طرح نگهداشت و افزایش تولید ۲۷ مخزن

Functional Design Specification-DCS/ESD Hardware

نگهداشت و افزایش تولید میدان نفتی بینک

V00	Mar. 2025	IFA	IGK	M.Fakharian	S.Faramarzpour	
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PAGE	V00	V01	V02	V03	V04
1	X				
2	X				
3	X				
4	X				
5	X				
6	X				
7	X				
8	X				
9	X				
10	X				
11	X				
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51	X				
52	X				
53	X				
54	X				
55	X				
56	X				
57	X				
58	X				
59	X				
60	X				

PAGE	V00	V01	V02	V03	V04
61	X				
62	X				
63	X				
64	X				
65	X				
66	X				
67	X				
68	X				
69	X				
70	X				
71	X				
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114	X				
115	X				
116	X				
117	X				
118	X				
119	X				
120	X				

PAGE	X	V01	V02	V03	V04
121	X				
122	X				
123	X				
124	X				
125	X				
126	X				
127	X				
128	X				
129	X				
130	X				
131	X				
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166					
167					
168					
169					
170					
171					
172					
173					
174					
175					
176					
177					
178					
179					
180					

PAGE	V00	V01	V02	V03	V04
181					
182					
183					
184					
185					
186					
187					
188					
189					
190					
191					
192					
193					
194					
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226					
227					
228					
229					
230					
231					
232					
233					
234					
235					
236					
237					
238					
239					
240					

TABLE OF CONTENTS

1.0 PROPRIETARY STATEMENT

1.1 DEFINITIONS

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	DCS and ESD Control System of Binak Gas Booster Station
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR/PURCAHSER:	Joint Venture of: Hirgan Energy – Design &
Inspection Companies (HE/DI)	
VENDOR:	IDEH GLOBAL KISH (IGK)
EXECUTOR:	Executor is the party which carries out all or part of Construction and/or commissioning for the project.
TPI:	Third-Party Inspector
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
MAY:	Is used where a provision is completely discretionary.

1.2 Purpose

This document defines the minimum requirements for the design, manufacture and test of Distributed Control System (DCS) and Emergency shut down (ESD) for the Binak Gas Booster Station.

All DCS systems and components, as far as mechanical and electrical characteristics and performances are concerned, shall conform to the present general specification and to the specifications issued for each system

and/or components. Any deviation from the present specification at any stage of the project shall be subject to CONTRACTOR and CLIENT approval.

1.3 Project Scope

The project scope encompasses system design and testing of the complete Integrated Process Control System (DCS) to monitor and control the plant and interface to a number of third party packages. IGK will be supplied with standard Honeywell hardware packages for system configuration. Include, operator stations, desks & chairs, large screens, engineering station, network cabinet that will be supplied by IGK as per contract accordingly.

Abbreviations

DCS	Distribution Control System
I/O	Input / Output
PKS	Process Knowledge System
FTE	Fault Tolerance Ethernet
UPS	Un-interruptible Power Supply
VDC	Volts Direct Current
IOTA	Input/output Termination Assemblies
EWS	Engineering Work station
OWS	Operator Work station
AI	Analog Input
AO	Analog Output
CM	Control Module
DI	Digital Input
DO	Digital Output
FB	Function Block
PV	Process Value
CCR	Central Control Room
SCADA	Supervisory Control and Data Acquisition
OPC	OLE for Process Control
HART	Highway Addressable Remote Transducer
IOM	Input Output Module
DSA	Distributed System Architecture
PCR	Process Control Room
CFCR	Common Facility Units Control Room

UCR	Utility Control Room
SIL	Safety Integrity level
SLS	Smart Logic Solver
IS	Intrinsic Safety
AMS	Asset Management System Station
FDM	Field Device Management

2.0 STANDARDS AND REFERENCE DOCUMENTS

2.1 Customer Reference Documents

This document is complemented by the following documents:

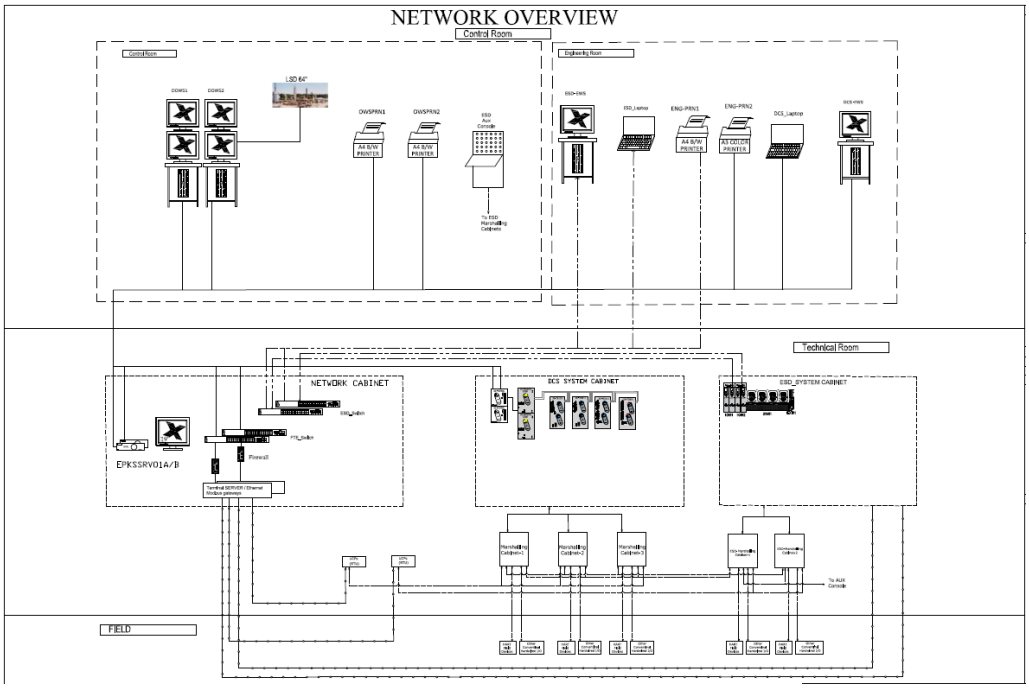
Item	Document Title	DCS Document Ref. No
1	Specification For ESD	BK-GNRAL-PEDCO-000-INSP-0003
2	Specification For Instrument/F&G Cables	BK-GNRAL-PEDCO-000-INSP-0010
3	Specification For Control System	BK-GNRAL-PEDCO-000-INSP-0002
4	Instrument & Control System Design Criteria	BK-GCS-PEDCO-120-IN-DC-0002
5	Instrument Earthing Typical Diagram	BK-GCS-PEDCO-120-IN-DG-0001

3.0 HARDWARE CONFIGURATION

The Experion System is located in control building. These systems are configured using the following standard hardware and software to meet the specific operational requirements.

The machine interface for the maintenance and diagnostics of the PKS system will be achieved by PKS servers and engineer stations in this project. One pairs of PKS servers , engineering and operation stations workstations , are provided in the control room and engineering room.

3.1 System Architecture



For Binak Gas Booster Station project the DCS system will be based on Honeywell Experion PKS. The DCS will be organized based on 1 pairs of redundant EPKS Servers. The safety systems for ESD will be built using DeltaV SIS process safety system Controllers.

The DCS equipment will be installed in the following locations throughout the plant:

- Control Room included:
  - Engineering Room
  - Technical Room

3.2 EXPERION Process Server

3.2.1 Server

Description

The Experion server will be Power Edge R730 redundant Server, Suitable for providing Experion Server Platform functionality for medium to large applications. The hardware configuration for Experion servers will be the minimum configuration or better than given in the technical specification.

An Experion server or redundant server combination functions as a system-wide historian and global database. The Experion server also supports communication to SCADA point sources, DSA point sources, OPC clients and servers and holds the system event journal, system configuration files, custom applications and server scripts. The server is the source for data, alarms, events, etc. for the client-connected applications and the Experion Station–Flex (ES-F). One or more Experion servers are required for an Experion system.

- **PKS server**

The R730 supports up to 16 x 2.5” or up to 8 x 3.5” front-accessible, hot-plug hard drives that are secured by a removable front bezel. Other front-panel features include an interactive LCD control panel, USB management port/iDRAC Direct, a video connector and a vFlash media card slot.

Power Edge R730

Feature	PowerEdge R720/R720xd	PowerEdge R730/R730xd
Chassis	2U rack	2U rack
Processors	Intel Xeon processor E5-2600 v2 product family	Intel Xeon processor E5-2600 v3 product family
Internal interconnect	Intel QuickPath Interconnect (QPI)	Intel QPI
Memory[1]	24 x DDR3 RDIMM, UDIMM, and LRDIMM Up to 768GB	24 x DDR4 RDIMM and LRDIMM Up to 768GB
Disk drives	R720: Up to 16 x 2.5" or 8 x 3.5" 6Gb SAS, 3Gb SATA R720xd: Up to 26 x 2.5" SAS SSD, SATA SSD, SAS, NL-SAS, SATA, SAS 512n or 12 x 3.5" SAS, NL-SAS, SATA + 2 x 2.5" drives	R730: Up to 16 x 2.5" HDD: SAS, SATA, NL-SAS; SSD: 12Gb SAS, 6Gb SATA Up to 8 x 3.5" HDD: SATA, NL-SAS; SSD: 12Gb SAS, 6Gb SATA R730xd: Up to 24 x 2.5" + 2 x 2.5" HDD: SAS, SATA, NL-SAS; SSD: 12Gb SAS, 6Gb SATA, up to 4 NVMe Express Flash PCIe Up to 16 x 3.5" + 2 x 2.5" HDD: SAS, SATA, NL-SAS; SSD: 12Gb SAS, 6Gb SATA
RAID controller	PERC S110 (software RAID), H310, H710, H710P, H810 (external); support for 2 internal RAID controllers	PERC S130 (software RAID), H330, H730, H730P, H830 (external); support for 2 internal RAID controllers
PCI slots	Max 7 + 1 x PCIe 3.0/6 + 1 x PCIe 3.0	Max 7 + 1 x PCIe 3.0/6 + 1 x PCIe 3.0 option to eliminate Riser 1
Embedded NICs	Select Network Adapter NDC 4 x 1GbE, 2 x 10GbE	Select Network Adapter NDC 4 x 1GbE, 2 x 10GbE, 4 x 10GbE
USB	USB 2.0	USB 3.0 (back and internal ports only)

Feature	Specification
Form factor	2U rack
Processors	Intel Xeon processor E5-2600 v3 product family
Processor sockets	2 sockets
Internal interconnect	2 Intel QPI links; 6.4GT/s; 7.2GT/s; 8.0GT/s
Cache	2.5MB per core; core options: 2, 4, 6, 8, 10, 12, 14, 16, 18

Feature	Specification
Chipset	Intel C610
Memory	Up to 768GB[1] (24 DIMM slots): 4GB/8GB/16GB/32GB DDR4 up to 2133MT/s
PCIe slots	**R730:** Up to 7 PCIe 3.0 slots plus dedicated PERC slot **R730xd:** Up to 6 PCIe 3.0 slots plus dedicated PERC slot
RAID controller	**Internal controllers:** PERC S130 (software RAID; R730 only) PERC H330 PERC H730 PERC H730P **External HBAs (RAID):** PERC H830 **External HBAs (non-RAID):** 12Gb/s SAS HBA
Drives	**R730 internal hard drive bay and hot-plug backplane:** Up to 16 x 2.5" HDD: SAS, SATA, NL-SAS; SSD: SAS, SATA Up to 8 x 3.5" HDD: SAS, SATA, NL-SAS; SSD: SAS, SATA **R730xd internal hard drive bay and hot-plug backplane:** Up to 16 x 3.5" SAS, SATA, NL-SAS, SSD + 2 x 2.5" drives Up to 18 x 1.8" SAS, SATA, NL-SAS, SSD drives + 8 x 3.5" SAS, SATA, NL-SAS, SSD drives, + 2 x 2.5" HDD Up to 26 x 2.5" SAS, SATA, NL-SAS, SSD, PCIe SSD drives
Maximum internal storage	**R730:** Up to 29TB using 16 x 2.5" 1.8TB SAS hard drives Up to 48TB using 8 x 3.5" 6TB NL-SAS hard drives **R730xd:** Up to 31.9TB using 18 x 1.8" 960GB SATA SSD + 8 x 3.5" 1.8TB SAS HDD Up to 43.2TB using 24 x 2.5" 1.8TB SAS HDD + 2 x 2.5" 1.8TB SAS HDD Up to 99.6TB using 12 x 3.5" 6TB NL-SAS HDD or SSD + 4 x 3.5" 6TB SAS + 2 x 2.5" 1.8TB SAS HDD or SSD
Embedded NIC	4 x 1GbE, 2 x 10+2GbE, 4 x 10GbE NDC
Power supply	750W AC (Titanium[2]); 495W, 750W or 1100W AC (Platinum[2]); 1100W DC
Availability	ECC memory, hot-plug hard drives, hot-plug redundant cooling, hot-plug redundant power, IDSDM, single device data correction (SDDC), spare rank, tool-less chassis, support for high availability clustering and virtualization, proactive systems management alerts, iDRAC8 with Lifecycle Controller
Systems management	**Systems management:** IPMI 2.0 compliant; Dell OpenManage Essentials; Dell OpenManage Mobile; Dell OpenManage Power Center **Remote management:** iDRAC8 with Lifecycle Controller, iDRAC8 Express (default), iDRAC8 Enterprise (upgrade) 8GB vFlash media (upgrade), 16GB vFlash media (upgrade) iDRAC Quick Sync **Dell OpenManage Integrations:** • Dell OpenManage Integration Suite for Microsoft® System Center • Dell OpenManage Integration for VMware® vCenter™ **Dell OpenManage Connections:** • HP Operations Manager, IBM Tivoli® Netcool® and CA Network and Systems Management • Dell OpenManage Plug-in for Oracle® Database Manager

Feature	Specification	
Rack support	• ReadyRails™ sliding rails for tool-less mounting in 4-post racks with square or unthreaded round holes or tooled mounting in 4-post threaded hole racks, with support for optional tool-less cable management arm • ReadyRails static rails for tool-less mounting in 4-post racks with square or unthreaded round holes or tooled mounting in 4-post threaded and 2-post (Telco) racks	
Operating systems	Microsoft® Windows Server® 2008 R2 Microsoft Windows Server 2012 Microsoft Windows Server 2012 R2 Novell® SUSE® Linux Enterprise Server Red Hat® Enterprise Linux® VMware® ESX®	Virtualization options: Microsoft Windows Server 2012 R2 with Hyper-V Citrix® XenServer® VMware vSphere ESXi For more information on the specific versions and additions, visit Dell.com/OSsupport.
OEM-ready version available	From bezel to BIOS to packaging, your servers can look and feel as if they were designed and built by you. For more information, visit Dell.com/OEM.	
Recommended support	Dell ProSupport Plus for critical systems or Dell ProSupport for premium hardware and software support for your PowerEdge solution. Consulting and deployment offerings are also available. Contact your Dell representative today for more information. Availability and terms of Dell Services vary by region. For more information, visit Dell.com/Service.	

[1]GB means 1 billion bytes and TB means 1 trillion bytes; actual capacity varies with preloaded material and operating environment and will be less.

[2]80 PLUS certification

❖ Note: This project has the following specification:

R730 Server (Rack mount)
CPU: Intel Xeon processor E5-2600 v3 product family
RAM: 32 GB DDR4
HDD: 24 x DDR4 RDIMM and LRDIMM Up to 768GB
DVD: DVD+/-RW Drive
Graphic: NVIDIA Geforce GT730 2GB HDMI-VGA-LAN-Audio USB 2.0/3.0
4x Network 10/100 GB Ethernet port
Interface: Keyboard / Mouse (optical)
OS: English Win 10

- **Server Monitor : P1917S Dell**

Monitor	
	Dell 19 Monitor – P1917S
Sichtbare Bildschirmdiagonale	48 cm (19 Zoll)
Aktiver Anzeigebereich	
Horizontal	374,78 mm (14,76 Zoll)
Vertikal	299,83 mm (11,80 Zoll)
Maximale voreingestellte Auflösung	1.280 x 1.024 bei 60 Hz
Seitenverhältnis	5:4
Bildpunktgröße	0,293 mm x 0,293 mm
Helligkeit	250 cd/m² (Standard)
Farbunterstützung	Farbspektrum (Standard): 84 %[4] Farbtiefe: 16,7 Millionen Farben
Kontrastverhältnis	1000:1 (Standard)
Megadynamisches Kontrastverhältnis	4 Millionen:1
Betrachtungswinkel	178°/178°
Antwortzeit	6 ms (Grau zu Grau), Standard
Bildschirmtyp	IPS-Technologie (In-Plane Switching)
Hintergrundbeleuchtung	LED
Sonstiges	ComfortView[2]
Lautsprecher (optional)	Dell Soundleiste AC511
Blendenfarbe	Schwarz
Konnektivität	
Anschlüsse	DisplayPort 1.2, HDMI 1.4, VGA, 2 x USB 3.0 (seitlich), 2 x USB 2.0 (unten)

Lieferumfang

Komponenten
- Monitor mit Standrahmen (Standrohr und Standfuß)

Kabel
- Netzkabel (je nach Land)
- DisplayPort (DP zu DP)
- VGA-Kabel
- DisplayPort-Kabel
- USB 3.0-Upstream-Kabel

Dokumentation
- Kurzanleitung
- Sicherheitsangaben und Hinweise zu Richtlinien
- Treiber und Dokumentation (CD)

19 inch LED monitor-P1917S

3.3 -Client Work Station

All of the EXPERION Workstations that supplied by IDEH GLOBAL will be DELL T7820 in this project.

3.3.1 Operation Workstation (OWS)

hardware/software configuration for EXPERION client station will be the minimum configuration or better than given in the technical specification of the specified release. Honeywell places the order for this computer hardware and software as per contract agreement.

- CPU: 7th generation Core i7
- RAM: 8 GB
- HDD: 1TB Raid 1
- DVD: DVD+/-RW Drive
- Graphic: P400 2GB DUAL OR equal
- 2xHDMI-VGA-LAN-Audio USB 2.0/3.0
- 2x Network 10/100 GB Ethernet port
- Interface: Membrane Keyboard / Mouse (optical)
- OS: English Win 10

The Experion Station is the human-machine interface (HMI) that can be used for different functions around a plant or mill including operations, monitoring, maintenance, and engineering. Each Experion Station type includes additional functionality as described in the following.
Experion PKS Stations will be provided in CONSOL Station (2pcs).All Experion PKS Station systems run under Microsoft Windows 10 operating systems.

We have DELL Precision T7820 PC desktop and Dell E2420HS 24" LED Monitor in our operator workstation and the you can see details about these products in figures below:

Feature	Precision 7820 Tower Technical Specifications
Processor Options	One or Two Intel Xeon Scalable Processor family CPUs (1st and 2nd generation) with up to 28 cores per processor and Intel Advanced Vector Extensions, Intel Trusted Execution Technology, Intel AES New instructions, Optimized Intel Turbo Boost and optional Intel vPro™ technology
Operating System Options	Windows 10 Pro for Workstations (up to 4 Cores) Windows 10 Pro for Workstations (4 Cores Plus) Red Hat® Enterprise Linux® 7.5 Red Hat Enterprise Linux 8.0 (Sept. 2019) is required for 2nd Generation Xeon SP (Cascade Lake) CPUs Ubuntu Linux 16.04 Ubuntu Linux 18.04 NeoKylin 6.0 SP3 (China only - select options supported)
Chipset	Intel® C621 (Lewisburg)
Memory Options[1]	Six channel memory up to 768GB 2933MHz DDR4 DDR4 ECC memory with dual CPUs, 12 DIMM Slots (6 DIMMs per CPU). Note: Memory speed is dependent on specific Intel Xeon Scalable Processor CPU installed.
Graphics Options[1]	Support for 2 PCI Express® x16 Gen 3 graphics cards - up to 600W with maximum of 2 x 300W double width graphics cards on single CPU configurations. Up to 2 x 160W single width graphics cards on dual CPU configurations. **High end 3D cards:** Radeon™ Pro WX 9100 Radeon™ Pro SSG NVIDIA Quadro GV100 NVIDIA Quadro P6000 NVIDIA Quadro P5000 NVIDIA Quadro RTX 8000 (future) NVIDIA Quadro RTX 6000 NVIDIA Quadro RTX 5000 **Mid-range 3D cards:** Radeon™ Pro WX 7100 Radeon™ Pro WX 5100 Radeon™ Pro WX 4100 NVIDIA Quadro P4000 NVIDIA Quadro P2000 NVIDIA Quadro RTX 4000 **Entry 3D cards:** Radeon™ Pro WX 3100 Radeon™ Pro WX 2100 NVIDIA Quadro P1000 NVIDIA Quadro P620 NVIDIA Quadro P400 Professional 2D cards: NVIDIA NVS 310
Storage Options[2]	Front accessible FlexBays support up to 4 x 2.5"/3.5" SATA HDD/SSDs and up to 6 x 2.5" and 5 x 3.5" drives with 5.25" bay populated. Up to 2 front accessible (hot plug) M.2/U.2

Feature	Precision 7820 Tower Technical Specifications
Storage Options[2]	NVMe PCIe SSDs are supported in FlexBay 1 on enabled PCIe backplane chassis with integrated Intel controller and up to 4 with MegaRAID 9460 NVMe hardware RAID controller option - see controller section. Note Precision PCIe FlexBay backplane and single M.2 Module (incl. 1 M.2 PCIe NVMe carrier) kits are available for customers to convert standard FlexBays to support Intel and new MegaRAID NVMe controller options. (different kits) NVMe RAID 0,1 option (Intel RSTe vROC). NVMe HW RAID 0,1,5,10 (MegaRAID 9460 NVME controller) Up to 4 x M.2 NVMe PCIe SSDs via 1 x Dell Ultra-Speed Drive Quad x16 card. NVMe RAID 0,1,10 option (Intel RSTe vROC) M.2 NVMe PCIe SSDs Up to 4 x 2TB drives on 1 Dell Precision Ultra-Speed Drive Quad x16 card. U.2 Intel® Optane™905P SSDs Up to 4 x 960GB drives Front FlexBay M.2/U.2 NVMe PCIe SSDs Up to 4 x 2TB M.2 drives 2.5" SATA 7200 RPM. Up to 6 x 1TB drives 2.5" SATA SSD Up to 6 x 1TB drives Up to 6 x 800GB drives 3.5" SATA 7200 RPM Hard Drives 2.5" SAS SSD Up to 5 x 12TB Enterprise Drives 3.5" SAS 7200 RPM 12Gb/s Up to 5 x 4TB 2.5" SAS 10K RPM 12Gb/s Up to 6 x 1.8TB 2.5" SAS 15K RPM 12Gb/s Up to 6 x 600GB M.2 PCIe SED SSD 512GB and 1TB
Storage Controller	Integrated: Intel® chipset SATA controller (6Gb/s) with 6 SATA ports plus 2 dedicated ports for optical drives. Intel RSTe software RAID 0,1,5,10 Intel RSTe (vROC) software RAID 0,1,10 option (motherboard activation key) for M.2 NVMe PCIe SSDs on Dell Ultra-Speed Drive Quad card, Duo x8 card (RAID 0,1) and for 2 x front FlexBay M.2/U.2 NVMe PCIe SSDs (RAID 0,1) or front FlexBay NVMe PCIe SSDs (RAID 0,1) Customer kit available for Intel RSTe (vROC) motherboard activation key for NVMe RAID support. Optional: Broadcom MegaRAID® SAS 9440-8i 12Gb/s SAS (6Gb/s SATA) PCIe controller, 8 ports, Software RAID 0,1,5,10. MegaRAID® SAS 9460-16i 12Gb/s SAS (6Gb/s SATA)) PCIe controller (4GB cache with Flash module/Super Cap backup) Hardware RAID 0,1,5,10. MegaRAID 9460 controller NVMe option supports up to 4 front FlexBay M.2/U.2 NVMe PCIe SSDs with Hardware RAID 0,1,5,10

Feature	Precision 7820 Tower Technical Specifications
Communications	Integrated: Intel® i219 Gigabit Ethernet controller with Intel Remote Wake UP, PXE and Jumbo frames support Optional: Intel® i210 10/100/1000 single port PCIe (Gen 3 x1) gigabit network card, Intel® X550-T2 10GbE dual port PCIe (Gen 3 x4) network card, Intel Dual Band Wireless AC 8265 (802.11ac) 2x2 + Bluetooth module,
Audio Controller	Integrated Realtek ALC3234 High Definition Audio Codec (2 Channel)
Speakers	Internal Speaker; Optional Dell 2.0 stereo speaker systems available and Dell sound bar for select flat-panel displays
Add-in cards	Optional: Dell Precision Ultra-Speed Drive Duo (HH/HL,x8) & Ultra-Speed drive Quad (FH/FL,x16) with active cooling. Support for up to 2 and 4 M.2 PCIe NVMe SSDs respectively. Optional USB 3.1 (Gen 2) 10Gb/s Type C card (2 ports) 1 DP pass-through port Optional dual & quad display Teradici PCoIP remote workstation host PCIe cards Optional Thunderbolt 3 PCIe Card (2 ports) 1 DP pass-through port Optional Serial Port PCIe Card
I/O Ports	Front 2 – USB 3.1 Gen 1 Type A 2 – USB 3.1 Type C 1 – Universal Audio Jack Internal 1 – USB 2.0 Type A 1 - 2 x 5 USB 2.0 header. (requires 3rd party splitter cable to support 2 x USB 2.0 Type A ports) 6 - SATA @6Gb/s plus 2 for optical Rear 6 – USB 3.1 Gen 1 Type A 1 – Serial 1 – RJ45 Network 2 – PS2 1 –Audio Line out 1– Audio Line in/Microphone
Chassis	HxWxD: 16.45" (417.9 mm) | Width: 6.95" (176.5 mm) | Depth: 20.4" (518.2 mm) Starting at Weight: 34lb/15.4kg Bays: (2) FlexBays can support up to 2x 3.5" or 2.5" drives each and (1) 5.25" FlexBay (can support 1 x 3.5" or 2 x 2.5" HDD/SSD drives as factory option or customer kit) (1) Slimline optical bay; (1) SD slot UHS II Class 3 with read only support (SW enabled) Available PCIe backplane FlexBay chassis supporting 1 - 4 x M.2/U.2 PCIe NVMe SSDs. Slots: All slots PCIe Gen 3: (2) PCIe x16, (1) PCIe x16 wired as x8, (1) PCIe x16 wired as x4, (1) PCIe x16 wired as x1, 1 PCI 32/33 Power Supply: 950W (input voltage 100VAC - 240VAC) –90% efficient (80PLUS Gold Certified) Externally accessible/removable/ lockable

Feature	Precision 7820 Tower Technical Specifications
Storage devices	Slimline Bay Options: DVD-ROM; DVD+/-RW, CAC/PIV card reader. 5.25" Bay Options: BD, DVD+/-RW; Standard: SD slot UHS II Class 3 with read only support
Security Options (Check regional availability)	Trusted Platform Module (TPM 2.0); Optional CAC/PIV card reader for slimline bay, chassis Intrusion switch; Setup/BIOS Password; I/O Interface Security; Kensington® lock slot, Padlock ring, lockable power supply; Optional hard drive locking sleds (key lock), Dell Data Guardian, Dell Endpoint Security Suite Enterprise Lockable front bezel (covers FlexBays), Front FlexBay NVMe drives are removable (hot swap).
Manageability[3]	AMT or vPro with DASH support Dell vPro Enhancements (Grasslake) SNMT/CIM vis OMCI Dell Command Suite
Regulatory and Environmental	Energy Star® configurations available including 80 PLUS® registered Gold power supplies; EPEAT® registered (see epeat.net for specific registration rating/status by country); China CECP; GS Mark. For a complete listing of declarations & certifications, see Dell's regulatory & compliance homepage at dell.com/ regulatory_compliance
Warranty & Support Services[4]	3-Year Limited Hardware Warranty and 3-year NBD On-Site Service after Remote Diagnosis Optional: Dell ProSupport is designed to rapidly respond to your business's needs, help protect your investment and sensitive data, and provide enhanced proactive support services to help reduce risk and complexity within your IT environment

DELL Precision T7820 specifications

3.3.2 Workstations Monitor:

Dell S3219D

Features:

The Dell S3219D monitor has an active matrix, Thin-Film Transistor (TFT), Liquid Crystal Display (LCD), anti-static, and LED backlight. The monitor features include:

- 81.28 cm (32 inch) viewable area display (measured diagonally). 2560 x 1440 resolution, plus full-screen support for lower resolutions.
- Dell monitors with selectable adaptive sync option (AMD Free Sync or No Sync).
  high refresh rates and a rapid response time of 5 ms.
- Digital connectivity with DisplayPort and HDMI.
- Equipped with 1 USB upstream port and 2 USB downstream ports.
- Plug and play capability if supported by your computer.
- supports Free sync 48 Hz - 75 Hz.
- On-Screen Display (OSD) adjustments for ease of setup and screen optimization.
- Removable stand and Video Electronics Standards Association (VESA™) 100 mm mounting holes for flexible mounting solutions.
- Energy Saver feature for Energy Star compliance.
- Security-lock slot.
- TCO-Certified Displays.
- BFR/PVC-Reduced (Its circuit boards are made from BFR/PVC-free laminates.)
- Arsenic-Free glass and Mercury-Free for the panel only.

- High Dynamic Contrast Ratio (8,000,000 : 1).
- 0.3 W standby power when in the sleep mode.
- Dell Display Manager Software included.
- Energy Gauge shows the energy level being consumed by the monitor in real time.
- Optimize eye comfort with a flicker-free screen and Comfort View feature which minimizes blue light emission.
- Build-in Speaker (5 W)x2

3.3.3 Large screen display

Large screen Display 65: SAMSUNG 65NU8900

- 65 Inch
- Precision Black / Ultra HD - 4K

NO	Typ of Work Station	Station QTY	Monitor QTY	Location
1	DCS Operator WorkStation-G1(Process)	2	4	Control Room
2	DCS Engineering Work Station	1	1	Engineering Room
3	ESD Engineering Work Station	1	1	Engineering Room
4	rge screen display	1	1	Control Room

Note: Two type of Operator WorkStation used for the DCS system.

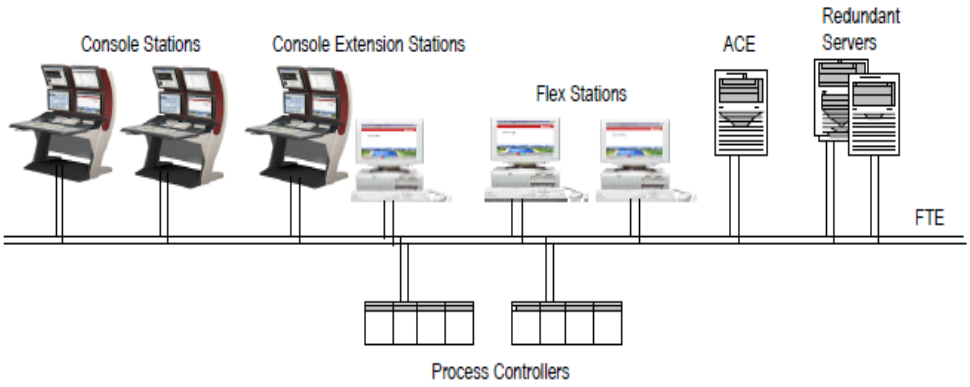
We have 2 types stations that includes:

Console Station

The Console Station provides direct access to process data and alarms and messages from Control Data Access (CDA) sources such as Process Controllers, FIM, IOLIM, and ACE nodes. Each Console Station contains an Experion CDA server to communicate directly with the CDA devices. This direct access provides a continuous view of your process, even if the Experion server is unavailable. After you configure the connection to the Experion server, the server database files are replicated to the Console Station. This means that configuration of items such as process points is only done once. However, some functionality such as reporting, history and events collection, and flexible point data are still provided by the Experion server. Therefore whenever the Experion server is unavailable, this functionality is not available on the Console Station. A Console Station can also have clients connected to it. These clients are called Console Extension Stations. A Console Extension Station connects to a Console Station in the same way a Flex Station connects to an Experion server. A Console

Extension Station has the same functionality as a Console Station. A Console Station and Console Extension Station can operate in the following environments:

The following figure shows an example architecture including Console Stations.



The following functionality is always available on Console Stations regardless of the availability of the Experion server:

• Data access from direct data sources such as Process Controllers and ACE nodes

• Notifications from direct sources

• Security restrictions, for example security levels and asset assignments

• Real-time trending of data from direct data sources such as Process Controllers

• Event journaling of Console Station events such as operator actions, for example, acknowledging alarms and logging on

- Distributed system architecture
- Icon Series Console environment
- Multi-window environment
- Display printing
- Backup and restore of the Console Station database
- 'Server-less' restart, whereby the Console Station can restart and begin communicating with process controllers, without needing to connect to the Experion server.

Flex station (ES-F)

The ES-F is a versatile operator interface that uses a client-server relationship to present process data to the operator. It is suitable for full-time operations in a large percentage of applications and can also be used as engineering or wireless Stations. The ES-F can be configured with a static or rotary connection. A static connection provides a permanent, dedicated link. A rotary connection provides an “as required” connection,

enabling numerous casual users to access the Experion system as needed, which is advantageous from a licensing point of view. For example when 40 Station connections are configured, 40 connections can be established at one time but the software could be installed and be available to many more than 40 individuals.

Difference between flex and console station

In the Client - Server Architecture of DCS, there are two types of communication depending on the configuration of the client. There are2 types of clients - Flex Station and Console station.

Flex station talks to server for data exchange. So, if the server fails, the flex stations do not receive anything & go blind.

The console stations directly talk to controller for IO status, set points, alarm set points. So, if the server is down, still the plant can be visualized on these computers, dynamic data exchange is possible, you can start / stop the motors, you can open / close the valves through console stations. (motors can be started / stopped only if they are connected through hardwired IOs / connected to the controller serially).

3.3.4 Engineering Workstation (EWS)

Fundamentally an engineering workstation is Experion Flex Station. The user connects to an Experion Server that then allows the user access to the client engineering tools, for example Control Builder, Quick Builder, Bulk Builder, etc.

3.3.5 Engineering Laptop ThinkPad P51:

Thin at 0.96” and weighing 5.9 lb, the 15.6” ThinkPad P51 Mobile Workstation from Lenovo has been designed as a go-to PC to subrent. It is powered by a 2.8 GHz Intel Core i7-7700HQ Quad-Core processor which allows you to run multiple applications simultaneously. If you need more power, the system can be over clocked to 3.8 GHz using Intel Turbo Boost 2.0 technology. The 8GB of 2400 MHz DDR4 RAM helps to ensure smooth multitasking and also allows the computer to quickly access frequently-used files and programs.

Processor	Intel Core i7-7700HQ Quad-Core
Base Clock Speed	2.8 GHz
Maximum Boost Speed	3.8 GHz
Total Installed Memory	8 GB
Maximum Memory Capacity	64 GB
Memory Type	DDR4 SDRAM
Size	15.6″
Aspect Ratio	16:9
Native Resolution	1920 x 1080
Viewing Angle	160° Horizontal, 160° Vertical
External Resolution	Up to 4096 x 2160
Operating System	Windows 10 Pro (64-Bit)
Keyboard	Type: Full-Size Features: Backlight, Numeric Keypad
Dimensions (W x H x D)	14.9 x 1.0 x 10.0″ / 378.5 x 25.4 x 254.0 mm
Weight	5.9 lb / 2.7 kg

3.4 Printers

The PKS system is equipped with two Printer color and B/W laser printer for screen printing. The printers are specified as:

3.4.1 A4 color Laser printer HP M255nw

Printing Speed	Up to 22 ppm
Resolution	Up to 600 x 600 dpi
Monthly duty cycle	40’000 pages
Interface	Hi-Speed USB 2.0 port; built-in Fast Ethernet 10/100Base-TX network port; 802.11n 2.4/5GHz wireless
Pages size	A4

3.4.2 A4 BW Laser printer HP P1108

Printing Speed	21 ppm black and white
Resolution	600 dpi B/W
Monthly duty cycle	30’000 pages
Interface	USB, 1 Parallel, Centronics type, 1 IEEE 802.3 Ethernet LAN
Pages size	A4

3.4.3 Project printers:

NO	PRINTER TYPE	LOCATION	Usage	QTY
1	A4 BW Laser printer HP P1108	Control Room	DCS Operator	1
2	A4 BW Laser printer HP P1108	Control Room	DCS Operator	1
3	B/W A4 LASERJET PRO P1108	Engineering Room	ESD Engineering Station	1

4	A4 color Laser printer HP M255nw	Engineering Room	DCS Engineering Station	1

3.5 DCS System Hardware

The Hardware that will be used for the Serial C system hardware consists of:

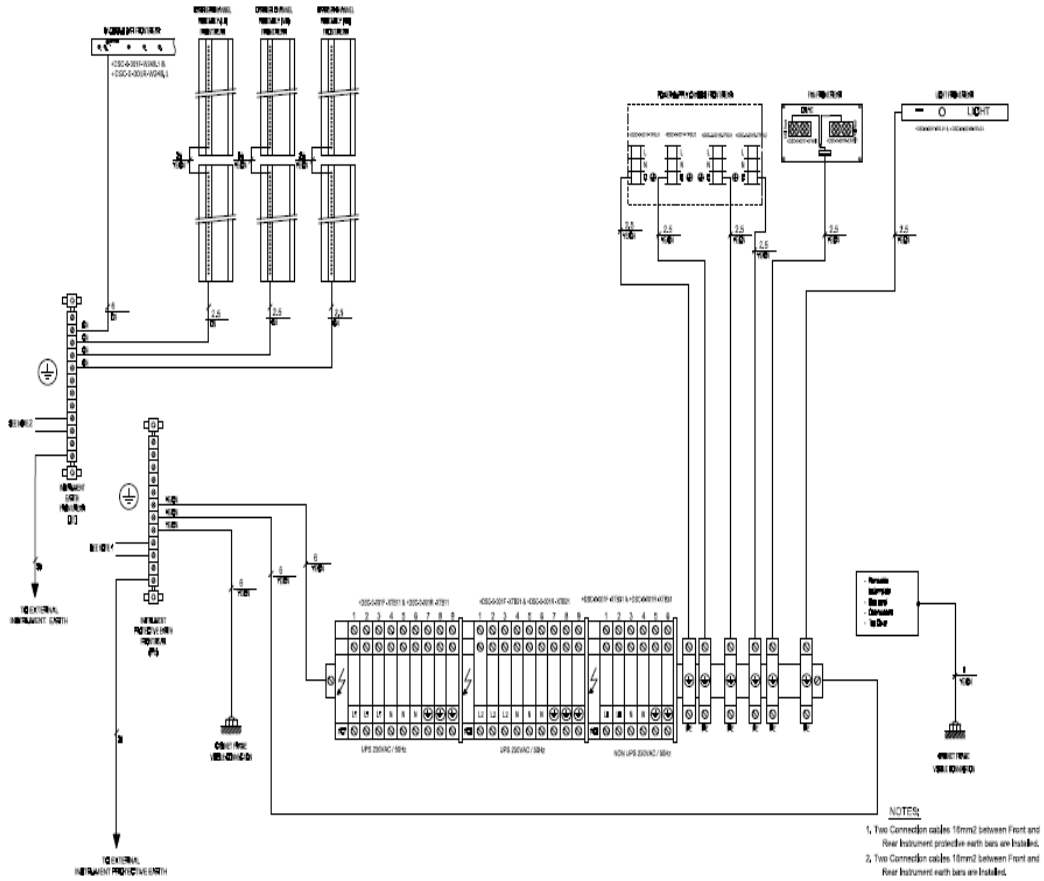
C300 Controller Module	CC-PCNT02
C300 Controller IOTA	DC-TCNT01
AI HART (16) Module	CC-PAIH02
AI IOTA (16)	DC-TAIX01
AO HART (16) Module	CC-PAOH01
AI IOTA Red	DC-TAIX11
AO IOTA (16)	DC-TAOX11
DO - 24V Bussed Out (32) Module	DC-TDOD51
DO 24V Buss IOTA (32)	DC-TDOD61
DI 24V (32) Module	DC-PDIL51
DO-Digital Output Module	DC-PDOD51
DI 24V IOTA, (32)	DC-TDIL51
Power supply redundancy	DU-PWPR21

3.5.1 Grounding

Adequate grounding is important for safety considerations and for reducing electromagnetic noise interference. All earth-ground connections must be permanent and provide a continuous low impedance path to earth ground for induced noise currents and fault currents.

Refer to the following guidelines when considering the grounding requirements of the system:

- For safe operation of the equipment, a high-integrity grounding system must be installed as part of the building's wiring system.
- Grounding should be as per the Honeywell recommendations and local codes for ground wiring.

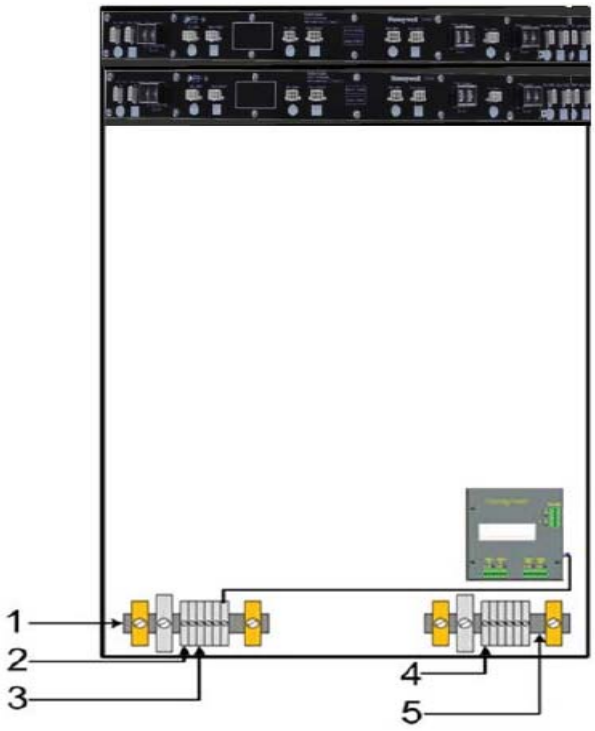


DCS System cabinet grounding

Series C cabinet safety ground connections

The following illustration and callout table identify typical safety ground connections in the Series C cabinet.

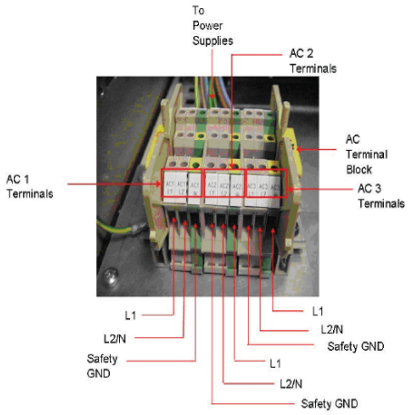
For Honeywell assembled cabinets, all power and ground connections within the cabinet are made by Honeywell manufacturing.



Typical Safety ground connections in Series C cabinet

Callout	Description
1	The upper and lower carrier channel assembly shield landing bus bar grounds are jumpered together in the center and the lower shield landing bus bar ground is connected to the AC safety ground bar. Accepts user supplied single or dual AC line power input - Hot (L1), Neutral (L2), and Ground (AC Safety ground).
2	The AC terminal block and mounting plate for routing power and making safety ground connections within the cabinet is mounted on the cabinet floor. See the following figure for details about typical power and ground connections.
3	The AC safety ground bar and the AC terminal block mounting plate are connected to the cabinet frame.
4	The AC safety ground bar is mounted to the cabinet frame.
5	To cabinet front or rear AC safety ground bar if required.
6	To cabinet complex front or rear AC safety ground bar as required.
7	To supplementary ground connection, if required.
8	The Local ground bar is mounted to the cabinet frame, if required.

Callout descriptions for Series C cabinet



Typical power and ground connections to AC terminal block in Series C cabinet

3.5.2 Electro Magnetize Capability Directive

This apparatus is tested to meet Council Directive 89/ 336/ EEC Electromagnetic Compatibility (EMC) using a technical construction file and the following standards, in whole or in part:

EN 50081- 2 EMC – Generic Emission Standard, Part 2 – Industrial Environment

EN 50082- 2 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

The product described in this document is intended for use in an industrial environment.

3.5.3 Cooling, Heating and Noise

Where required to control heat dissipation each cabinet will be provided with roof mounted cooling fans and door filters. The fans and door filters will be fitted to cabinets which require forced air ventilation. Fan failure alarms will be provided.

Environmental conditions.	Operative and Storage limits
Operating temperature	0 to 60 OC
Storage temperature	-40 to 85 OC
Relative humidity	5 to 95% non-condensing, up to 40OC. Above 40 OC the RH spec is derated to 55% to maintain constant moisture content.
Temperature rate of change	≤ 1 OC/min (≤ 5 OC/min storage)

Environmental conditions

3.6 Wiring and Cabling

3.6.1 Internal Wiring and Cabling

The Series C IOTAs will be installed in the C300 System cabinets and will be connected to the Marshaling cabinets via a Plug and socket arrangement between the IOTA Terminal Blocks in the C300 System cabinet and the FTA in the Marshaling cabinet.
The IOTA have removable screw terminal blocks which will be removed to allow preformed cables to be plugged on to the FTA.
The field terminals will be cross wired to the Terminal Strip in the Marshaling cabinets.
The FTA will have a direct plug and socket arrangement to facilitate easy interconnection between the Marshaling and System cabinets during the hook up and commissioning phase.
Experion PKS IOTA connectors shall be wired to the engineered system cable end that shall be plugged in DCS IOTA. These engineered system cables shall interconnect Experion PKS I/O modules (in the DCS system cabinet) to the Marshaling cabinet.

interconnection cable

3.7 INTEGRATION WITH THIRD PARTY

Experion PKS can interface to numerous third-party devices at the controller and server level using industry standard protocols such as Modbus. For this project the integration with third party can be made following protocols:

3.7.1 MODBUS (RTU) Link

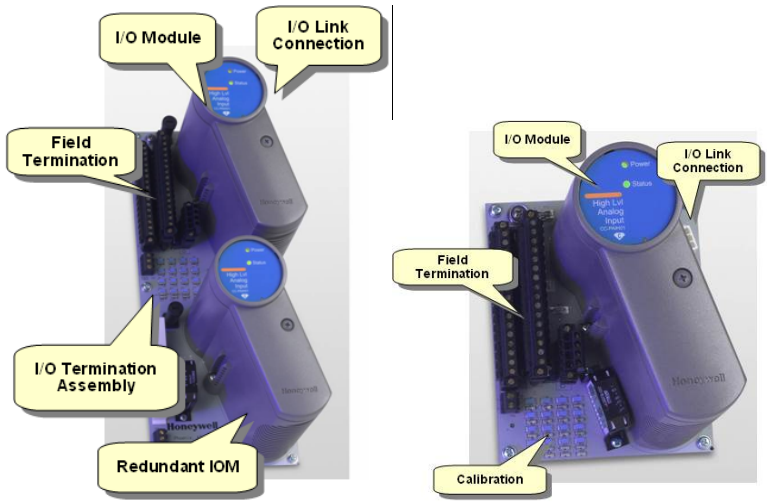
Modbus is a standard industrial control data exchange protocol, which can be used for the mutual transmission of protocol data in RTU, (Remote Terminal Unit) directly transmits data in binary form through serial communication, such as RS-485, offering high efficiency and low overhead.

The Modbus RTU protocol facilitates communication between controllers and between controllers and other devices through serial communication channels such as RS-232 and RS-485. It is widely used in industrial environments where reliable and efficient communication is required over short to medium distances.

3.8 Series C-IO Module

1) The Series C I/O subsystem follows the same consolidated, single board philosophy as the C300 controllers. All I/O is offered in either single or redundant configurations. Unlike other vendors who offer redundancy via separate cards which are mounted in the same of different chassis with multiple cables connected to a single field termination device, the Series C I/O family provides a single-board redundant configuration.

2) This configuration both improves reliability, while reducing space requirements and improving maintenance effectiveness. This modular connection system means that there is no common backplane, and therefore no single point of failure. To reduce the overall cost of supporting redundancy, both redundant and non-redundant configurations use the same I/O module. Redundancy is available for both analog and digital I/O signal types.

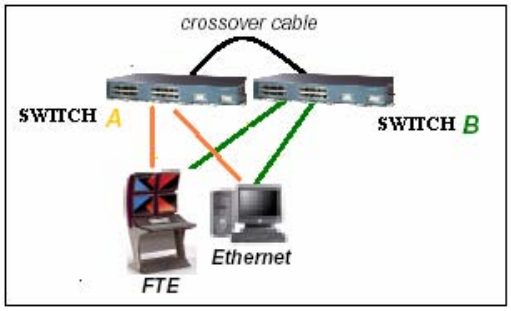


3.9 Network Specification

3.9.1 Fault Tolerant Ethernet (FTE)

FTE is the control network of Experion PKS. It is dedicated to the control mission of not only providing fault tolerance, but also fast response, determinism, and the security required for industrial control applications. FTE

is a single network topology with redundancy. This redundancy is achieved using Honeywell's FTE driver and commercially available components. The driver and the FTE-enabled components allow network communication to occur over an alternate route when the primary route fails. In case of failure of switch (either 1 or 2) redundant FTE configuration provides a bump less switchover. An FTE network interconnects cluster of nodes. A node is a networked device used in a control application such as an Experion Station. A simplest FTE network may consist of one pair of cluster switches, a cross over cable and cabling to FTE and Ethernet nodes.



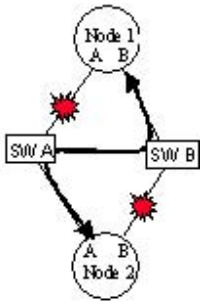
Simplest FTE Network

3.9.2 Communication Between FTE nodes

The following figure illustrates how FTE node continues to communicate in the event of a failure. Even with a broken channel on FTE Node 1 (Channel A) and FTE Node 2 (Channel B) the nodes continue to communicate from FTE Node 1's Channel B to FTE Node 2's Channel A.

Sending Channel	Receiving Channel	Channel Path	Path Status
Channel A	Channel A	1	0
Channel B	Channel B	2	0
Channel B	Channel A	3	1
Channel A	Channel B	4	0

1 == channel is healthy
0 == channel is broken



3.9.3 IP Address Configuration

Servers, Station, printers, controllers and other network device IP address planning table:

Controller IP				
S/N	Device Description	Honeywell FTE Adapter IP	Subnet mask	Location
1	DCSCTRL01_P	010.010.001.021	255.255.252.000	Control Room
2	DCSCTRL01_S	010.010.001.022	255.255.252.000	Control Room

Station IP				
S/N	Device Description	Honeywell FTE Adapter IP	Subnet mask	Location
1	Experion Server Primary	010.010.001.001	255.255.252.000	Control Room
2	Experion Server Backup	010.010.001.003	255.255.252.000	Control Room
3	DCS Operator WorkStation	010.010.001.005	255.255.252.000	Control Room
4	DCS Operator WorkStation	010.010.001.007	255.255.252.000	Control Room
30	DCS Engineering work station	010.010.001.009	255.255.252.000	Eng_Room
32	Laptop	010.010.001.011	255.255.252.000	Eng_Room

Printer IP				
S/N	Device Description	Honeywell FTE Adapter IP	Subnet mask	Location
1	B/W A4 LASER JRT PRINTER-G1	010.010.001.014	255.255.252.000	Control Room
2	B/W A4 LASER JRT PRINTER-G2	010.010.001.015	255.255.252.000	Control Room
9	COLOR PRINTER	010.010.001.016	255.255.252.000	Eng_Room

System / Marshalling AND Network Guidelines

3.10 System Cabinet

System Cabinet typically houses:

- C300 controller (CC-PCNT02)
- Series C-IO Module (CC-PAIH02)-(CC-PAOH01)-(DC-PDIL51)-(DC-PDOD51)
- Redundant Power Supply Phoenix
- IO Link cable

- Memory Backup DC-SCMB02

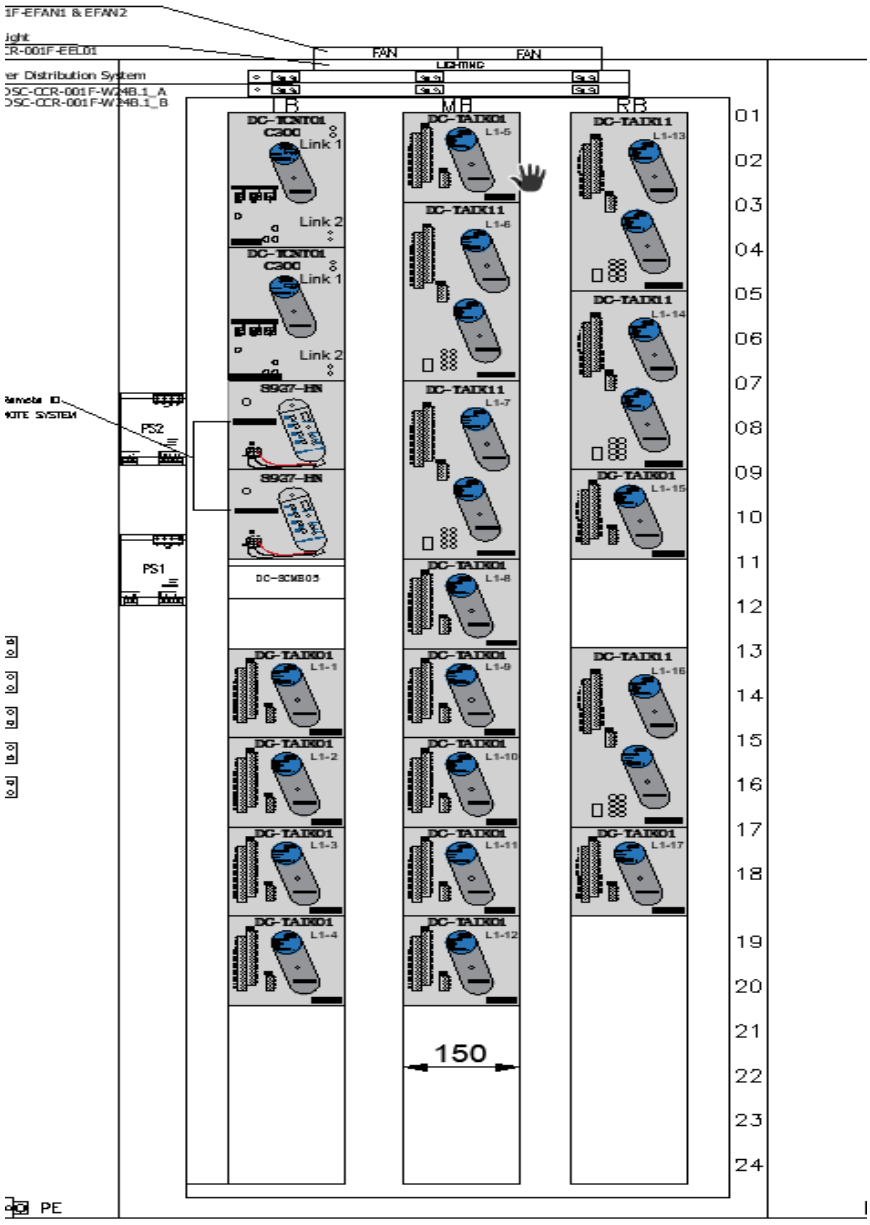
Each System Cabinet (Rittal type) shall have the following dimensions in (mm):

800W x 800D x 2100H

These shall be provided in sufficient numbers to house all necessary components, including, but not limited to:
a) Redundant processor bins and cards.
b) I/O cards.
c) Redundant incoming power supply feeders (110 Vac from UPS)

RITTAL Type TS8 FREESTANDING ENCLOSURES

- The modular design allows for efficient system updates, flexible baying options and virtually endless configurations, all based on a robust 16-fold tubular frame system.
- The frame can hold weight loads up to 1,500 lb. on the mounting panel and features multi-level mounting capability for unsurpassed flexibility.
- The 25 mm hole pattern allows components and accessories to be mounted in three directions – by height, width and depth – which provides maximum space utilization (up to 30% more available space than traditional NEMA style enclosures of equal dimension) .
- The door is strengthened with an attached frame which includes holes on a 25 mm pitch pattern for the attachment of ducts, cable harnesses, wiring plan pockets and much more.
- The gasketed roof is secured with removable eyebolts that screw directly to the enclosure frame to seal out dirt and moisture.



FRONT VIEW

3.11 Marshalling Cabinet

The Marshalling Cabinets shall provide, as a minimum:

a) The termination point for all field cables.
b) Barriers for all IS signals.
c) Interposing relays to provide isolation between systems for Digital Signal.
d) Cabinet wiring between field terminals and Terminal Strip.
e) The prefab cable is stretched between the Terminal board and the system cabinet.
f) The wiring between the terminal strip and Terminal Board is connected.

Each Marshaling Cabinet (Rittal Type) shall have the following dimensions in (mm):

- 800W x 800D x 2100H

Conductor sizes for all internal wiring shall be:

- Analog Input/ Output / Digital Input / Output Signal 0.75 mm^2
- 110 VAC fan power >=2x2.5 mm^2
- 24VDC Power >=2x1.5mm^2
- Safety earth (Dirty/Panel earth) 2.5 mm^2

The following specifies the conductor size to be used for the Interface cable between system cabinets and marshalling cabinets.

- Signal: 0.75 mm^2
- 24VDC System Power Supply: >=2x1.5 mm^2

All internal wiring shall be distinctively color coded as follows:

- 24V DC Positive (+) Red
- Negative (-) Black
- 230V AC Live (L) Brown
- Neutral (N) Blue
- Signal Positive (non-IS) + Gray
- Negative (non-IS)- White
- Signal Positive (IS) + Light Blue
- Negative (IS)- Black
- Safety Earth(PE) Green with yellow strip
- IE Green
- ISE Green
- DC/AC Power Circuits Gray

All wires shall have ferruling displaying the identification data for each signal at both end and shall have plastic insulator.

Terminal specification:

For AI, AO signal (IS) a knife-knife terminal will be considered.
For AI, AO signal (NIS) a fuse-knife terminal will be considered.
For DI, DO signal (IS) a knife-knife terminal will be considered.
For DI, DO signal (NIS) a fuse-knife terminal will be considered.
All terminal used in marshalling is RAAD brand as listed as follow:
Fuse Type Terminal: RFT 5
Knife Type Terminal: RDT 2.5-C
Normal Type Terminal: RTP 2.5
Fuse Element: Glass Fuse
All wires shall be laid in PVC ducting with removable covers. Proper and adequate segregation of wires and cables of different signal types such as power, analog signals, discrete signals shall be followed.

- Ducting (non-IS) Grey
- Ducting (IS) Blue

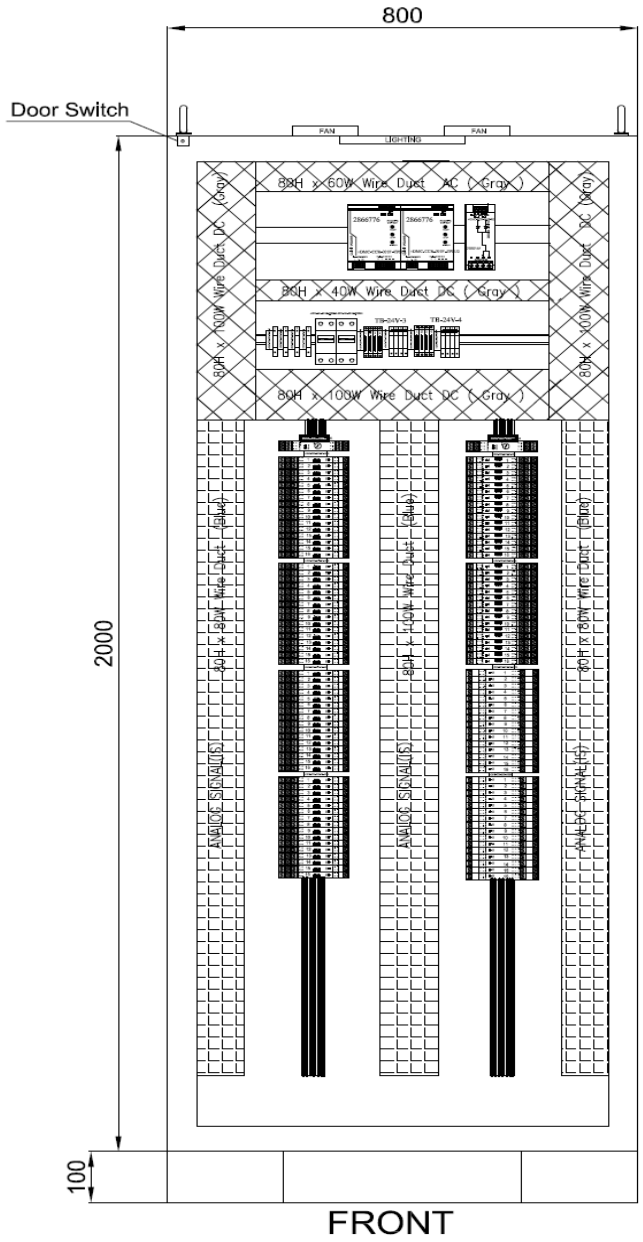
Cooling fans shall be mounted on the top of the cabinet where there is significant heat dissipation (e.g., System Cabinets with Power supply mountings) Cooling fans shall be powered by 110V AC.

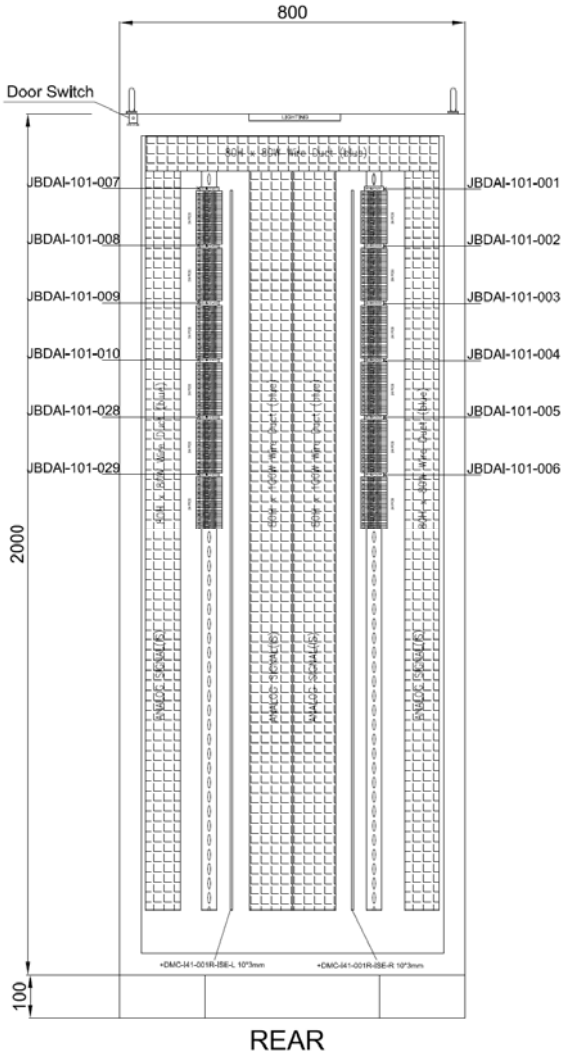
For the system cabinet, the thermostat temp sensor is installed in the each the cabinets to detect high temperature in the cabinet.

A safety ground connection shall be provided for each cabinet. Conducting parts such as doors and frames that are not permanently connected to safety earth shall be connected to the cabinet frame with flexible earthling strips of 6mm^2 minimum. A safety earth copper bus bar physically and electrically bonded to the cabinet frame shall be provided.

Master Reference Ground shall be provided in all marshalling cabinets, insulated from the cabinet frame. The bus bar shall be provided with grounding terminals.
Power supply for some field devices / Transmitters will be provided from the cabinets.
A separate terminal column needs to be designed for it.

Front view


800
Door Switch
FAN
LIGHTING
FAN
80H x 60W Wire Duct AC (Gray)
80H x 40W Wire Duct DC (Gray)
80H x 100W Wire Duct DC (Gray)
80H x 100W Wire Duct DC (Gray)
80H x 100W Wire Duct DC (Gray)
80H x 80W Wire Duct (Blue)
80H x 100W Wire Duct (Gray)
80H x 80W Wire Duct (Blue)
ANALOG SIGNALS
ANALOG SIGNALS
POWER SIGNALS
2000
100
FRONT



Rear view

3.12 Network Cabinet

The network devices such as servers, switches , and media convertors will be Located in the Network Cabinet.

Network Cabinet (Pay system) shall have the following dimensions in (mm):

- 800W x 1000D x 2100H

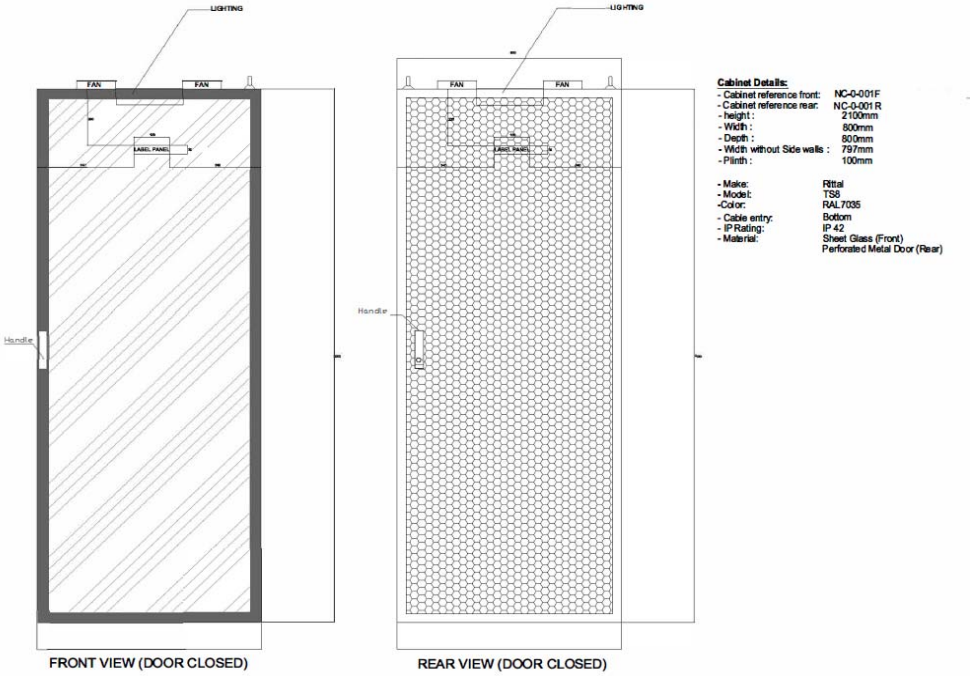
Each cabinet shall be fitted with the following accessories:

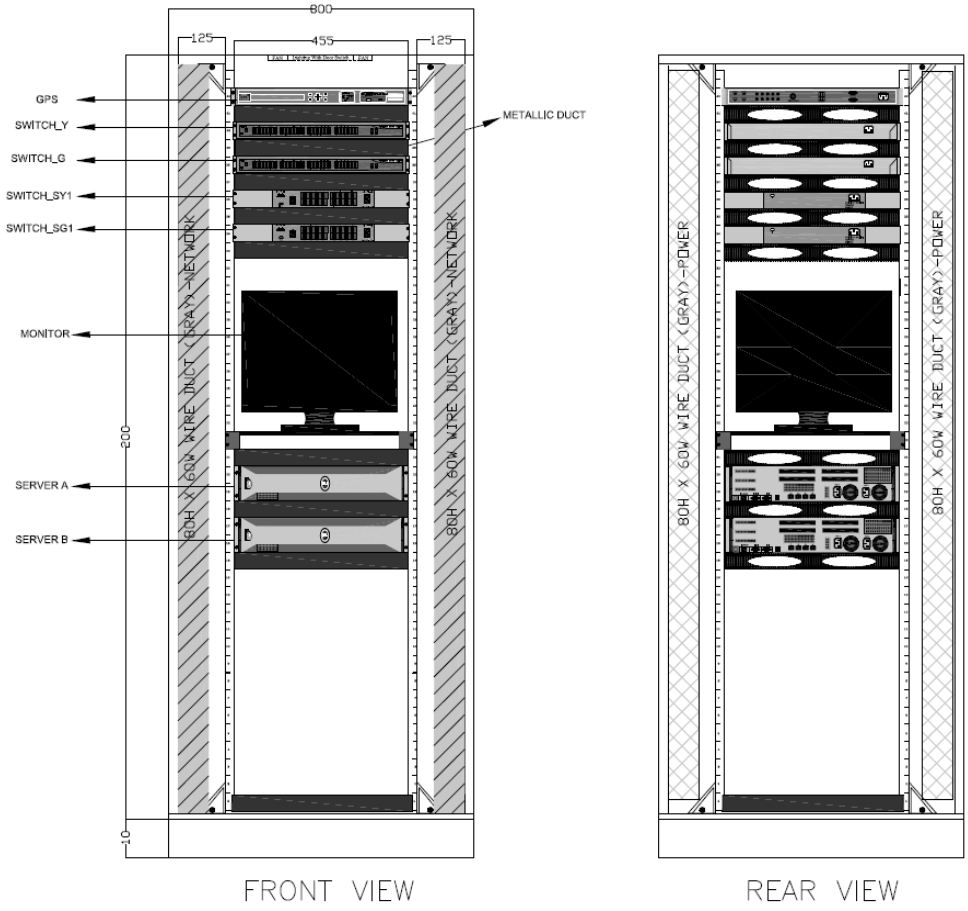
- Fixed Mounting Panel
- Bottom Cable Entry

- 100 mm Plinth
- Enclosure Lighting
- Door Switch
- Outlet Filter with Fan Unit(if any)
- A4 File Pocket

Each cabinet shall have (4) removable lifting eyebolts at the top to facilitate handling and lifting. PVC ducting shall be used to neatly route all internal wiring and cabling within the network Cabinets for easy maintenance. The duct size shall be properly sized.

Nameplates shall be provided on both front and rear door of cabinet, on the middle of the door, drop down 300mm from top. The Nameplate shall be plastic with black Text etched or embossed legend in English. The “Honeywell “Nameplates shall be provided on front door of cabinet, on the right top corner.





3.13 Ventilation & Lighting system

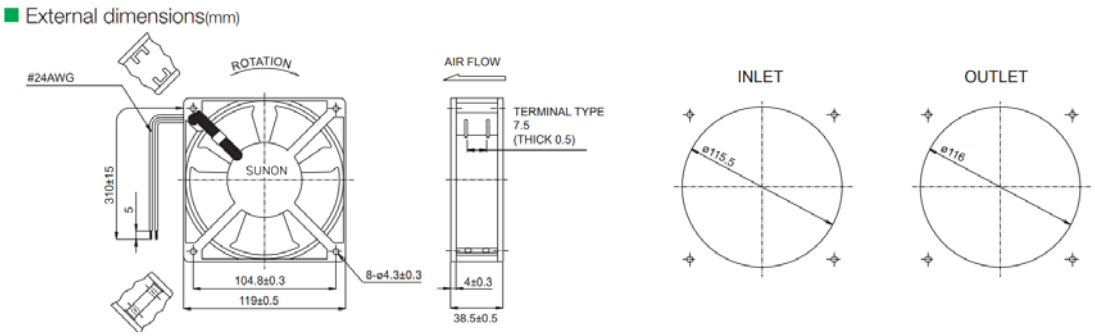
This function will be applicable by installation FAN and Filter on cabinets and as said before Fan is roof mounted and filter will be located on bottom of cabinets door.

3.13.1 Fan

Specification:

Item Dimensions LxWxH	120 x 38 x 120 Milimeter
Brand	Jason L Terry
Voltage	110 Volts
Wattage	29 watts
Cooling Method	Air
Noise Level	43 dB

DP100A 1123XSL SUNON 110V 120mm - 0.26A 12038 2-wire cooling fan For replacing damaged cooling fans, CPU cooling fans, etc.



3.13.2 Filter

The filter is used to prevent dust from entering the cabinets. The dimension of filter is 150 * 150 Millimeter.

3.13.3 Dehumidifier heater(TK-60)

Advantages at a glance:

- Built-in hygrostat
- Modularly expandable
- Wide range of applications

Description

The Kroll TK 60 dehumidifier is the professional version of the TK series, whose units feature a built-in hygrostat that measures relative humidity throughout the entire operation. In addition, they are modularly expandable and can be stacked, which significantly facilitates storage and transport of multiple units.The built-in hour meter also allows the units to be rented. The standard equipment of Kroll dehumidifiers opens up a wide range of applications for the units. For example, they have proven themselves in drying acceleration on new buildings, renovation work and water damage. The light-emitting diode display provides constant information about the current operating status. The two versions of the TK series differ above all in their dehumidification performance.

Technical data:

AIR DELIVERY	1.000 m³/h
DEHUMIDIFICATION CAPACITY	60 l/24 hrs.
EL. POWER CONSUMPTION	1,2 kW
ELECTRICAL CONNECTION	230/50 V/HZ/A
WIDTH	520 mm
LENGTH	560 mm
HEIGHT	980 mm
WEIGHT	40 kg
NOICE LEVEL	56 db(A)

Technical Information

Cataloge Code/product code:	M459EL60LED1840-W
Mounting Type:	Wall Mounted; Surface Mounted, Surface Mounted
Application:	Office, Shopping centers, Hospitality
Light source type:	DOB LED (PF> 0.5)
Module/ Lamp quantity:	1
CCT (Color temperature):	4000K - Neutral White
Light source:	LED
Lumen maintenance:	> 50.000 hours
Lumen maintenance factor:	L70
CRI (Color rendering index):	> 80
Power Consumption:	10
Luminous Flux:	950
Efficacy (lm/W):	95
IP (Ingress Protection):	IP65
Insulation Class:	Class II
FLICKER:	Flicker Free
Mains voltage:	200~250 VAC
Voltage Frequency:	50 Hz
Wire / Cable Spec:	PVC flexible wire
Wire cross section:	0.5

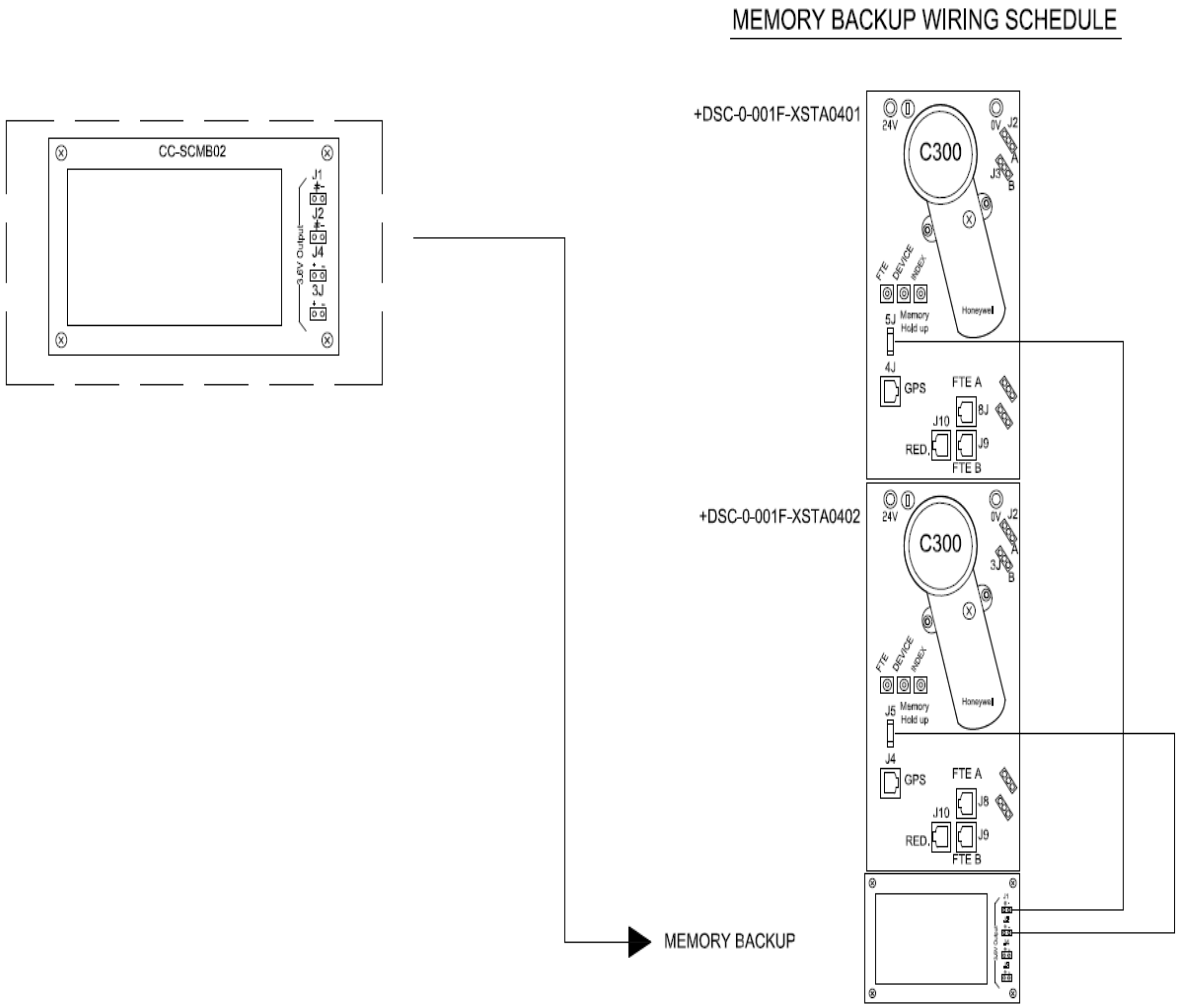
4.0 SYSTEM HARDWARE SPECIFICATIONS

4.1 Memory Backup Assembly

The Memory Backup Assembly (MBA) module connects to the C300 IOTA's MEMORY BACK-UP connector to provide the power necessary for C300 Retention Save. There are 3 model numbers for the Memory Backup Assembly Module:

SCMB02 C300 Memory Backup Assembly for 1 to 4 PCNT02 C300s.

When fully discharged, the Memory Backup Assembly module can take up to 400 seconds to recharge to full capacity. The controller state may not be maintained through a power outage if the Memory Backup Assembly module is not charged to full capacity requiring the user to reload control strategies when power is restored.



Wiring Diagram for Memory Backup Module

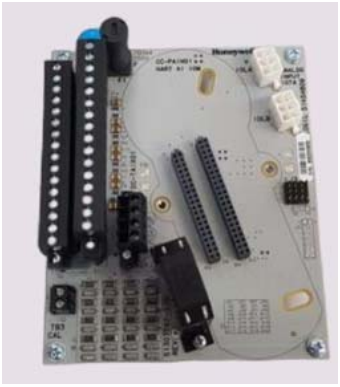
4.2 Analog Input Specifications

4.2.1 HART Analog Input Module, High-Level(CC-PAIH02)

Function

The Honeywell CC-PAIH02 is a 16-channel high-level AI module with HART communication. It is part of Honeywell's Experion Series-C I/O system. The CC-PAIH02 is designed to accept current inputs from transmitters and sensing devices. It provides non-incendive field power, suitable for configuring and monitoring HART devices.

4.2.2 Analog Input HART IOTA Models DC-TAIX01



Analog Input IOTA Non-Redundant

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 Updated the compatibilities of DC-TAID01/11 and DC-TAIX01/11 with CC-PAIH02

4.2.3 Analog Input HART IOTA Redundant Models DC-TAIX11

The Series C Mark II Analog Input IOTA board is represented by the following information and graphic.
To access the parts information for the:

- module
- IOTA
- terminal plug-in assembly, and
- fuses

associated with this board and module, refer to Analog Input in the Recommended Spare Parts section.
Series C Mark II Analog Input 6 inch, non-redundant IOTA is displayed.

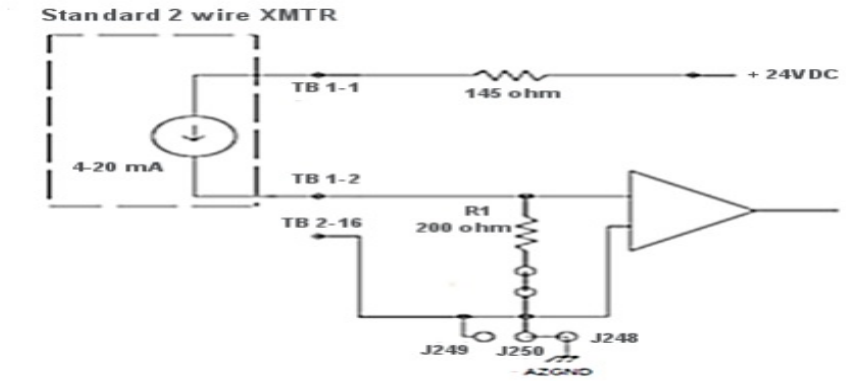
Field wiring and module protection - Analog Input HART module

Individual field wiring is protected by an internal protection circuit permitting.

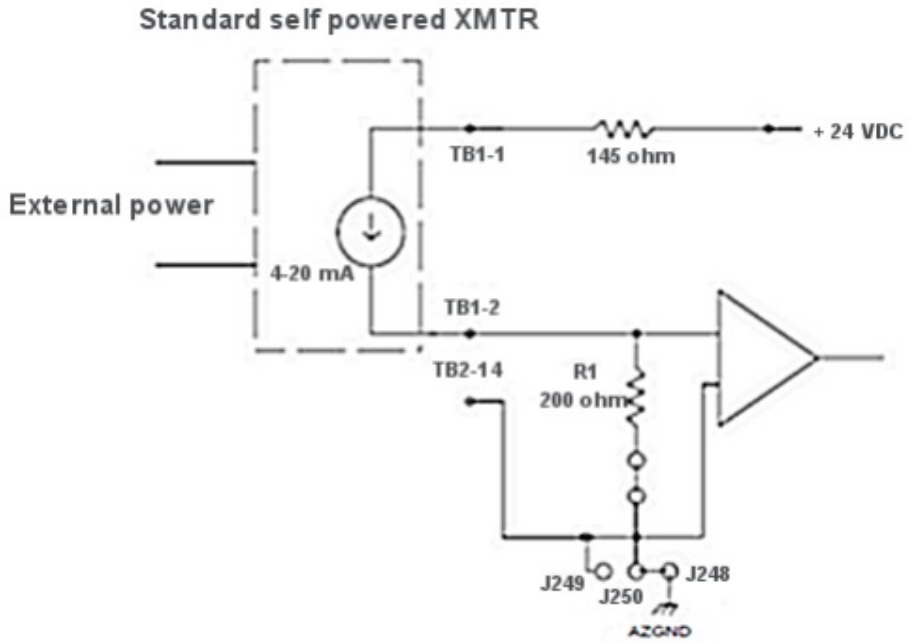
- Short circuit protection of input for field short circuits. Protection suitable for Division 2 non-incendive / Zone 2 non-arcing.
- Each signal can be shorted in the field with no damage to module or board. Other channels on the same IOM will not be affected.

Two-wire transmitter wiring - Analog Input HART module

The AI IOM/IOTA is optimized for use with classic two-wire transmitters. All 16 channels can accept inputs from two-wire transmitters without any special wiring or jumper options Standard and self-powered two-wire transmitter wiring - Analog Input HART module The HART/non-HART AI IOM/IOTA is optimized for use with classic two-wire transmitters. All 16 channels can accept inputs from two-wire transmitters. It is recommended to use channels 13 through 16, since these channels have a dedicated ground screw (although it is possible to use channels 1 through 12). Following figure illustrates an example jumper configuration for channel 1 of non-redundant 9 inch IOTA.



Non-redundant Analog Input 6 inch, standard 2-wire transmitter wiring

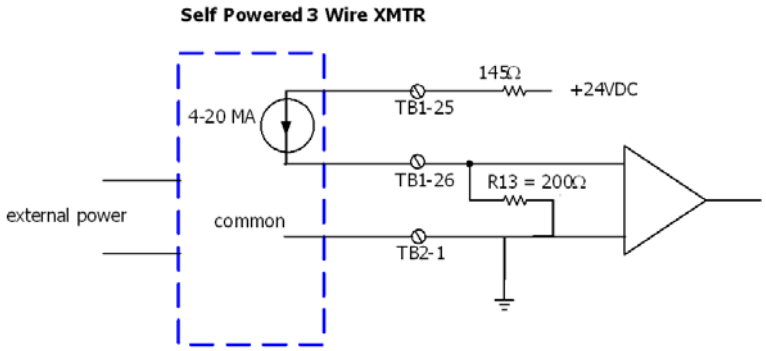


Non-redundant Analog Input 6 inch, self-powered 2-wire transmitter wiring Self-powered 3-wire transmitter (system ground) - Analog Input HART module

It is recommended to use channels 13 through 16, since these channels have 3 screws per channel (although it is possible to use channels 1 through 12).

For the following example:

- Channel 13 is used
- The three wires are terminated to TB1-25, TB1-26 and TB2-1



TB1: This is done through a 145 ohm resistor inline with a Positive Temperature Coefficient (PTC) device that acts like a fuse (but never needs replacement). Thus, these field terminals can be permanently shorted to ground without damage. This is an improvement over Process Manager due to the inclusion of the PTC device.

Analog Input HART module wiring reference table

Input style	Connection characteristics
Standard 2-wire transmitter	• Can use any of the 16 channels. • No custom wiring required.
Standard self-powered transmitter	• Can use any of the 16 channels. • No custom wiring required.
Self-powered transmitter with loop power(system ground)	• Can use any of the 16 channels. • Custom wiring is required for channels 1-12: you must find a screw terminal at Series C ground for one leg of the transmitter.
Self-powered 3-wire transmitter (system ground)	• Can use any of the 16 channels. • Custom wiring is required for channels 1-12: you must find a screw terminal at Series C ground for one leg of the transmitter.

The following table summarizes the possible Analog Input wiring connections.

Field wiring and module protection - Analog Output HART module

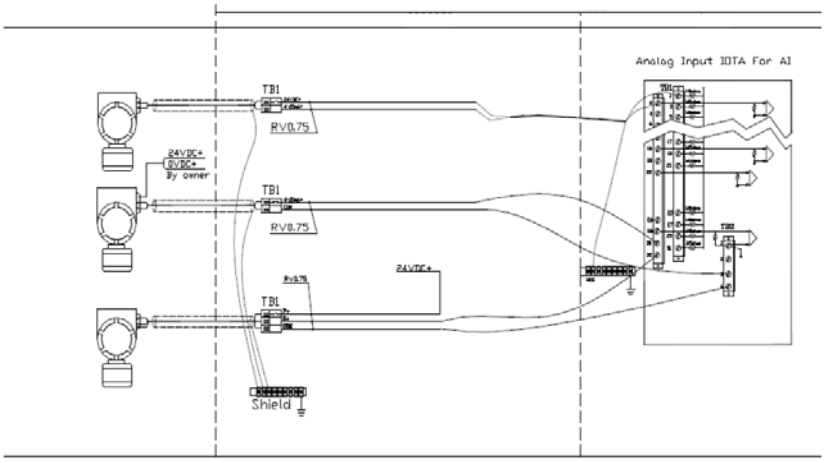
The Analog Output module provides an output current range of 0ma, and 2.9 mA through 21.1 mA based on the requested Analog Output by the Series C controller. The output current including the HART modulated signal, does not exceed 22.5mA.

- Short circuit protection of field short circuits. Protection suitable for Division 2 non-incendive / Zone 2 non arcing.
- Each field wiring pair can be shorted together without damage to the module or IOTA. Other channels in the same module(s) will not be affected.

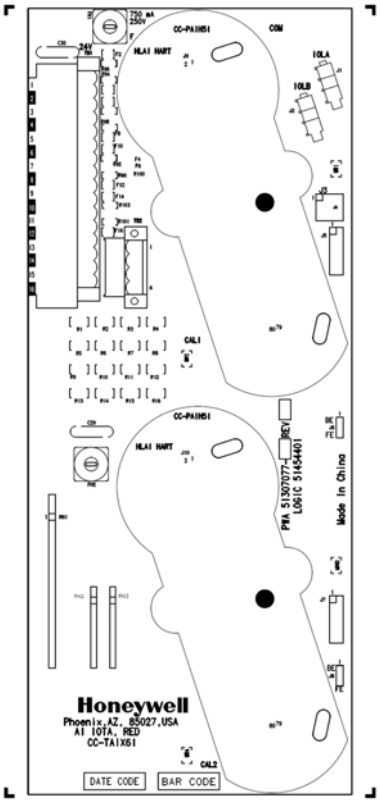
- A +30 Vdc source can be continuously applied across the OUT+ to OUT- terminals of the IOTA without damage to either module(s) or IOTA (i.e. with the positive lead of the source connected to OUT+ and the negative lead connected to OUT-). To prevent damage to the IOTA surge protection diodes, the current must be limited to 500 mAdc if the source is applied in the reverse polarity (i.e. with the positive lead of the source attached to OUT-, negative lead attached to OUT+). This 500 mAdc restriction does not apply in the positive polarity case.

IOTA board and connections - Analog Input HART module

Series C Analog Input 6 inch, non-redundant IOTA and field wiring connection is displayed in the following image.



Series C Analog Input 6 inch, non-redundant IOTA and field wiring connection



Series C HART/non-HART Analog Input 12 inch, redundant IOTA

4.3 Analog Output Specification

4.3.1 HART Analog Output Module (CC-PAOH01)

C300 Controller CC-PAOH01

The C300 Controller is constructed using the Series C form factor that employs an Input-Output Termination Assembly (IOTA) and an electronics module which mounts and connects to the IOTA.

One C300 Controller contains all of the control functionality and the communications functions with plug-in modules.

The C300 Controller may operate in both non-redundant and redundant configurations. Redundant operation requires a second identical controller and connecting cables, which is the typical configuration.

The C300 Controller is connected to the associated I/O hardware by a pair of I/O Link Interface cables The table below identifies the C300 Controller components and their associated components.

TheC300 Controller supports the non-redundant and fully redundant operation.

Redundancy is built into the controller so that just by adding another controller and a redundancy cable; a redundant controller pair is achieved.

Note that the 'CC' designation on the model number indicates the printed wiring boards are conformally coated for additional protection from the environment, (CU = uncoated).

4.3.2 Analog Output IOTA Models Redundant (DC-TAOX11) and non Redundant (DC-TAOX01)

This Series C Mark II Analog Output IOTA board is represented by the following information and graphics.

To access the parts information for the:

• module
• IOTA
• terminal plug-in assembly, and
• fuses

associated with this board and module, refer to Analog Ouput in the Recommended Spare Parts section.

Field wiring and module protection - Analog Output module The Analog Output module provides an output current range of 0ma, and 2.9 mA through 21.1 mA based on the requested Analog Output by the Series C controller. The output current including the HART modulated signal, does not exceed 22.5mA.

• Short circuit protection of field short circuits.

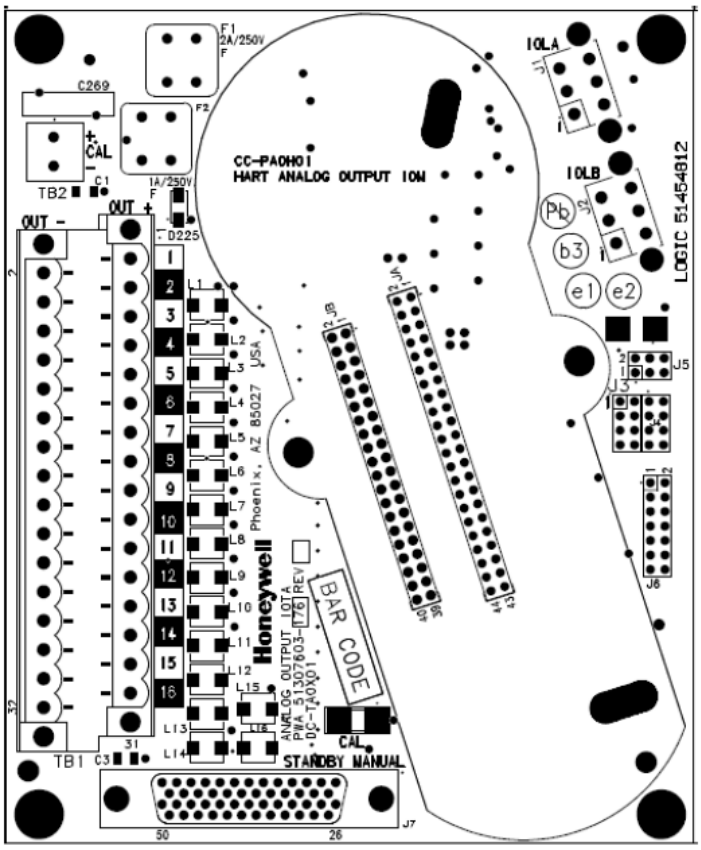
• Each field wiring pair can be shorted together without damage to the module or IOTA. Other channels in the same module(s) will not be affected.

• A +30 Vdc source can be continuously applied across the OUT+ to OUT- terminals of the IOTA without

damage to either module(s) or IOTA (i.e. with the positive lead of the source connected to OUT+ and the negative lead connected to OUT-). To prevent damage to the IOTA surge protection diodes, the current must be limited to 500 mAdc if the source is applied in the reverse polarity (i.e. with the positive lead of the source attached to OUT-, negative lead attached to OUT+). This 500 mAdc restriction does not apply in the positive polarity case.

Series C Mark II IOTA board and connections - Analog Output module

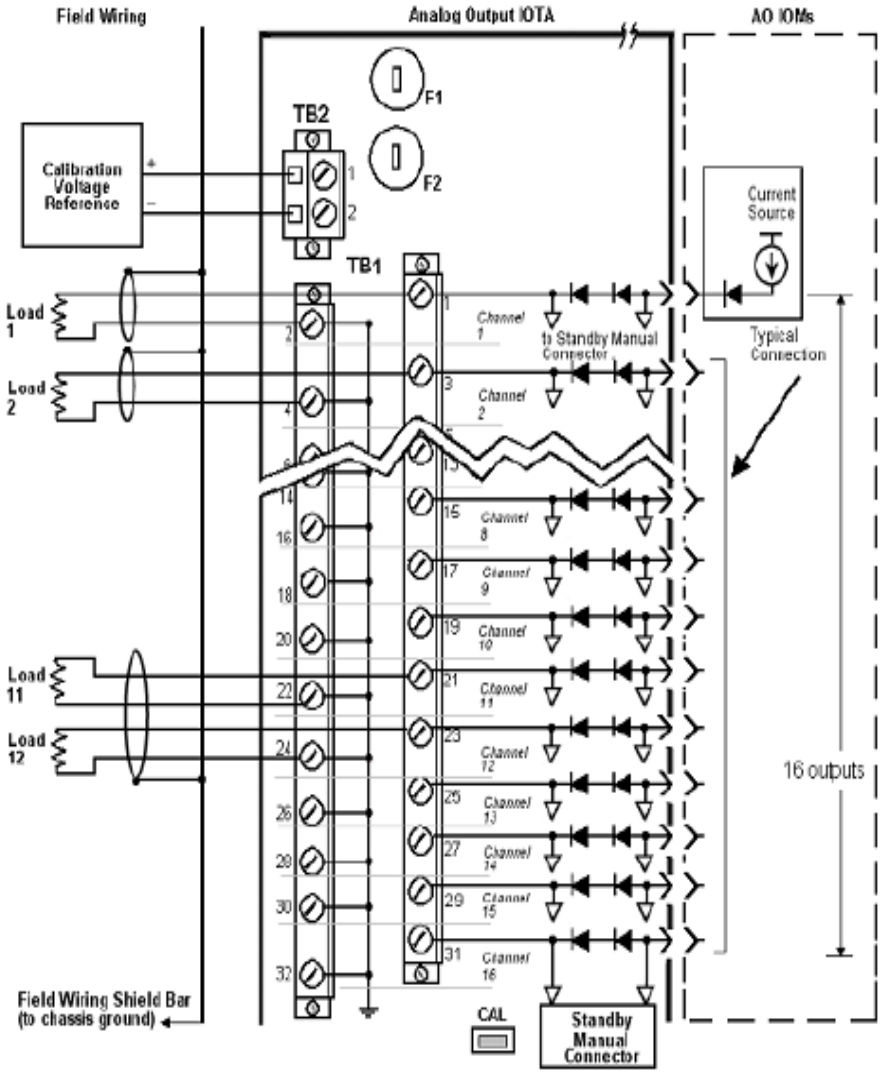
Series C Mark II Analog Output 6 inch, non-redundant IOTA is displayed.



Series C Mark II Analog Output 6 inch, non-redundant IOTA

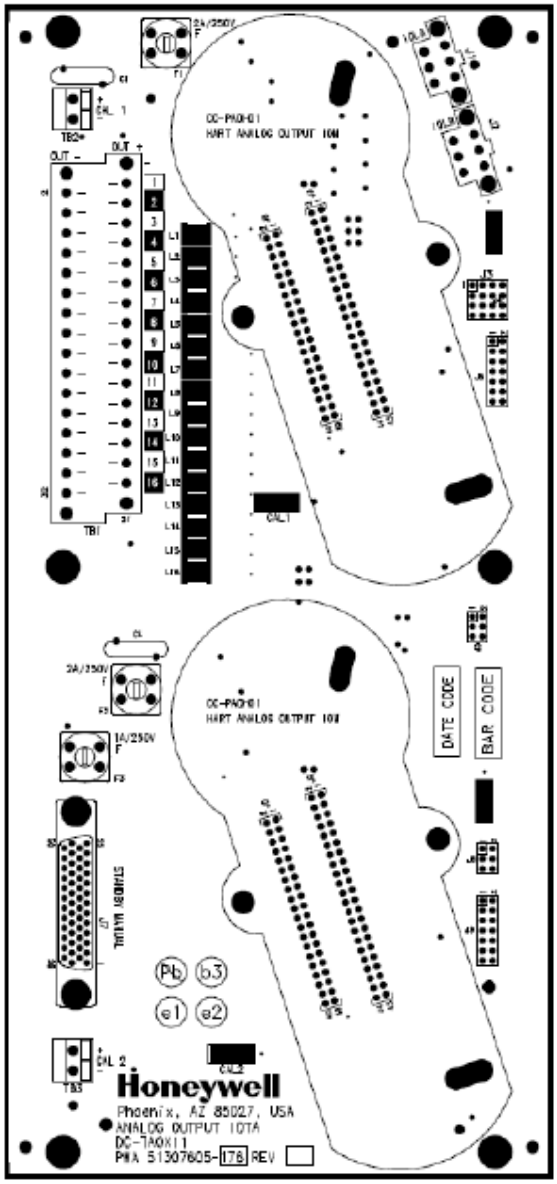
To properly wire your module to the Series C Mark II Analog Output IOTA board with terminal block 1 (TB1), use the following table.

Series C Mark II Analog Output 6 inch, non-redundant IOTA and field wiring connection



Series C Mark II Analog Output 6 inch, non-redundant IOTA and field wiring connection

Series C Mark II Analog Output 12 inch, redundant IOTA is displayed:



Series C Mark II Analog Output 12 inch, redundant IOTA

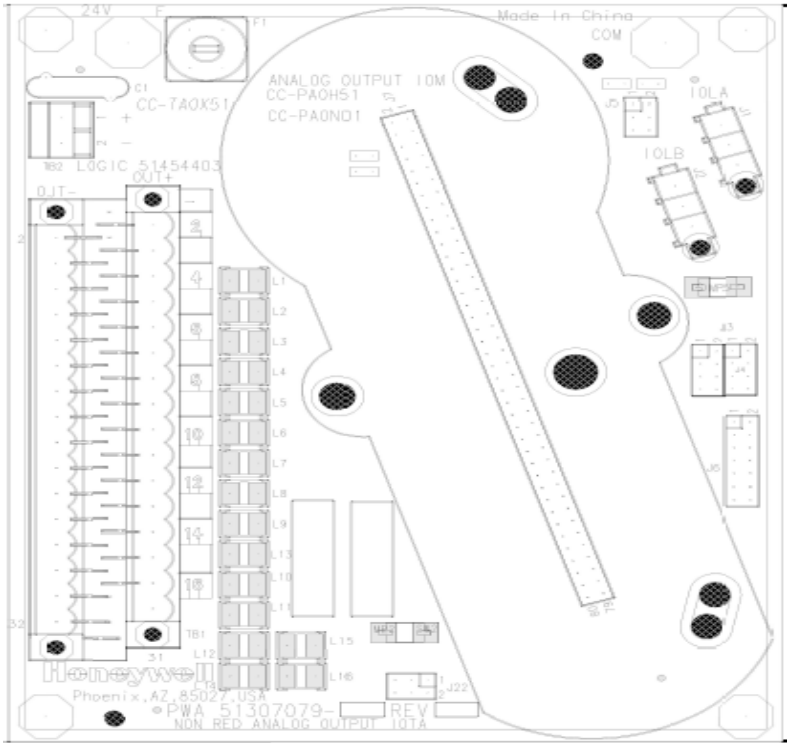
Field wiring and module protection - Analog Output HART module

The Analog Output module provides an output current range of 0ma, and 2.9 mA through 21.1 mA based on the requested Analog Output by the Series C controller. The output current including the HART modulated signal, does not exceed 22.5mA.

- Short circuit protection of field short circuits. Protection suitable for Division 2 non-incendive / Zone 2 nonarcing.
- Each field wiring pair can be shorted together without damage to the module or IOTA. Other channels in the same module(s) will not be affected.
- A +30 Vdc source can be continuously applied across the OUT+ to OUT- terminals of the IOTA without damage to either module(s) or IOTA (i.e. with the positive lead of the source connected to OUT+ and the negative lead connected to OUT-). To prevent damage to the IOTA surge protection diodes, the current must be limited to 500 mAdc if the source is applied in the reverse polarity (i.e. with the positive lead of the source attached to OUT-, negative lead attached to OUT+). This 500 mAdc restriction does not apply in the positive polarity case.

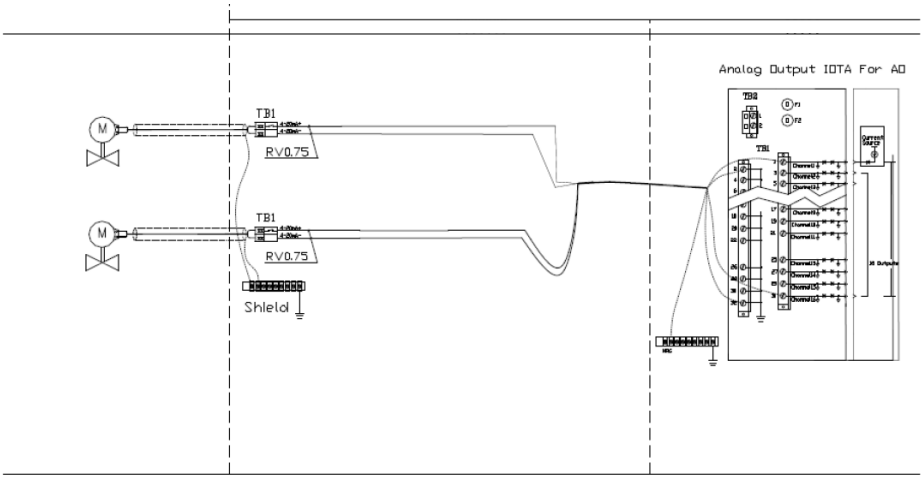
IOTA board and connections - Analog Output HART module

Series C Analog Output 6 inch, non-redundant IOTA is displayed.



Series C Analog Output 6 inch, non-redundant IOTA

To wire your module to the Series C Analog Output IOTA board with terminal block 1 (TB1), use the following table



Series C Analog Output 6 inch, non-redundant IOTA and field wiring connection

4.4 Digital Input Specifications

4.4.1 Digital Input (DC-PDIL51)

Digital Input Module and IOTA Specifications

Digital Input 24V IOTA Models DC - TDIL51 and DC - TDIL61:

The Series C Mark II Digital Input 24V IOTA board is represented by the following information and graphics.

To access the parts information for the:

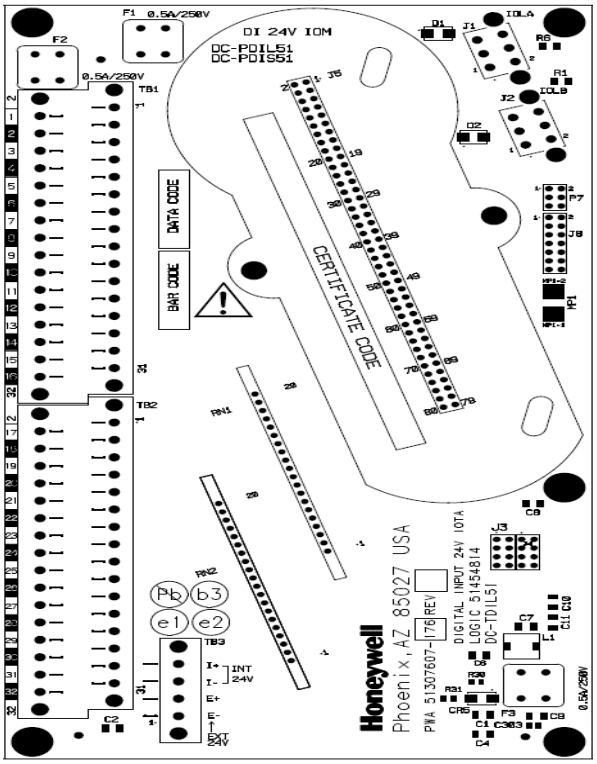
• Module
• IOTA
• Terminal plug-in assembly, and
• fuses

Associated with this board and module, refer to Digital Input 24V in the Recommended Spare Parts section.

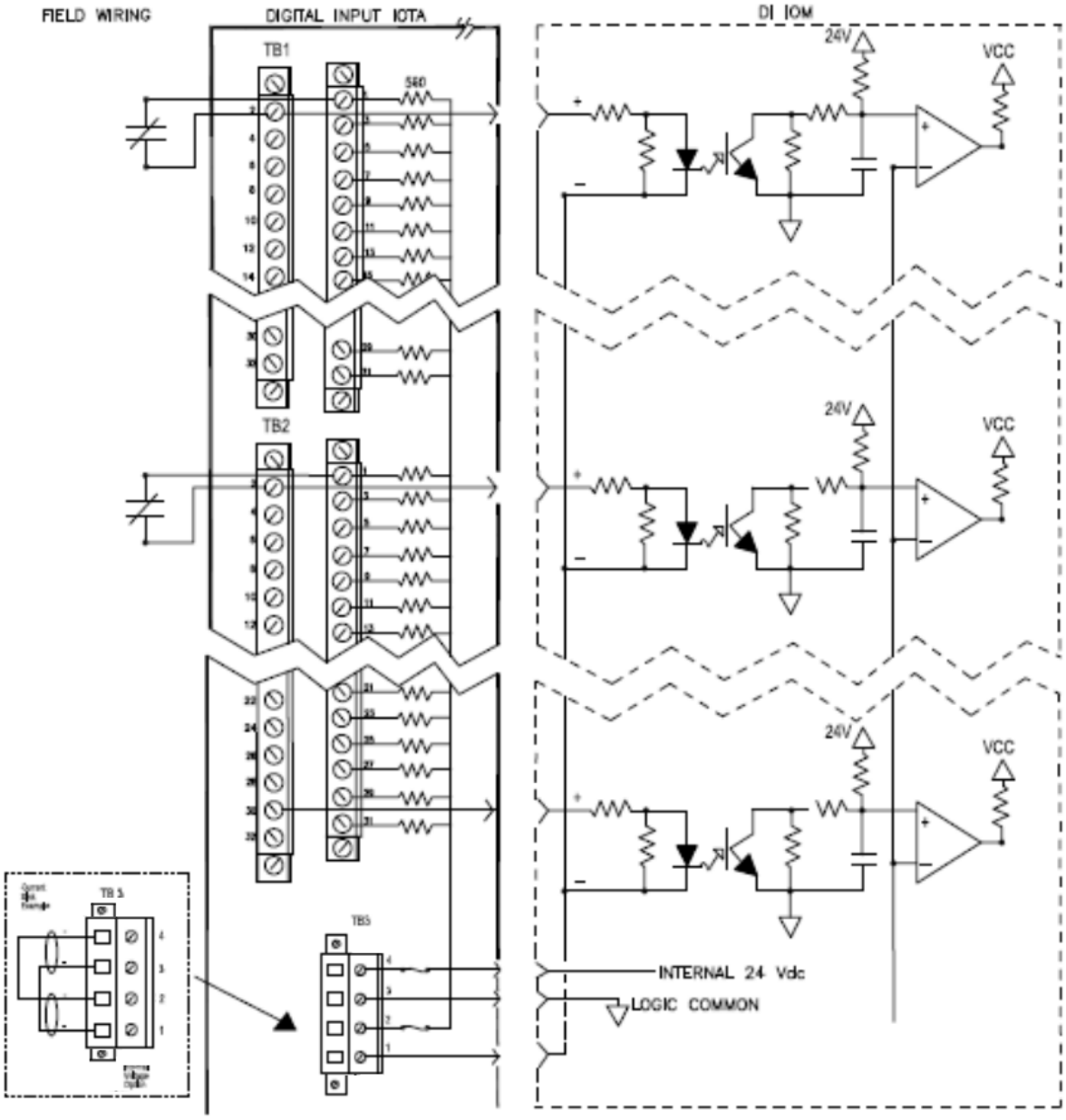
An internal protection circuit protects Field wiring, which:

• Allows for internal or external DI sense power (field selectable using jumper block TB3)
• Permits short circuit protection of input for field short circuits.
• Allows each signal to be shorted in the field with no damage to module or board. Other channels on the same IOM are not affected.
• Field drive current is limited. Short circuit of input allowed.

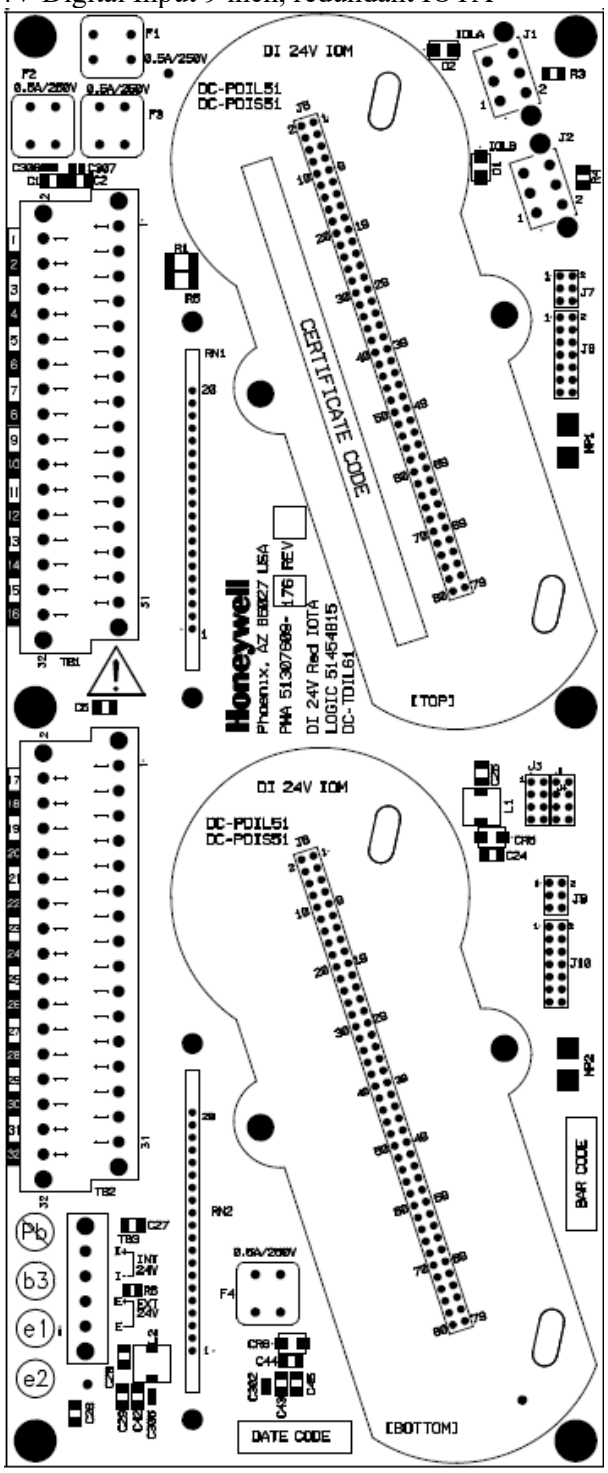
Series C Mark II 24V Digital Input 9 inch, non-redundant IOTA is displayed.



Series C Mark II 24V Digital Input 9 inch, non-redundant IOTA and field wiring connection



Series C Mark II 24V Digital Input 9 inch, redundant IOTA



4.5 Digital Output Specifications

4.5.1 Digital Output Module DC-PDOD51

Parameter	Specification		
Input / Output Model	CC-PDOD51	24Volt Digital Output , Field Isolated, Bussed output	
IOTA Model Numbers	CC-TDOD51	Non Redundant	9"
	CC-TDOD61	Redundant	9"
Output Channels	32		
Output Type	Source		
Load Voltage Range	30 VDC		
Load Current	0.5 A (max) per point 1.0 A (max) per 2 points 5 A (max) per 32 points		
Isolation	Galvanic Isolation (photo coupler) 120 VAC, ±42.4 VDC max. (see trace tag below) (Any output voltage referenced to common)		
On-State Voltage	24 V (typ), load current @ 0.5A(3)		
Off-State Voltage	0v VDC (max) (3.3VDC (max) indicated under no-load condition)		
Off-State Leak Current	0.5 µA (max)		
Turn-On/Turn-Off Time	10 ms (max)		
Gap (0 current) of Output to Field on Switchover	150 µs maximum (applies to Redundancy only)		
Output voltage will be the Source Voltage – 150mV maximum.			

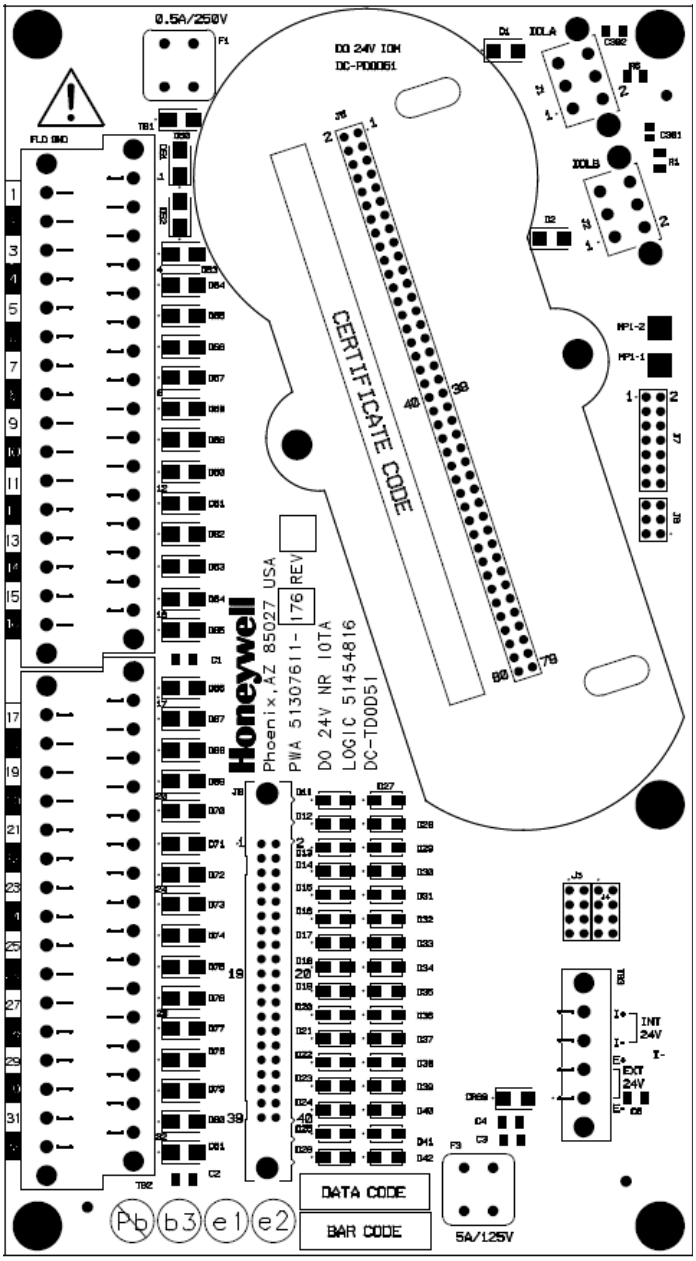
Digital Output 24V IOTA Models DC-TDOD51 and DC-TDOD61:

The Series C Mark II Digital Output 24V IOTA board is represented by the following information and graphics. To access the parts information for the:

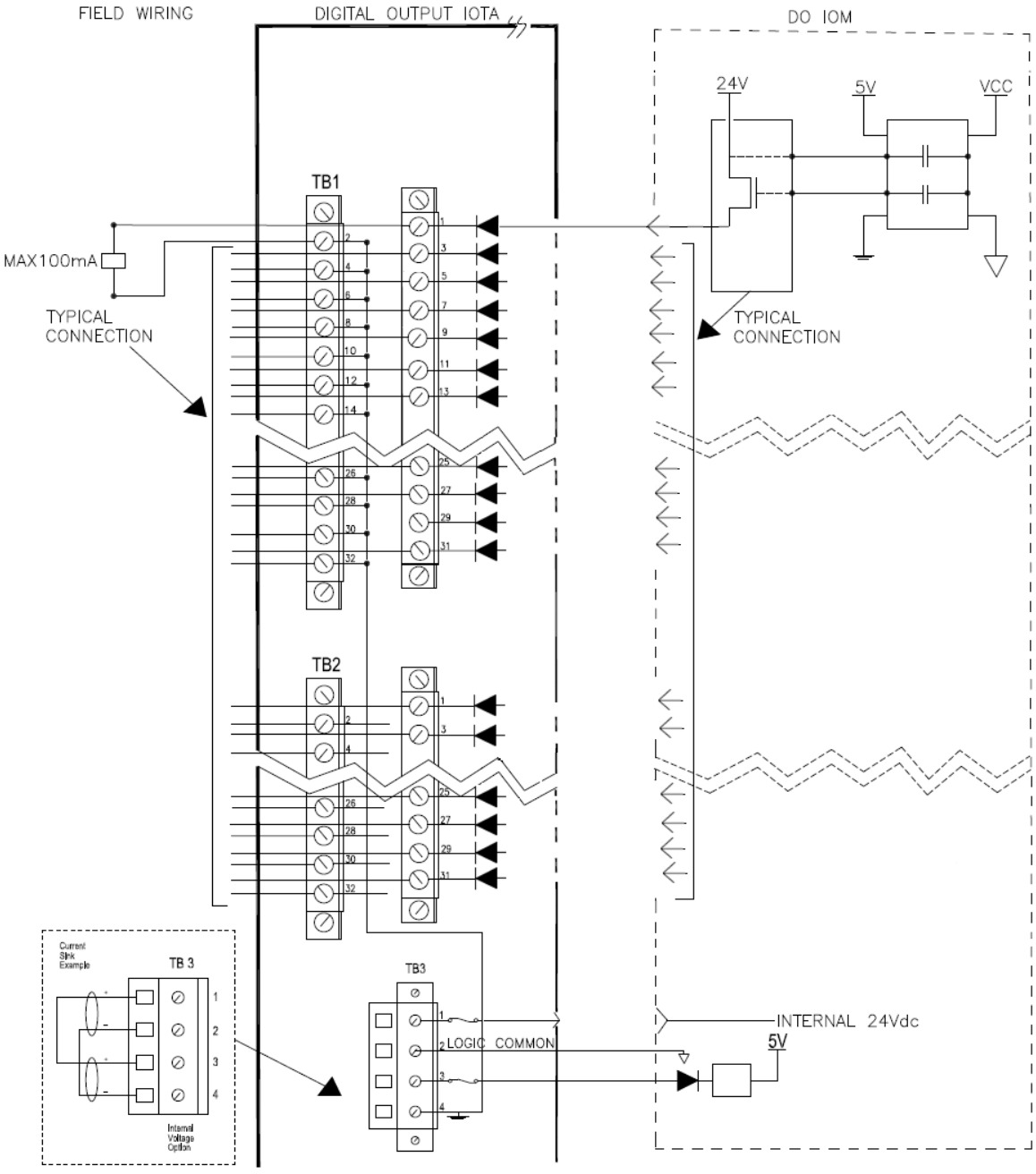
• Module

• IOTA
• Terminal plug-in assembly, and
• fuses
Associated with this board and module, refer to Digital Output 24V in the Recommended Spare Parts section.
The Digital Output 24Volt Module provides a unique and highly functional output power protection method. When a short occurs in the field, the following occurs.
• The output circuits sense the over-current condition and shut down the output.
• The shutdown of the point places the mode of the point into Manual.
• An Over-current Soft Failure is generated.
This failure is maintained until the short circuit condition is repaired and the point is again supplying the proper current.
Only one channel is affected at a time. If multiple channels are affected, they are individually shut down. Any channels that do not have a short circuit condition are unaffected.
• Each channel in a DO module can handle a maximum load of 100mA.

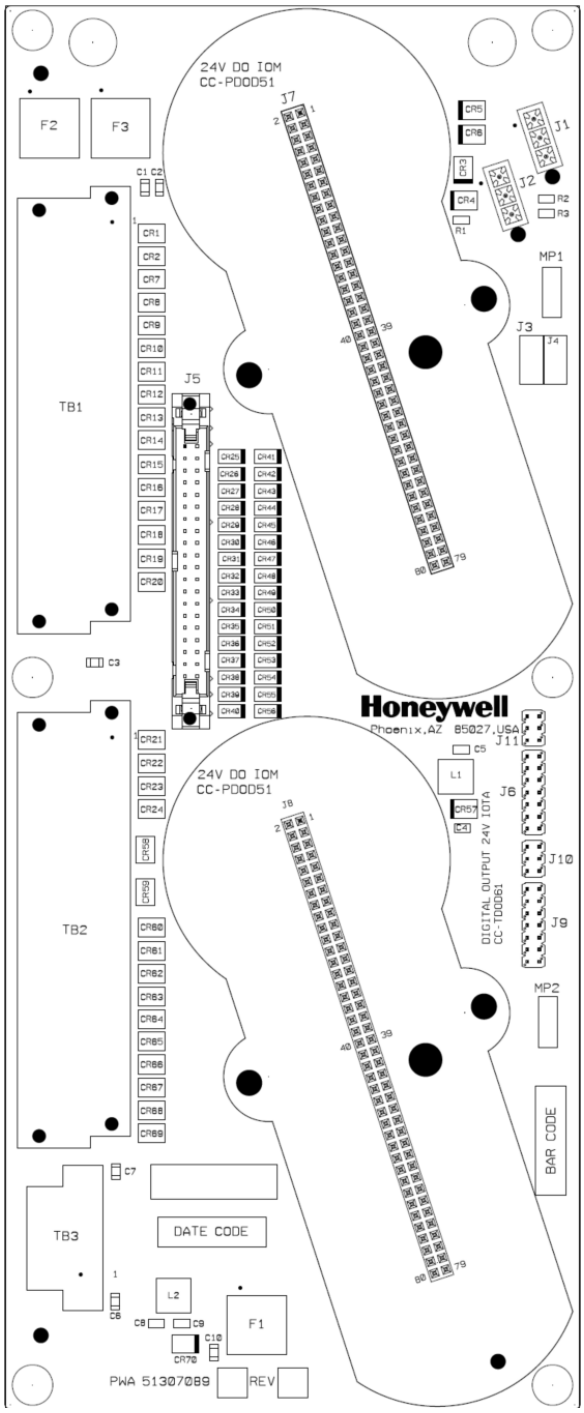
Series C Mark II 24V Digital Output 9 inch, non-redundant IOTA is displayed.



Series C Mark II 24V Digital Output 9 inch, non-redundant IOTA and field wiring connection is displayed



Series C Mark II 24V Digital Output 9 inch, redundant IOTA is displayed.


24V DO IOM
CC-PDOD51
F2
F3
J7
J1
J2
MP1
J3
J4
J5
TB1
Honeywell
Phoenix,AZ 85027,USA
24V DO IOM
CC-PDOD51
J11
J6
J10
J9
DIGITAL OUTPUT 24V IOTA
CC-TDOD61
MP2
BAR CODE
TB2
TB3
DATE CODE
L2
F1
PWA 51307089
REV

4.6 Human Machine Interface (HMI)

The Redundant EXPERION Server will act as a Workstation-a Human-Machine interface. It will work as Operator as well as Engineering Workstation also. Security rights control the functional difference between them as well as additional installed software for Engineer use.

The Operator and/or Engineer workstation shall consist of a keyboard, mouse, processor and LCD. This combination and its associated electronics shall be a stand-alone device of modular design with sufficient intelligence to display the process in schematic form with the process variables, set points, and outputs shown in engineering units. Where required, additional software will be installed on Engineer workstations to build the displays necessary for both Operator and Engineering manipulation and for trouble shooting, problem resolution and configuration changes. Access to these engineering tools will be restricted to authorized people only.

4.7 Redundancy procedure

All equipment that have important data will be consider as redundancy and this feature will be Accessible in Power, switch, controller, UPS and… In network redundancy its should be two separate route to transmit data from controller to workstation and verse vise , switch, converter, patch panel firewall controller and even the station have two port for connection. For serial connections as same as network redundant transmit ion will be consider and all Lan cable and ip configuration will be in different way.

5.0 C300 CONTROLLER PURPOSE

This section provides a quick comparison of C200 and C300 Controller features.

5.1 C300 Controller and C200 Controller comparison

The C300 Controller provides design improvements and greater operational capabilities for process control over the chassis-based C200 controller. The following table is a listing that compares design features and operational improvements of the C300 Controller with the C200 controller.

Controller Feature	Comparison
Form Factor	**C200** - Chassis-based controller with plug-in modules for Control Processor, I/O Link Interface, Redundancy, FTE interface, Fieldbus, other I/O and control modules. **C300** - A single control module that plugs into an Input Output Terminal Assembly (IOTA). Control module functions include a Control processor, two I/O Link interfaces, Redundancy functions, and FTE interfaces.
Memory (RAM)	**C200** - 4MB User Memory **C300** - 16MB User Memory
Redundancy	**C200** -Two identically-equipped controller chassis that contain two Redundancy Modules (RM) provide controller redundancy. **C300** - Controller redundancy function is built in. A second C300 Controller and redundancy cable is all that is required for redundant controller operation. (No RMs)
I/O Link Interface	**C200** - An I/O Link Interface plug-in Module (IOLINK) installed in the controller chassis is required to connect PMIO I/O to the controller CPM. **C300** - Two I/O Link interfaces are built in to the controller. Each I/O Link can connect with either PMIO I/O or Series C I/O modules. **Note**: C300 - 20mS CEE Controller supports only Series C I/O modules.
Communications Interface to supervisory network	**C200** - Ethernet or Fault Tolerant Ethernet plug-in modules are needed to connect to respective Ethernet and FTE communication networks. ControlNet Interface plug-in module is needed to connect with other ControlNet nodes. **C300** - Ethernet interface is built into the controller and supports both Ethernet and redundant FTE communications. No ControlNet interface.

Peer-to-Peer Connections	**C200** - Ethernet or Fault Tolerant Ethernet Bridge plug-in modules are needed to connect to respective Ethernet and FTE networks. ControlNet Interface plug-in module is needed to connect with other ControlNet nodes. **C300** - Ethernet interface is built into the controller to support both Ethernet and redundant FTE communications. C300 connection to C200 controller is made through an FTE Bridge module installed in the C200 chassis. No ControlNet interface. **Note**: C300 - 20mS CEE Controller does not support peer-to-peer connection with C200E.
Function Blocks	**C200 and C300** - Both Controllers use the same standard Experion function block types for control strategy execution. There are some exceptions. **Note**: C300 - 20mS CEE Controller supports only limited function blocks. For more information.
Engineering Tools	C200 and C300 - Both controllers use the same engineering tools utilities and applications for maintenance tasks (except NTools). The CTools engineering utility is used to upgrade C300 firmware and extract files containing diagnostic data when troubleshooting problems.

5.1.1 C300 CONTROLLER PLANNING AND DESIGN

This section includes information about system planning and design of the C300 Controller.

5.1.2 Review Experion system capabilities

Read the Overview document so that you understand the basic concepts and terminology, and appreciate the capabilities of Experion.
Complement the information in this document with the data in the Server and Client Planning Guide to cover all aspects of an Experion installation.
For planning and design topics for Experion servers and clients as well as information about adding third-party controllers, see the Server and Client Planning Guide.

5.1.3 Planning for system security

System security must be achieved at all levels in the Experion system to manage security threats.

5.2 Control Hardware Planning Guide

Refer to the Control Hardware Planning Guide for a general discussion of planning activities for Experion Control hardware that covers:

- Initial planning and design
- Control network considerations
- Control hardware configuration
- Site selection and planning
- Control processing considerations
- Application licensing considerations

Series C control hardware:

Series C control hardware consists of the following system components:

- **C300 Controller** is a distributed process controller and I/O gateway for the Experion system.
- **C300 - 20mS CEE Controller** is a distributed process controller and I/O gateway for the Series C I/O

modules including the two new modules. The C300 - 20mS CEE Controller fully supports the functions, configuration, load and execution of control applications. Once loaded, you cannot change the base execution speed and retain the application configuration.

- **Series C Input/output Modules** that feature HART-capable AI and AO modules, and a low level Mux AI module. Digital input modules that support 24V DC, and a Digital Output module that provides 24 VDC. A 9-port Control Firewall, (CF9)Level1 Switch provides eight FTE interface connections for C300 Controllers and Series C FIMs within a control cabinet and one uplink to the supervisory FTE communications network.

5.2.1 Series C form factor

All Series C control hardware is constructed using the same form factor; that is, the C300 Controller modules, Series C I/O modules, Control Firewall modules, and Series C FIMs all mount on their associated Input Output Termination Assemblies (IOTA), which are installed on channel hardware specifically designed to support Series C hardware installation. The module's circuit board assemblies are housed in a plastic

case with a round faceplate that identifies the module type and model number along with status LEDs and a four-character alphanumeric display. The IOTA contains connectors that accept the associated control module and the various I/O connectors for cables that connect to other Series C control hardware. Below figure shows an example of the design.

Series C Mark II form factor example

5.2.2 C300 Controller

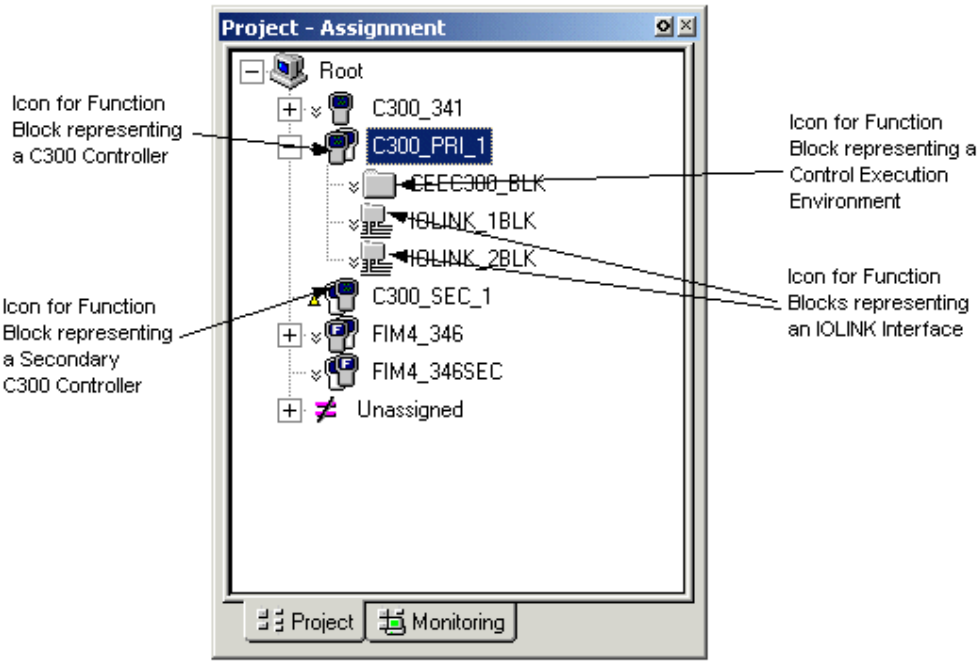
Component	Description	Model Number
C300 Controller Module	A distributed process controller and I/O gateway for the Experion system. Module contains printed circuit assemblies, status indicators and a display, inside in a plastic housing. Module mounts to its Input Output Termination Assembly (IOTA).	CC-PCNT02
C300 Controller Input Output Termination Assembly (IOTA)	Provides the connection point for the C300 Controller module and all cable terminations to the controller, (FTE, IOLink, Redundancy, Battery, and Time Source cable terminations). Provides 24 Vdc power distribution to the controller module. Note: The C300 Controller IOTA supports only one controller module.	DC-TCNT01
C300 Controller memory backup	Provides up to 50 hours of memory backup to one or two connected C300 Controllers.	DC-SCMB02

C300 Controller redundancy

The C300 Controller may operate in both non-redundant and redundant configurations. Redundant operation requires a second identical controller and connecting cables, which is the typical configuration. The switchover time from the active primary controller to the backup controller of a redundant pair is less than500 milliseconds.

C300 Controller block

When a C300 Controller block is added to the Project tree in Control Builder, a graphic representation of a controller module and its resident function blocks appears as shown in following Figure The function blocks that are contained in the controller support multiple execution environments. A Control Execution Environment block (CEEC300) and two IOLINK blocks are contained in the controller and appear under the controller. When the controller block is configured as redundant, the secondary controller block is added in the Project tree.



Redundant C300 Controller block in the Project tree

5.2.3 C300 Controller execution environments

The C300 Controller supports three Execution Environment (EE) function blocks. One is the Control EE block (CEEC300) which is essentially the same block found in the C200 controller. The other two are I/O Link blocks, (IOLINK) similar to the IOLINK block available with the C200.The IOLINK block sin the C300 support connection and communication with PMIO I/O control hardware,(as with the IO Link Interface Module

in C200 controllers), but also support connection and communications with all Series C I/O modules.

CEE function block

The Control Execution Environment (CEEC300) block is a function block which is similar to the CEE blocks in the C200 and ACE controllers and uses the same library of block types. The CEEC300 block provides an execution and scheduling environment in which Control Modules (CMs) and Sequential Control Modules (SCMs) execute user-configured control strategies. Existing control strategies (from a C200 controller for example) can be ported to a C300 controller, although manual editing of these strategies is required to support the C300 controller configuration. The CEEC300 block contains a peer-to-peer communications layer which is used to communicate between other controllers. This block also supports communication and containment of Series an I/O module and channel blocks.

IOLink function blocks

Two IOLINK function blocks, which represent the 2 physical IO links on the C300 Controller IOTA, provide t user-configured he I/O Link interface to support communications with PMIO I/O module card files and/or Series C I/O modules. Each IOLINK is configured to support either PMIO modules, Series C I/O modules or 'No Link' if no I/O control is required. Each IOLINK supports redundant and non-redundant communications and contains the same functionality as the IOLINK blocks used in the C200 controller and IOLIM interface.

5.2.4 I/O modules supported by the C300 Controller

The C300 Controller supports all Series a chassis-based I/O modules, all Series C I/O modules and all PMIO I/O modules that are qualified for use in Experion. Series an I/O modules are connected to the C300 through a Fault Tolerant Ethernet Bridge (FTEB) module which is installed in a C200 controller or remote I/O chassis. See FTE Bridge (FTEB) Topologies in the Control Hardware Planning Guide for an example of this connection. Some Series A modules are implemented in a Control Component Library (CCL).

Series C I/O and PMIO modules are connected to the C300 by a pair of I/O Link Interfaces. Two IO Link interfaces, which are redundant, provide connection between the C300 controller and associated I/O modules. Each IO links can be configured to support Series C I/O modules or PMIO I/O modules.

See the following resources for listings of the supported I/O modules:

- **PMIO Modules** - Planning Your Input/Output Processor (IOP) Cards in the control Hardware Planning Guide.

- **Series C I/O Modules** - Available Series C I/O modules in the Series C IO User's Guide.

5.2.5 C300 Controller installation and upgrades

This section includes information about installing various Series C components. Physical descriptions of the components as well as procedures for installing these components are provided.

5.3 C300 Controller IOTA (DC-TCNT01)

Series C Component	Description	Model Number
C300 Controller Input Output Termination Assembly (IOTA)	The DC-TCNT01 51307591-175 is a Provides the connection point for the C300 Controller module and all cable terminations to the controller, (FTE, IO Link, Redundancy, Battery and Time Source cable terminations). Provides 24Vdc power distribution to the controller module. The C300 Controller is constructed using the Series C form factor that employs an Input Output Termination Assembly (IOTA) and an electronics module which mounts and connects to the IOTA. One C300 Controller contains all of the control functionality and the communications functions with plug-in modules	DC-TCNT01

In following section is completely explain about different pin of C300 IOTA and how to implement that and other necessary data.

5.4 Pre-installation considerations

5.4.1 Installation declarations

Electrostatic discharge can damage integrated circuits or semiconductors if you touch connector pins or tracks on a printed wiring board. Follow these guidelines when you handle any electronic component:

- Touch a grounded object to discharge static potential,
- Wear an approved wrist-strap grounding device,
- Do not touch the wire connector or connector pins,
- Do not touch circuit components inside a component,
- If available, use a static safe workstation,
- When not in use, keep the component in its static shield box or bag.

5.5 Series C Mark II power system

Power systems for Series C Mark II control hardware provides the following:

- Redundant power supplies with separate mains power feeds.
- 20A redundant versions available.
- Optional system battery backup is also available with 20A version.
- Memory RAM battery is provided to supply memory retention power for C300 controller.

The capabilities and options available with the Series C Mark II power system are identical to those available with the Process Manager Power System.
The power supply for the Series C Mark II control hardware is mounted on the left hand side of the enclosure and includes battery backup and battery charger if required. IOTAs are connected by combo cables. The other end of combo cable is connected with header board which is powered from the power supply.
With Series C Mark II, the Commercial Off-the-Shelf (COTS) power system is available which, is a low cost power system used to power Series C Mark II system. The power system provides 24 volts DC with maximum output of 20 A. The COTS power system is available in the following two configurations.

- The COTS power redundant system, which consists of the following:

– Two power supply modules
– Two power supply back panels
– Two cable-AC power inputs, alternate Fan (Length -3000 millimeter)

– Alarm Cable - Redundant option, COTS Power supply

Following are the two types of the COTS power system that are available.

- COTS Power- Meanwell redundant (20A)
- COTS Power-Phoenix redundant (20A)

Phoenix or Meanwell power contact supply does not have an on/off switch. The AC input power to the power supplies is via double pole circuit breaker.

NOTE:

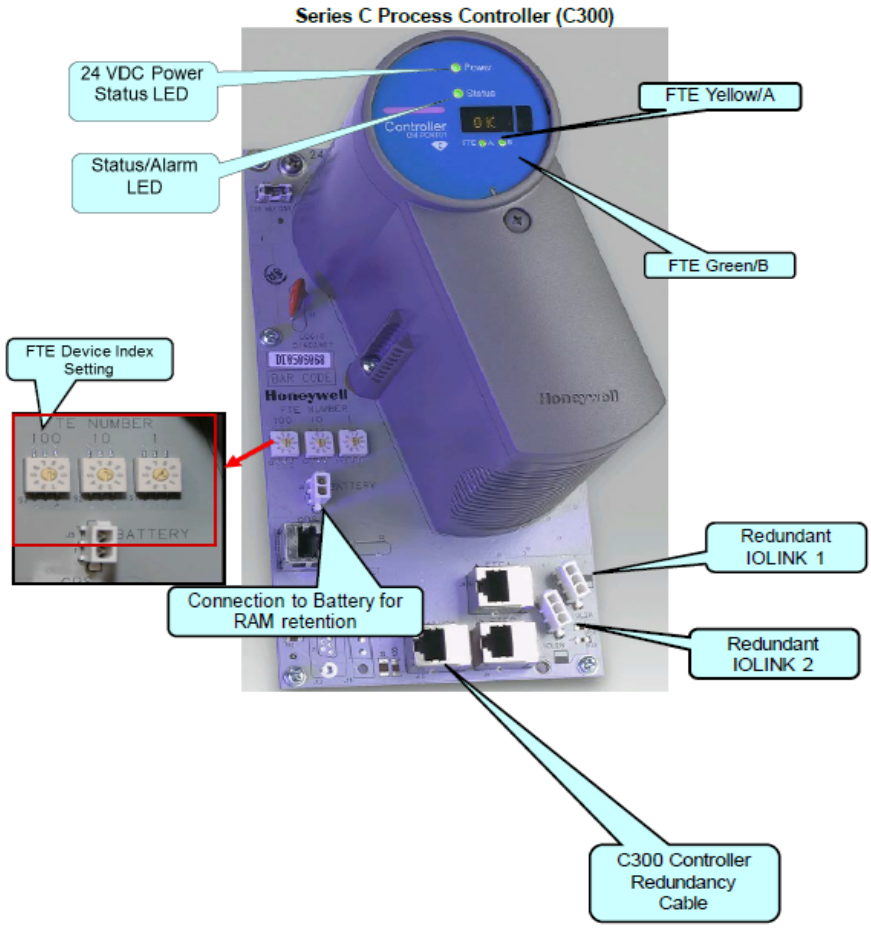
5.5.1 Controller memory backup for Series C Mark II

C300 Controller memory backup provides memory retention power for the C300 should power be lost to the Series C cabinet. Memory power is rated for 50 hours for a pair of redundant C300 controllers.

5.6 C300 Controller installation

5.6.1 C300 Controller assembly

The C300 Controller consists of an Input/output Terminal Assembly (IOTA) board and the controller module which is housed within a plastic cover and is mounted onto the IOTA board. The Controller assembly is installed in a control cabinet on vertically-mounted channels specifically for Series C control hardware. The following figure shows the features of the C300 Controller IOTA board.



C300 IOTA Board	Description
F1	Fuse
IOL1A, IOL1B (Gray cable) IOL2A, IOL2B (Violet cable)	Redundant IOLINK connectors for IOLINK 1 and IOLINK 2 IOLink A cable connectors are Yellow. IOLink B cable connectors are Green.
FTEA, FTEB	Fault Tolerant Ethernet (FTE) network connectors FTE A network cable connectors are Yellow. FTE B network cable connectors are Green.
REDUNDANCY	Redundant private path cable connector. Redundancy cable connector is Orange
MEMORY HOLD-UP	Battery Backup cable connector Battery cable is a twisted pair.
GPS (Currently not used)	GPS cable connector
FTE DEVICE INDEX 99, 10, 1	Three rotary decimal switches used to set the FTE network address (Device Index) of the controller. See the To install a C300 Controller for setting the address.

Prerequisites

When installing a redundant controller pair consisting of a primary and a partner secondary controller:

- The secondary controller should be installed in the same cabinet as the primary controller.
- The secondary controller may be installed on a separate channel from the primary controller.
- Both the primary and partner secondary controllers must be connected to the same pair of Control Firewall assemblies.

Before you install the C300 Controller you should have:

- A control cabinet installed with appropriate channel hardware for mounting Series C control hardware.
- A Series C power supply and optional battery backup hardware installed in the cabinet.
- Installed pair of Control Firewall assemblies.
- The necessary parts for installing C300 Controller to the control system.

Parts include:

– the C300 Controller assembly (control module with IOTA board and mounting hardware)

– 2 STP Cat5 Ethernet cables (one Yellow cable, one Green cable)

– 2 or 4 IOLink cable assemblies for connecting on-board IO Link interface if the controller is supporting

Series C I/O or Process Manager IO modules.

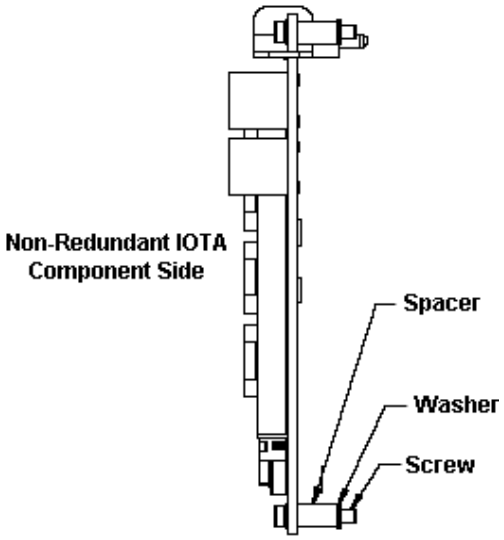
- Ensure the cabinet enclosure is connected to a protective earth ground using #8 AWG solid copper wire.

There should be metal to metal contact between the grounding bus bar and the enclosure as well as the channel.

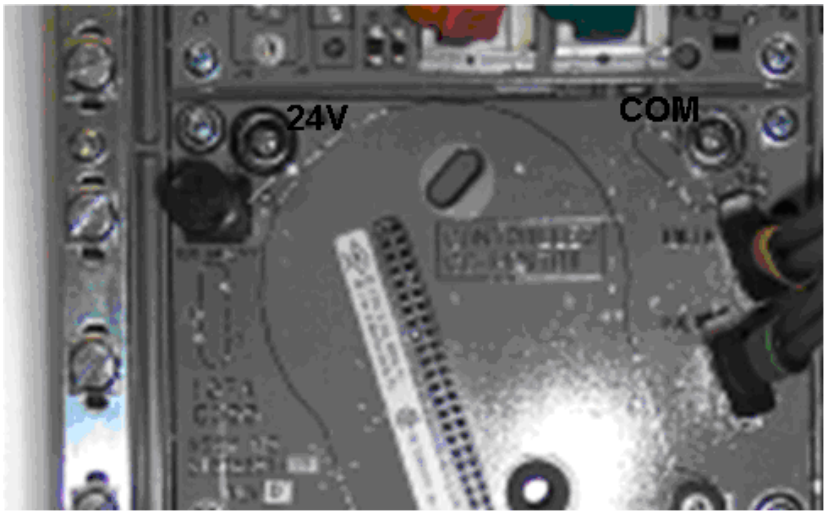
To install a C300 Controller

1. Refer to appropriate site location drawings for the specified controller installation location, controller Device Index (FTE address) and wiring diagrams.
2. Identify the mounting location on channel and align mounting holes in IOTA with screw hole locations on the channel.
3. Ensure that the component side of IOTA is facing up. Refer to the figure below.

Assemble the mounting screws, washers, and spacers. Insert spacers and washers between the backside of IOTA and front of the channel.



4. Position the assembled IOTA board at the proper mounting location.
5. Thread the four mounting screws only half-way to attach the IOTA board to the channel. Do not tighten.



6. Refer to the preceding figure.
   - Insert and tighten the screw to the left side of the IOTA board that connects to the 24 Vdc bus bar.
   - Insert and tighten the screw to the right side of the IOTA board that connects to the COM bus bar.

7. Tighten the mounting screws securing the IOTA board to the channel.

8. Connect FTE-A and FTE-B Ethernet link cables to the RJ-45 connectors on C300 IOTA board.
   - The Yellow Cat5 cable connects to the “FTEA” connector on the IOTA.
   - The Green Cat5 cable connects to the “FTEB” connector on the IOTA.

9. Route the FTE cables to the appropriate Control Firewall module location.
   - The Yellow FTE cable is routed to the Control Firewall that supports FTE-A.
   - The Green FTE cable is routed to the Control Firewall that supports FTE-B.

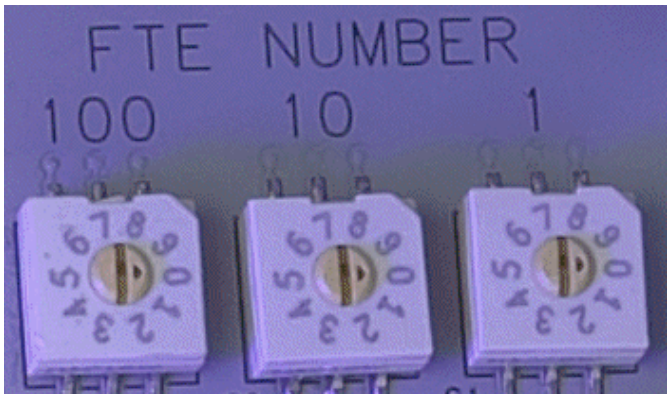
10. If using the IOLINK interface in the controller, connect IOLink cable pairs to IOTA board.

Four connectors on the IOTA provide redundant support for two IOLink interfaces IOLINK 1 (Gray) and IOLINK 2 (Violet). IOLink cable pairs include multidrop connectors to connect other I/O components to the IOLink.
   - Connect IOLINK cable pair to IOL1A and IOL1B for IOLINK 1 interface of the controller.
   - Connect a second IOLINK cable pair to IOL2A and IOL2B for IOLINK 2 interface of the controller.

Note that when connecting Redundant C300 Controller pairs, connect the primary controller IOLINK and the redundant partner IOLINK to the same IOLink cable pair.

11. Install the two-wire twisted pair battery cable onto the MEMORY HOLD-UP connector on the left side of the IOTA board.

12. Set the Device Index (FTE DEVICE INDEX) of the controller according to the site documentation by turning the three rotary decimal switches located on the IOTA board. Set the switches to the three digit address ranging from 001 to 509. The leftmost switch (100) is used to set the hundreds digit.



The middle switch (10) is used to set the tens digit and the rightmost switch (1) sets the ones digit. The Device Index of all non-redundant and primary C300 Controllers must be set to an odd number address. on page 60 number entered in the Main tab of the Controller block's configuration form.

13. Secure the controller module to the IOTA board with two screws located on each side of the plastic cover. The screws must be tightened to 1.3 Newton-meters.
14. Using a #2 Phillips screwdriver, hand-tighten the plastic screw on the front of the module cover. Ensure that you do not strip the plastic screw head.
15. If the controller is to be redundant -

In Control Builder, select the Main tab of the primary controller's configuration form and be sure to check the Controller is Redundant check box.

5.6.2 C300 Secondary Controller Installation

Creating a C300 Controller redundant pair is as simple as installing a second controller in the control hardware cabinet.

- The secondary controller should be installed in the same cabinet as the primary controller.
- The secondary controller may be installed on a separate channel from the primary controller.
- Both the primary and partner secondary controllers must be connected to the same pair of FTE Control Firewall assemblies.

Prerequisites

Before you install the C300 Controller you should have:

- A control cabinet installed with appropriate channel hardware for mounting Series C control hardware.
- A Series C power supply and optional battery backup hardware installed in the cabinet.
- An installed pair of Control Firewall assemblies.

- The necessary parts for installing C300 Controller to the control system.

Parts include:

- a C300 Controller assembly (controller module with IOTA board and mounting hardware)
- STP Cat5 Redundancy Cable (Orange cable)
- 2 STP Cat5 Ethernet cables (one Yellow cable, one Green cable)
- 2 or 4 IOLink cable assemblies for connecting on-board IO Link interface if the controller is supporting

Series C I/O or Process Manager IO modules.

- Ensure the cabinet enclosure is connected to a protective earth ground using #8 AWG solid copper wire. There should be metal to metal contact between the grounding bus bar and the enclosure as well as the channel.

The Device Index of the secondary controller must be set to the primary controller's Device Index plus

1. For example, if the primary controller's Device Index is 3 (all primary controller Device Indexes are set to

an odd number address), then set the Device Index of the secondary controller to 4.

15. Insert the controller module onto IOTA board making sure that the controller circuit board mates properly with the IOTA board connector.

Secure the controller module to the IOTA board with two screws located at each side of the plastic cover.

16. Using a #2 Phillips screwdriver, hand tighten the plastic screw on the front of the module cover. Be careful not to strip the plastic screw head.

17. Load firmware that is identical to the firmware version currently running on the primary controller (if not loaded already).

18. Load the Secondary C300 FB and initiate an Enable Synchronization command.

Result: The new secondary should synchronize with primary controller and display the sync status.

5.7 Upgrading C300 Controller firmware

The Series C Firmware Load Tool (CTool) utility is used to efficiently upgrade firmware in Series C control hardware components.

5.7.1 Using the Controller Migration Wizard

If you have Series C Controllers which are configured and loaded, you can use the Controller Migration Wizard to update you control component's firmware in an On-Process or Off-Process fashion to the latest release version or to a service pack or point

release. Note that you must have Control Builder to use this application. Using the Controller Migration Wizard.

5.7.2 C300 Controller behavior during firmware upgrade and timeout

The following indications are shown on the faceplate display of the C300 Controller during the firmware upgrade operation.

- The display shows LOAD while the firmware image is being loaded to the controller
- The display shows PROG while the firmware image is being programmed into the controller's flash memory
- The STATUS LED is red and blinks on and off during the upgrade operation.

The controller is set to timeout in 4.5 minutes if the firmware upgrade operation is not completed. When the timeout occurs, the controller aborts the upgrade operation and returns to the operating state (ALIV or RDY) prior to the start of the firmware upgrade.

5.8 Control Firewall Overview

About CF9

The nine-port, Control Firewall (CF9) serves as the Fault Tolerant Ethernet (FTE) communications center for a given Series C control network. It consists of a Control Firewall module that plugs into its associated CF9 input/output termination assembly (IOTA) as shown in the following figure.

Control Firewall (CF9) with Series C IOTA

Control Firewall (CF9) with Series C Mark II IOTA

Control Firewall (CF9) and IOTA

The CF9 provides eight ports for FTE connections to C300s and Series C FIMs within a Series C cabinet as well as FTE Bridge modules (FTEB) in a Series A Chassis I/O chassis. It has a ninth port for an uplink connection to the supervisory FTE network and level 2 control area. It provides network security by

- Rejecting all Ethernet messages not needed for control,
- Giving priority to traffic on downlink ports over ingress traffic on the uplink port, if the fabric becomes saturated, and
- Allowing only valid C300-compliant messages to pass on to the C300 domain.

The CF9 provides eight ports for FTE connections to C300s and Series C FIMs within a Series C cabinet as well as FTE Bridge modules (FTEB) in a Series A Chassis I/O chassis. It has a ninth port for an uplink connection to the supervisory FTE network and level 2 control area. It provides network security by

- Rejecting all Ethernet messages not needed for control,
- Giving priority to traffic on downlink ports over ingress traffic on the uplink port, if the fabric becomes saturated, and
- Allowing only valid C300-compliant messages to pass on to the C300 domain.

5.8.1 Control Firewall Planning and Design

7.2.1 General Planning References

Please refer to the following documents for planning and design details for the Experion system in general and the Fault Tolerant Ethernet supervisory network. For the sake of brevity, this Guide does not repeat the applicable general guidelines, considerations, cautions, and so on that are covered in these other Guides.

- Control Hardware Planning Guide
- Server and Client Planning Guide
- Fault Tolerant Ethernet Overview and Implementation Guide

7.2.2 Identifying Control Firewall Components

- The following table identifies the Control Firewall components that will be needed to provide a FTE interface with a Series C control system. The CC/DC prefix in a model number means the component's printed wiring boards are coated to provide additional protection from the environment and the CU prefix means the boards are uncoated.

Component	Description	Honeywell Model
Control Firewall Module (CF9)	Module mounts on CF9 Input/Output Termination Assembly (IOTA).	CC-PCF901
CF9 Input/Output Termination Assembly	Provides physical connection to Control Firewall module and FTE cables. Mounts on backplane in	DC-TCF902

5.8.2 Control Firewall Installation and Upgrades

Installation Declarations

Attention

This equipment shall be installed in accordance with the requirements of the National Electrical Code (NEC), ANSI/ NFPA 70, or the Canadian Electrical Code (CEC), C22.1. It is intended to be mounted within an enclosure or suitable environment

acceptable to the local authority having jurisdiction, as defined in the NEC, or authorized person as defined in the CEC.

CAUTION

Electrostatic discharge can damage integrated circuits or semiconductors if you touch connector pins or tracks on a printed wiring board. Follow these guidelines when you handle any electronic component:

- Touch a grounded object to discharge static potential,
- Wear an approved wrist-strap grounding device,
- Do not touch the wire connector or connector pins,
- Do not touch circuit components inside a component,
- If available, use a static safe workstation,
- When not in use, keep the component in its static shield box or bag.

CAUTION

Unless the location is known to be non-hazardous, do not:

- connect or disconnect cables,
- install or remove fuses, terminal blocks, and so on, while the component is powered.

CAUTION

Do not connect Control Firewalls to interfaces configured for uplinks. Configure all Control Firewall interfaces for port fast before attaching the Control Firewall. Otherwise, interfaces connected to Control Firewalls will be blocked and cause loss of view upon recovery of a root switch in a network, which causes recalculation of the switch spanning tree topology. Control Firewalls do not use spanning tree.

7.3.2 Installing CF9 Input/Output Termination Assembly DC-TCF902

To mount CF9 IOTA

Series C IOTA size is 6 inches.

1. Select desired mounting location on carrier and align mounting holes in IOTA with screw hole locations on the

carrier. See the following dimension drawing for details.

2.Be sure component side of IOTA is facing up. Secure IOTA to carrier using screws, washers and spacers provided.

Insert spacers and washers between bottom of IOTA and top of carrier.

Only tighten mounting screws half way.

3. Tighten the screws in terminals 24 Vdc + and COM (logic ground) to the vertical bus bar to connect the cabinet resident 24 Vdc power supply to the IOTA.

4. Fully tighten the mounting screws.

5. Repeat Steps 1 to 4 to mount the second CF9 IOTA immediately below the one that was just installed.

6. This completes the procedure. Go to Wiring IOTA for connection details.

Control Firewall (CF9) with Series C Mark II IOTA

Mounting Dimensions for CF9 IOTA DC-TCF902

To wire CF9 IOTA

CF9 connection requirements

- You must always connect the Control Firewall uplink port to a Cisco switch.
- You must not stack the Control Firewall.
- You must connect the Control Firewall to an interface configured for portfast.
- You must connect All Series C FIMs and C300s to a Control Firewall.
- You must connect any FTE Bridge (FTEB) module communicating to a C300 to the same Control Firewall as the C300.
- You may connect FTEB/C200 and FTEB/Series A FIM to level 1 configured switches according to the established best practices. For FTEB/Series A FIM, you also have an option to connect to a Control Firewall.
- It is valid for an FTEB to be connected to a CF9, only when it is for a Series A FIM.
- It is invalid for a CF9 to host a C200 through FTEB.

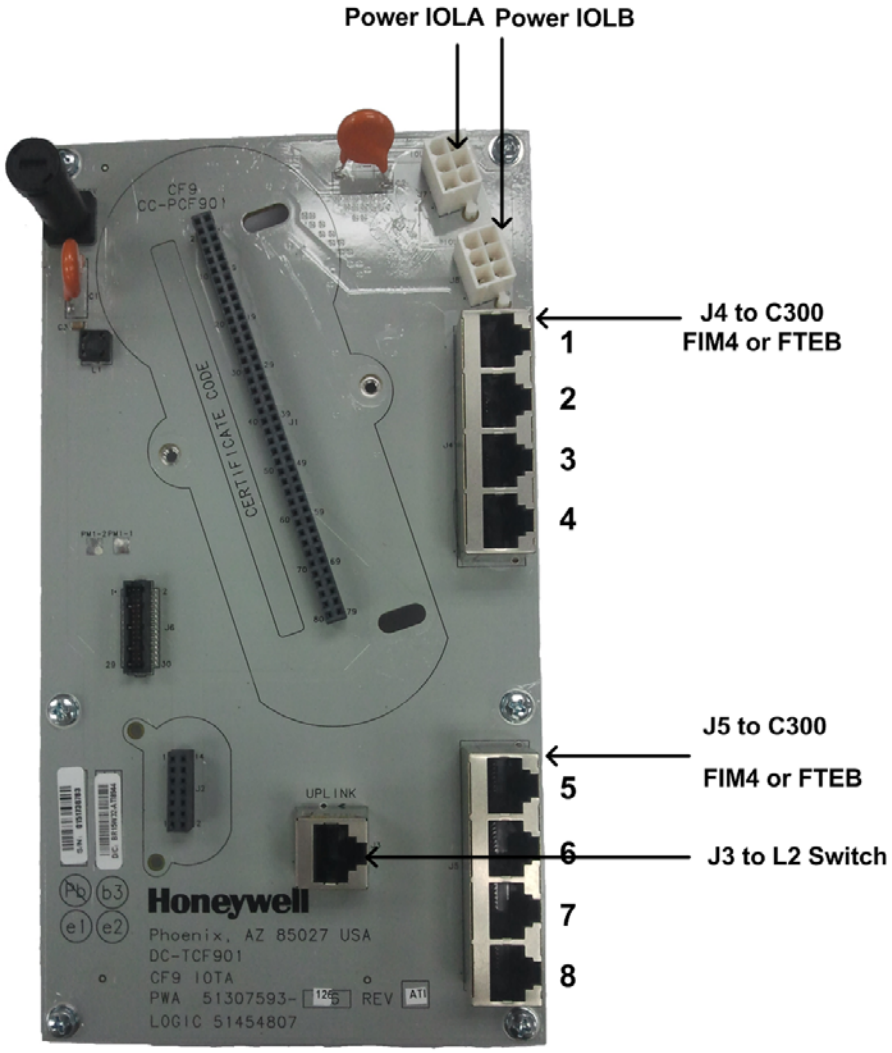
1.

- Connect yellow FTE cable from FTE A link, L1/L2 Ethernet switch to the J3 connector on the Control Firewall (CF9) to be used as the FTE A link (yellow cable)
- Connect green FTE cable from FTE B link, L1/L2 Ethernet switch to the J3 connector on another Control Firewall (CF9) to be used as the FTE B link (green cable) redundant IOTA.

2. Route yellow cables from four J4 and four J5 connectors on the CF9 for FTE A links to corresponding FTE A ports on C300s, Series C FIMs, and FTE Bridge modules, as required.

3. Route green cables from four J4 and four J5 connectors on the other redundant CF9 IOTA for FTE B inks to corresponding FTE B ports on C300s, Series C FIMs, and FTE Bridge modules, as required.

4. This completes the procedure. Go to the next section.



Typical Connector Locations on CF9 IOTA for Series C Mark II

7.3.3 Installing Control Firewall DC- PCF902

To install CF9

- The following caution is not applicable for Series C Mark II.
- 1. Align CF9 connector pins over the connector/slot on the IOTA labeled as Control Firewall 9 Module.
- 2. Carefully press down on the CF9 module until it is fully seated in the connector.

- 3. Use the screws provided to secure the CF9 module to the IOTA. The screws must be tightened to 1.3 Newton-meters.

4 Repeat Steps 1 to 3 to install other CF9s on their IOTAs, as required.

5. This completes the procedure. Go to the next Section.

7.3.4 Upgrading Control Firewall Firmware

You can update the Control Firewall firmware using the Control Firewall Update tool. You can launch the tool from the Configuration Studio or as a standalone tool. Refer to the About the Control Firewall Update tool topic in the System Definition and Configuration online help for information on launching the tool. Refer to the Software Change Notice (SCN) supplied with your Experion system for the latest firmware version and file location details.

5.8.3 Control Firewall Configuration

Adding CF9 to network

You can add a Control Firewall (CF9) to be visible on the Network Tree in Configuration Studio. Please refer to the Adding and Configuring Switches and Control Firewall topic in the System Definition and Configuration help in Configuration Studio for details.

5.8.4 Control Firewall Operation

Control Firewall Startup

The following table summarizes the stages the CF9 goes through after power is applied to its IOTA during startup. The CF9 repeats these stages every time power is cycled Off/On or the pins on its reset pad are shorted.

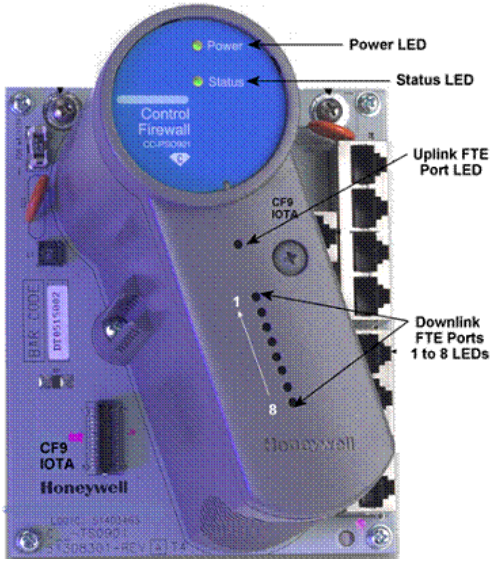
1. Power Light Emitting Diode (LED) lights (green).

2. Status LED is red while the CF9 runs its power-on self test (POST).

3. When the CF9 POST completes, the Status LED turns green and the FTE port LEDs blink green and off for all connected ports when there is traffic, and remain steady green for connected ports when there is no traffic. The LEDs for unconnected FTE ports are off.

5.8.5 CF9 LED Descriptions

The following illustration and table identify and describe the indications associated with the LEDs on the CF9.



LEDs on CF9

LED	State				
	Off	Green	Red	Blinking Green	Green with Brief Flicker
Power	No Power	Power On	See Note 1	-	-
Status	No Power or	Normal	Running POST	See Note 2	-
Downlink Ports 1 to 8	No Power or No Cable Connected	Link Present, No Traffic	-	Link Present, Traffic	Too Many Attached Devices
Uplink Port	No Power or No Cable Connected	Link Present, No Traffic	-	Link Present, Traffic	-

Notes

- The - indicates the LED is never in this state.
- The CF9 has detected a soft failure and is working in a diminished state. Typical causes are a

5.8.6 Control Firewall Maintenance

Periodic Checks

The following table identifies checks that you should make periodically (every 3 to 6 months) to keep the CF9 in good working condition.

Check . . .	Possible Corrective Action . . .
That all light emitting diodes (LED) are working.	If LED is not lit or has dimmed, you must replace the CF9 module, since LEDs are not
That all connections are secure.	Secure connections, as needed.
That cable insulation is not worn or cracked.	Replace cables, as required.
That IOTA is secure.	Tighten mounting screws.

5.8.7 Replacing Failed Control Firewall

Just reverse the steps in the previous installation procedures for mounting and wiring the CF9 and its associated IOTA, as required. You can replace the CF9 module without removing the IOTA. Please observe the following cautions and warnings.

CAUTION

We recommend that you proceed with extreme caution whenever replacing any component in a control system. Be sure the system is offline or in a safe operating mode. Component replacements may also require corresponding changes in the control strategy configuration through Control Builder, as well as downloading appropriate data to the replaced component.

CAUTION

Unless the location is known to be non-hazardous, do not :

- connect or disconnect cables,
- install or remove fuses, terminal blocks, and so on,

while the component is powered.

CAUTION

This caution is not applicable for Series C Mark II. Only use a #2 Phillips screw driver to carefully loosen or tighten the long gray plastic screw on the CF9 Module's face. Do not use either a #1 Phillips screw driver or a battery powered screw driver to remove or install the plastic screw as this can damage the screw head.

CAUTION

Be sure you use the following sequence when removing an IOTA.

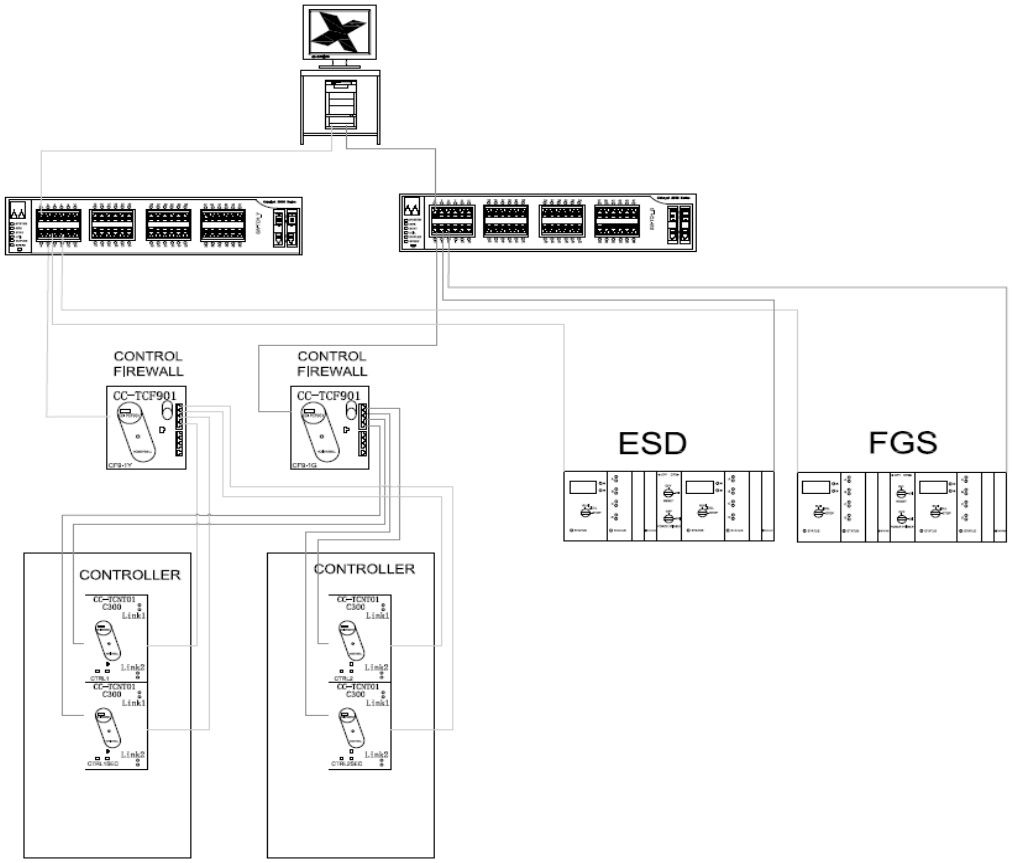
- Only loosen the IOTA mounting screws half way.
- Remove the screws in the 24V + and COM terminals.

For Series C Mark II, remove the combo cable.

- Remove the mounting screws and the IOTA.

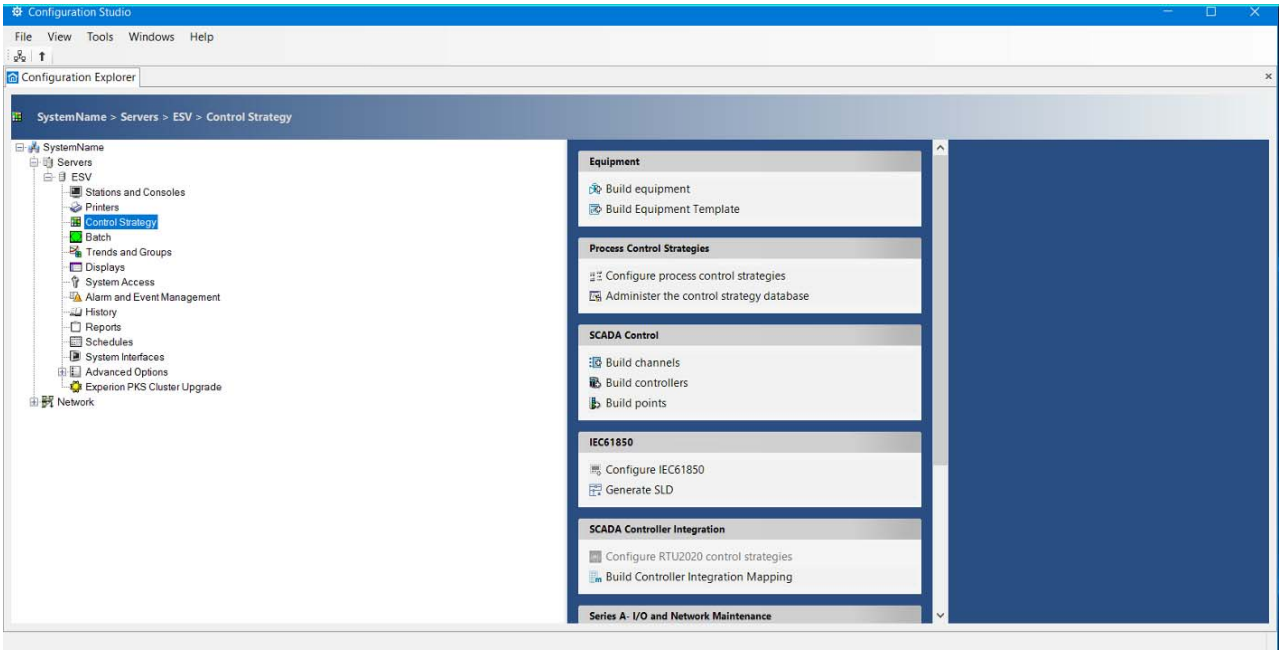
5.8.8 network configuration between control firewalls and C300 controllers

for configuration CF9 to controller , for each two redundant controller its need two CF9 module.

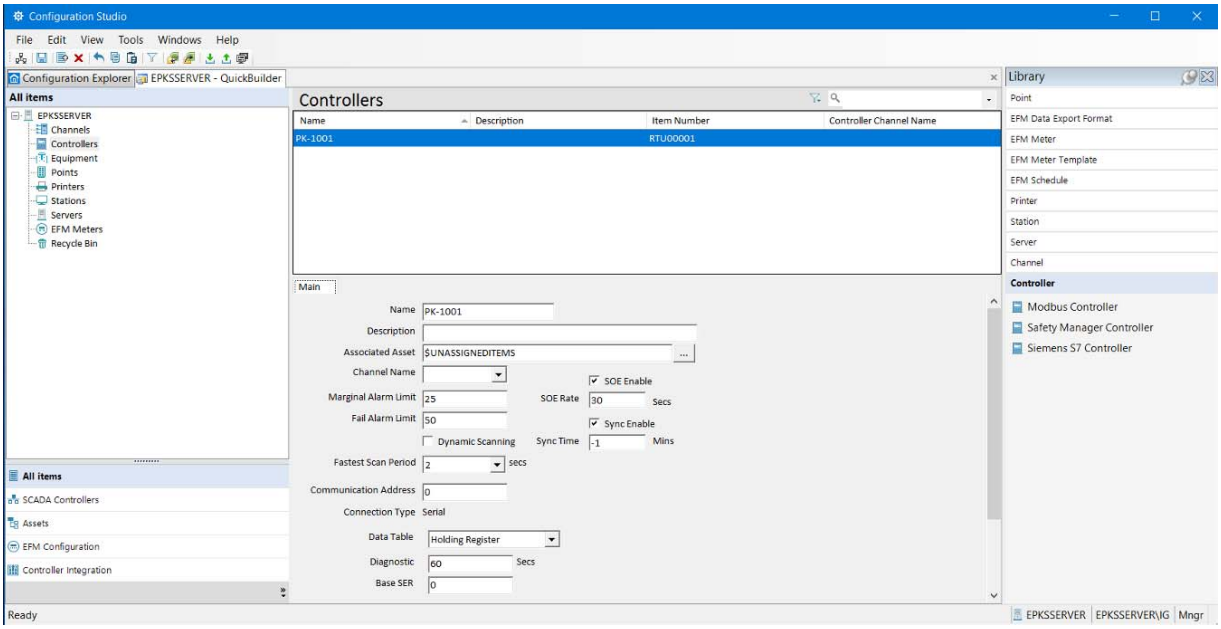


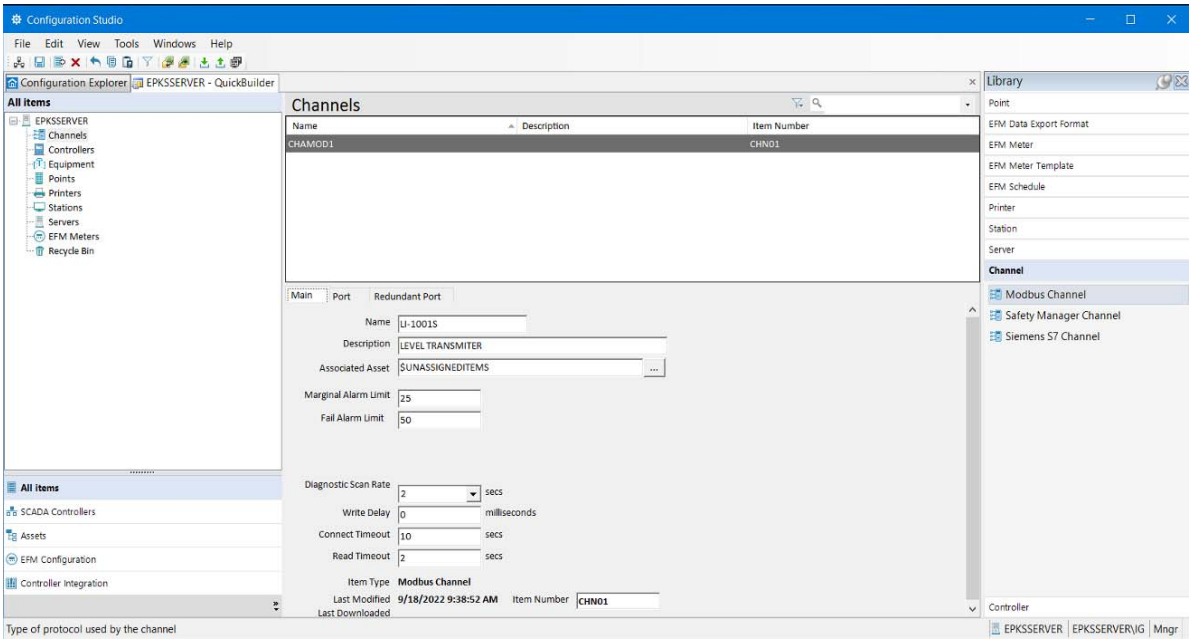
5.8.9 MODBUS implementation

In this project communication between DCS and other packages will be as MODBUS RTU. The serial interface Modbus RTU will be connected to the converter, then it will be connected through the RJ45 port of the firewall, and finally, it will be connected to the system.to firewall ports RJ45 of FTE switches. For Modbus RTU all serial link signals are considered signals type SCADA (not signal processing needed). Time Stamp will be generated by Experion PKS System.



To read Modbus data in Experion enviorment, we should config that in SCADA tab of configuration studio. At first add new SCADA controler and then add related signals.


Configuration Studio
File Edit View Tools Windows Help
Configuration Explorer
EPKSSERVER - QuickBuilder
All items
EPKSSERVER
Channels
Controllers
Equipment
Points
Printers
Stations
Servers
EFM Meters
Recycle Bin
Controllers
Name
Description
Item Number
Controller Channel Name
PK-1001
RTU00001
Main
Name PK-1001
Description
Associated Asset $UNASSIGNEDITEMS
Channel Name
Marginal Alarm Limit 25
Fail Alarm Limit 50
Dynamic Scanning
Fastest Scan Period 2 secs
Communication Address 0
Connection Type Serial
Data Table Holding Register
Diagnostic 60 Secs
Base SER 0
SOE Enable
SOE Rate 30 Secs
Sync Enable
Sync Time -1 Mins
All items
SCADA Controllers
Assets
EFM Configuration
Controller Integration
Library
Point
EFM Data Export Format
EFM Meter
EFM Meter Template
EFM Schedule
Printer
Station
Server
Channel
Controller
Modbus Controller
Safety Manager Controller
Siemens S7 Controller
Ready
EPKSSERVER
EPKSSERVER\IG
Mngr


Configuration Studio
File Edit View Tools Windows Help
Configuration Explorer
EPKSSERVER - QuickBuilder
All items
EPKSSERVER
Channels
Controllers
Equipment
Points
Printers
Stations
Servers
EFM Meters
Recycle Bin
Channels
Name
Description
Item Number
CHAMOD1
CHN01
Main
Port
Redundant Port
Name LI-1001S
Description LEVEL TRANSMITER
Associated Asset $UNASSIGNEDITEMS
Marginal Alarm Limit 25
Fail Alarm Limit 50
Diagnostic Scan Rate 2 secs
Write Delay 0 milliseconds
Connect Timeout 10 secs
Read Timeout 2 secs
Item Type Modbus Channel
Last Modified 9/18/2022 9:38:52 AM
Last Downloaded
Item Number CHN01
All items
SCADA Controllers
Assets
EFM Configuration
Controller Integration
Library
Point
EFM Data Export Format
EFM Meter
EFM Meter Template
EFM Schedule
Printer
Station
Server
Channel
Modbus Channel
Safety Manager Channel
Siemens S7 Channel
Controller
Type of protocol used by the channel
EPKSSERVER
EPKSSERVER\IG
Mngr

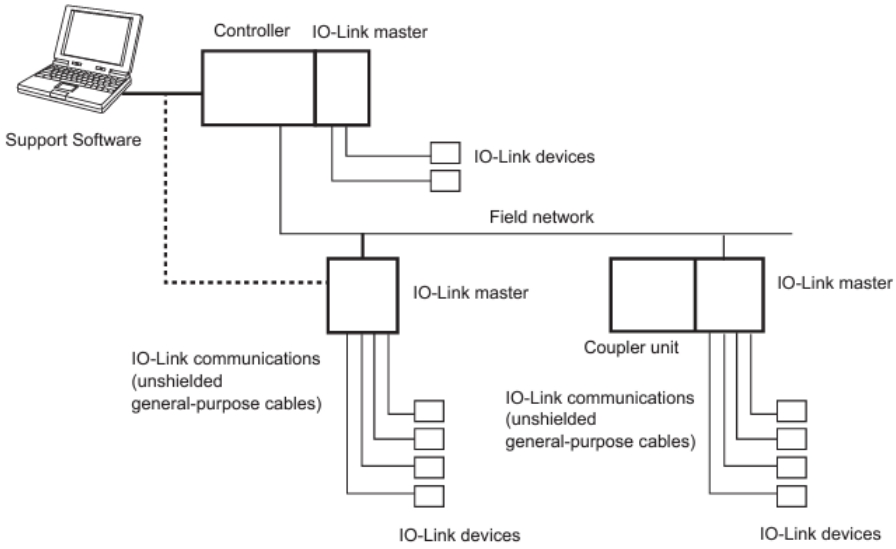
6.0 IO LINK

6.1 System overview

Description

IO-Link is a standard interface for 1:1 (point-to-point) connections with sensors, actuators, or other devices as defined in international standard IEC 61131-9. Devices that previously could not exchange digital I/O signals can now exchange information such as detected amounts. Data exchange is possible using the following two types of communications. • Cyclic communications to exchange specified data in a specific cycle with devices • Message communications to access user-specified data in devices when required You can also connect non-IO-Link sensors or actuators that support only digital input signals or only digital output signals.

An IO-Link System consists of the following elements.



6.1.1 Overview IO-Link

Components

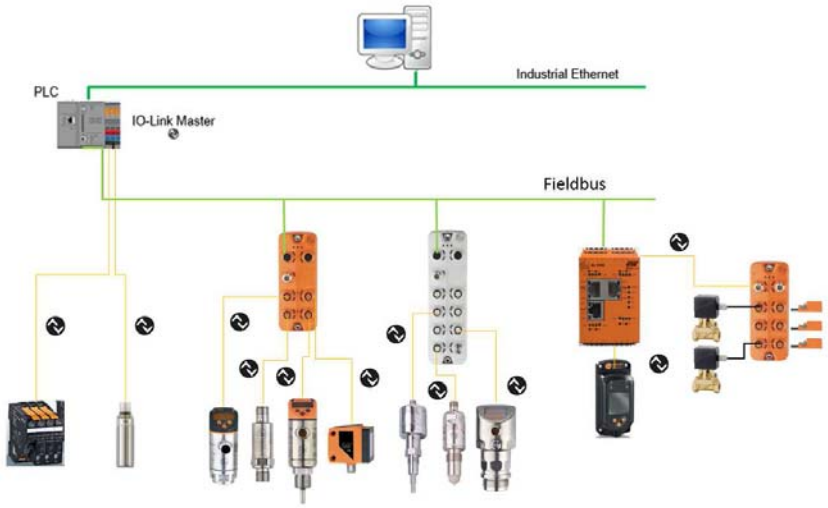
An IO-Link system consists of the following components:

- IO-Link master
- IO-Link device

(For example: sensors, RFID readers, valves, motor starters, I/O modules)

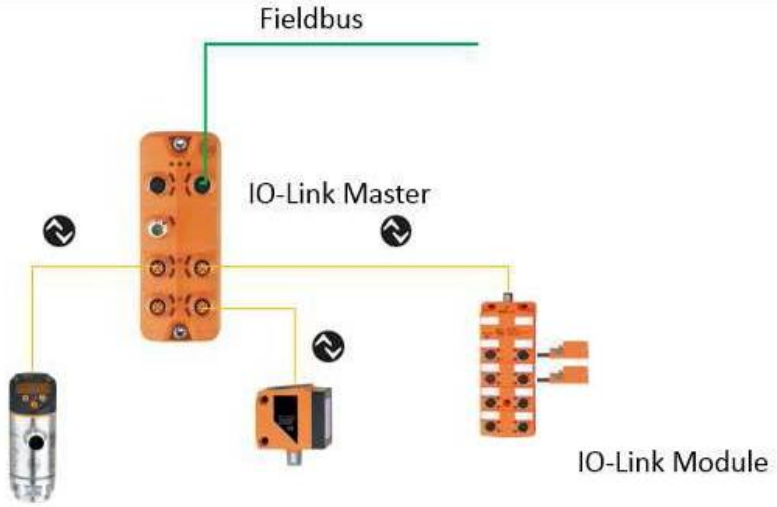
- Unscreened 3, 4 or 5-wire standard cables
- Engineering tool for projection and parameter setting of IO-Link

Figure below shows an example of a system architecture using IO-Link.



Example system architecture using IO-Link

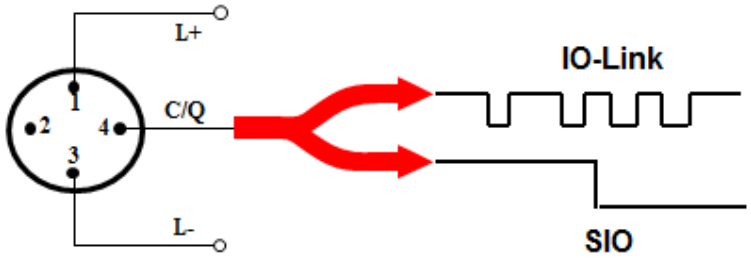
The IO-Link master establishes the connection between the IO-Link devices and the automation system. The IO-Link master is a component of a peripheral system and is installed either in the control cabinet or as remote I/O with protection rating IP 65/67 directly in the field. The IO-Link master communicates with the controller via various fieldbuses or product-specific backplane buses. An IO-Link master can have several IO-Link ports (channels). It is possible to connect an IO-Link device to each port. That means that IO-Link is a point-to-point communication and not a fieldbus.



The pin assignment is specified according to IEC 60974-5-2 as follows:

- Pin 1: 24 V
- Pin 3: 0 V
- Pin 4: Switching and communication line (C/Q)

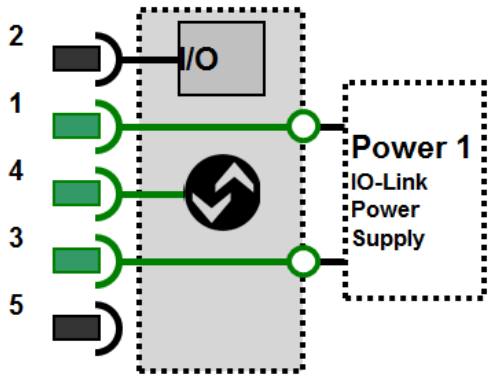
These 3 pins are used for the IO-Link communication as well as for supplying the with max. 200 mA (see following Figure) with max. 200 mA (see following Figure)



Pin assignment of the IO-Link device

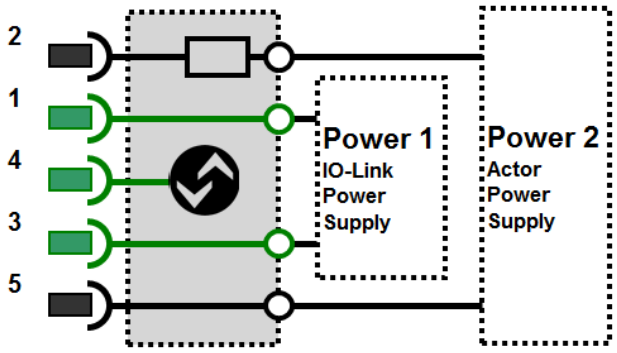
6.1.2 IO-Link interface

Port types
Two types of port are distinguished in the specification for the IO-Link master:
Port class A (type A)
For this type the functions of pins 2 and 5 are not specified. These functions are defined by the manufacturer. Usually an additional digital channel is assigned to pin 2.



Port Class A

Port class B (type B)
This type provides additional supply voltage and is suitable for the connection of devices with a higher current requirement. Additional (electrically separated) supply voltage is provided via pins 2 and 5. To use this additional supply voltage a 5-wire standard cable is required.



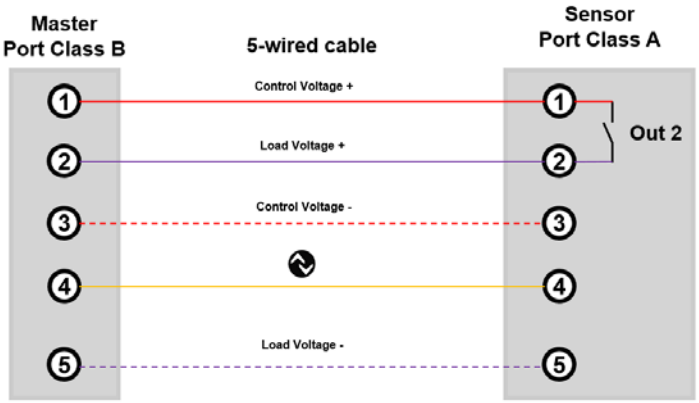
Port Class B

Connection cable

The devices are connected to the master via unscreened 3, 4 or 5-wire standard cables with a max. Length of 20 m. Screening or observance of specific guidelines for laying the cables are not necessary.

Connecting of sensors to Port Class B

In general it's possible to connect sensors to ports Class B
The IO-Link-part is the same for Class A and Class B
Please consider the different power supply
For sensors = Class A Pin5 is not in use during Pin 2 can be used as an additional digital output.
For actuators = Class B Pin 2 and Pin 5 are used to transfer the load-voltage to the IOLink
actuator device

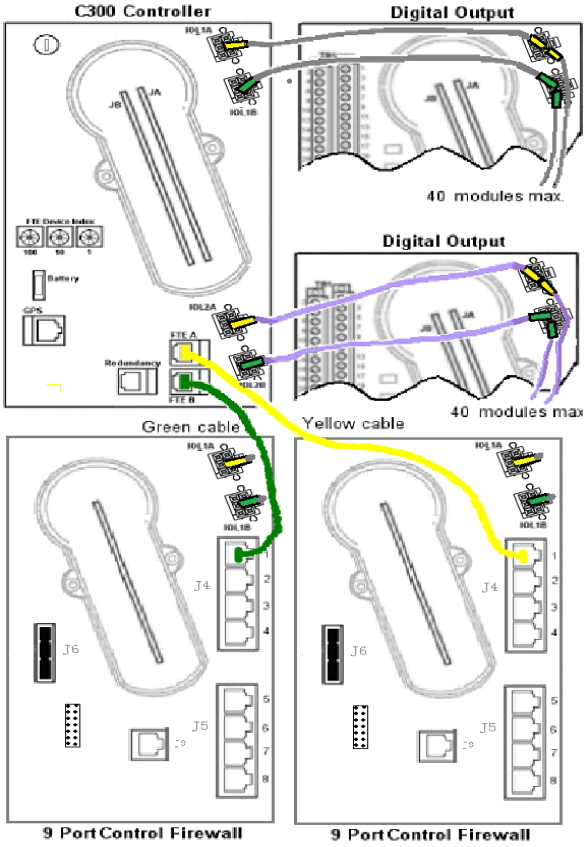


By connecting a Sensor to a Masterport Class B control- and load-voltage will be connected if the digital out-put Out 2 is closed. This may cause short-circuits and misbehaviors in safety To connect sensors with two digital out-puts please use a three-wired cable.

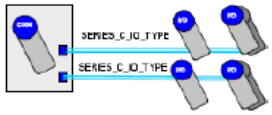
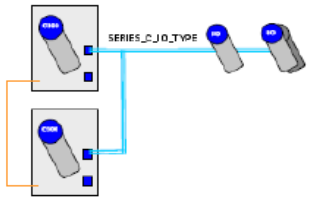
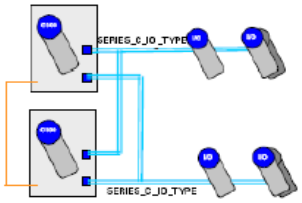
6.2 Connection of IO link with cards and controllers

The following figure represents the main cabling of the Series C300 controller, Control Firewall, and I/O IOTA boards

.



Series C connections

Description	Diagram
Non-Redundant C300 with One Series C I/O Link	
Non-Redundant C300 with Two Series C I/O Links	
Redundant C300 with One Series C I/O Link	
Redundant C300 with Two Series C I/O Links	

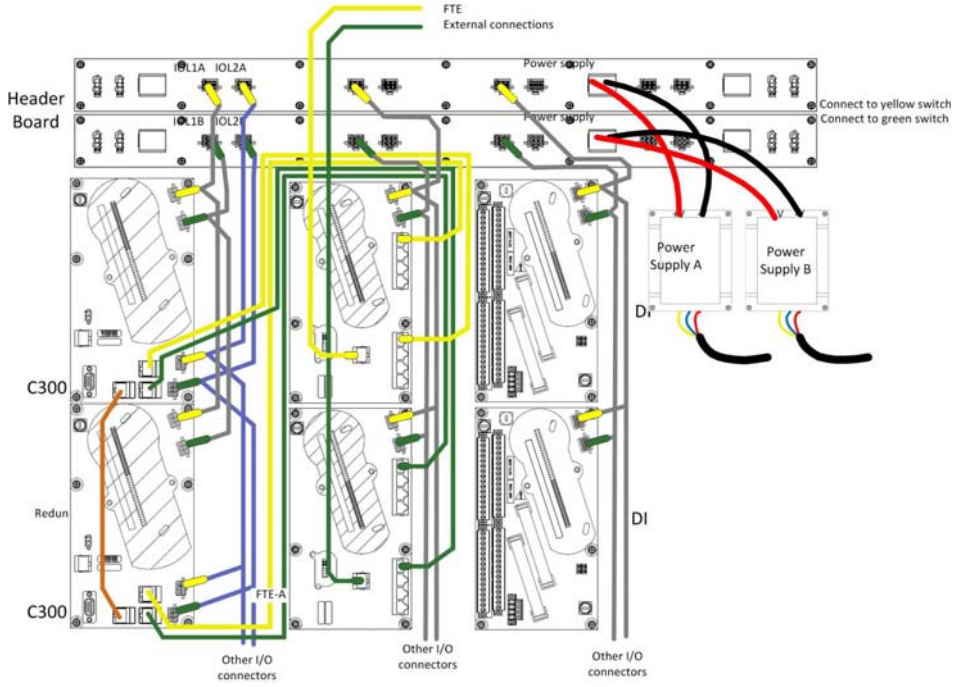
Typical of Series C connections

6.2.1 Cabling

The following graphic is an example of possible configuration connections with regards to the Series C I/O cabinet. Your configuration may vary based on the module layout of your cabinet. The following table defines cable type and usage in the graphic below.

Cable	Color	Purpose
FTE -A	Yellow	Connect controller to firewall (point-to-point)
FTE - B	Green	Connect controller to firewall (point-to-point)
FTE - Redundant	Orange	Private path between primary and secondary controller (point-to-point)
IOL1A	Grey/yellow	Connect controller to I/O
IOL1B	Grey/green	Connect controller to I/O
IOL2A	Violet/yellow	Connect primary controller to secondary controller and then to I/O
IOL2B	Violet/green	Connect primary controller to secondary controller and then to I/O

Series C I/O cable types



Series C cabling

Each IO LINK can connect to 32 IO MODULES.

6.3 IO-Link basics

6.3.1 IO-Link protocol

Operating modes

The IO-Link ports of the master can be operated in the following operating modes:

- IO-Link

In the "IO-Link" operating mode the port is in the IO-Link communication.

- DI

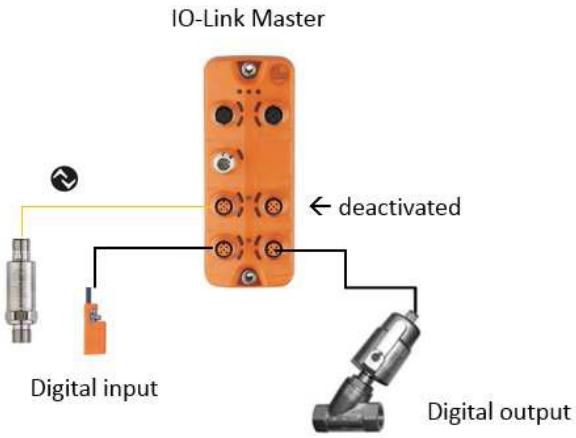
In the "DI" operating mode the port acts like a digital input.

- DQ

In the "DQ" operating mode the port acts like a digital output.

- Disabled

The "Disabled" operating mode can be used for unused ports.



When IO-Link was defined special emphasis was placed on the compatibility of conventional units with a simple binary output stage. In the standard I/O mode (SIO) IO-link sensors can also be operated on conventional input modules. Conversely, sensors with switching output also work on IO-Link ports. In SIO mode the sensor is operated as digital input to the master.

- **Transfer rate**

Three data transfer rates for the IO-Link operation mode are specified in the IO-Link specification V1.1:

- COM 1 = 4.8 kBaud
- COM 2 = 38.4 kBaud
- COM 3 = 230.4 kBaud (optional to specification V1.0)

Example PN7:
= COM 2 (38.4 kBaud)
= 2 byte process data
= Refresh rate 2.3 ms
An IO-Link device supports only one of the defined data transfer rates. The IO-Link master supports all data transfer rates and adapts them automatically to the data transfer rate supported by the device.

- **Response time of the IO-Link system**

The response time of the IO-Link system informs about the frequency and speed of the data transfer rate between the device and the master. The response time depends on several factors.

A value for the min. cycle time of the device is defined in the device description file IODD of the device. This value indicates at which time intervals the master may address the device. The value has a great influence on the response time. In addition the master has an internal processing time which is included in the calculation of the response time.

- **Transfer quality**

IO-Link is a very robust communication system. This communication system operates with a 24 V level. If transfers fail, the message is repeated twice. Only after the failure of the third attempt will the IO-Link master detect a communication failure and will Signal it to the higher-level controller.

Data types

In general three data types are available:

- Process data → Cyclic data
- Parameters → Acyclic data
- Events → Acyclic data

Process data

The process data of the devices is transferred cyclically. The process data size is defined by the device. Depending on the device process data from 0 to 32 bytes is possible (input and output each).

Example:

- PN, PP, LMT, LR = 2 byte process data input
- SM, SD = 8 byte process data input

Value status (process value validity)

Each port has a value status (port qualifier). The value status indicates if the processed data is valid or invalid. The value status can be cyclically transferred.

Device data (parameters)

Device data can be parameters, identification data and diagnostic information. It is exchanged acyclically and on request of the IO-Link master. Device data can both be written to the device or read from the device.

Events

When an event occurs, the device signals the presence of an event to the master. Then the master reads the event. Events can be error messages (e.g. short circuit) and warnings/maintenance data (e.g. soiling, overheating). Error messages are transferred from the device to the controller or the HMI via the IO-Link master. The IO-Link master can also transfer events and conditions. Such events are e.g. wire breaks or communication failures.

Device parameters or events are transferred independently of the cyclic transfer of the process data. The transfers do not influence or impair each other.

6.4 Testing for power at IOLINKA's and IOLINKB's terminal on the header board

1 Insert the probes at DC 24V Extension Port without any connection on the header board.

2 Be careful not to connect 24V to GND directly, otherwise it can result in an electrical short, which impacts all modules attached to the cabinet.

IOLINK's terminal on the header board for power testing

C300 Name: IP : 42		DSC-0-001 F						DSC-0-001 R					
Header cable type/		51202329-606						51202329-616					
		4 (LB)		5 (MB)		6 (RB)		4 (LB)		5 (MB)		6 (RB)	
UPPER CHANNEL	POS 01	C300	51202329-312	1-3	51202329-100	1-12	51202329-100	2-1	51202329-110	2-7	51202329-410	2-13	51202329-410
	POS 02												
	POS 03			1-4		1-13		2-2					
	POS 04	C300											
	POS 05							2-3		2-8		2-14	
	POS 06												
	POS 07			1-5		1-14		2-4					
	POS 08												
	POS 09			1-6		1-15				2-9		2-15	
	POS 10												
	POS 11	MB		1-7									
	POS 12												
LOWER CHANNEL	POS 13	1-1	51202329-200	1-8	51202329-100	1-16	51202329-200	2-5	51202329-410	2-10	51202329-210	2-16	51202329-410
	POS 14												
	POS 15			1-9		1-17				2-11			
	POS 16							2-6					
	POS 17	1-2		1-10									
	POS 18					1-18				2-12			
	POS 19			1-11									
	POS 20												
	POS 21												
	POS 22												
	POS 23												
	POS 24												

IO Link Connections

7.0 EARTHING PRINCIPLES

General

Consideration should be given to the mechanical strength or physical protection provided for the grounding conductor all over the field areas.

Panels/Cabinets Earthing

Each indoor instrument panel / cabinet shall have:

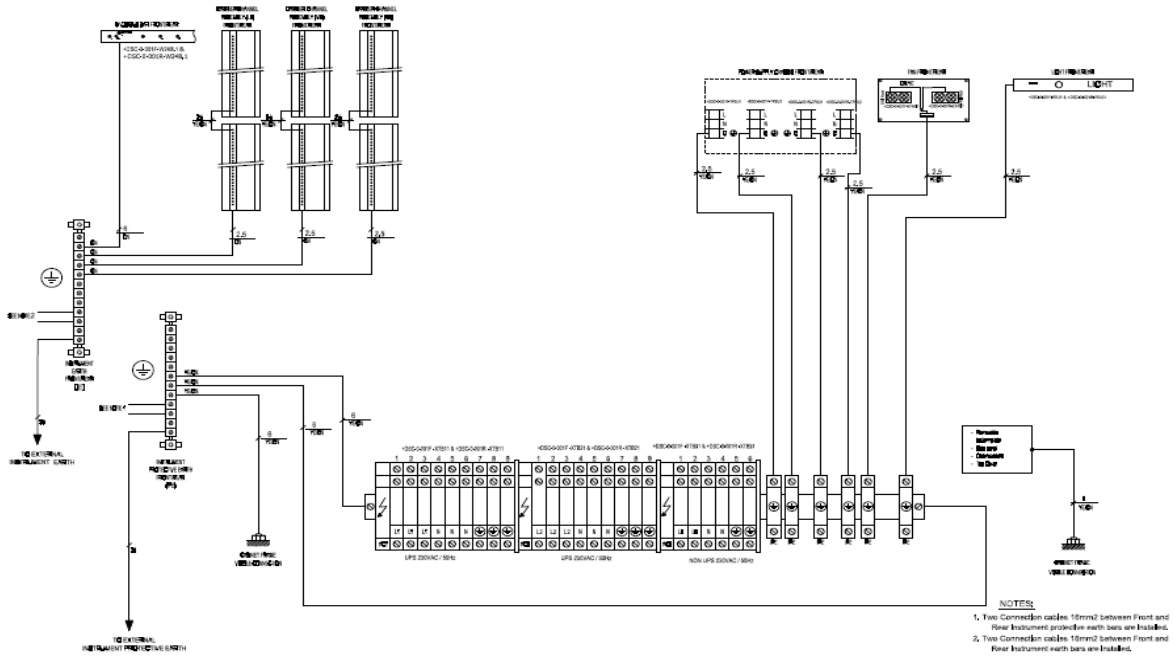
- A IPE bus bar which shall be connected to IPE loop inside room
- A IE bus bar which shall be connected to IE loop inside room

Each local instrument panel shall have:

- A IPE bus bar connected to PE loop
- A IE bus bar which shall be connected to IE loop inside room

In addition, each instrument panel / cabinet in which intrinsic safety barriers are installed shall have an ISE bus bar which shall also be connected to ISE loop inside room.

IPE, IE and ISE bus bars shall be mounted on insulated blocks.
Connections to the PE shall be 35 mm^2 minimum.
Within each instrument panel / cabinet, earth bars shall be isolated. It shall be possible to isolate one earth from the other(s) without any disturbance to the other (s).
Hinged doors of enclosures, cabinets or panels shall be bonded to the main frame with flexible straps.



DCS EARTHING DIAGRAM

PE and IE earth bars are connected to the bus bar of the cabinet system from the site and protect all over the field areas. This picture shows PE and IE earth bar connected to building deep earth and deep earth central.

For local instrument, the cable armor shall be earthed through the cable gland threaded entry or through a cable gland earth lug. The instrument shall have an earth stud connected directly to the Plant Earth loop (PE) by a 6 mm² minimum yellow / green cable .

Also support of instrument shall have an earth stud connected directly to the PE loop by a 6 mm² minimum cable.

8.0 NETWORK EQUIPMENT SPECIFICATION

8.1 Serial-to-Ethernet Modbus gateways

The MGate MB3170 and MB3270 are 1 and 2-port Modbus gateways, respectively, that convert between Modbus TCP, ASCII, and RTU communications protocols. The gateways provide both serial-to-Ethernet communication and serial (master) to serial (slave) communications. In addition, the gateways support simultaneously connecting serial and Ethernet masters with serial Modbus devices. The MGate MB3170 and MB3270 Series gateways can be accessed by up to 32 TCP master/clients or connect to up to 32 TCP slave/servers. Routing through the serial ports can be controlled by IP address, TCP port number, or ID mapping. A featured priority control function allows urgent commands to obtain an immediate response. All models are rugged, DIN-rail mountable, and offer optional built-in optical isolation for serial signals.

Integrate TCP Masters without Altering the Modbus RTU/ASCII Network or Software

The MB3270 can integrate Modbus TCP with Modbus RTU/ASCII, without modifying the existing Modbus RTU/ASCII architecture or software. With the serial redirector function, a serial master can maintain direct access to serial slave devices through a specially mapped serial port. This allows the serial and TCP masters to access serial slaves simultaneously.

Optical Fiber for Ethernet Communication

The MGate MB3170 Series includes 100BaseFX fiber models that support transmission distances up to 4 km for multi-mode models, and up to 40 km for single-mode models. Optical fiber is well-suited for industrial applications because it is immune to electromagnetic noise and interference. For environments that experience high ground

loop voltages, fiber provides the best isolation protection, and because there is no danger of sparking, optical fiber is safer than copper wire to use in hazardous environments.

Priority Control for Urgent Commands

Moxa's Auto-Device Routing function helps eliminate many of the problems and inconveniences encountered by engineers who need to configure large numbers of Modbus devices. A single mouse click is all that's required to set up a slave ID routing table and configure Modbus gateways to automatically detect Modbus requests from a supervisory control and data acquisition (SCADA) system. By removing the need to manually create the slave ID routing table, the Auto-Device Routing function saves engineers significant time and cost.

8.2 MODBUS/TCP Firewall

Applications

(Xenon-0200T1T1TDDZ9)
The robust design of the Tofino Xenon enables it to withstand the harshest environmental conditions and it can be used wherever maximum data security is called for. This makes it the ideal industrial security appliance for mechanical and plant engineering and industrial automation. Other areas for its versatile use include the transportation sector, with applications ranging from road and rail transport right through to shipping. Indeed, the Tofino Xenon has been certified by Germanischer Lloyd for this very purpose. Since this security appliance is also approved for substations (IEC 61850-3) and for explosive environments (ATEX and ISA 12.12.01

HazLoc), it can also be used in the energy sector as well as in power transmission and distribution systems and renewable energy applications such as wind farms.

Tofino Xenon Security Appliance

The included Tofino Configurator software makes it easy for the control technician to define rules that specify exactly which devices are allowed to communicate, what protocols they may use, and what actions those protocols perform. Any network traffic that does not fit the rules is automatically blocked by the Tofino Xenon and reported as a security alert.

The standard Tofino Xenon includes a stateful firewall with layer 2, 3 and 4 filtering. Adding Enforcer LSMs provides stateful DPI to manage traffic based on high level message content, such as the commands/services being used or the registers/ objects being accessed. There are multiple Enforcers available – each one providing inspection for a different protocol. The LSMs can be pre-loaded onto the Tofino Xenon at the factory, or purchased and installed at a later date as your needs change. Other features of this security appliance include extensive management facilities nd diagnostic tools, a robust metal housing for DIN rail mounting, and a redundant power supply for both DC and AC.

The Tofino Xenon allows for operating temperature ranges from 0°C to +60°C or from -40°C to +70°C. In addition, there are variants for twisted-pair cables or multimode fibers, as well as with a variety of certifications and approvals including ATEX, IEC 61850-3 and EN 50121-4.

Product Code	WS-C2960X-24PD-L
Enclosure Type	Rack-mountable - 1U
Feature Set	LAN Base
Uplink Interfaces	2 x 10G SFP+
Ports	24 x 10/100/1000 Ethernet Gigabit ports
Available PoE Power	370W
Maximum stacking number	8
Stack bandwidth	80G

Forwarding Performance	95.2Mpps
Switching Bandwidth	216Gbps
RAM	512 MB
Flash Memory	128 MB
Dimensions	44.5cm x 27.9cm x 4.45cm
Package Weight	9.19 Kg

Product Details

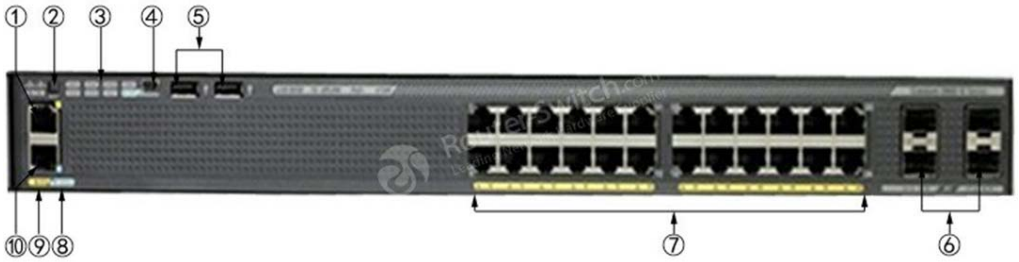
Figure 2 shows the front panel of WS-C2960X-24PD-L.

8.3 Cisco-Catalyst 2960X-24PD-L Switch:

Product Code	WS-C2960X-24PD-L
Enclosure Type	Rack-mountable - 1U
Feature Set	LAN Base
Uplink Interfaces	2 x 10G SFP+
Ports	24 x 10/100/1000 Ethernet Gigabit ports
Available PoE Power	370W
Maximum stacking number	8
Stack bandwidth	80G
Forwarding Performance	95.2Mpps
Switching Bandwidth	216Gbps
RAM	512 MB
Flash Memory	128 MB
Dimensions	44.5cm x 27.9cm x 4.45cm
Package Weight	9.19 Kg

Product Details

Figure 2 shows the front panel of WS-C2960X-24PD-L.



Note:

(1) Ethernet management port (6) SFP module ports

(2) Mode button (7) 24 x 10/100/1000 ports

(3) Switch LEDs (8) CONSOLE LED

(4) USB mini-Type B (console) port (9) MGMT LED

(5) USB Type A ports (10) RJ-45 console port

· The Switch LEDs include SYST, STAT, SPEED, RPS, MAST, POE and STACK LEDs.

MAC Address Table Size	16K (default)
CPU	APM86392 600MHz dual core
RAM	256 MB
Flash Memory	64 MB
Status Indicators	Per-port status: Link integrity, disabled, activity, speed, and full duplex System status: System, RPS, Stack link status, link duplex, PoE, and link speed
Expansion / Connectivity	
Console ports	USB (Type-B), Ethernet (RJ-45)
Stacking cable	Optional
Power Redundancy	Option (PWR-RPS2300)
Voltage range (Auto)	110V-240V
Power Consumption Operational	0.49KVA
Miscellaneous	
Width	17.5 Inches (44.5 cm)

Depth	14.5 Inches (36.8 cm)
Height	1.75 Inches (4.5 cm)
Weight	12.7 lb (5.7 Kg)
Package Weight	20.26 lb (9.19 Kg)
Rack Mounting Kit	optional
MTBF in hours	325,780

Specification

WS-C2960X-24PD-L Specification	
Enclosure type	Rack-mountable - 1U
Ports	24 x 10/100/1000 + 2 x 10G SFP+
Network management Interface	10/100 Mbps Ethernet (RJ-45)
Available PoE Power	370W
Forwarding bandwidth(Gbps)	108Gbps
Maximum stacking number	8
Stack Bandwidth	80 G
Forwarding Performance	95.2Mpps
Switching bandwidth	216Gbps
Maximum active VLANs	1023

8.4 Ethernet-to-fiber converters (IMC-101-M-SC)

The IMC-101 industrial media converters provide industrial grade media conversion between 10/100BaseT(X) and 100BaseFX (SC/ST connectors). The IMC-101's reliable industrial design is excellent for keeping your industrial automation applications running continuously, and each IMC-101 converter comes with a relay output warning alarm to help prevent damage and loss. The IMC-101 media converters are designed for harsh industrial environments, such as in hazardous locations (Class 1, Division 2/Zone 2, DNV, and GL Certification), and comply with FCC, TV, UL, and CE standards. The IMC-101 series is available in models that support an operating temperature of 0 to 60˚C, and an extended operating temperature of -40 to 75˚C. All IMC-101 series are subjected to a 100% burn-in test.

Features:

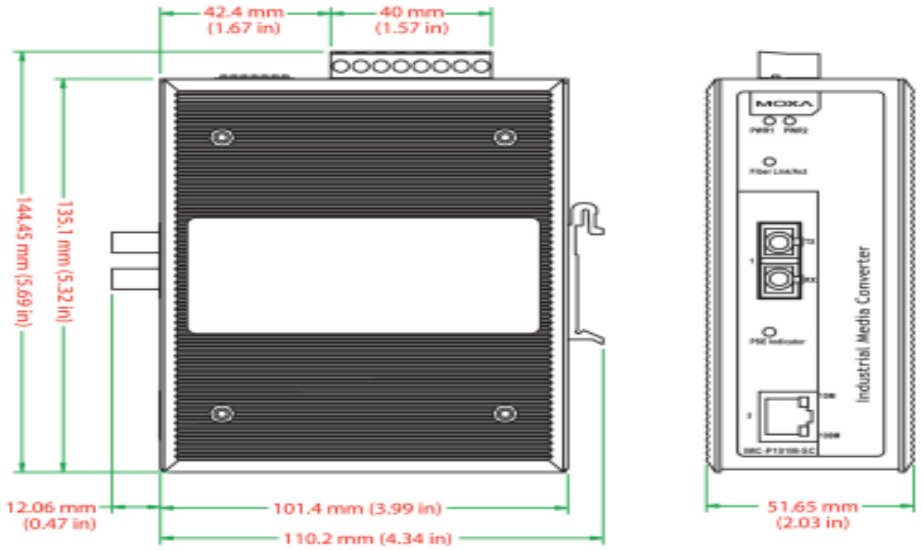
- 10/100BaseT(X) auto-negotiation and auto-MDI/MDI-X
- Link Fault Pass-Through (LFP) (media converters should work as a pair)
- Power failure, port break alarm by relay output
- Redundant power inputs
- -40 to 75°C operating temperature range (T models)
- Designed for hazardous locations (Class 1 Div. 2/Zone 2)

Specifications

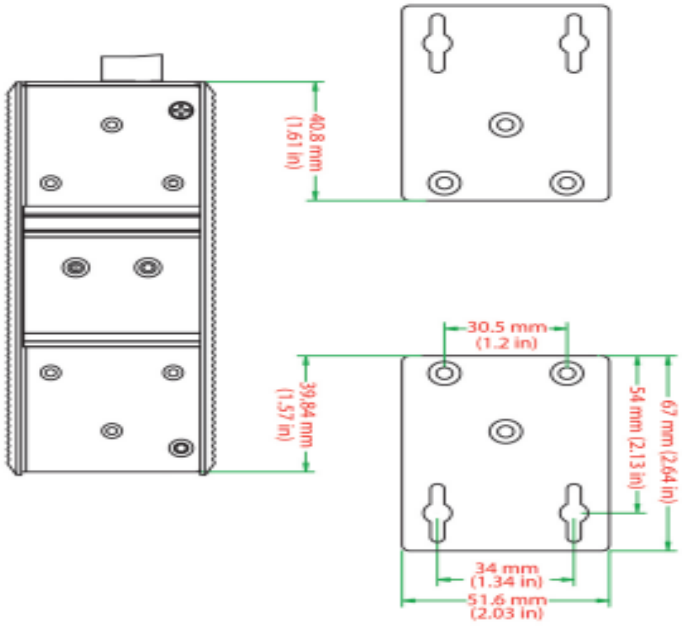
Optical Fiber			
	Multi mode	Single mode, 40	Single mode, 80
Distance, km	5	40	80
Wavelength, nm	1300	1310	1550
Min. TX Output, dBm	-20	-5	-5
Max. TX Output, dBm	-14	0	0
Sensitivity, dBm	-32	-34	-34
Recommended Diameter	62.5/125	9/125	9/125
(Core/Cladding) µm	(1 dB/km, 800 MHz x km)		
Power Requirements			
Input Voltage	24 VDC (12 to 45 VDC); redundant inputs		
Input Current	0.16 A @ 24 V		
Connection	Removable Terminal Block		
Overload Current Protection	1.1 A		
Reverse Polarity Protection	Present		
Physical Characteristics			
Casing	IP30 protection, aluminum case		
Dimensions	53.6 x 135 x 105 mm		
Weight	0.63 kg		
Installation	DIN rail, wall mounting		
Environmental Limitations			
Operating Temperature	Standard Models: 0 to 60°C (32 to 140°F), Wide Temp. Models: -40 to 75°C (-40 to 167°F)		
Storage Temperature	-40 to 85°C (-40 to 185°F)		
Ambient Relative Humidity	5 to 90% (non-condensing)		
Regulatory Approvals			
Safety	UL 60950-1, UL 508, EN 60950-1		
Hazardous Location	UL/cUL Class I, Division 2, Groups A, B, C and D ATEX Class I, Zone 2, Ex nC nL IIC T4, IECEx		
EMI	FCC Part 15, CISPR (EN 55022) Class A		
EMS	EN61000-4-2 (ESD), Level 3 EN61000-4-3 (RS), Level 3 EN61000-4-4 (EFT), Level 3 EN61000-4-5 (Surge), Level 2 EN61000-4-6 (CS), Level 3		
Shock	IEC 60068-2-27		
Freefall	IEC 60068-2-32		
Vibration	IEC 60068-2-6		

Dimensions

Mounting Dimensions



Side View FrontView



Rear View Panel Mounting Kit (Optional)

9.0 ESD SYSTEM HARDWARE SPECIFICATIONS

9.1 .Controller (SQ3008) and power supply (SE5009):

Controller that performs local control and manages communication between the I/O subsystem and the Control Network. It mounts on the right slot of the 2-wide Power Controller carrier for horizontal installations and to the right of a power supply on the 4-wide Power Controller carrier for vertical installations .Delta V supports a system power supply (AC/DC) and a system power supply (Dual DC/DC) as well as an Intrinsically Safe system power supply.

9.1.1 Controller Specification:

Specifications for the SQ Controller	
DST Limit	750
SCADA Tags	3200
Max Data Values Sent	2000/second
Max Data Values Received	250/second
Max Unsolicited Client Nodes	64
Module Execution Rates	100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 30s, 60s
User Memory	48 MB
Fuse Protection (Internal)	3.0 A, non-replaceable fuses
Power Dissipation	5.0 W typical, 7.0 W maximum
Environmental Specifications	
Operating Temperature	-40° to 70°C (-40° to 158°F)
Storage Temperature	-40° to 85°C (-40° to 185°F)
Relative Humidity	5 to 95%, non-condensing
Protection Rating	IP 20, NEMA 12
Airborne Contaminants	ISA-S71.04-1985 Airborne Contaminants Class G3 Conformal coating
Shock (Normal Operating Conditions)	10 g ½-sine wave for 11 ms
Vibration (Operative Limit)	1 mm peak-to-peak from 5 Hz to 13.2 Hz, 0.7 g from 13.2 Hz to 150 Hz
LED Indicators	
Green – Power	Indicates DC power is applied.
Red – Error	Indicates an error condition.
Green – Active	Indicates that the controller is operating as the primary controller.
Green – Standby	Indicates that the controller is operating as a backup controller.
Yellow flashing – Pri. CN	Indicates valid primary control network communication.
Yellow, flashing – Sec. CN	Indicates valid secondary control network communication.
External Connections	
Primary Control Network	8-pin RJ-45 connector
Secondary Control Network	8-pin RJ-45 connector

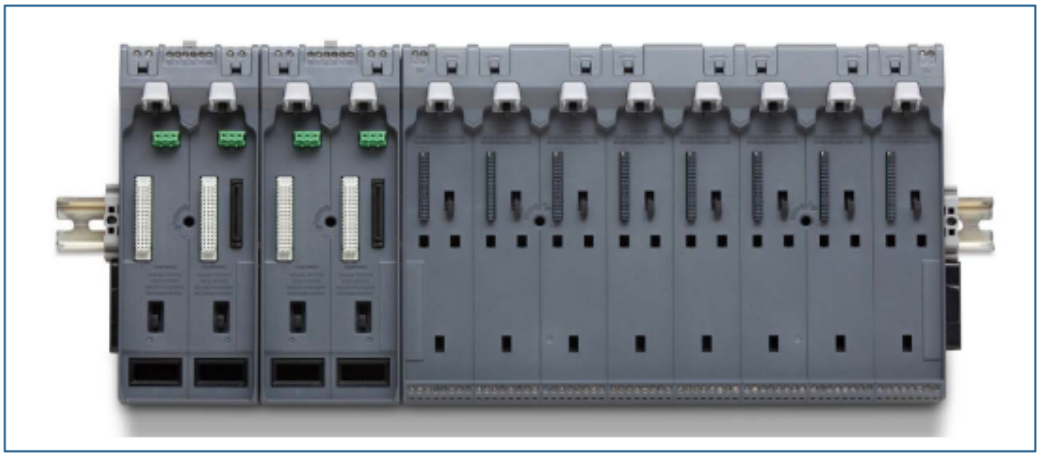
9.1.2 DC to DC Power Supply Specification (SE5009):

Description	24 VDC System Power Supply Specifications
Input	24 VDC ± 20% at 6.1A
Inrush (soft start)	20 A peak maximum for 5 ms over 24 VDC input range (including 12 VDC output)
Output Power Rating -40-60C	+12 VDC at 8.0 A (24 VDC Input) +5 VDC at 2.0 A (10 W total for combined outputs of +5 VDC)
Output Power Rating 60-70C	+12 VDC at 6.0 A (24 VDC Input) +5 VDC at 2.0 A (10 W total for combined outputs of +5 VDC)
Input protection	Internally fused, non-replaceable
Overvoltage protection	Output protected at 110% to 120%
Hold-up time	Output: remains within 5% of nominal at full load and minimum input voltage for 5 ms (excluding 12 VDC current with 12 VDC input)
Operating temperature	-40 to 60 °C (-40 to 140°F) without de-rating 60 to 70 °C (140 to 158°F) with de-rating
Storage temperature	-40 to 70 °C (-40 to 158 °F)
Relative humidity	5 to 95%, non-condensing
Airborne contaminants	ISA-S71.04-1985 airborne contaminants class G3
Shock	10 g ½-sine wave for 11 ms
Vibration	1 mm peak-to-peak from 5 Hz to 13.2 Hz, 0.7 g from 13.2 Hz to 150 Hz
Mounting	On either slot of 2-wide power/controller carrier, power slot of VerticalPlus 4-wide carrier, any slot of 4-wide power carrier.
LED Indicators:	
Green—DC Power	Input DC power is applied and internal fuse/diode is sound.
Red—Error	The +5 VDC outputs are out of tolerance.
External connectors:	
Primary power	DC input, 2-wire
Alarm contact	2-wire normally open relay; relay is closed when 3.3 and 5 VDC outputs are within ±4% of nominal; 2.0 A at 30 VDC, 2.0 at 250 VAC

9.2 .Wide Power/Controller Carrier (SE3051C0)

9.2.1 Product Description

The S-series IO subsystem has been redesigned with a focus on fast assembly and simplified power connections. The system uses only 24V DC bulk power supplies. All power is connected to system carriers. Bus connectors have been upgraded to support additional 12V DC power to the IO cards, allowing additional power carriers to be inserted anywhere along the bus. Carriers mount to standard t-type DIN rail with latches that require no tools for quick installation. The latches can be released using a blade screw driver. Simply snap the carrier to the rail and slide adjacent carriers together to engage the bus connector. The I/O carrier supports 8 IO modules. Each card can be connected to an internal 24V DC bus using the Power Buss Plugs, or it can be individually powered by using the Power Terminal Plugs. The internal 24V DC bus is divided into primary and secondary power, with primary power distributed to odd numbered slots and redundant power distributed to even numbered slots using the Power Buss Plugs.



The DeltaV™ modular I/O subsystem is easy to install and maintain.

9.2.2 Hardware Specifications

Specifications for S-series Power/Controller carriers	
24V DC Power Input	8 amps
Power/Controller Carrier	2 Power supplies or 1 power supply with 1 Controller
Specifications for S-series Horizontal I/O carriers	
Backplane Current	15 Amps
Power Terminal Plug	12 Amps
Power Buss Plug (fused)	5 Amps
Primary/Secondary 24V DC Bussed Power Distribution	12 Amps per bus (Max 3 A per card)
IO Carrier Capacity	8 IO modules
Environmental specifications	
Operating Temperature*	-40 to 70°C (-40 to 158 °F)
Storage Temperature	-40 to 85°C (-40 to 185 °F)
Relative Humidity	5 to 95%, non-condensing
Airborne Contaminants	ISA-S71.04-1985 Airborne Contaminants Class G3 Conformal coating
Protection Rating	IP 20
Shock	10 g ½-sine wave for 11 ms
Vibration	1 mm peak-to-peak from 5 to 13.2 Hz; 0.7 g from 13.2 to 150 Hz

9.3 . Redundant Logic Solver (VS3202)

9.3.1 Product Description

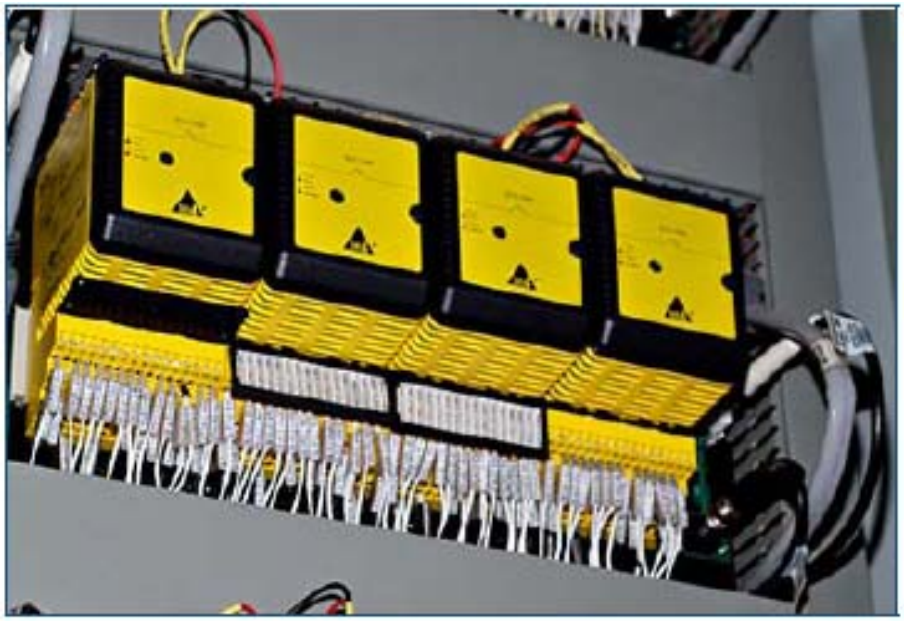
This section provides general information on Delta V SIS hardware. Refer to the Installing Your Delta V Distributed Control System manual for more information on Delta V system hardware.

Delta V SIS Hardware

The Delta V SIS process safety system consists of the following hardware:

- Redundant Logic Solvers (SLS 1508) and termination blocks
- SIS Net Repeaters (see separate product data sheet)
- Carrier extender cables
- Local peer bus extender cables
- Right 1-wide carrier with termination

Logic Solvers (SLS 1508) contain the logic-solving capability and provide an interface to 16 I/O channels that can be configured as Discrete Input, Discrete Output, Analog Input (HART) and HART two-state output channels. Logic Solvers and termination blocks install on the 8-wide carrier. Logic Solvers communicate with each other through the carriers over a two-channel, local peer bus (SIS net) and remote peer ring. Local Logic Solvers are hosted by the same Delta V controller and remote Logic Solvers are hosted by a different Delta V controller. Logic Solvers are powered by a 24 V DC power supply that is separate from the power supply that drives the Delta V controller and I/O. Logic Solvers install in odd-numbered slots (1,3,5,7) on the 8-wide carrier. Redundant Logic Solvers use four slots.
SIS Net Repeaters extend communication beyond the local Logic Solvers connected to one Delta V controller and broadcast global messages to remote SLS 1508 Logic Solvers through a fiber-optic ring Carrier extender cables extend Local Bus power and signals between 8-wide carriers. Local peer bus extender cables extend the local peer bus (SIS Net) between SLS 1508 Logic Solvers on different carriers. 1-wide carriers with terminators terminate the local peer bus at the final carrier. For additional information please consult Delta V SIS Net Repeater product datasheet.



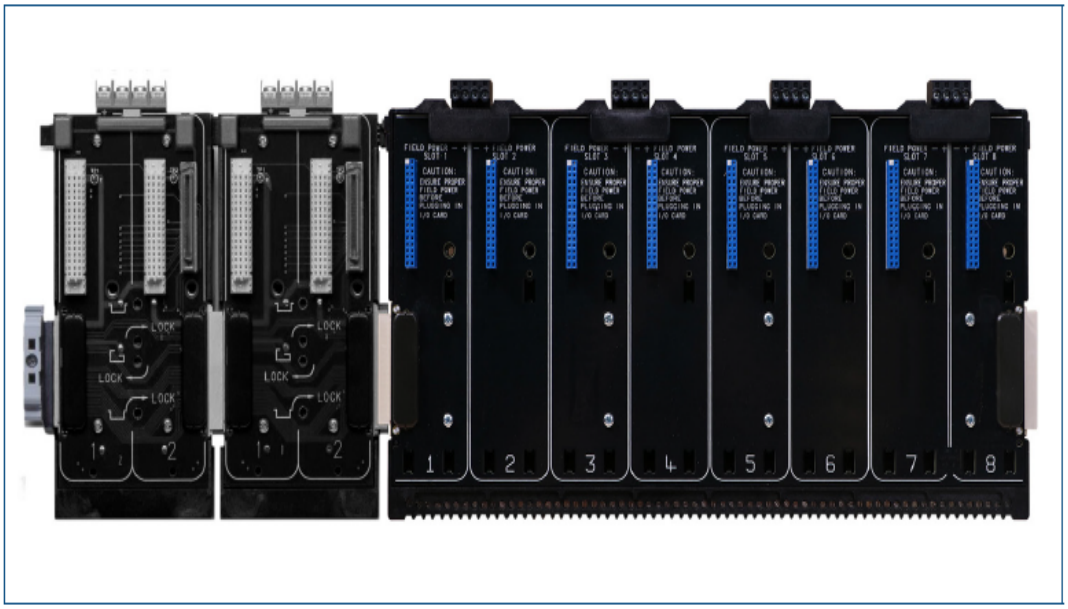
The DeltaV SIS process safety system scales to fit your safety application.

9.3.2 Delta V SLS 1508 Specifications

Common Environmental Specifications for SLS 1508 Logic Solver	
Category	**Specifications**
Storage Temperature	-40 to 85°C (-40° to 185°F)
Operating Temperature*	-40 to 70°C (-40° to 158°F)
Relative Humidity	5 to 95% , non-condensing
Airborne Contaminants	ISA-S71.04-1985 Airborne Contaminants Class G3 Conformal coating
Protection Rating	IP 20
Hazardous Area/Location	European EMC Directive per EN61326-1, Criterion A NAMUR NE21 EMC Requirements Low Voltage Directive IEC 61010-1 Factory Mutual, Non-Arcing Class 1, Div 2, Groups A, B, C, D, T4 hazardous locations ATEX 3 G EEx IIC-nA T4 EN50021:1999 CSA 1010
Shock	10 g ½-sine wave for 11 ms
Vibration	1 mm peak-to-peak from 5 to 16 Hz; 0.5 g from 16 to 150 Hz
SLS 1508 Logic Solver Physical Specifications	
Item	**Specifications**
Input Power	24 V DC ± 20%, 1.0 A plus field power (5.0 A total)
	Note: It is recommended that the SLS and DeltaV controller and I/O use separate power supplies
Field Power	4 A maximum (actual value depends upon channel type and field device type)
Isolation	Each channel is optically isolated from the system and factory-tested to 1500 V DC. No channel-to-channel isolation.
Local Bus Current	None
Mounting	In SIS (yellow) terminal blocks in odd-numbered slots (1, 3, 5, 7) on the 8-wide carrier. Redundant SLSs take 4 slots.

9.4 .Wide I/O Interface Carrier with Carrier Shield Bar, Enhanced Carrier Extender Cable, and Redundant SIS Net Coax Cables (VE4050E2C2)

The I/O interface carrier plugs on to the power/controller carrier. The power/controller carrier supplies the system power and communications between the I/O interfaces and the controller. The controller processes the I/O interface information. An additional power/controller carrier is required for use with redundant controllers. Mount your interface carrier on a T-type DIN rail. The I/O interface carrier includes the connections for the bulk 24 V DC field instrument power, I/O interfaces, and terminal blocks. Each I/O interface carrier is equipped with a connector that allows an additional I/O interface carrier to be plugged on to it. Up to 64 I/O interfaces on eight 8-wide I/O interface carriers are supported by a single I/O subsystem. For the horizontal-mount solution, 1-wide local bus extenders allow you to continue the I/O bus on a different row of carriers. There are two types of 8- wide I/O interface carriers available. They both have connectors for field power on the top of the carrier. The original carrier connects each set of field power terminals to two I/O cards, and the other option have individual field power per card slot and is ideal if separate field power is required for redundant I/O cards



The DeltaV™ modular I/O subsystem is easy to install and maintain.

9.4.1 Hardware Specifications

Specifications for the I/O Subsystem Horizontal Carriers		
2-Wide Power/Controller Carrier		
Capacity	One system power supply and one controller or two system power supplies	
Dimensions	**Centimeters**	**Inches**
Height	16.5	6.5
Width	8.4	3.3
Depth	3.1	1.2
Connector to connector width	9.1	3.6
8-Wide I/O Carrier with field power per two I/O cards Specifications		
Capacity	Eight I/O cards and eight terminal blocks	
Dimensions	**Centimeters**	**Inches**
Height	16.5	6.5
Width	33.6	13.2
Depth	3.1	1.2
Current Ratings		
Backplane	8 A max (supplied to I/O cards)	
Bussed field power bus	6.5 A max (supplied to field terminals) per two I/O cards	
8-Wide I/O Carrier with separate field power for each I/O cards Specifications		
Capacity	Eight I/O cards and eight terminal blocks	
Dimensions	**Centimeters**	**Inches**
Height	16.9	6.7
Width	33.6	13.2
Depth	3.1	1.2
Current Ratings		
Backplane	8 A max (supplied to I/O cards)	
Bussed field power bus	3.2 A max (supplied to field terminals) per I/O card	

4-Wide I/O Carrier Specifications		
Capacity	Four I/O cards and four terminal blocks	
Dimensions	**Centimeters**	**Inches**
Height	16.9	6.7
Width	17.0	6.7
Depth	3.1	1.2
Current Ratings		
Backplane	8 A max (supplied to I/O cards)	
Bussed field power bus	3.2 A max (supplied to field terminals) per I/O card	
1-Wide I/O Carrier Extender (Left and Right) Specifications		
Capacity	Single or dual cables with SIS safety bus coax cables	
Dimensions	**Centimeters**	**Inches**
Height	16.5	6.5
Width	4.2	1.7
Depth	3.1	1.2
Current Ratings		
Backplane	8 A max (supplied to I/O cards)	
Injected Power connector (Left extender only)	8 A max (supplied to I/O cards)	

Environmental specifications (All Carrier components)	
Operating temperature*	-40 to 70°C (-40 to 158°F)
Storage temperature	-40 to 85°C (-40 to 185°F)
Relative humidity	5 to 95%, non-condensing
Airborne contaminants	ISA-S71.04-1985 Airborne Contaminants Class G3 Conformal coating
Shock (normal operating conditions)	10 g ½-sine wave for 11 ms
Vibration (operative limit)	1 mm peak-to-peak from 5 Hz to 16 Hz, 0.5 g from 16 Hz to 150 Hz

9.4.1 ESD IP Address Configuration

Controller IP				
S/N	**Device Description**	**IP Adapter**	**Subnet mask**	**Location**
1	ESDCTRL01_P	192.168.0.1	255.255.252.000	Control Room
2	DCSCTRL01_S	192.168.0.2	255.255.252.000	Control Room
3	ESD Engineering work station	192.168.0.5	255.255.252.000	Eng_Room

10.0 PANEL ACCESSORIES

10.1 POWER SUPPLY PHOENIX (2904602)

DIN rail power supply unit 24 V DC/20 A, primary-switched, 1-phase.
Please use the following item in new systems: 2904602

Technical data

Input data

Nominal input voltage range	100 V AC ... 240 V AC
Input voltage range	85 V AC ... 264 V AC
	90 V DC ... 350 V DC
Input voltage range AC	85 V AC ... 264 V AC
Input voltage range DC	90 V DC ... 350 V DC
Voltage type of supply voltage	AC/DC
Inrush current	< 15 A (typical)
Inrush current integral (I^2t)	< 3.2 A^2s
AC frequency range	45 Hz ... 65 Hz
Frequency range DC	0 Hz

Mains buffering time	> 25 ms (120 V AC) > 25 ms (230 V AC)
Current consumption	approx. 4.76 A (120 V AC) approx. 2.3 A (230 V AC)
Nominal power consumption	524 W
Protective circuit	Transient surge protection; Varistor
Typical response time	< 1 s
Input fuse	12 A (slow-blow, internal)
Permissible DC backup fuse	DC: Connect a suitable fuse upstream
Recommended breaker for input protection	10 A ... 16 A (Characteristics B, C, D, K)

Output data

Efficiency	> 92 %
Nominal output voltage	24 V DC ±1 %
Setting range of the output voltage (U_{Set})	22.5 V DC .....28.5 V DC
Nominal output current (I_N)	20 A (up to 60 °C)
POWER BOOST (I_{Boost})	26 A
Derating	60 °C ... 70 °C (2.5 %/K)
Feedback voltage resistance	35 V DC
Protection against overvoltage at the output (OVP)	≤ 35 V DC
Max. capacitive load	unlimited
Active current limitation	Approx. I_{BOOST} = 26 A (for short-circuit)
Control deviation	< 1 % (change in load, static 10 % ... 90 %) < 2 % (change in load, dynamic 10 % ... 90 %) < 0.1 % (change in input voltage ±10 %)
Residual ripple	< 10 mV_{PP} (with nominal values)
Output power	480 W
Peak switching voltages nominal load	< 30 mV_{PP} (20 MHz)
Maximum no-load power dissipation	< 3 W

Power loss nominal load max.	< 44 W
Rise time	< 2 ms (U_{OUT} (10 % ... 90 %))
Connection in parallel	yes, for redundancy and increased capacity
Connection in series	yes

Output description	U_{OUT} > 0.9 x U_N: High signal
Maximum switching voltage	≤ 24 V
Output voltage	+ 24 V DC (Signal)
Maximum inrush current	≤ 40 mA
Continuous load current	≤ 40 mA

Output description	Relay contact, UOUT > 0.9 x UN: Contact closed
Maximum switching voltage	≤ 30 V AC/DC
Maximum inrush current	≤ 1 A
Continuous load current	≤ 1 A

Connection data

Connection method	Screw connection
Conductor cross section, rigid min.	0.2 mm²
Conductor cross section, rigid max.	6 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	4 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	10
Stripping length	8 mm
Screw thread	M3
Tightening torque, min	0.5 Nm
Tightening torque max	0.6 Nm

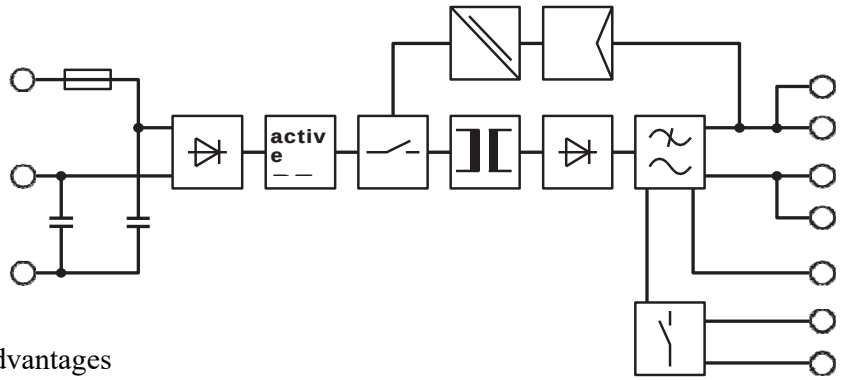
Output

Connection method	Screw connection
Conductor cross section, rigid min.	0.5 mm²
Conductor cross section, rigid max.	16 mm²
Conductor cross section flexible min.	0.5 mm²
Conductor cross section flexible max.	10 mm²
Conductor cross section AWG min.	20
Conductor cross section AWG max.	6
Stripping length	10 mm
Screw thread	M4
Tightening torque, min	0.5 Nm
Tightening torque max	0.6 Nm

Environmental and real-life conditions

Degree of protection	IP20
Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C Derating: 2,5 %/K)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	95 % (at 25 °C, non-condensing)
Shock	18 ms, 30g, in each space direction (according to IEC 60068-2- 27)
Vibration (operation)	< 15 Hz, amplitude ±2.5 mm (according to IEC 60068-2-6)

Drawings

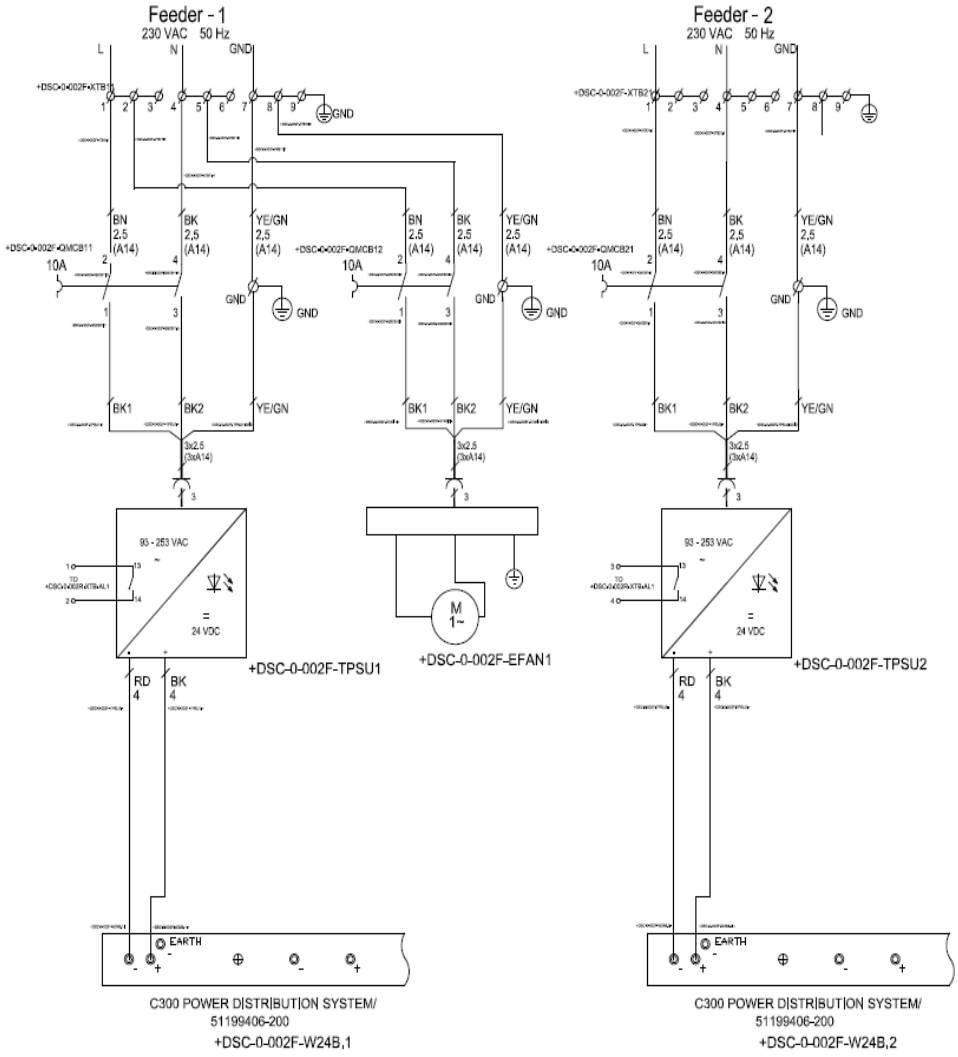


Your advantages

- Reliable starting of difficult loads with the static POWER BOOST power reserve with up to 1.5 times the nominal current permanently
- Fast tripping of standard circuit breakers with dynamic power reserve SFB (selective fuse breaking) technology with up to 6 times the nominal current for 12 ms
- For superior system availability
- Preventive function monitoring

Power Distribution

All components in a system cabinet are powered via redundant AC feeds and the C300 power
distribution system. Dual 24Vdc power supplies feed a rail based power distribution system. The
status of each power supply is monitored via hardwired digital inputs wired to the C300 IOTAs. The following diagnostic/status signals are provided within DCS cabinets (per controller):
• PSU A Failed
• PSU B Failed
• Fan Fail
Each C300 System Cabinet will require a redundant AC feed. Internal AC distribution will be provided for any other equipment requiring AC power within each system cabinet suite.
The incoming cables are terminated on suitable terminals and fed to isolators and MCBs rated for the load downstream. The isolator is used to provide isolation of the complete supply.
The MCBs are used to provide power to groups of devices and provide protection to the rest of the
supply on failure of the downstream device. Standard discrimination techniques will be used to size the MCBs. MCBs is used in preference to fuses, although fuses may be used where space restrictions apply.



As shown in the picture above, we have two power supplies that are in the form of a redundant.

10.2 Diode Quint-Diode/12-24DC/2X20 PHOENIX (2320157)

-USE IN MARSHALLING & IRP CABINETS

Product Description

A safe redundant system is the result of the parallel connection of two power supply units which are decoupled from one another. To further increase System availability, QUINT DIODE provides the solution: decoupling with diode.

DIODE

Technical data

Width	50 mm
Height	130 mm
Depth	125 mm
Installation distance right/left	5 mm / 5 mm

Ambient conditions

Degree of protection	IP20
Inflammability class in acc. with UL 94 (housing / terminal blocks)	V0
Ambient temperature (operation)	-40 °C ... 70 °C (> 60 °C Derating: 2,5 %/K)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 95 % (at 25 °C, non-condensing)
Climatic class	3K3 (in acc. with EN 60721)
Degree of pollution	2
Installation height	≤ 5000 m

Input data

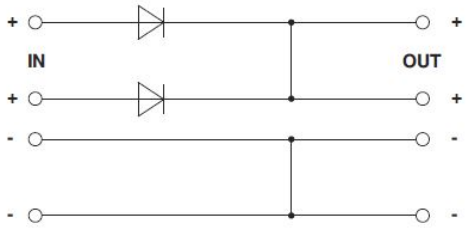
Nominal input voltage range	12 V DC ... 24 V DC
	12 V DC ... 24 V DC
Input voltage range	10 V DC ... 30 V DC
	10 V DC ... 30 V DC
Nominal input current	2x 20 A (-25 °C ... 60 °C)
	1x 40 A (-25 °C ... 60 °C)
Maximum input current	2x 30 A (-25°C ... 40°C)
	1x 60 A (-25°C ... 40°C)

Output data

Nominal output current (I_N)	40 A (Increasing power)
	20 A (Redundancy)
Derating	60 °C ... 70 °C (2.5%/K)
Connection in series	No
Power loss nominal load max.	10 W (I_{OUT} = 20 A)

Drawings

Block diagram

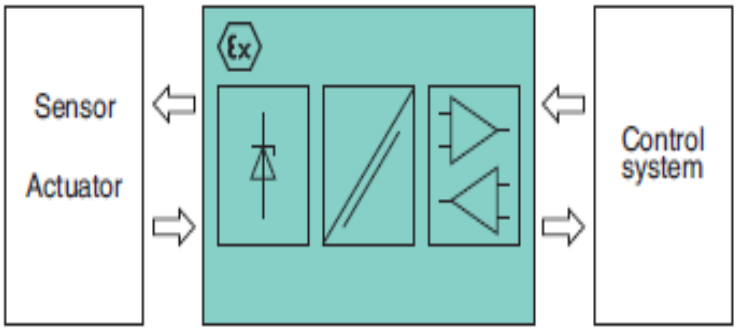


10.3 BARRIER & REALY SPECIFICATIONS

- Isolator
- DIN Mounting Rail
- Barrier types
- Relay

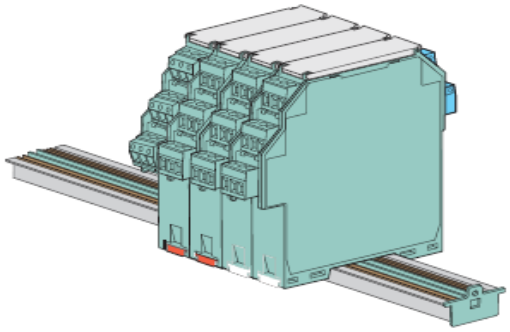
10.3.1 ISOLATOR FUNCTION

Isolated barriers are isolators used for protection of intrinsically safe circuits in hazardous areas. In addition to the required current, voltage and power limitation, the isolated barriers have a galvanic isolation between the field circuit and the controller.



Function – isolating, amplifying and transforming signals

The K-System consists of wide range of isolated barriers suitable for mounting on 35 mm DIN mounting rail. K-System is easy to specify, integrate and expand. Our extensive line of intrinsic safe isolators for hazardous location applications contains over 150 different devices.



K-System on Power Rail

10.3.2 Housing Styles

Depending on the functionality and application, K-System devices have 3 different housing widths:

• KC devices with 12.5 mm width

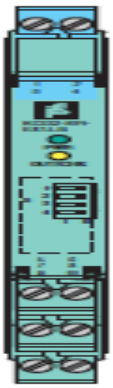
• KF devices with 20 mm width

• KF devices or KH devices with 40 mm width

The 3 housing widths versions have the same system characteristics. All devices can be mounted on the 35 mm DIN mounting rail or the Power Rail.

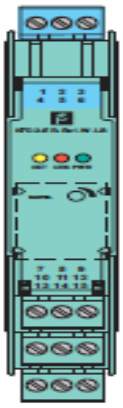
- In this project KC devices with power rails & power feed modules will use.

KC Device Housing



KC device housing (12.5 mm)

KF Device Housing

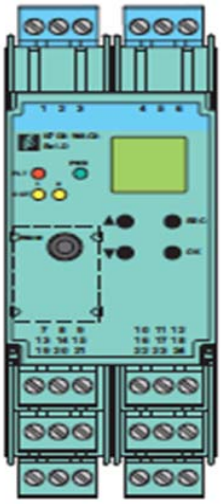


KF device housing (20 mm)

Used for high channel density

• Compact 20 mm housing

• Packing density from 5 mm per channel



KF device housing (40 mm)

Used for applications with high functionality

• Digital devices monitor speed, direction of rotation, slip, flow rates and time.

• Analog devices monitor transmitter signals, temperature signals and load cells.

• Configured using keypad or PACTwareTM software, see also manual "Installation and Configuration Device Type Manager (DTM)"

• AC/DC wide range supply available

KH Device Housing

KH device housing (40 mm)

10.3.3 Terminals

Removable Terminal Blocks

The removable terminal blocks simplify connection and control cabinet assembly. The terminal blocks offer space for the connection of leads with core cross-sections of up to 2.5 mm2 (14 AWG). The terminal blocks are coded with red coding pins so misconnection of terminal blocks are eliminated.

Observe the tightening torque of the terminal screws. The tightening torque is 0.5 Nm to 0.6 Nm.

The 20 mm and 40 mm wide KF devices are factory-equipped with screw terminals. The KC devices are available with screw terminals or spring terminals. The order designation of the versions of the KC devices with spring terminals has the extension ".SP".

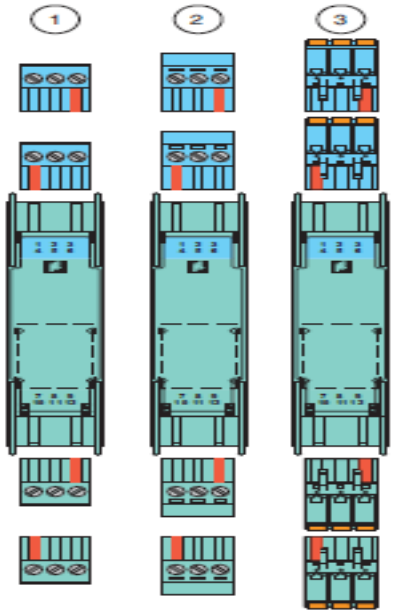
As an alternative to the factory-equipped terminal blocks the devices can be used with other terminal blocks:

• Terminal blocks with screw terminals

• Terminal blocks with screw terminals and test plug socket

• Terminal blocks with spring terminals and test plug socket

These terminal blocks are available as accessories. The terminal blocks can be easily coded with KF-CP coding pins (available optionally).



K-System removable terminal blocks

1 Terminal blocks with screw terminals

2 Terminal blocks with screw terminals and test sockets

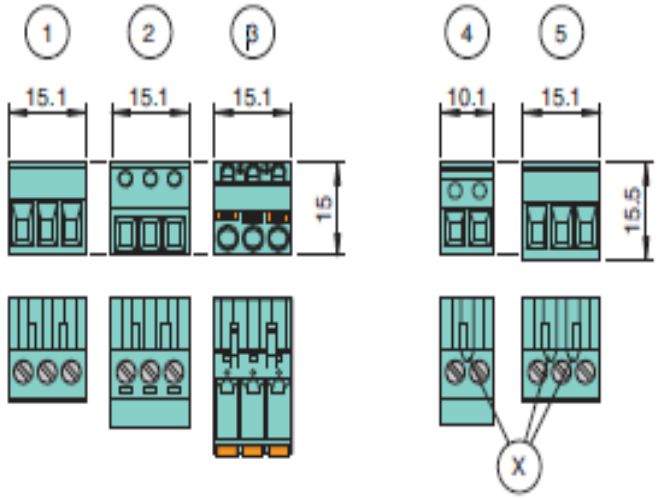
3 Terminal blocks with spring terminals and test sockets

10.3.4 Protection against direct contact

The removable terminal blocks have different heights:

• Height 15 mm (1), (2), (3): These terminal blocks are used in applications that have rated voltages lower than 50 V AC. The insulation of the removable terminal blocks provides protection against direct contact. The insulation corresponds to a reinforced insulation according to EN 62020-1 for a rated insulation voltage of 50 V AC.

• Height 15.5 mm (4), (5): These terminal blocks are used in applications that have rated voltages higher than 50 V AC. The insulation of the removable terminal blocks provides protection against direct contact. The insulation corresponds to a basic



insulation according to EN 62020-1 for a rated insulation voltage of 300 V AC. The higher terminals are marked (X).

Removable terminal blocks with different heights

1 Terminal block with screw terminals, height 15 mm

2 Terminal block with screw terminals and test sockets, height 15 mm

3 Terminal block with spring terminals and test sockets, height 15 mm

4 Terminal block with screw terminals and test sockets, height 15.5 mm

5 Terminal block with screw terminals, height 15.5 mm

10.3.5 Color Identification

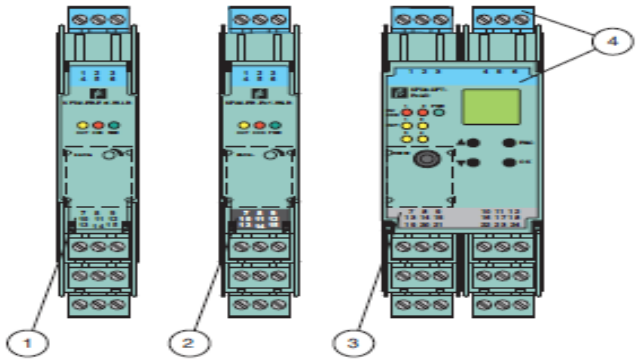
The color identification of the devices has the following meaning:

• Green (1) indicates devices with DC power supply.

• Black (2) indicates devices with AC power supply.

• Gray (3) indicates devices with AC/DC wide range supply.

• Blue (4) indicates devices that process signals from the hazardous area.



Color identification of devices

1 green

2 black

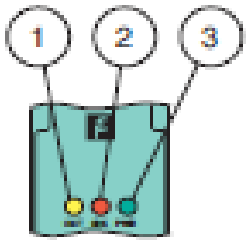
3 grays

4 blue

10.3.6 Status Indicators of the Isolators

LEDs are often used on isolators to indicate different statuses (e. g. for power supply, device failure, status messages, binary switching states). Standard LED colors are assigned to the status display according to NAMUR NE44.

LED	Display function	Display	Meaning
Green LED	Power supply	On	Power supply OK
		Off	No power supply or insufficient power supply – device faulty
Red LED	Device fault, device failure	On	Internal fault signal, failure signal – fault/failure display of causes detected inside the device, device needs replacing
	Line fault	Flashing	External fault signal, failure signal – fault/failure display of causes detected outside the device, inspection and elimination of fault required
	No fault	Off	No malfunction, device is operating properly
Yellow LED	Switching states of binary inputs and outputs	On	Possible causes of the output: • The relay is energized. • The NO contact (also a change-over contact) is actively closed. • The open collector is switched through. • The switching voltage generated inside the device is applied. Possible causes of the input: • A binary switching signal is present. • An analog limit value is reached.
		Off	Possible causes of the output: • The relay is de-energized. • The NO contact (also a change-over contact) is actively opened. • The open collector is not switched through. • The switching voltage generated inside the device is not applied. Possible causes of the input: • A binary switching signal is present. • An analog limit value is reached.



Example status indicators

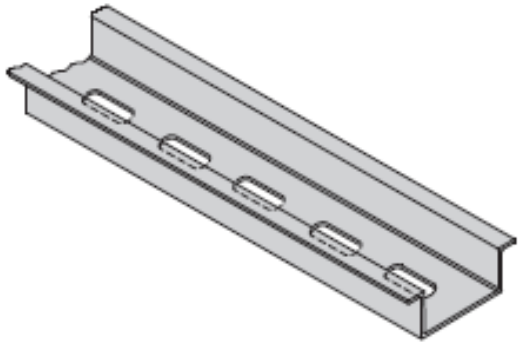
1 Yellow LED "OUT" Switching state of the output

2 Red LED "CHK" Lead breakage and short circuit status indicator

3 Green LED "PWR" Power supply status indicator

10.3.7 DIN Mounting Rail

The devices are mounted on a 35 mm DIN mounting rail according to EN 60715.



Example: DIN mounting rail UPR-MR (35 mm x 15 mm)

10.4 BARRIER

The barrier or isolator provides only a part of limit in energy, it ensures that current or voltage fed to the hazardous area from a source in the safe area is insufficient to cause ignition.

Barriers are used in Hazardous locations to power Intrinsic Safe instruments. The barrier will reduce the available loop current to a level that cannot produce a spark.

An Isolator is used to connect signals of different common mode voltage for example a transmitter signal may be referenced to +24 whereas the DCS may be referenced to ground.

You can also have an isolator that is designed for use in Intrinsic Safe circuit.

- **AI BARRIER (KCD2-STC-Ex1)**

SMART TRANSMITTER POWER SUPPLY KCD2-STC-EX1.E

4 1-channel isolated barrier

5 24 V DC supply (Power Rail)

6 Input for 2-wire SMART transmitters and current sources

7 Output for 4 mA ... 20 mA or 1 V ... 5 V

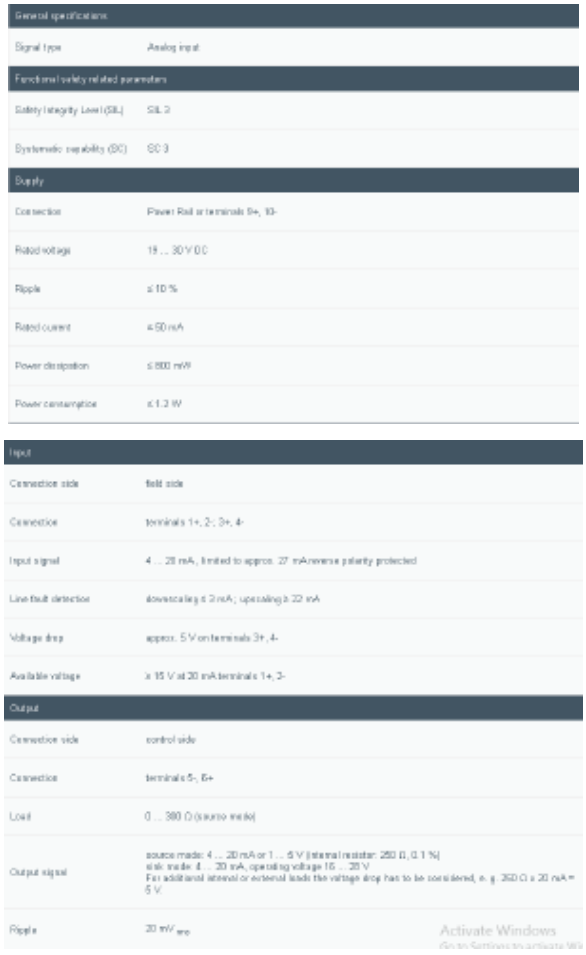
8 Sink or source mode

9 Line fault detection (LFD)

10 Housing width 12.5 mm

11 Up to SIL 3 acc. to IEC/EN 61508

SPECIFICATION



General specifications	
Signal type	Analog input
Functional safety related parameters	
Safety Integrity Level (SIL)	SIL 3
Systematic capability (SC)	SC 3
Supply	
Connection	Power Rail or terminals 9+, 10-
Rated voltage	19 ... 30 V DC
Ripple	≤ 10 %
Rated current	≤ 60 mA
Power dissipation	≤ 800 mW
Power consumption	≤ 1.2 W

Input	
Connection side	field side
Connection	terminals 1+, 2-; 3+, 4-
Input signal	4 ... 20 mA, limited to approx. 27 mA reverse polarity protected
Line fault detection	downscaling ≤ 3 mA; upscaling ≥ 22 mA
Voltage drop	approx. 5 V on terminals 3+, 4-
Available voltage	≥ 15 V at 20 mA terminals 1+, 3-
Output	
Connection side	control side
Connection	terminals 5-, 6+
Load	0 ... 350 Ω (source mode)
Output signal	source mode: 4 ... 20 mA or 1 ... 5 V (internal resistor: 250 Ω, 0.1 %) sink mode: 4 ... 20 mA, operating voltage 15 ... 28 V For additional internal or external loads the voltage drop has to be considered, e. g. 350 Ω x 20 mA = 5 V.
Ripple	20 mV$_{pp}$

Function

This isolated barrier is used for intrinsic safety applications.

The device supplies 2-wire SMART transmitters in a hazardous area, and can also be used with 2-wire SMART current sources.

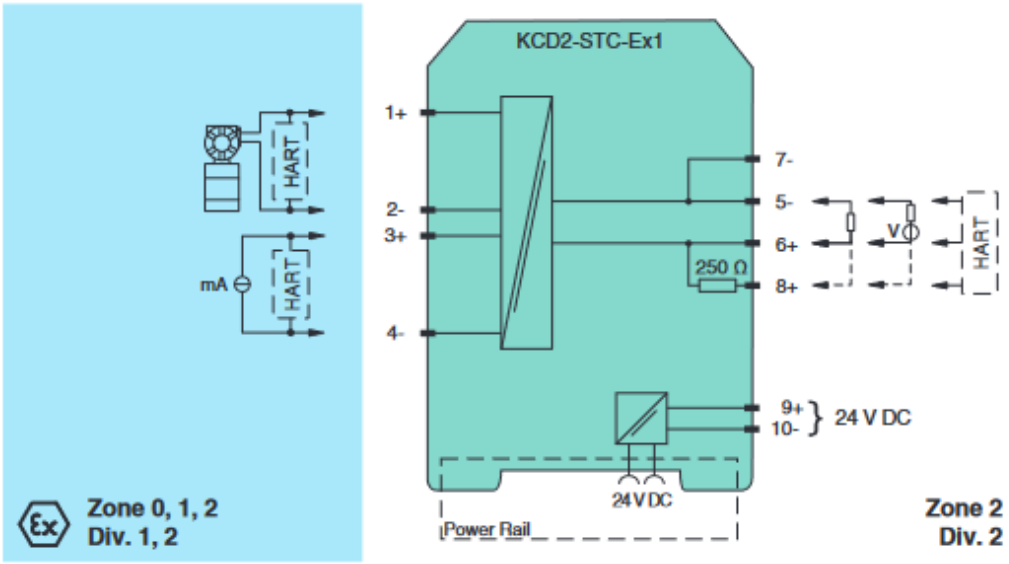
It transfers the analog input signal to the safe area as an isolated current value.

Digital signals may be superimposed on the input signal in the hazardous or safe area and are transferred bi-directionally.

Selectable output of current source, sink mode, or voltage output is available via DIP switches.

If the HART communication resistance in the loop is too low, the internal resistance of 250 Ω between terminals 6 and 8 can be used.

Connection



Test sockets for the connection of HART communicators are integrated into the terminals of the device.

Technical data

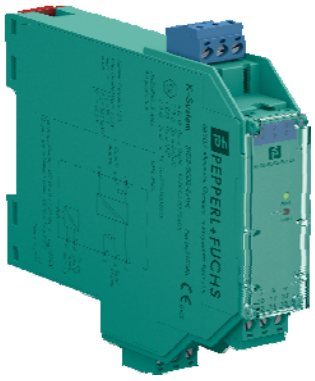
Technical Data

General specifications	
Signal type	Analog input
Functional safety related parameters	
Safety Integrity Level (SIL)	SIL 2
Systematic capability (SC)	SC 3
Supply	
Connection	Power Rail or terminals 9+, 10-

Technical Data

Rated voltage	U_r	19 ... 30 V DC
Ripple		≤ 10 %
Rated current	I_r	≤ 45 mA at 24 V and 20 mA source mode output
Power dissipation		≤ 800 mW
Power consumption		≤ 1.1 W
Input		
Connection side		field side
Connection		terminals 1+, 2-; 3+, 4-
Input signal		4 ... 20 mA limited to approx. 26 mA
Open circuit voltage/short-circuit current		terminals 1+, 2-: 22 V / 26 mA
Voltage drop		terminals 3+, 4- : approx. 5 V
Available voltage		terminals 1+, 2-: ≥ 15 V at 20 mA ; ≥ 18 V at 4 mA
Output		
Connection side		control side
Connection		terminals 5-, 6+ terminals 5-, 8+ for HART resistor
Load		0 ... 350 Ω (source mode)
Output signal		4 ... 20 mA or 1 ... 5 V (on 250 Ω, 0.1 % internal shunt) 4 ... 20 mA (sink mode), operating voltage 10 ... 30 V
Ripple		20 mV_{rms}
Transfer characteristics		
Deviation		at 20 °C (68 °F) < 0.1 % of full scale, incl. non-linearity and hysteresis (source mode and sink mode 4 ... 20 mA) ≤ ± 0.2 % incl. non-linearity and hysteresis (source mode 1 ... 5 V)
Influence of ambient temperature		< 2 µA/K (-20 ... 70 °C (-4 ... 158 °F)); < 4 µA/K (-40 ... -20 °C (-40 ... -4 °F)) (source mode and sink mode 4 ... 20mA) < 0.5 mV/K (-20 ... 70 °C (-4 ... 158 °F)); < 1 mV/K (-40 ... -20 °C (-40 ... -4 °F)) (source mode 1...5 V)
Frequency range		field side into the control side: bandwidth with 0.5 V_{pp} signal 0 ... 3 kHz (-3 dB) control side into the field side: bandwidth with 0.5 V_{pp} signal 0 ... 3 kHz (-3 dB)
Settling time		≤ 50 ms
Rise time/fall time		≤ 10 ms
Galvanic isolation		
Input/Output		basic insulation according to IEC/EN 61010-1, rated insulation voltage 300 V_{eff}
Input/power supply		reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V_{eff}
Output/power supply		basic insulation according to IEC/EN 61010-1, rated insulation voltage 300 V_{eff}
Indicators/settings		
Display elements		LED
Control elements		DIP switch
Configuration		via DIP switches
Labeling		space for labeling at the front
Directive conformity		
Electromagnetic compatibility		
Directive 2014/30/EU		EN 61326-1:2013 (industrial locations)
Conformity		
Electromagnetic compatibility		NE 21:2017 EN 61326-3-2:2018
Degree of protection		IEC 60529:2001
Protection against electrical shock		UL 61010-1:2012
Ambient conditions		
Ambient temperature		-40 ... 70 °C (-40 ... 158 °F)
Mechanical specifications		
Degree of protection		IP20
Connection		screw terminals
Mass		approx. 100 g

- **AO BARRIER (KFD2-SCD2-EX1.LK)**



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Function

This isolated barrier is used for intrinsic safety applications.

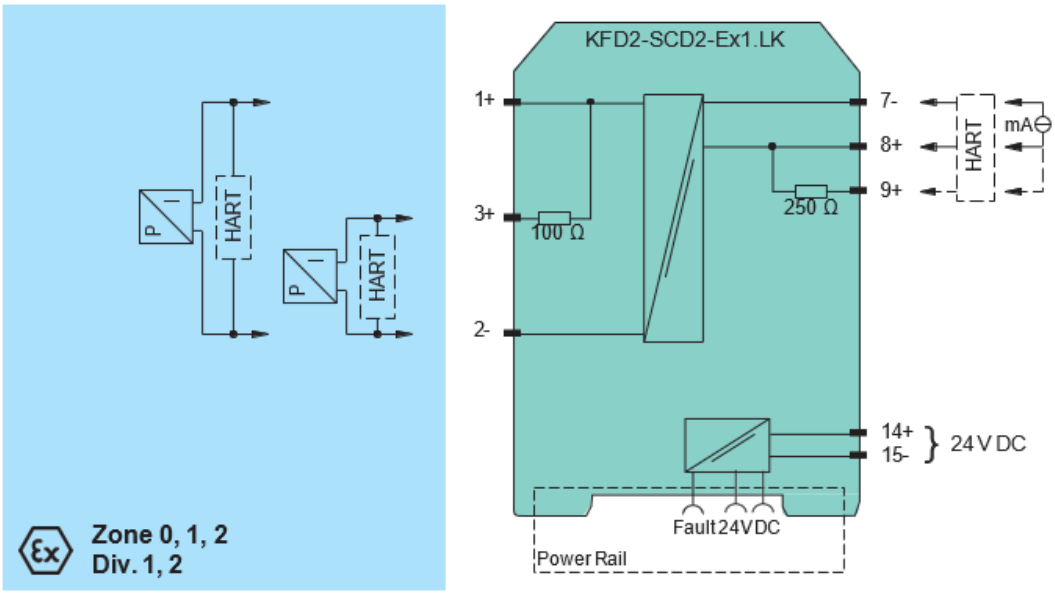
The device drives SMART I/P converters, electrical valves, and positioners in hazardous areas.

Digital signals are superimposed on the analog values at the field side or control side and are transferred bi-directionally.

Current transferred across the DC/DC converter is repeated at terminals 1 and 2. Terminals 2 and 3 are used when no short circuit detection is required.

An open or short field circuit presents a high impedance to the control side to allow alarm conditions to be monitored by the control system. If the HART communication

Connection



Technical Data:

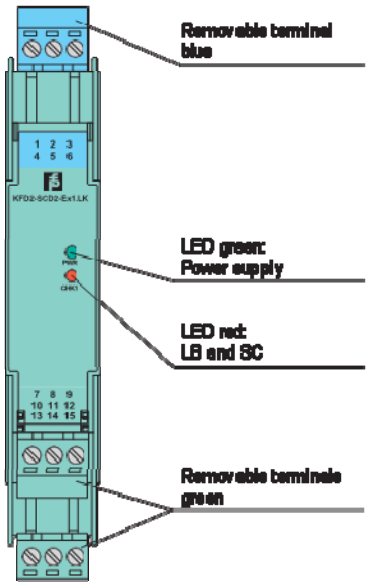
General specifications		
Signal type		Analog output
Functional safety related parameters		
Safety Integrity Level (SIL)		SIL 2
Systematic capability (SC)		SC 3
Supply		
Connection		Power Rail or terminals 14+, 15-
Rated voltage	U_r	19 ... 30 V DC
Ripple		≤ 10 %

Rated current	I_r	≤ 30 mA at 24 V
Power dissipation		≤ 600 mW at 20 mA and 500 Ω load
Power consumption		≤ 700 mW
Input		
Connection side		control side
Connection		terminals 7-, 8+, (9+)
Input signal		4 ... 20 mA , limited to approx. 30 mA
Input voltage		open loop voltage of the control system ≤ 30 V
Voltage drop		approx. 6 V at 20 mA
Input resistance		field wiring open circuit : > 100 kΩ field wiring < 50 Ω : > 100 kΩ when using terminals 1 and 2

Output		
Connection side		field side
Connection		terminals 1+, 2- terminals 3+, 2- (no short circuit detection)
Voltage		≥ 13 V at 20 mA
Current		4 ... 20 mA
Load		100 ... 650 Ω , for terminals 1, 2 0 ... 550 Ω , for terminals 2, 3
Ripple		20 mV rms
Line fault detection		breakage, load > 100 kΩ, short-circuit, load < 50 Ω
Fault indication output		
Output type		open collector transistor (internal fault bus)
Transfer characteristics		
Deviation		at 20 °C (68 °F), 4 ... 20 mA < 0.1 % of full scale, incl. non-linearity and hysteresis
Influence of ambient temperature		< 2 µA/K (-20 ... 70 °C (-4 ... 158 °F)); < 4 µA/K (-40 ... -20 °C (-40 ... -4 °F))
Frequency range		field side into the control side: bandwidth with 0.5 V_{pp} signal 0 ... 3 kHz (-3 dB) control side into the field side: bandwidth with 0.5 V_{pp} signal 0 ... 3 kHz (-3 dB)
Rise time		10 to 90 % ≤ 10 ms
Galvanic isolation		
Input/Output		basic insulation according to IEC/EN 61010-1, rated insulation voltage 300 V_{eff}
Input/power supply		basic insulation according to IEC/EN 61010-1, rated insulation voltage 300 V_{eff}
Output/power supply		reinforced insulation according to IEC/EN 61010-1, rated insulation voltage 300 V_{eff}
Indicators/settings		
Display elements		LEDs
Labeling		space for adhesive label at the front
Directive conformity		
Electromagnetic compatibility		
Directive 2014/30/EU		EN 61326-1:2013 (industrial locations)
Conformity		
Electromagnetic compatibility		NE 21:2017 EN 61326-3-2:2018
Degree of protection		IEC 60529
Protection against electrical shock		UL 61010-1:2012
Ambient conditions		
Ambient temperature		-40 ... 70 °C (-40 ... 158 °F)
Mechanical specifications		
Degree of protection		IP20
Connection		screw terminals
Mass		approx. 115 g
Dimensions		20 x 124 x 115 mm (0.8 x 4.9 x 4.5 inch) (W x H x D) , housing type B2
Mounting		on 35 mm DIN mounting rail acc. to EN 60715:2001
Data for application in connection with hazardous areas		
EU-type examination certificate		BAS 00 ATEX 7240 X
Marking		II (1)G [Ex ia Ga] IIC II (1)D [Ex ia Da] IIIC I (M1) [Ex ia Ma] I
Output		Ex ia, Ex iaD
Voltage	U_o	25.2 V
Current	I_o	93 mA

Power	P_o	585.3 mW
Internal capacitance	C_i	1.05 nF
Internal inductance	L_i	0
Supply		
Maximum safe voltage	U_m	250 V $_{rms}$ (Attention! The rated voltage can be lower.)
Input		
Maximum safe voltage	U_m	250 V $_{rms}$ (Attention! The rated voltage can be lower.)
Certificate		FIDI 22 ATEX 0002 X
Marking		II 3G Ex ec IIC T4 Gc
Galvanic isolation		
Input/Output		safe electrical isolation acc. to IEC/EN 60079-11, voltage peak value 375 V
Output/power supply		safe electrical isolation acc. to IEC/EN 60079-11, voltage peak value 375 V
Directive conformity		
Directive 2014/34/EU		EN IEC 60079-0:2018 , EN 60079-11:2012 , EN IEC 60079-7:2015+A1:2018
International approvals		
UL approval		E106378
Control drawing		116-0345 (cULus)
IECEx approval		
IECEx certificate		IECEx BAS 04.0014X
IECEx marking		[Ex ia Ga] IIC , [Ex ia Da] IIIC , [Ex ia Ma] I Ex ec IIC T4 Gc
General information		
Supplementary information		Observe the certificates, declarations of conformity, instruction manuals, and manuals where applicable. For information see www.pepperl-fuchs.com.

Assembly:



- **RELAY MODULE-PLC-RSC-24DC/21-2966171**

Technical data

Note

Utilization restriction	EMC: class A product, see manufacturer's declaration in the download area

Dimensions

Width	6.2 mm
Height	80 mm
Depth	94 mm

Ambient conditions

Ambient temperature (operation)	-40 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C

Coil side

Nominal input voltage U_N	24 V DC
Typical input current at U_N	9 mA
Typical response time	5 ms
Typical release time	8 ms

Product Features Slim design PLC relay, consisting of base terminal block PLC-BSC.../21 with screw connection and pluggable miniature relay with power contact, for assembly on DIN rail NS 35/7.5, 1 PDT, input voltage 24 V DC

Product Features:

- Slim design
- Efficient connection to system cabling using V8 adapter
- Safe isolation according to DIN EN 50178 between coil and contact
- RT III sealed relay
- Functional plug-in bridges
- Integrated input circuit and interference suppression circuit

+

Safety relays(2986960):

Safe coupling relay for SIL 3 high- and low-demand applications, couples digital output signals to the periphery, two enabling current paths, one signal contact, module for safe state off applications, integrated test pulse filter, plug-in screw connection, width: 17.5 mm

Your advantages

- Narrow 17.5 mm housing
- Up to SIL 3 in accordance with IEC 61508
- Easy proof test according to IEC 61508 thanks to integrated signal contact
- Long service life thanks to filtering of controller test pulses
- Force-guided contacts in accordance with EN 50205
- 2 enabling current paths
- Couples digital output signals from failsafe controllers to I/O devices (valves, etc.) for electrical isolation and power adaptation

Product type	Coupling relay
Product family	PSRclassic
Application	Safe switch off High demand Low demand
Control	1-channel
Mechanical service life	10x 10^6 cycles
Relay type	Electromechanical relay with force-guided contacts in accordance with IEC/EN 61810-3

Electrical properties

Maximum power dissipation for nominal condition	2.4 W
Nominal operating mode	100% operating factor

Air clearances and creepage distances between the power circuits

Rated insulation voltage	250 V
Rated surge voltage/insulation	Safe isolation, reinforced insulation 6 kV between the control circuits (A1/A2), (31/32), (13/14, 23/24)

Input data

Rated control circuit supply voltage U_S	24 V DC -15 % / +10 %
Power consumption at U_S	typ. 1.32 W
Rated control supply current I_S	typ. 55 mA
Input voltage range	20.4 V DC.....26.4 V DC
Inrush current	max. 100 mA
Filter time	max. 5 ms (at A1 in the event of voltage dips at U_s)
	max. 2 ms (Test pulse width; high test pulse at A1/A2)
	≥ 100 ms (Test pulse width; high test pulse at A1/A2)
	Test pulse rate = 80 x Test pulse width
	max. 5 ms (Test pulse width; low test pulse at A1/A2)
	≥ 50 ms (Test pulse rate; low test pulse at A1/A2)
	Test pulse rate = 15 x Test pulse width
Typ. starting time with U_s	50 ms
Typical release time	50 ms
Recovery time	1 s
Maximum switching frequency	0.5 Hz
Protective circuit	

Output data

Contact switching type	2 enabling current paths
	1 confirmation current path
Contact material	AgCuNi, + 0.2 µm Au
Maximum switching voltage	250 V AC/DC (N/O contact / N/C contact, observe the load curve)
Minimum switching voltage	15 V AC/DC (N/O contact / N/C contact)
Limiting continuous current	5 A (N/O contact, pay attention to the derating)
	100 mA (N/C contact)
Maximum inrush current	5 A (N/O contact)
	100 mA (N/C contact)
Inrush current, minimum	5 mA (N/O contact / N/C contact)
Sq. Total current	50 A^2 (observe derating)
Interrupting rating (ohmic load) max.	120 W (24 V DC, τ = 0 ms, N/C contact: 2.4 W)
	192 W (48 V DC, τ = 0 ms, N/C contact: 4.8 W)
	162 W (60 V DC, τ = 0 ms, N/C contact: 6 W)
	66 W (110 V DC, τ = 0 ms, N/C contact: 11 W)

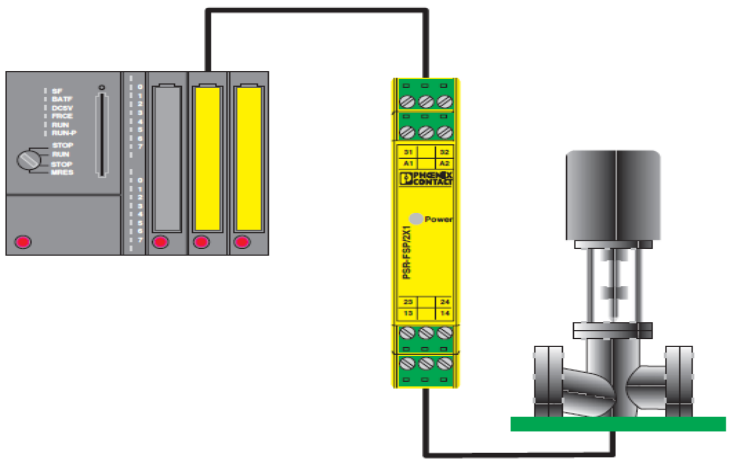
	60 W (220 V DC, τ = 0 ms, N/C contact: 22 W)
	1250 VA (250 V AC, τ = 0 ms, N/C contact: 25 VA)
Maximum interrupting rating (inductive load)	72 W (24 V DC, τ = 40 ms, N/C contact: 2.4 W)
	43 W (48 V DC, τ = 40 ms, N/C contact: 4.8 W)
	41 W (60 V DC, τ = 40 ms, N/C contact: 6 W)
	35 W (110 V DC, τ = 40 ms, N/C contact: 11 W)
	48 W (220 V DC, τ = 40 ms, N/C contact: 22 W)
Switching capacity	min. 75 mW
Switching capacity (3600/h cycles)	5 A (24 V (DC13))
	5 A (230 V (AC15))
Output fuse	10 A gL/gG (N/O contact)
	4 A gL/gG (for low-demand applications)
	150 mA Fast-blow (N/C contact)

Connection data

Connection method	Screw connection
Conductor cross section rigid	0.2 mm² ..... 2.5 mm²
Conductor cross section flexible	0.2 mm² ..... 2.5 mm²
Conductor cross-section AWG	24 ... 12
Stripping length	7 mm
Screw thread	M3

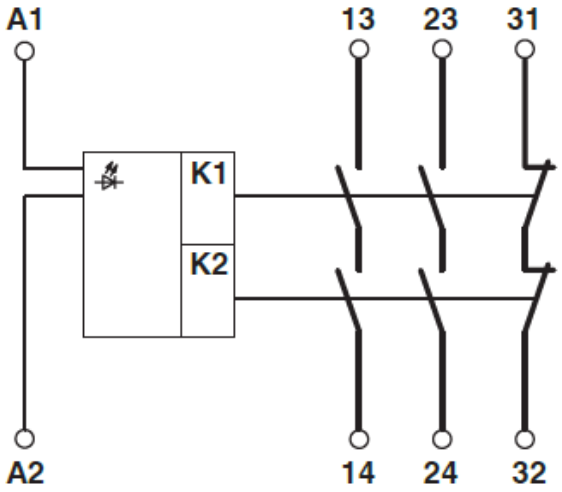
Drawings

Application drawing

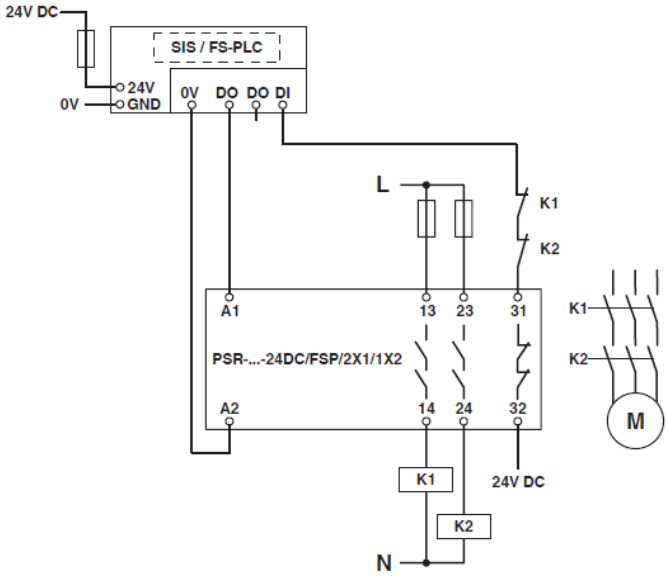


Example of electrical isolation of a safety PLC output from the field.

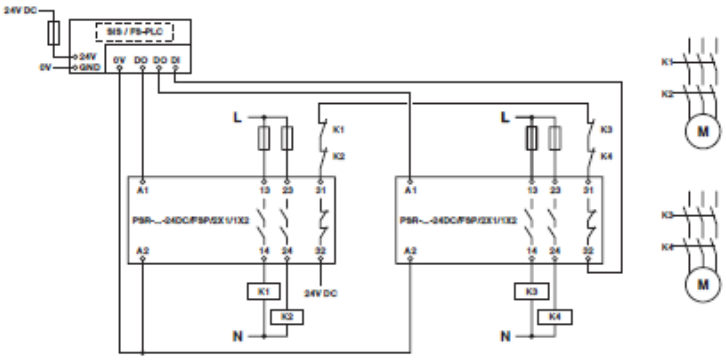
Circuit diagram



Circuit diagram



Circuit diagram



Two-channel connection with integration of the confirmation current path

10.5 TERMINATIN BOARD & TERMINALSPECIFICATION

10.6 Termination Boards

Termination board modules is specially designed for coupling to the I/O cards with dedicated system cable by Phoenix for Honeywell C300 IO series.

- **Phoenix termination board (UM 45-D37SUB/S):**

These boards have been specially designed for coupling to C300 I/O cards by 1:1 connection to the field level with dedicated system cables. The following features characterize these boards:
- Transmission of 16 channels
- D-SUB 37 male system connector
- 1:1 wiring
- Screw connection to the field level

Following I/O cards can be connected:
DI/ AI/ AO/ DO

10.7 Terminal type

Fuse Type Terminal RT/SF4 (RFT5) :

Technical Specifications :

Parameter	Value
Instantaneous Voltage	8 kV
Color	Gray, Black, Blue
Certification	KEMA
Standard	IEC 60947-7-3
Voltage	800 V
Current	6.3 A
Material Group	I
Voltage Category	III
Pollution Degree	3
Cross-Section	4 mm²
Maximum Current	–
Maximum Wire Capacity	–
Mountable on Rail	TH35-15, TH35-7.5
End Cover	–
End Cover Width	–
Separator	–
Separator Width	–
Small Separator	–
End Clamp	EB/1, EB/3
End Clamp Width	10 mm, 9.5 mm
Fixed Jumper	JEB10-6, JEB2-6, JEB3-6
Maximum Jumper Current	41 A
Test Socket	–
Screwdriver Size	3.0 x 0.5 mm

Terminal Number	NS8
Length	72.5 mm
Width	8 mm
Height with TH35-7.5 Rail	55.6 mm
Height with TH35-15 Rail	63.1 mm
Stranded Cable	0.5-4 mm²
Clamp Screw Size	M3
Tightening Torque	0.5 N·m
Insulation Material	Polyamide
Product Size	5
Single-Wire Cable Capacity	0.5-4 mm²
Stranded Cable Capacity	0.5-4 mm²
Flexible Cable Capacity	0.5-4 mm²
American Wire Gauge (AWG) Capacity	12-20 AWG
Test Gauge according to IEC	A4
Cable Insulation Length	12 mm

Terminal Normal (RTP 2.5)

Technical Specifications :

Technical Specifications of RTP2.5	
Parameter	Value
Standard	IEC 60947-7-1, IEC/EN 60079-7
Instantaneous Voltage	6 kV
Color	Gray, Black, Green, Blue, Yellow, Orange, Red, Brown, White
Certification	EX, KEMA
Voltage	500 V
Current	24 A
Material Group	I
Voltage Category	III
Pollution Degree	3
Cross-Section	2.5 mm²
Maximum Current	32 A
Maximum Wire Capacity	4 mm²
Mountable on Rail	TH35-15, TH35-7.5
End Cover	Ep-RTP2.5
End Cover Width	1.5
Separator	P-RTP2.5
Separator Width	1.6
Small Separator	SP-2.5-10
End Clamp	EB/1, EB/3, EB/4
End Clamp Width	9.5 mm
Fixed Jumper	CC10-2.5, CC2-2.5, CC3-2.5
Maximum Jumper Current	24 A
Test Socket	TS3/6/2.3
Screwdriver Size	3.0 x 0.5 mm
Terminal Number	NS6
Length	45.2 mm
Width	6 mm
Height	42 mm
Stranded Cable	0.5-4 mm²
Clamp Screw Size	2.5 mm
Tightening Torque	0.6 N·m
Insulation Material	Polyamide
Product Size	2.5
Single-Wire Cable Capacity	0.5-4 mm²
Stranded Cable Capacity	0.5-4 mm²
Flexible Cable Capacity	0.5-2.5 mm²
American Wire Gauge (AWG) Capacity	12-20 AWG

Knife Type Terminal (RDT2.5-C)

Transient Voltage	6 kV
Voltage	500 V
Current	17.5 A
Material Group	I
Voltage Category	III
Pollution Degree	3
Cross-Section	1.5 mm²
Maximum Current	20 A
Maximum Wire Capacity	2.5 mm²
Clamp Screw Size	2.5 mm
Tightening Torque	0.4 N·m / 0.6 N·m
Insulation Material	Polyamide
Product Size	2.5
Test Gauge (IEC)	A4
Cable Insulation Length	12 mm
Product Color	Gray
Certificate	KEMA
Standard	IEC 60947-7-1
Mountable on Rail	TH35-15, TH35-7.5
Small Separator	–
End Clamp	EB/1, EB/3
End Clamp Width	10 mm, 9.5 mm
Test Socket	–
Screwdriver	3.0*0.5
Terminal Number	NS6
Length	45.3 mm
Width	6 mm
Height (with TH35-7.5 rail)	47.6 mm
Height (with TH35-15 rail)	55.1 mm
Stranded Cable	0.5-4 mm²
Solid Wire Capacity	0.5-4 mm²
Multi-Strand Cable Capacity	0.5-4 mm²
Flexible Cable Capacity	0.5-4 mm²
AWG Wire Capacity	12-20 AWG

10.8 CIRCUIT BREAKER

RB/M-2P B2-10kA:

Part Number	RB/M-2P B2-10KA 
Manufacturers	RAAD ELECTRIC
Rated voltage Ue (V)	230-400
Rated current Ie (A)	2
Insulation voltage Ui (V)	500
Rated frequency (Hz)	50-60
Connection	From top and bottom
Poles	2

RB/M-2P B10-10kA:

Part Number	RB/M-2P B10-10kA 
Manufacturers	RAAD ELECTRIC
Rated voltage Ue (V)	230-400
Rated current Ie (A)	10
Insulation voltage Ui (V)	500
Rated frequency (Hz)	50-60
Connection	From top and bottom
Poles	2

RB/M-2P B4-10kA:

Part Number	RB/M-2P B4-10kA 
Manufacturers	RAAD ELECTRIC
Rated voltage Ue (V)	230-400
Rated current Ie (A)	4
Insulation voltage Ui (V)	500
Rated frequency (Hz)	50-60
Connection	From top and bottom
Poles	2

RB/M-2P B6-10kA:

Part Number	RB/M-2P B6-10kA 
Manufacturers	RAAD ELECTRIC
Rated voltage Ue (V)	230-400
Rated current Ie (A)	6
Insulation voltage Ui (V)	500
Rated frequency (Hz)	50-60
Connection	From top and bottom
Poles	2

10.9 Labeling procedure

Cabinet labelling:

Tag Number	Section 1-Section 2-Section 3
e.g.	DSC-CR-001F

= DCS System Cabinet located in CCR front view

Section 1		Section 2	Section 3	
D	SC	CR	XXX	F
E	MC	ITR	XXX	R
	EWS			
	OWS			
	AUX			

Abbreviations:

D	DCS System
E	ESD System
G	F&G System
SC	System Cabinet
MC	Marshaling Cabinet
EWS	Engineering Work Station
OWS	Operator Work Station
AUX	Auxiliary Console
SOE	Sequence of event work station
CCR	Central Control Room
MSS	Main Substation
F	Front
R	Rear
XXX	Sequence Number

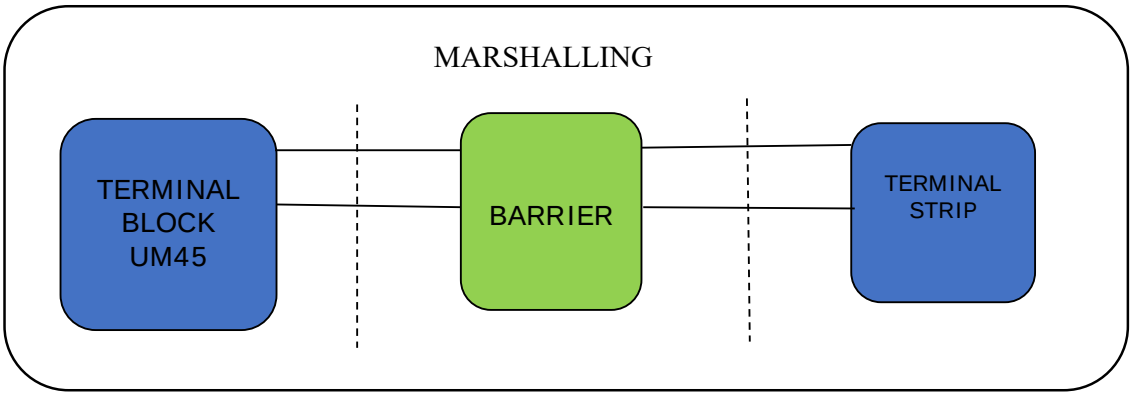
10.10 marshalling cabinets

In DCS marshalling, there are barriers on the front and terminal strip (junction box) on the rear side of cabinet, which are connected using wire as bottom.

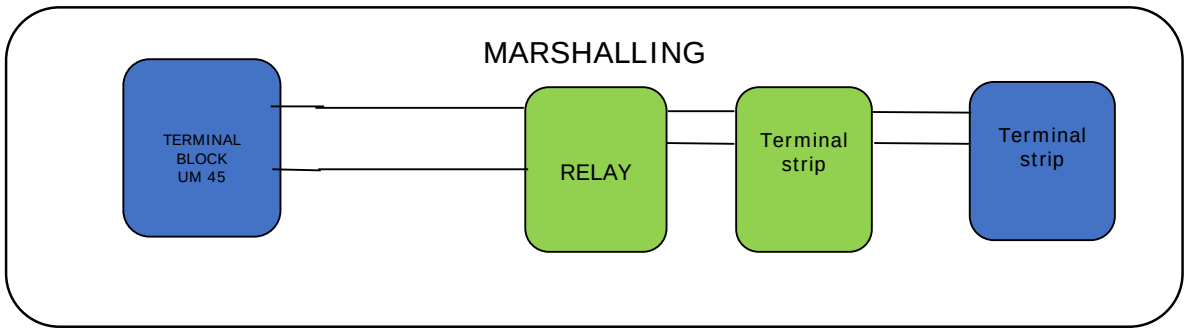
For labeling on the front side (barrier side),barriers name and channel and pins of barrier are used as the wire label, and on the rear side (terminal stip), the JB number and number of pin are labeled on the wires.

This is a diagram of DCS marshalling cabinet .For example on the front side, AI01-(+1) means barrier names(AI) and barrier channel (01) and pin (+1).

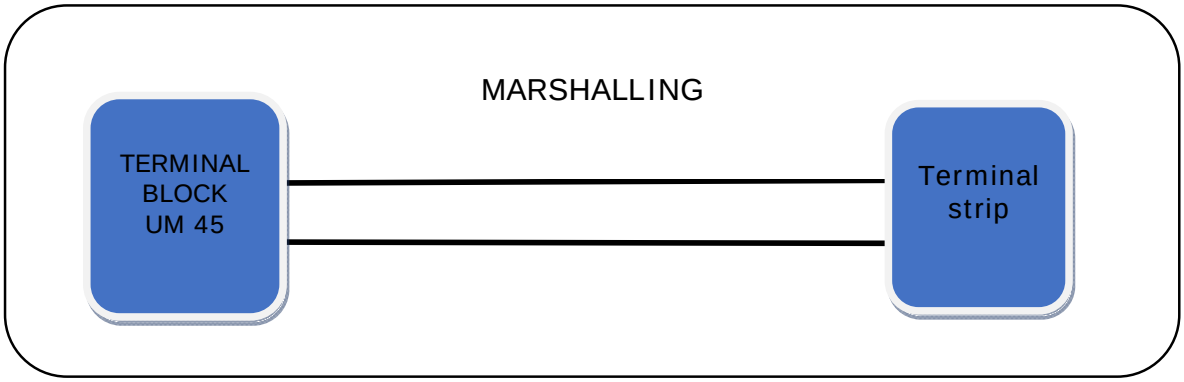
IS



DI/DO (NIS)



AI/AO (NIS)



10.11 Pre Fabricated

the DCS system cabinets are connected with a Prefabricated cable. In DCS between DMC and DCS we used pre fabricated cable too. There are modules card on DCS, and barriers on DMC.
On the Prefabricated cables on the side of the DCS cabinet system, the name of the cabinet is named along with the module tag of the card, and on the side of the DCS marshalling cabinet, the cabinet number and the barrier number is named on the Prefabricated cable.
For example on DCS side, DCS-AI01R means DCS number (DCS) and number of card (AI01R).