Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements	CAN/CSA E60079-0	2011
	Explosive atmospheres Part 15: Equipment protected by type of protection “n”	CAN/CSA E60079-15	2012
IECEX[1]	Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements	IEC 60079-0	2011
	Explosive atmospheres Part 15: Equipment protected by type of protection “n”	IEC60079-15	2010

Note 1:

- The installer shall provide transient over-voltage protection external to the apparatus such that the voltage at the supply terminal of the apparatus does not exceed 140% of the voltage rating of the equipment.
- The equipment shall be mounted in an enclosure providing a minimum degree of protection of IP54 in accordance with IEC 60079-15, and in a tool-secured enclosure which meets the requirements of IEC 60079-0 and IEC 60079-15.
- The equipment shall be used in an area not more than Pollution Degree 2 as defined in IEC 60664-1.

3. C300 Controller

3.1. Overview

The Experion Series 8 C300 controller forms the heart of the Experion control system and deterministically executes control strategies, batch operations, interfaces to local and remote I/O and directly hosts custom programmable applications. The compact controller design does not require any additional Interface / communication modules and all control execution and communications are contained in the controller module.

The C300 controller runs the filed proven, deterministic Control Execution Environment (CEE) which is the core C300 software that provides powerful and robust control for the distributed control system (DCS). The control strategies are configured and loaded to the C300 controller through the Control Builder, an easy and intuitive engineering tool.

The C300 Controller is constructed using the Series 8 form factor that employs an Input Output Termination Assembly (IOTA) and an electronics module which mounts and connects to the IOTA. One C300 Controller module and its IOTA contains all of the control and communication functionalities. The C300 IOTA contains only passive devices such as FTE address switches, FTE cable connectors and I/O Link cable connectors. Figure 1 below depicts the IOTA components.

The C300 Controller may operate in both non-redundant and redundant configurations. Redundant operation require a second identical controller with its own IOTA and connecting redundancy cable. The C300 Controller supports Series 8 I/O modules. Two IO Link interfaces, which are redundant, provide connection between the C300 controller and associated I/O modules. The IO Link interface connectors are on the C300 IOTA.

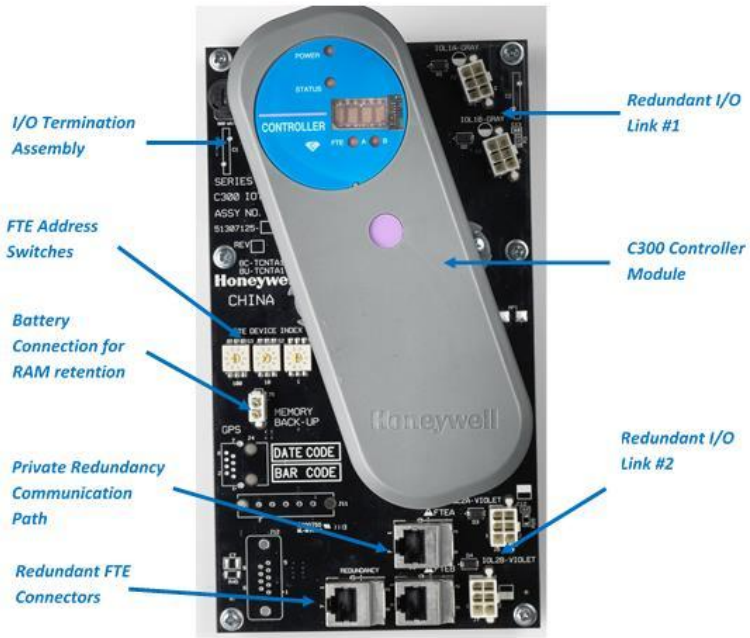

Figure 1 - C300 Controller

3.2. Model Numbers

The Model Numbers of C300 controller are shown as below:

Model Number	Description
8C-PCNT03	Series 8 C300 Controller, Coated [1,3,4]
8C-TCNTA1	Series 8 C300 Controller I/O Termination Assembly(IOTA), Coated [1]
51305980-836	Cable, Redundant C300 Controller [2]

Note 1 – Conformal coating applied on the module and the IOTA

Note 2 – Redundancy is implemented with two modules/IOTAs and a redundancy cable (51305980-836)

Note 3 – Optional rechargeable battery pack for C300 Memory Backup is available, details are provided in section 5.4

Note 4 – 8C-PCNT02 part number is replaced by 8C-PCNT03. The new controller (8C-PCNT03) is compatible with all current and previous PC/LX releases.

3.3. C300 Controller Specifications

3.3.1. C300 Control Execution Environment (CEE)

The C300 CEE provides an execution and scheduling environment in which Control Modules (CMs) and Sequential Control Modules (SCMs) execute user-configured control strategies. The CEE also support peer to peer communications with other C300 controllers and communication modules like Foundation Fieldbus and Profibus. The C300 CEE is configured using the Control Builder Engineering environment. The Control builder provides a graphical engineering environment where engineers can configure the Experion system and create control strategies by using the various function blocks available in the Library. The C300 CEE based control strategies can be configured with minimum execution rates of 50 msec.

3.3.2. C300 Hardware Specifications

Specifications	Limit
Power requirement	24 V (provided through cables by the Series 8 power system)
IOTA Dimension	220 mm (9 “) height, 120 mm (4,75 “) width
Program Memory	16MB
Processor	PowerPC 8270, 400 MHz, 32-bit
Features	
Module Removal and Insertion Under Power	Supported
Conformal Coated	Yes, G3 level of Harsh Environment (ANSI/ISAS71.04-1985 corrosion standard)
Redundancy	IOTA based design, no single point of failure for IOM, Termination, and Communication links (Downlink and Uplink)
RAM Retention	50 hour through rechargeable battery backup pack (Optional)

Programing Language	Function Block Design (FBD) via Experion Control Builder
Supported I/Os and Uplink Communication	
Supported I/O type	Series 8
Supported I/O Links	2 I/O Links, each I/O Link configurable for Series 8 I/Os
Supported I/O Link Speed	750 kbps
Supported number of I/O Modules per Controller	80 I/O Units (Redundant or Non-Redundant IOMs)
Supported number of I/O Modules per I/O Link	40 I/O Units (Redundant or Non-Redundant IOMs)
Maximum number of I/Os per Controller	2560 [1]
Number of Uplink (FTE) Connection	Dual uplink FTE ports, 100Mbps speed
Control Capacity	
Execution Units	5500 Execution Units (single or redundant)
Tagged Objects	4095 objects
Memory Units	16000 Memory Units
Execution Period	50 msec – 2000 msec (adjustable per control strategy, configurable)
Controller Communication	
CEE-based Platforms	Native peer to peer with other Series 8 C300s, C200 and ControlEdge UOC controllers [2]
Supervisory Control Network	Fault Tolerant Ethernet (FTE)
Third party devices	Modbus Master
Modbus TCP devices	PCDI function block
Modbus RTU or ASCII	Via Modbus TCP/IP conversion gateway
Ethernet/IP	Native peer to peer
Foundation Fieldbus	Via Fieldbus Interface Module (FIM) gateway
Profibus DP	Via Profibus Gateway Module (PGM)
Optional C300 Memory Backup	
51454475-100	Series 8 C300 RAM Charger Module
51202330-300	Cable, Battery RAM charger, 30 in
51202330-200	Cable, Battery RAM charger, 84 in

Note 1 – When using full capacity with 32 channel digital IO module
Note 2 – C200 and ControlEdge UOC support available from Experion LX/PlantCruise R510 and onwards.

3.3.3. C300 Supported Function Blocks

Function Block
General Purpose (Utility)
Alarm Window
Annpanel
Dig Acq
EXECTIMER
First Out
Flag
Flag Array
Operator Message
Numeric
Numeric Array
Push
Text Array
Timer
Type Convert
PV Algorithms (Auxiliary)
PV Calculator
Summer
Counter
Dead Time
Enhanced PV Calculator
Enhanced General Linearization
Flow Compensation

Function Block
General Linearlization
Lead / Lag
Rate of Change
Signal Selector
Totalizer
PV Handling
Data Acquisition
Regulatory Control
Auto Manual
Regulatory Calculator
Enhanced Regulatory Calculator
Fan Out (1 input / up to 8 outputs)
Override Selector (4 inputs)
PID (Proportional, Integral, Derivative)
PID with External Reset
PID with Feed Forward
Profit Loop
Positional Proportional
Pulse Count
Pulse Length

Function Block
Ramp / Soak
Ratio Bias
Ratio Control
Remote Cascade Support
Switch (8 input single pole)
Device Control
Device Control (multi input, multi output, multi state)
Custom Block Types
Custom Data Block
Custom Algorithm Block
Math
Absolute Value
Addition
Divide
Exponent
LN
LOG
Modulo
Multiply
Negate
Power
Rolling Average

Function Block
Round
Square Root
Subtract
Truncate
Discrete Logic
2oo3 (2 out of 3 voting)
AND
CHECKBAD
CHECKBOOL
CHGEXEC
CONTACTMON
DELAY
EQ (Compare Equal)
FTRIG (Falling Edge Trigger)
GE (Compare Greater than or Equal)
GT (Compare Greater Than)
LE (Compare Less than or Equal)
LIMIT
LT
MAX
MAXPULSE
MIN
MINPULSE

Function Block
MUX
MUXREAL
MVOTE
NAND
NE
nOON
NOR
NOT
OFFDELAY
ONDELAY
OR
PULSE
QOR
ROL

Function Block
ROR
RS
RTRIG
SEL
SELREAL
SHL
SHR
SR
STARTSIGNAL
TRIG
WATCHDOG
XOR
Power Related
GRPCAPRBK

Function Block
HTMOTOR
LEVELCOMP
LTMOTOR
MAINIBV
SOLENOID
VALVEDAMPER
Sequential Control Functions
Step
Transition
Synchronize
Handler
Phase

Function Block
Container Block Types
Control Module
Sequential Control Module
Recipe Control Module
Unit Control Module
IO Related
Series 8 I/O
PCDI
Profibus Interface
VCONE