

DeltaV™ PK Flex Controller

- Easy Engineering with Software-Scalable Capacity
- Simple Project Sizing with Flex DST
- Reduce Project Cost with Subscription-Based Licensing
- Increased Affordability for Future Updates



The DeltaV™ PK Flex Controller is a Software-scalable Controller with flexible Subscription-based Licensing.

Introduction

The DeltaV™ PK Flex Controller provides a feature-packed control solution for applications of all types and sizes. It is designed to operate as part of a DeltaV system (not as a standalone controller) and works in combination with other nodes in the system.

PK Flex Controller provides the same powerful functionality as other controllers in the system, but with the added advantage of flexible capacity and a term-based license that helps reduce the upfront capital investment costs. This is because users subscribe only to what they need and can add functionality at any time.

Benefits

Simple Project Sizing with Flex DST: Traditionally, DST counting requires knowledge of the I/O type (AI, AO, DI and DO) that will be configured to determine the DST license. PK Flex Controller introduces a new way of counting capacity with Flex DSTs, where there is not a need to know

the I/O type, but only the amount of I/O. This simplifies the engineering and capacity planning of a project.

Easy Engineering with Software Scalable Capacity:

With the PK Flex Controller, there is no need for precise or time-intensive engineering. Users do not need to determine the Device Signal Tags (DST) capacity of their controllers at the beginning of the project. They can increase capacity by simply adding software subscription-based licenses. Projects can start with as little as 50 Flex DSTs. If the project changes and more I/O is needed, users can simply add licenses, up to a maximum of 1500 Flex DSTs per PK Flex Controller.

Reduce Project Cost with Term-Based License:

Businesses can significantly reduce project capital costs by transitioning to a subscription-based license that allows them to pay over time for controller functionality instead of paying upfront. This is a superior alternative when capital investment is tight and there is high uncertainty in the duration and scope of the project. Subscription-based licensing provides a financial incentive and reduces that uncertainty by shifting the cost to be an operational

expense. Subscription-based licensing allows annual payments for the duration of the operation of the system, and because the process is at full production, it accelerates the return on the investment.

Also, the PK Flex Controller can reduce the cost by allowing you to pay only what you need—when you need it—by making all the functionality selectable. Businesses can start with certain functionality and if more functionality is needed at a later date and over time, users can simply add more licenses to the same hardware platform. This enables businesses to start small pilot projects with the PK Flex Controller and later scale up production with that same system, reducing project costs by eliminating the need to purchase new controllers for additional functionality.

Increased Affordability for System Expansions and Controller Upgrades: Whether planning a system expansion or controller upgrades, the PK Flex Controller offers a cost-effective solution, while providing access to the latest controller technology and functionalities. With its subscription-based licenses and reduced hardware price, businesses can keep their systems evergreen with the confidence that a powerful controller supports both current and future plans.

Lower Cost of Ownership: Another benefit of the PK Flex is that as part of the subscription, it includes the Extended Hardware Warranty for the controller. This means that if any of your PK Flex assemblies fail while under a continuously maintained, active subscription license, a replacement or repaired assembly will be provided at no additional cost. This provides you with the peace of mind that you have a better management of the lifecycle of your controllers and a lower total cost of ownership.

Easy Redundancy: The DeltaV PK Flex Controller supports 1:1 redundancy for increased availability. Simply install the redundant controller onto the carrier next to the primary – no added cabinet space or configuration changes.

Flexibility in I/O: The following DeltaV I/O may be used with the DeltaV PK Flex Controller: M-series Series 1 & Series 2 traditional^{1,2}, S-series traditional with the use of the M-series to S-series I/O Interface Carrier Adapter³, CHARMS I/O (CIOCs), and Wireless I/O (WIOCs), enabling you to select the I/O family that best meets your needs.

Integrated Safety: The DeltaV PK Flex Controller can use either of the DeltaV SIS™ products, including DeltaV SIS with Electronic Marshalling, or the DeltaV SLS1508 Safety Logic Solver. Both offer unique benefits and are easily scalable.

Easily Connect Third Party Devices: Third party devices such as variable speed drives and Ethernet based transmitters are easily connected using the native on-board protocols, without the use of a dedicated Ethernet or I/O card. For protocols not supported natively on the PK Flex Controller, the DeltaV Virtual IO Module 2 (VIM2) can be used as well as any of the traditional DeltaV Bussed cards.

Speed: The DeltaV PK Flex Controller executes control modules as fast as 25ms when using simplex High Density cards, enabling control of faster process applications.

Advanced Software: The PK Flex Controller supports all of the advanced DeltaV features that are expected in a world class Distributed Control System:

- DeltaV™ Class-based control and unit-modules
- DeltaV Model Predictive Control
- DeltaV Neural Networks
- Works with DeltaV Batch Executive
- Works with DeltaV Version Control Audit Trail (VCAT)

Product Description

The DeltaV PK Flex Controller executes control logic based on the process signals derived from the I/O and Ethernet Device subsystems.

Control modules are automatically scheduled by the controller, based on their assigned scan rates. This allows each control function to be optimized based on the process dynamics.

Modules scan times can be set as fast as 25ms, and as slow as 60 seconds. The number of control modules that can be assigned to a controller depends on the complexity and scan rate of each modules. For the fastest loop execution time, use the supported High Density cards in a simplex configuration.

¹ M-series Intrinsically Safe traditional cards are supported for use with the PK Flex Controller in v15.FP2 or later.

² M-series 8-wide I/O Interface Carriers manufactured prior to 2002 are not compatible with PK Flex Controller. Contact your local sales representative for additional information.

³ M-series Vertical Plus I/O Interface Carriers are compatible with the PK Flex Controller when using the M-series to S-series I/O Interface Carrier Adapter. Contact your local sales representative for additional information on installation and setup.

Each controller node can be installed as a simplex or redundant node. Redundancy is provided by adding a second controller, mounted adjacent to the primary controller. Controllers may be connected to DeltaV traditional I/O carriers, which are mounted to the right of the controller carrier. Up to 8 carriers with 8 cards each can be connected to the local bus I/O, for a total of 64 traditional I/O cards. 4-wide I/O carriers may be used in combination with 8-wide I/O carriers, and in this case, the maximum of 8 total I/O carriers is retained.

In addition to traditional I/O cards, the local bus supports fieldbus technologies, including FOUNDATION Fieldbus, DeviceNet, and Profibus DP, as well as Serial interface cards. These various I/O products provide a wide range of interfaces to meet the needs of your control application. The DeltaV PK Flex Controller also supports CHARMs and *WirelessHART* I/O cards.

A DeltaV PK Flex Controller can communicate with up to 16 CIOCs. Starting in version 15.FP3, the limit increases to 32, but exceeding 16 requires the use of CIOC2s. Each CIOC provides up to 96 individually configurable signal types (Limited to the Flex DST capacity enabled in the DeltaV PK Flex Controller). The *WirelessHART* I/O card (WIOC) provides redundant communication for up to 100 *WirelessHART* devices, providing high availability and reliability of wireless data. DeltaV PK Flex Controller can communicate with up to 16 WIOCs.

The DeltaV PK Flex Controller is designed for harsh environments and is rated for G3 corrosive environments, with an operating temperature range from -40 to 60°C. It is ideally suited for remote installation close to the process equipment. For more traditional installations with central marshalling cabinets, the PK Flex Controller can utilize any DeltaV I/O solution, including Electronic Marshalling and traditional I/O, meaning it has the flexibility to be installed where the application requires.

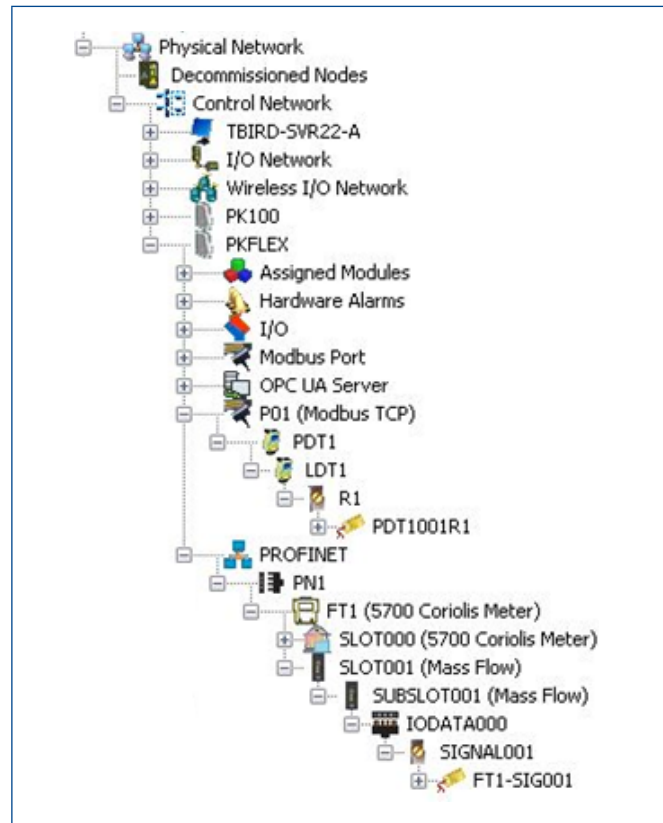
Capacity

The DeltaV PK Flex Controller is configured like any other controller in a DeltaV system and can be installed as simplex or redundant node. It can be used for applications in a wide variety of sizes, from 50 to 1500 Flex DSTs, depending on which capacity you subscribe to. For Ethernet Device Control, the DeltaV PK Flex Controller can be used for a variety of Ethernet Devices, supporting Modbus TCP client or EtherNet/IP interface in port P01 and PROFINET (PN1). P01 and PN1 can be enabled at the same time for greater functionality.

DeltaV PK Flex Controller maximum capacity* is:

Sizing	Max # Flex DSTs	Max # Ethernet Devices in port P01	Max # of Devices in PROFINET port PN1
PK Flex Controller	1500	128	250

*Consult DeltaV™ engineering guide for performance with maximum capacities.



PK Flex Controller Subsystems include Port P01 that can be enabled as EtherNet/IP Interface or Modbus TCP Client and a PROFINET Port PN1.

How Subscription Works

PK Flex is only available to Product Support subscribers. PK Flex Controller hardware is available for purchase in both simplex and redundant configurations. Controller hardware must be purchased separately by the customer and is not included as part of the subscription. Ownership of the hardware remains with the customer at all times.

PK Flex Controller software is licensed on a subscription basis that provides flexibility in the length of the term (license terms are available in 1-, 3-, and 5-year terms) and controller-specific parameters. Specifically, PK Flex Controller software license pricing and enabled functionality are dependent upon the below parameters, which the customer may specify:

- **Flex DST** – the quantity of I/O needed per PK Flex Controller. There is no need to distinguish between the type of I/O (AI, AO, DI and DO). You can start as low as 50 and go up to 1500 DSTs per controller.
- **Controller Redundancy** – when the PK Flex Controller is used in a redundant configuration.
- **Protocol License** – the protocol you want to enable in the controller: OPC UA server, Modbus TCP server, Modbus TCP client, EtherNet/IP interface or PROFINET.
- **Ethernet Device License** – the number of Devices (PDTs) that you will need to configure in P01 and PN1.

The expiration date of the licensing can be found in the system licensing summary. Customers will get reminded via email to renew subscription.

If a PK Flex Controller software license is allowed to expire, the continued use of the software is not permitted, the Extended Hardware Warranty will expire and cannot be renewed. The PK Flex Controller software will continue running the currently-loaded configuration in this unlicensed state, but downloading any configuration changes to the unlicensed PK Flex Controller will not be possible.

Once you select the license term and controller-specific parameters that are applicable to your application, you will receive a bundle of authorization keys that you can load in your DeltaV system to enable the selected functionality. Flex DSTs and PDTs licenses are system wide assigned to the ProfessionalPLUS, and therefore are shared among all the PK Flex Controllers. The Protocol and Controller redundancy licenses are assigned to individual controllers. Remember that you can add more functionality (e.g., increased I/O) during your subscription, and you will be sent a new authorization key that will be synchronized with the duration of the selected license term.

Please contact your sales representative to know more about the subscription contract process.

Also remember to size your ProfessionalPLUS station and Product Support appropriately to the total amount of DST (regular and Flex DSTs) in the system.

The DeltaV system still has a limit 30K DSTs, which can be entirely Flex DSTs or a combination of Flex DSTs and regular DSTs.

PK Flex Controller Supported as Part of a DeltaV™ System in Combination with Other Controllers

The DeltaV PK Flex Controller can only be used as part of a DeltaV system (not supported as Standalone controller) starting with v15.FP1 and can be combined with other controllers in the same system. Providing total flexibility in combining term-based license nodes and perpetual licenses nodes in the same system.

Supported/Embedded Protocols

OPC UA

The OPC UA Server in the PK Flex Controller provides native server implementation of a Data Access profile (real-time data) compliant with OPC UA version 1.02. The OPC UA server supports up to 5,000 reads/second and 500 writes/second.

Modbus TCP

The PK Flex Controller supports Modbus TCP Client and Server interfaces. The Modbus TCP Server interface allows the PK Flex Controller to talk to Modbus Client devices like HMIs for monitoring purposes.

Available in P01, the Modbus TCP Client interface supports Modbus data sources such as PLCs, MCCs, analyzers and similar devices communicating Modbus TCP. In this interface the PK Flex Controller is a Modbus Client reading data from and writing data to Modbus Server devices. These Modbus server devices can be Modbus TCP devices or Modbus serial devices using a Modbus TCP gateway.

The Modbus TCP interface supports the following types of data access:

- Reading input data from Modbus Coils, Discrete Input, Holding Registers, and Input Registers.
- Writing output data to Coils and Holding Registers.

All reads are performed periodically and outputs will be sent when written.

EtherNet/IP

The EtherNet/IP protocol allows data sources such as PLCs, Intelligent Field Devices (IFDs), variable-speed drives, MCCs, analyzers, and other EtherNet/IP devices to connect directly in to DeltaV via the PK Flex Controller.

The EtherNet/IP interface supports both implicit and explicit messaging, allowing access to both Class 1 and Class 3 EtherNet/IP I/O adapters. Redundancy with EtherNet/IP Class 1 Implicit and Class 3 Explicit messaging for control (sending outputs to the device) requires special considerations due to exclusive owner communications defined by the protocol. Please refer to the DeltaV System Planning Guide for more information. Class 3 PCCC and UCMM with Logix tags message classes are also supported.

PROFINET

PROFINET is a communication protocol designed to exchange data between controllers and devices in an industrial automation network. PK Flex Controller is a PROFINET controller and can connect with up to 250 devices, such as Drives, Remote I/O, transmitters, and valves.

PROFINET in the PK Flex Controller is compliant with version 2.3 and CC-A functionality, allowing configuration via GSDML files and enabling device name and IP address assignment from DeltaV Explorer. It supports connectivity to real time cyclic data coming from the devices for use in process control applications (acyclic data and IRT data are not supported).

In addition to that, PROFINET in the PK includes the support of Process Automation (PA) Profiles for easy configuration and commissioning of PROFINET devices.

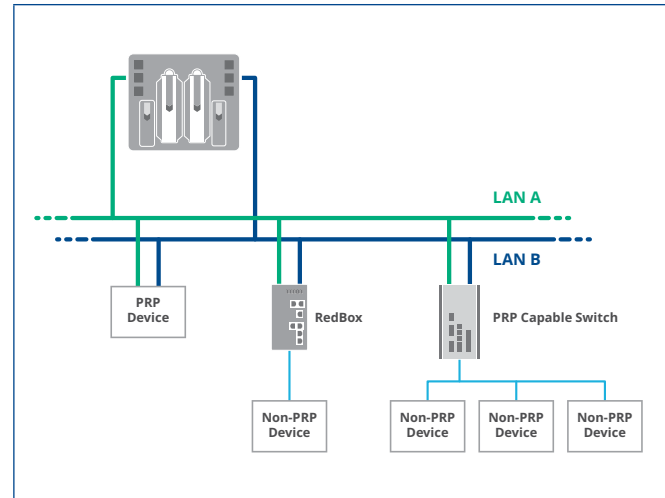
For better trouble shooting, device diagnostics are displayed in DeltaV Diagnostics and available within Control Studio for mapping into alarming or historization.

With the recent adoption of Advance Physical Layer (APL) in the process control industry, the PK Controller can be used with Ethernet-APL Devices, APL switches and PROFINET for greater connectivity. This makes the PK Controller the perfect platform for use in this emerging technology.

Parallel Redundant Protocol

Parallel Redundant Protocol (PRP) is a network protocol standard for Ethernet that provides seamless failover against failure of any network component. Therefore, it is a great solution when high availability and short

switchover time is required. PRP allows for communications in Primary and Secondary ports of the Ethernet Device Network in the PK Flex Controller. This means that a device connected to the Ethernet Device Network is getting the same information at the same time, through different network paths. In the event of failure in one of the networks, PRP basically provides a zero-time to recovery and eliminates any single point of failure in a redundant Ethernet Device Network.



PK Flex Controller with Parallel Redundant Protocol (PRP) enabled in a Redundant Ethernet Device Network, talking directly with Native PRP Devices and using a RedBox to talk to Non-native PRP Devices.

PRP is independent of the application-protocol and can be used by most Industrial Ethernet protocols. In the PK Flex Controller, PRP is an optional feature than can be enabled at the Ethernet Device Network level and is available with all protocols except PROFINET. When enabled, PRP runs on top of the selected protocol. For PRP to work properly, the Ethernet devices connected to the redundant network needs to support PRP natively as well. If the devices do not support PRP natively, then a RedBox must be used to allow connection to the PRP network without triggering bad status in diagnostics.

Bridging and Bonding PK Flex Ports

The PK Flex Controller can connect to different network architectures to suit various network topologies by bridging or bonding two Ethernet Ports.

Bridging happens on the PK Flex when you create a logical connection between two ports on the same IOP in DeltaV Explorer. This allows designated subsystems on the PK Flex

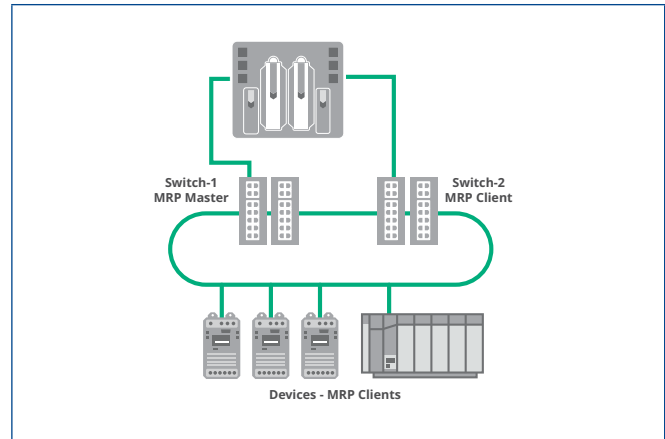
Controller to be connected to two different Local Area Networks (LANs) in the network architecture. This is similar to how the different ports on a network switch operate.

Bonding happens on the PK Flex when you logically connect a port on the left IOP to the correspondent port on the right IOP through DeltaV Explorer. With bonded ports, the PK Flex can make two physical connections to one LAN, providing local and physical redundant access to the underlying network. In turn, this allows the PK Flex to interface with Media Redundancy Protocol over a ring topology to provide network redundancy without a single point of failure.

The Media Redundancy Protocol (MRP) is a specific way used by PROFINET to achieve media redundancy and is designed to increase the reliability of industrial Ethernet networks. Instead of sending copies over two LANs as in Parallel Redundancy Protocol (PRP), in MRP, frames are forwarded via ring topology to MRP Participants with a 'Ring Manager' which allows traffic through only one of its two connections to prevent a network loop. If the ring becomes 'broken', the ring manager will notify the other 'clients' on the ring that there is a failure and then it will switch from a logical ring to a separated/split line topology, ensuring a quick recovery time for the network.

The PK Flex Controller with bonded ports can redundantly connect to a ring topology with or without MRP. However, it does not manage nor participate in the ring architecture directly. You would need to use at least two MRP Switches to provide MRP management functionality to the ring. The MRP Switch enabled as a ring manager (master) will monitor the ring topology for proper operation. If the

connection to the PK stops working properly, the PK Flex communication is expected to switch over to the alternative connection within 200 milliseconds. This is typically required in those environments where high availability of process control systems and continuous operation of the process plants are critical.



PK Flex Controller connected to a Ring Topology with Media Redundancy Protocol (MRP) where an MRP Master Switch is managing the Ring.

Advanced Networking

With advanced networking in the PK Flex Controller, now is easier than ever to setup the IP addresses for all the different network configurations used in the Ethernet ports. Now from one place, you can set up IP Address, define the default gateway, enable PRP, or bond ports to redundantly connect to an MRP ring.

The screenshot shows the 'PKFLEX1 - Network Interfaces Diagram' window. It features a central graphic of a network switch with 'PRP' (Parallel Redundancy Protocol) indicated between two ports. Surrounding this are configuration tables for six ports:

- Port 1 - Primary ACN (10.4.0.10)**: Empty table.
- Port 2**: Empty table.
- Port 3 - OPCUA-PRP**:

IP Address	Subnet Mask	Subnet	Subsystems/Ports
192.168.2.18	255.255.255.0	192.168.2.0	
192.168.4.32	255.255.255.0	192.168.4.0	Modbus Port
- Port 4 - Secondary ACN (10.8.0.10)**: Empty table.
- Port 5 - OPCUA-PRP**:

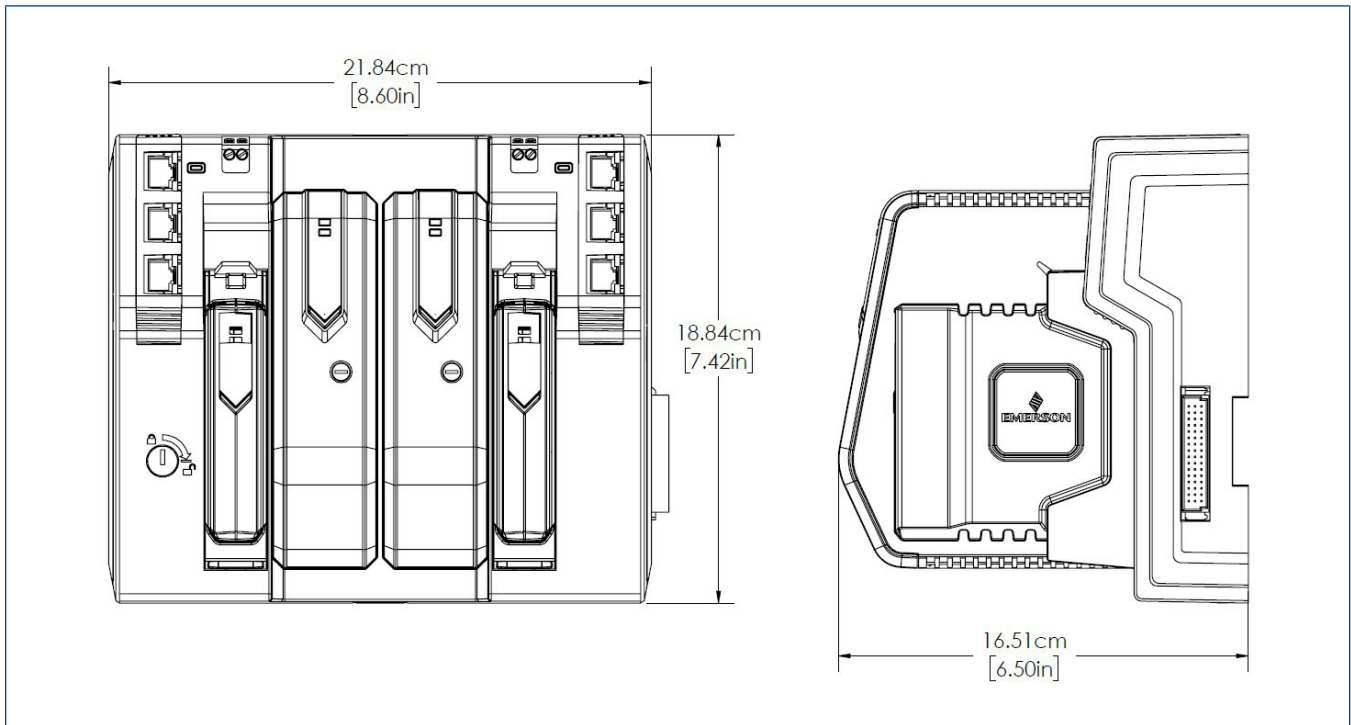
IP Address	Subnet Mask	Subnet	Subsystems/Ports
192.168.2.18	255.255.255.0	192.168.2.0	
192.168.4.32	255.255.255.0	192.168.4.0	Modbus Port
- Port 6 - OPCUA-PRP**:

IP Address	Subnet Mask	Subnet	Subsystems/Ports
192.168.2.18	255.255.255.0	192.168.2.0	
192.168.4.32	255.255.255.0	192.168.4.0	Modbus Port

Buttons for 'Close' and 'Help' are visible at the bottom.

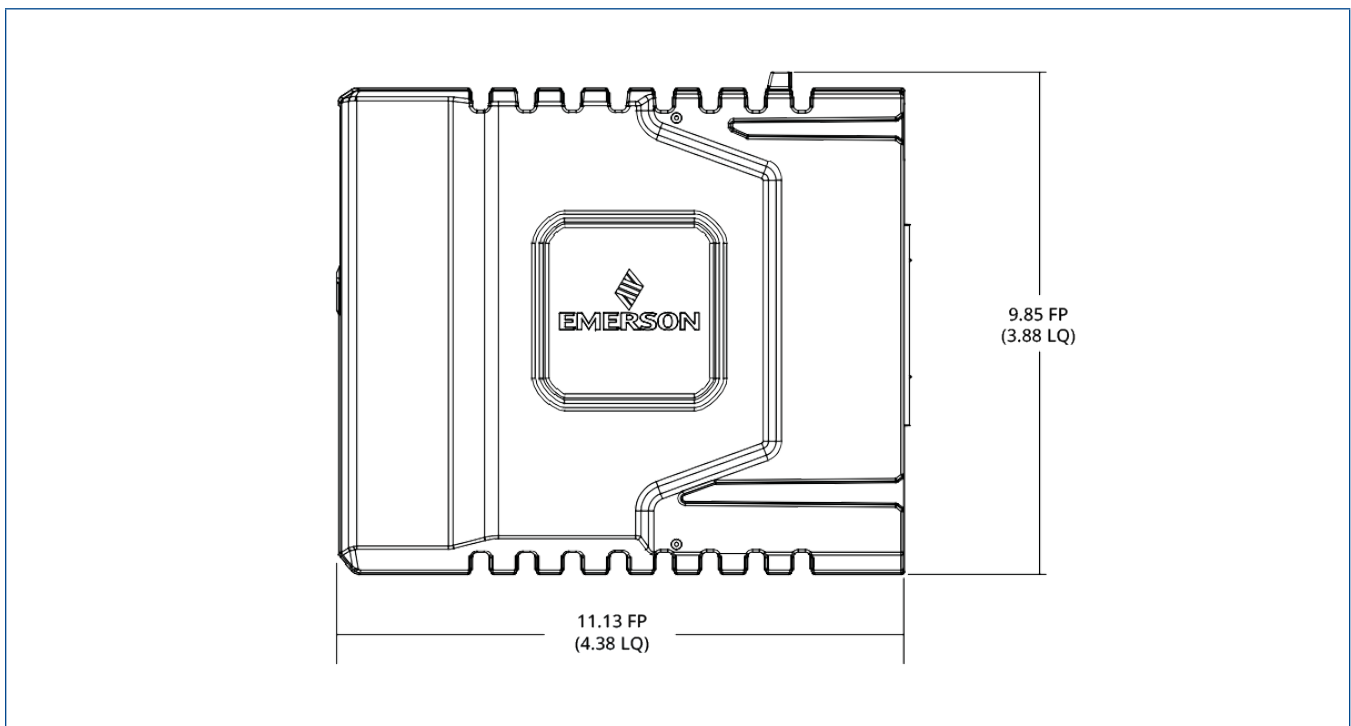
Network Interface Diagram allows you to see the Network Configuration for all your Ethernet Ports in the PK Flex Controller.

Hardware Specifications



Dimensioned Drawing of Redundant DeltaV PK Flex Controller with Carrier and Power Modules.

PK Flex Controller Power Module Dimensions



PK Flex Controller Power Module Dimensions.

PK Flex Controller Specifications

Item	Specification
Input Power Requirement through the PK Flex Controller Carrier	+24 VDC \pm 10% at 350 mA maximum; 700 mA maximum for redundant
Externally Applied Backup Power for Real-time Clock	+5.0 to +12.6 VDC at 15 μ A typical for a simplex controller. Double the consumption for redundant PK Flex Controllers
Power Dissipation	7.5 W simplex; 15 W redundant
Isolation	None. All circuits are referenced to the +24 VDC return

PK Flex Controller Carrier Specifications

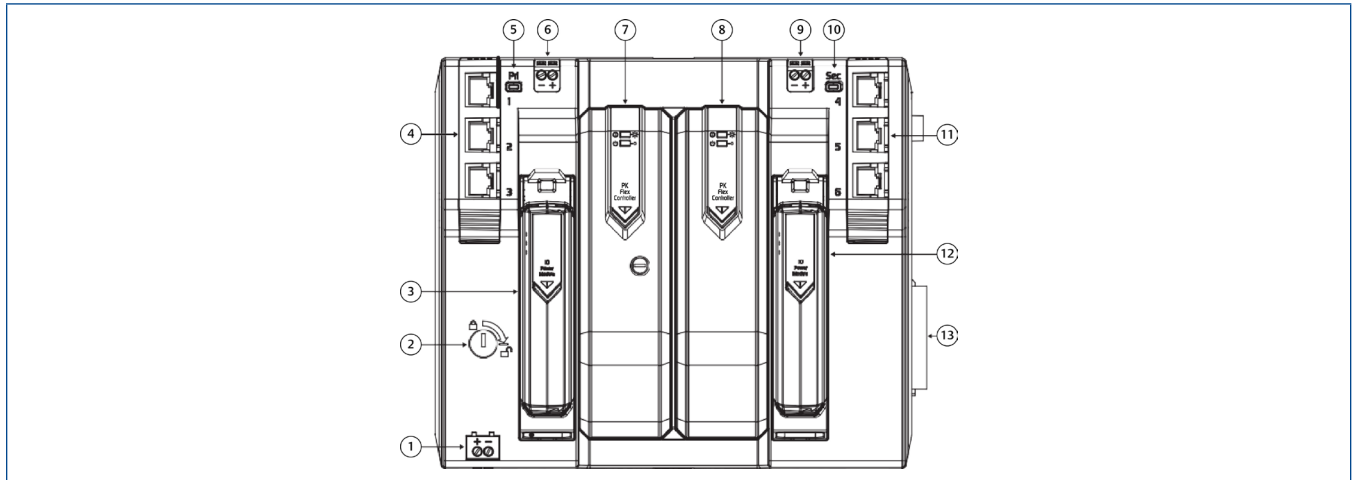
Item	Specification
Capacity	Two PK Flex Controllers
Input Power (redundant)	+24 VDC \pm 10% at 2.75 A maximum
Output Power to I/O Card Carrier(s)*	+12.25 VDC at 3.0 A maximum*
Redundant Ethernet Connections (six)	Copper twisted pair: 10/100BASE-TX with RJ45 connectors; full duplex operation
Ethernet Port Power Requirement, each (provided by controller)	+5.0 VDC at 200 mA maximum; carrier supports +5.0 VDC at 300 mA maximum
Mounting	Upright on a horizontal DIN rail

*For systems that require additional power (more than the power modules supply), use one of our recommended methods for injecting power into the I/O card carrier. See **DeltaV M-series I/O Subsystem Horizontal Carriers** PDS for more information.

PK Flex Controller Power Module Specifications

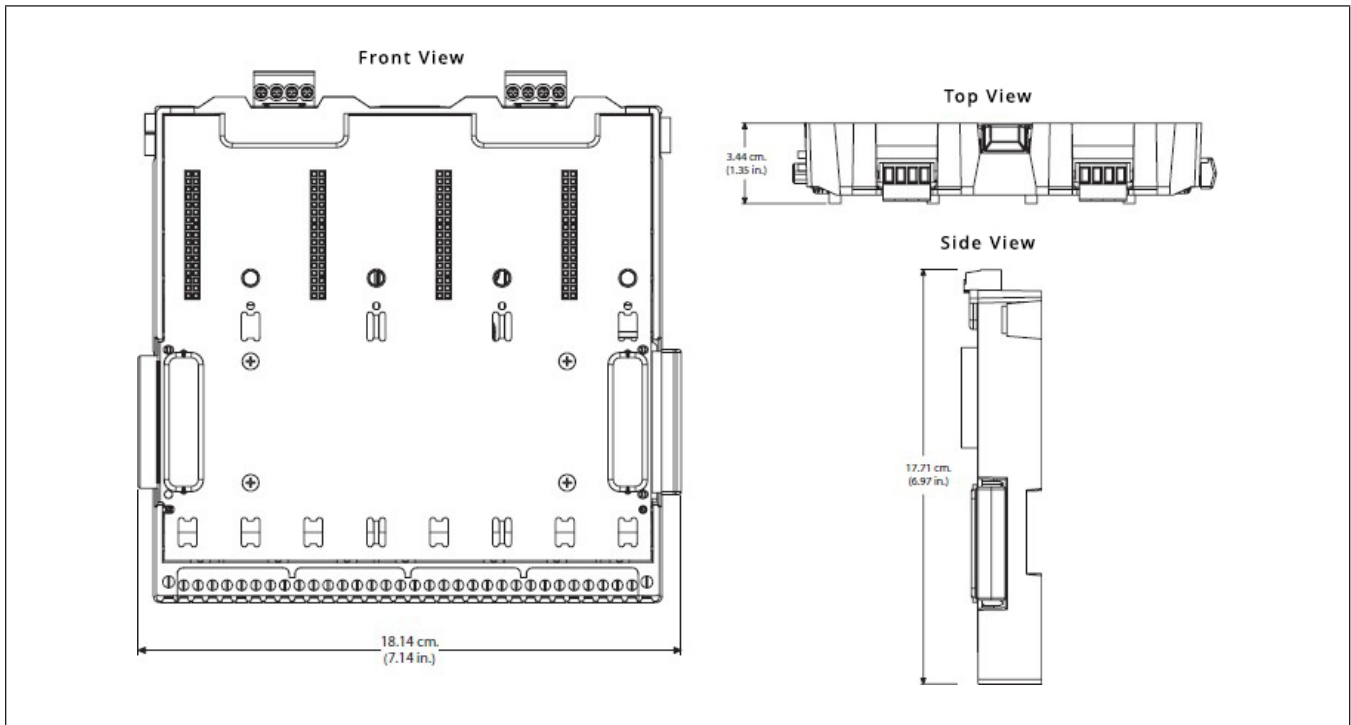
Item	Specification
Input Power (redundant)	+24 VDC \pm 10% at 2.75 A maximum
Output Power	+12.25 VDC at 3.0 A maximum
Power Dissipation	3.25 W

PK Flex Controller Carrier Parts



Callout	Description
①	Screw terminals for backup battery connection.
②	Physical Key Switch When the switch is in the locked position, the KeyLockStatus parameter of the controller has a value of TRUE and you cannot download, decommission, upgrade or Telnet to the PK Flex Controller. When locked, you can commission and authenticate the PK Flex Controller.
③	Redundant Power Module Provides power to connected I/O.
④	Ethernet ports 1-3. These appear in software as Network Portx. The three RJ45 connectors on the primary ports are connections for separate networks. These have an electrically isolated shield for each port. The Faraday shield for each RJ45 connector has no DC ground connection (floats) and only used to extend the shield onto the electronics around the Ethernet circuitry.
⑤	Pushbutton release for Ethernet ports 1-3.
⑥	Screw terminals for primary power.
⑦	Redundant PK Flex Controller.
⑧	Redundant PK Flex Controller.
⑨	Screw terminals for secondary power.
⑩	Pushbutton release for Ethernet ports 4-6.
⑪	Ethernet ports 4-6. These appear in software as Network Portx. The three RJ45 connectors on the secondary ports are connections for separate networks. These have an electrically isolated Faraday shield for each port. The Faraday shield for each RJ45 connector has no DC ground connection (floats) and only is used to extend onto the electronics around the Ethernet circuitry.
⑫	Redundant Power Module Provides power to connected I/O.
⑬	Carrier connector.

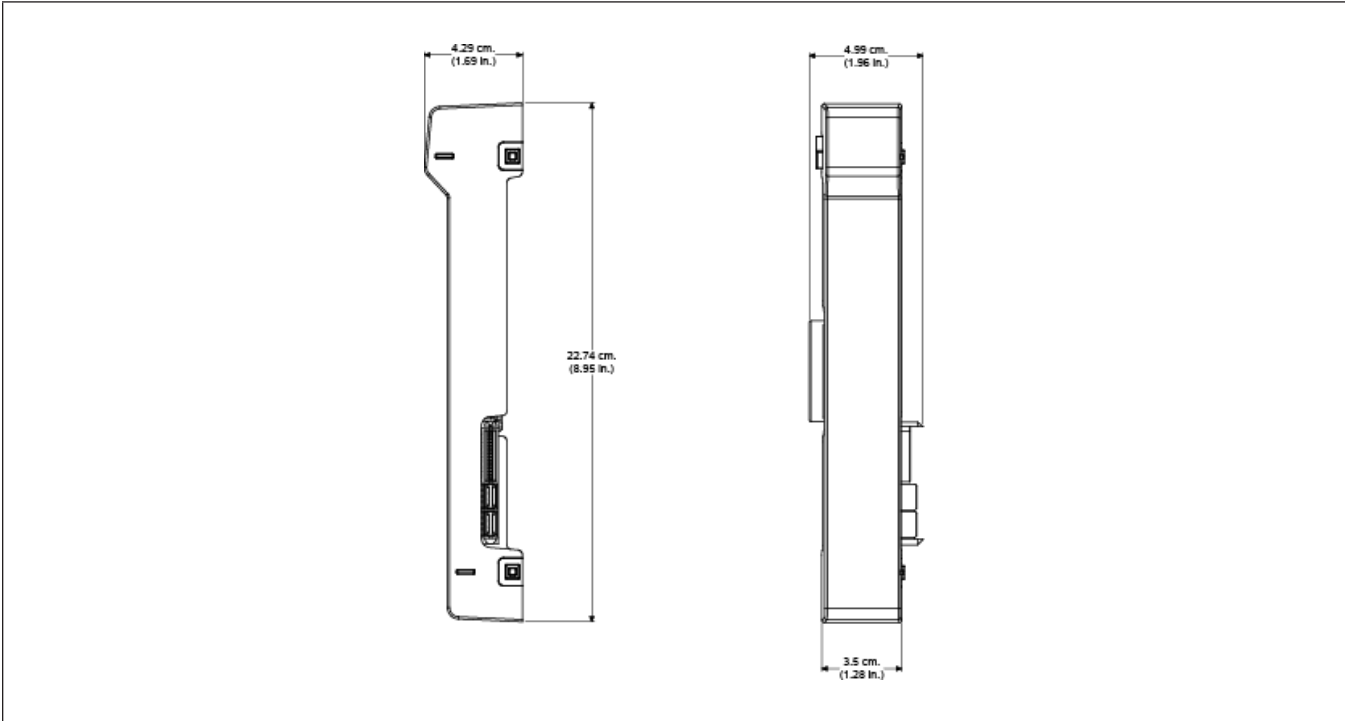
4-wide Horizontal I/O Interface Carrier Dimensions



4-wide I/O Carrier Specifications

Item	Specification
Capacity	Four I/O cards with terminal blocks.
Maximum Current	Bussed field power bus (per I/O card): 3.2 A at 30 VDC or 250 VAC for each connection.
LocalBus Cable Lengths	0.87m (2.8ft) 1.2m (3.9ft) (standard) 1.53m (5.0ft)

M-series to S-series I/O Interface Carrier Adapter



M-series to S-series I/O Interface Carrier Adapter Specifications

Item	Specification
Maximum Current	LocalBus (Powers IO cards): 8A

Certifications

The following certifications are available for the DeltaV PK Flex Controller:

- **CE**

EMC-EN 61326-1

- **FM**

FM 3600

FM 3610

FM 3611

FM 3810, Jan 2005

- **CSA**

CAN/CSA C22.2 No.213

CAN/CSA C22.2 No. 61010-1

- **ATEX**

EN 60079-0

EN 60079-15

- **Marine Certifications:** IACS E10

ABS Certificate of Design Assessment

DNV GL Type Approval Certificate

- **Security Certifications**

Achilles Level 2*

Hazardous Area/Location

The following standards are available for the DeltaV PK Flex Controller:

- **FM (USA)**

Installation: Class 1, Division 2, Groups A, B, C, D, T4

- **cFM (Canada)**

Installation: Class 1, Division 2, Groups A, B, C, D, T4

- **ATEX**

[Ex] II 3 G Ex nA IIC Gc

- **IEC Ex**

Installation: Ex nA IIC T4 Gc

For installation instructions, please refer to:

DeltaV Scalable Process System Zone 2 Installation Instructions.

*PRP communications are not included in the certification.

Specifications for the DeltaV™ PK Flex Controller	
DST Limit	1500
Module Execution Rates	25ms, 50ms, 100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 30s, 60s
User Memory	Controller memory
Input Power Required	+24 VDC ±10% at 2.75 A maximum
Protocols Supported	<ul style="list-style-type: none"> ■ Protocols Supported Natively on the PK Flex Controller: Modbus TCP (Server & Client), Ethernet/IP (Client: Class 1 & Class 3), PROFINET controller (real time cyclic data) and OPC UA Server (real time data) ■ Non-native protocols available through dedicated Bussed cards or the DeltaV™ Virtual I/O Module 2 (VIM2)
Environmental Specifications	
Operating Temperature	-40° to 60°C (-40° to 140°F)
Storage Temperature	-40° to 85°C (-40° to 185°F)
Relative Humidity	5 to 95%, non-condensing
Protection Rating	IP20, NEMA 12
Airborne Contaminants	<ul style="list-style-type: none"> ■ ISA-S71.04-1985 Airborne Contaminants Class G3 ■ Conformal Coating
Shock (Normal Operating Conditions)	10g ½-sine wave for 11 ms
Vibration (Operative Limit)	1mm peak-to-peak from 5Hz to 13.2Hz, 0.7g from 13.2Hz to 150Hz
LED Indicators ¹	
Power – Green V	Indicates DC power is available
Error – Red Continuous	Indicates an internal error condition
Error – Red Flashing	Indicates the controller is decommissioned
Active – Green	Indicates the controller is operating as the primary controller
Active – Green Flashing	Indicates the active controller is not configured or a download is in progress
Standby – Green	Indicates the controller is operating as the backup controller
Standby – Green Flashing	Indicates the standby controller is not configured or a download from the active is in progress

¹ For additional information refer to DeltaV Books Online.

Protocol Specifications of the PK Flex Controller	
Modbus TCP (Server)	<ul style="list-style-type: none"> ■ Modbus TCP protocol as specified by www.modbus.org. ■ PK Flex Controller as a Server reads and writes data from and to Modbus Client devices. ■ Supports 8 connections. ■ Uses MODICON (PLC) based addressing (Modbus absolute addressing is not supported). ■ To enable you need to add the Flex Modbus TCP Server Interface subscription-based license. No other license is required, and it does not consume Flex DSTs. <p><small>*Please review the VIM2 product data sheet as an alternative to provide added Modbus TCP functionality (e.g. Modbus RTU, Modbus ASCII, etc.).</small></p>
Modbus TCP (Client) ¹	<ul style="list-style-type: none"> ■ Modbus TCP protocol as specified by www.modbus.org. ■ For non-extended address ranges, register addresses fall within the following ranges: <ul style="list-style-type: none"> ● Coils: 1 – 9999 ● Discrete Inputs: 10001 – 19999 ● Input Registers: 30001 – 39999 ● Holding Registers: 40001 – 49999 ■ In v15.FP2 or later, the Full Modbus Addressing range can be enabled, in which case register addresses will fall within the following ranges: <ul style="list-style-type: none"> ● Coils: 1 – 65536 ● Discrete Inputs: 100001 – 165536 ● Input Registers: 300001 – 365536 ● Holding Registers: 400001 – 465536 ■ PK Flex Controller as the Modbus Client reads and writes data from and to Modbus Server devices. ■ Uses MODICON (PLC) based addressing (Modbus absolute addressing is not supported). ■ Available in port P01 subsystem. To enable you need to add the Flex Modbus TCP Client Interface subscription-based license and add Flex Ethernet Connected I/O subscription-based license for each device connected in port P01. Then one Flex DST will be consumed for every LDT that is configured. <p><small>*Please review the VIM2 product data sheet as an alternative to provide added Modbus TCP functionality.</small></p>

Protocol Specifications of the PK Flex Controller	
EtherNet/IP Interface ¹	<ul style="list-style-type: none"> ■ EtherNet/IP interface in the PK Flex Controller is a Scanner Device (Client) that reads and writes data from EtherNet/IP Adapter devices (Servers). ■ EtherNet/IP interface supports the following types of messaging connections: <ul style="list-style-type: none"> ● Implicit messages (Class 1) ● Explicit messages (Class 3) ● Class 3 with PCCC ● UCMM with Logix Tags ■ Configuration of this messages connections is only supported via manual configuration on the DeltaV Explorer at the LDT level or bulk edit configuration. EDS files are not supported. ■ Available in port P01 subsystem. To enable you need the Flex EtherNet/IP Interface subscription-based license and add Flex Ethernet Connected I/O subscription-based license for each device connected in port P01. Then one Flex DST will be consumed for every LDT that is configured. <p style="font-size: small; margin-top: 5px;">*Please review the VIM2 product data sheet as an alternative to provide added EtherNet/IP functionality (e.g. EDS file support.).</p>
OPC UA Server	<ul style="list-style-type: none"> ■ PK Flex Controller is a Server and allows reads and writes from OPC UA Clients. ■ Supports up to 6 concurrent sessions that can be consumed by 3 clients. ■ Allows up to 5,000 reads/sec and 500 writes/sec. ■ Supports only the DA profile (real time data). ■ Is based on OPC UA standard version 1.02 that supports the following: <ul style="list-style-type: none"> ● OPC Binary Transportation ● 128 or 256-bit encryption levels ● Message Signing ● Digital Certificates – Self Signed and Certificate Authority (CA) ● Support online browsing ■ To enable you need the Flex OPC UA Server Interface subscription-based license. No other license is required, and it does not consume Flex DSTs. <p style="font-size: small; margin-top: 5px;">*Please review the DeltaV OPC UA product data sheet for more information regarding other OPC UA clients and servers available in DeltaV.</p>

Protocol Specifications of the PK Flex Controller	
PROFINET Controller	<ul style="list-style-type: none"> ■ Compliant with PROFINET version 2.3 and CC-A. ■ Configuration using GSDML files. ■ DCP operations. Discovery and basic Configuration Protocol that allow users to discover, identify, and configure PROFINET device name and IP address using DeltaV Engineering tools. ■ Support reading and writing Real time cyclic data and reading Device Diagnostics. ■ Does not support Real time Acyclic data and Isochronous Real Time Data (IRT). ■ Maximum of 250 devices. ■ When configuring and commissioning Ethernet-APL devices, Process Automation profiles are supported but expanded diagnostics and drop-in device replacement for a shared profile are not supported. ■ PK Flex Controller can redundantly connect to a ring topology with bonding ports but cannot be a member of the ring. ■ The use of PRP is not supported with PROFINET. ■ DeltaV v15.FP1 and v15.FP2 support only S1 devices. That means that when using redundant controllers, there will be a bump during a controller switchover due to reconnection time with any S1 device (This is per definition of S1 devices in PROFINET standard). ■ Starting in v15.FP3, DeltaV supports S2 Devices. Switchovers are expected to be bumpless for redundant PK Flex Controllers connected to only S2-enabled devices on the device network. For a redundant pair, connect to a mixed of S1 and S2 devices, there will be a bump similar to the S1 only environment described above. ■ AMS Device Manager is not supported natively through the PK Flex Controller. Consult AMS Device Manager product data sheet for connectivity with PROFINET. ■ To enable you need the PK Flex Controller PROFINET interface License and add Ethernet connected I/O licenses for each device connected in the PN1 network. ■ The consumption of DST Flexs will happen in the following way for systems in v15.FP1 and v15.FP2. <ul style="list-style-type: none"> ● If device has 1 or 2 Physical Slots (or Modules) defined in the GSDML file (most common in small devices like Motor starters & transmitters): <ul style="list-style-type: none"> - 1 Flex DST for the first 16 values. - After the first 16 values, every signal consumes one Flex DST. ● If the device has more than 2 Physical Slots (or Modules) defined in the GSDML file (most common in large devices like Remote I/O & PLCs): <ul style="list-style-type: none"> - All inputs and outputs are counted and charged with a Flex DST. ■ The consumption of Flex DSTs will happen in the following way for systems in v15.FP3 or later: <ul style="list-style-type: none"> ● For Remote I/O devices and gateways, the system consumes one Flex DST for the first 16 signals. Each additional signal requires one DST Flex. ● For all other PROFINET device types, the system consumes one Flex DST for every 16 signals. <p>*Please review DeltaV Engineering guide for communication and redundancy performance of PROFINET.</p>

¹The PK Flex Controller can natively support running either the Modbus TCP Client or the EtherNet/IP Scanner interface but not both simultaneously in P01. The Modbus TCP Server and OPC UA Server can be run simultaneously alongside one of the chosen protocol Clients in P01 and PROFINET.

Hardware Warranty Description for PK Flex

The PK Flex Hardware Warranty provides replacement parts for up to 15 years after shipment or until the PK Flex is retired, as long as the system remains under a continuous, active subscription contract. The Hardware Warranty is included as part of the Flex DST subscription and requires no additional purchase. Therefore, its renewal and expiration depend on the subscription terms.

Please consult the **Extended Hardware Warranty** Service Data Sheet for additional information.

Hardware Ordering Information

Description	Model Number
Simplex PK Flex Controller Assembly (includes 1 PK Flex Controller, 1 Carrier, 2 IOPs, 1 Power Module, 1 PK Controller Protection Cover, and 1 Power Module Protection Cover)	PKFLEXS
Redundant PK Flex Controller Assembly (includes 2 PK Flex Controllers, 1 Carrier, 2 IOPs, and 2 Power Modules)	PKFLEXR

Note: Converting a PK Flex Hardware into a regular PK controller or the other way around is not possible. Also, combining a regular PK with a PK Flex in the same carrier for redundancy is not supported.

Subscription-Based Licensing Ordering Information

Description	Model Number
Flex DST w-Year Subscription for use with PK Flex Controller Hardware; xxxx Flex DSTs	VEFLEXDSTSwSxxxx_YyFYzz*
Flex Ethernet Connected I/O w-Year Subscription for use with PK Flex Controller Hardware; Physical Device	VE4109FLEXSwSnnn_YyFYzz*
Flex OPC UA Server Interface w-Year Subscription for use with PK Flex Controller Hardware; 1 Interface License	VE4111FLEXSwS01_YyFYzz*
Flex MODBUS TCP Server Interface w-Year Subscription for use with PK Flex Controller Hardware; 1 Interface License	VE4110FLEXSwS01_YyFYzz*
Flex MODBUS TCP Client (P01) Interface w-Year Subscription for use with PK Flex Controller Hardware; 1 Interface License	VE4101FLEXSwS01_YyFYzz*
Flex EtherNet/IP (P01) Interface w-Year Subscription for use with PK Flex Controller Hardware; 1 Interface License	VE4100FLEXSwS01_YyFYzz*
Flex PROFINET Interface w-Year Subscription for use with PK Flex Controller Hardware; 1 Interface License	VE4108FLEXSwS01_YyFYzz*
Flex Controller Redundancy w-Year Subscription for use with PK Flex Controller Hardware; 1 Controller Redundancy License for 1 Redundant Pair of PK Flex Controllers	VE31REDFLEXSwS01_YyFYzz*

These model numbers are for initial subscriptions only; model numbers for renewals are listed separately in the price book.

*w represents the length of the subscription term in years (1, 3, or 5).

*y represents the specific year of the subscription term (1, 2, 3, 4, or 5).

*zz represents a two-digit indicator of the year of purchase (e.g. 23).

*xxxx represent the bundle size for Flex DSTs (50, 100, 200, 500 or 1500).

*nnn represent the bundle size for Flex Ethernet Connected I/O (1, 5, 10, 20, 50, 100 or 500).

PK Flex Controller Spare Part Ordering Information

Description	Model Number
PK Flex Controller	KL2002X1-BE1
PK Controller Protection Cover	KL4002X1-DA1
Power Module; for PK Controller Carrier	KL1502X1-BA1
Power Module Protection Cover; for PK Controller Carrier	KL1502X1-BB1
I/O Port Switch Module; Copper; for PK Controller Carrier	KL1605X1-BA1
PK Controller Carrier	KL4002X1-BA1

Related Products

- DeltaV M-series Traditional I/O
- DeltaV M-series Intrinsically Safe I/O (support starting in v15.FP2)
- DeltaV S-series Traditional I/O
- DeltaV M-series I/O Subsystem Horizontal Carriers
- S-series Horizontal Carriers
- M-series Virtual I/O Module 2
- S-series Virtual I/O Module 2
- DeltaV PK Controller
- DeltaV OPC UA Servers and Clients
- ProfessionalPLUS Station Software suite
- DeltaV Distributed Control System Product Support
- DeltaV Extended Hardware Warranty Service

Prerequisites

- PK Flex is only available to Product Support subscribers.
- The DeltaV PK Flex Controller requires v15.FP1 or later DeltaV software.
- For each DeltaV PK Flex Controller (or pair of redundant controllers), a PK Controller carrier is required.
- Each PK Flex Controller requires a dedicated system bulk power supply. Please refer to **DeltaV Bulk Power Supplies** product data sheet for details.
- For PROFINET S2 Functionality, DeltaV v15.FP3 or later is required.
- Product Support needs to be sized appropriately to the total amount of DTS (regular and Flex DST) in the DeltaV system.
- ProfessionalPLUS workstation software license (VE2101Sxxxx-1) or ProfessionalPLUS Premium workstation software license (VE2101PSxxxx) needs to be sized appropriately to the total amount of DTS (regular and Flex DST) in the DeltaV system.

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