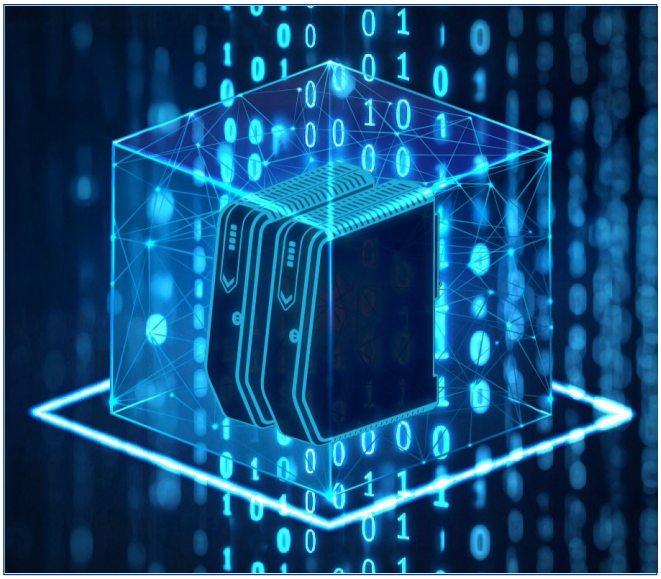
DeltaV™ IQ Controller

- High Capacity
- Lower startup costs
- Simplify the “IT” in IT/OT
- Increased flexibility



Introduction

The DeltaV™ IQ Controller is a powerful control solution for all types and sizes of applications. By separating proven DeltaV control software from the traditional controller hardware platform, the IQ Controller provides a flexible system that minimizes the hardware requirements and footprint by allowing users to load multiple controllers on a single host.

The DeltaV IQ Controller uses standard, off-the-shelf hardware to host IQ Controller software. The controller software provides the same powerful functionality as other DeltaV controllers and integrates with CHARMs I/O over the DeltaV control network. The DeltaV IQ Controller operates as part of the DeltaV system and functions in combination with other nodes in the system.

A single host supports up to 10 DeltaV IQ Controllers. The controllers can be easily managed through DeltaV Virtual Studio. Fault tolerance is supported by adding a second, independent host which enables the ability to create standby controllers.

Combined with DeltaV Electronic Marshalling using CHARMs, the DeltaV IQ Controller represents the most flexible automation architecture DeltaV has ever delivered.

Benefits

High Capacity

A host can run 10 simplex DeltaV IQ Controller instances, and a pair of hosts can run 10 redundant controllers. This reduces power, network wiring, and the need for expensive controller cabinets.

Lower Startup Costs

Implementing a new system can incur significant initial expenses, including costs for cabinets, wiring, power, controller hardware, and licenses. The DeltaV IQ Controller can lower these upfront capital investments by using standard IT hardware and streamlining the installation process. Additionally, it offers a subscription-based licensing model, allowing users to subscribe only to what’s required and add functionality as needed.

Simplify the "IT" in IT/OT

DeltaV Virtual Studio eliminates the need for specialized IT expertise by streamlining the setup and management of virtual machines. Users can quickly deploy IQ Controllers from predefined templates—without additional software installation—and seamlessly integrate them into the control network, all without the complexity of virtual network mapping.

Increased Flexibility

Typically, projects and automation teams are bound by the number of controllers in a system and adding or removing controllers is expensive and time consuming. The DeltaV IQ Controller provides a hardware-independent solution that allows users to increase or decrease the number of instances used according to demand. With flexible licensing, only pay for the controllers you need.

Easy High Availability

The DeltaV IQ Controller supports 1:1 redundancy on separate independent hosts for increased availability. Simply connect two independent servers and use DeltaV Virtual Studio to create a redundant IQ Controller. DeltaV Virtual Studio automatically creates two virtual machines, one on each server. The redundant DeltaV IQ Controller appears as a redundant pair in DeltaV Explorer.

Product Description

The DeltaV IQ Controller executes control logic based on process signals from DeltaV Electronic Marshalling with CHARMs. It automatically schedules control modules according to their assigned scan rates, optimizing each control function based on process dynamics. Module scan times range from 100ms to 60 seconds. The number of control modules assignable to a controller depends on each module's complexity and scan rate.

Each DeltaV IQ Controller can be instantiated as a redundant pair or simplex, with redundancy provided by a second instance on a different server. It can communicate with up to 32 CIOCs, each offering up to 96 individually configurable signal types, limited by the DST capacity of the installed controller.

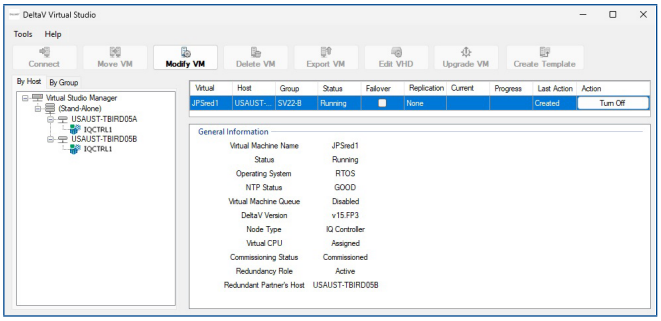
A DeltaV IQ Controller host exclusively runs DeltaV IQ Controllers and does not support DeltaV virtual workstations. These hosts can share a cabinet with other IT equipment, including DeltaV Virtual Studio servers, reducing overall hardware footprint and wiring.

A DeltaV IQ Controller can be used in redundant or simplex mode for applications ranging from 100 to 3,000 DSTs. Virtualization templates for the controller are available through DeltaV Virtual Studio and can also be downloaded through Guardian™.

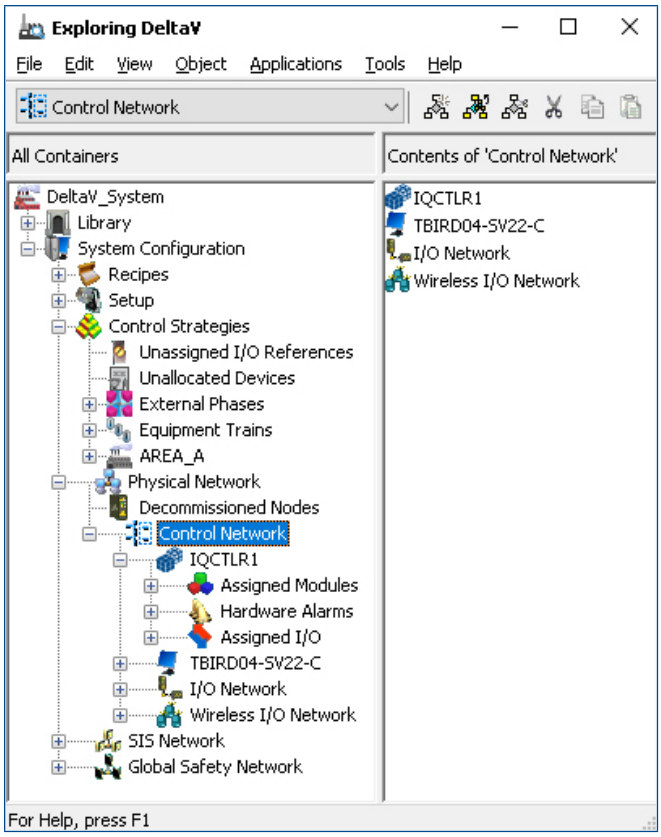
The controller supports running advanced embedded control technology to enhance control performance and optimize plant operations using DeltaV PredictPro Model Predictive Control (MPC) without additional equipment or parameter mapping. It includes unlimited single manipulated variable (MV) MPC, with additional licenses available for multi-variable applications using up to 20 MVs per controller.

Configuration and Management

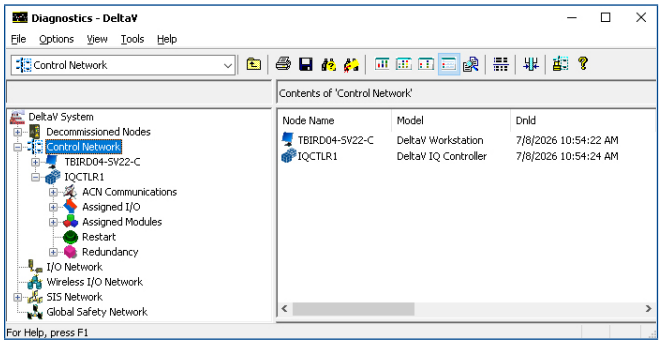
DeltaV IQ Controller operation is managed in DeltaV Virtual Studio. Controllers can be created, upgraded, started, stopped, and deleted. When the controller is in a commissioned state, DeltaV Virtual Studio will provide extra warnings to the user.



The DeltaV configuration of IQ Controllers is managed the same as traditional controllers in DeltaV Explorer. Modules and I/O can be assigned and node properties configured and downloaded.



The health of IQ Controllers can be monitored in the same manner as traditional DeltaV controllers, through DeltaV Diagnostics and the Controller Performance Index.



High Availability

High availability is accomplished through 1:1 redundancy using two or more independent standalone host servers. Using a redundant IQ Controller, your process is automatically protected in case of a hardware failure.

If an active IQ Controller fails, the standby controller takes over automatically, providing uninterrupted control operation without initialization or user intervention. The switchover generates no disturbances to the field output signals, so your process continues to run without impact.

Switchover Detection

Each controller in a redundant pair continuously monitors itself and its redundant partner for conditions that require a switchover. Each IQ Controller runs continuous self-test routines to determine its ability to function. A hard failure of the active controller triggers an immediate switchover to the standby controller. The standby controller also monitors I/O network connections to detect if the active controller stops communicating with CHARMs and failed to issue a switchover command.

Some of the events that can cause a switchover are:

- Hardware failure of the active controller's host server
- Communications failure between the active controller and CHARMs I/O
- Communications failure of the primary and secondary network on the active controller
- Shutdown or failure of the active controller's software
- User request initiated from DeltaV™ Diagnostics Explorer

Online Upgrades

Redundant IQ Controllers facilitate online upgrades of both IQ software and host hardware. You can install update IQ software on the standby controller without interrupting operations. After the upgrade, the standby controller is automatically configured and available, enabling a seamless switchover to the new IQ software without any process disruption. Once the switchover is finished, the original active controller can also be upgraded to the new IQ software while remaining online.

When replacing the host hardware for a standby instance, you use the DeltaV Virtual Studio to move the standby to the new host hardware. The DeltaV software automatically creates, commissions and downloads the new instance to bring it online and make it available in standby mode.

Automatic Creation and Commissioning

The system automatically creates the standby controller instance on a separate server host when you create a redundant IQ Controller with DeltaV Virtual Studio. There is no need to manually create and configure the standby instance. The redundant partners find each other and are available for commissioning as a redundant pair in DeltaV Explorer.

Bumpless Transition

The DeltaV IQ Controller enables a seamless transfer of control from the active controller to the standby controller. During this transition, output channels maintain their current states until the switchover is finalized and control modules start executing. The control module verifies the status of all I/O channels to ensure they are functioning correctly before initiating control actions. Additionally, all output signals are synchronized using I/O readback features to ensure that control calculations are based on the most recent output states. This guarantees a smooth transfer of control during the switchover when using CHARMs I/O.

Dispersed Backups

Each host in a redundant IQ Controller pair can be located in separate physical locations as long as the network meets the requirements for the DeltaV control network.

DeltaV™ Virtualization System Health Alerts

Through DeltaV Virtual Studio, the IQ Controller supports virtualization system health alerts within the DeltaV system. Standard alarms can be configured to notify operators and maintenance personnel when there is an abnormal condition in the virtualization hardware or software. Components monitored include the host computers, virtual network switches, and virtual network communication.

Licensing Considerations

DeltaV IQ Controller is only available to Product Support subscribers. Host hardware is purchased by the user and is owned by the user.

DeltaV IQ 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, IQ Controller software license pricing and enabled functionality are dependent upon the system attributes as described below:

- **IQ Controller –** each IQ Controller instance requires either a redundant or simplex node license. The license is independent of the number of DSTs assigned and contains all of the functionality available in an IQ Controller.
- **Flex DST –** the quantity of I/O needed per IQ Controller instance. This is the same Flex DST license used with PK Flex controllers and the Flex System. 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 3,000 DSTs per IQ Controller.

The expiration date of the licensing can be found in the system licensing summary. Emerson will remind users by email to renew their subscriptions.

If an IQ Controller software license is allowed to expire, continued use of the software is not permitted. The IQ Controller software continues running in the currently loaded configuration in this unlicensed state, but you will not be able to download any configuration changes to the unlicensed IQ Controller. The last known good download can continue to be sent to an unlicensed IQ Controller.

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 DST licenses are system-wide, are assigned to the ProfessionalPLUS, and therefore are shared among all IQ and PK Flex controllers. Remember that you can add more functionality (for example, increased DSTs) during your subscription, and Emerson will send a new authorization key that will be synchronized with the duration of the selected license term.

Please contact your sales representative to learn more about the subscription contract prices.

Also make sure to size your ProfessionalPLUS station appropriately to the total number of DSTs (regular and Flex DSTs) in the system. The DeltaV system still has a limit of 30,000 DSTs. All DST licenses can be Flex DSTs or combined with regular DSTs up to a maximum of 30K.

Supported Host Hardware

2 (redundant) and 1 (simplex) Dell PowerEdge R660xs rack servers running Windows Server 2025 in a user-provided cabinet, networking switches and power supplies. Each R660xs ordered from Emerson contains special BIOS settings to guarantee performance.

SE2770C01 – IQ Controller Host Platform
General specifications [based on Dell PowerEdge R660xs]

- Optimized for real-time operation
- Chassis available in 1U rack-mountable form factor
- Eight 10/1GbE ports (Intel X710-T4L + Intel X710-T2l adapters)
- One Broadcom 5720 Dual Port 1Gb On-Board Ethernet adapter
- Drives: Four 960 GB SSD Mixed-Use 2.5in drives (PERC H755 RAID Controller)
- Two CPUs – Intel Xeon Gold 6526Y 2.8Ghz, 16 cores each (32 cores total)
- Memory: 64 GB; Two 32 GB DDR5-5600 RDIMMs
- Redundant, hot-swappable 1100W Titanium power supplies (1+1)
- iDRAC port for easy management of all resources (server nodes, storage, networking, and power)
- Efficient cooling with 7 standard fans
- Local power cord option
- Rack configuration dimensions: 30" (74.9cm) D x 19" (48.2cm) W x 1.68" (4.2cm) H
- Rack configuration weight: 55.3 lbs. (19.5 kg), maximum configuration
- ReadyRails sliding Rails with Cable Management Arm included in the box
- Five-year extended warranty with next business day parts replacement
  (For same day 4-hour parts replacement, contact your Dell representative)

For more information about the R660xs chassis, see the PowerEdge R660xs Technical Guide on Dell.com.

***Notes –** On-line Production systems using the DeltaV IQ Controller server require 2 of the above servers using redundant IQ Controllers to ensure system availability during upgrades or managed repairs and provide disaster recovery capabilities.

Operating Environment Specifications
It is the responsibility of the user to ensure their environment is compatible with G1. Due to compliance to RoHS requirements newer computers may not survive in the same environment as older models. If there is any chance of sulfur in the environment computers must be protected in environmental enclosures or relocated to a sulfur free environment.
Temperature: Operating 10° to 35°C (50° to 95°F), Storage -40° to 65°C (-40° to 149°F)
Relative Humidity: 20% to 80% (non-condensing)
Altitude: Operating -15.2 to 3048 m (-50 to 10,000 ft.), Storage -15.2 to 10,668 m (-50 to 35,000 ft.)
All computers must be installed in a dust-free, contaminant-free environment. These computers are not suitable for mounting in industrial environments unless they are mounted in enclosures that provide the necessary dust-free and contaminant-free environment. Environment must meet Class G1 level for airborne contaminants per the ISA standard ISA-71.04-1985, Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants.

Servers intended for embedded applications. 'Embedded application' means a software application that permanently resides in an industrial or consumer device, typically stored in a non-volatile memory such as read-only memory or flash memory. Server intended for use as appliances. 'Server appliance' means a server that is not intended to execute user supplied software, delivers services through one of more networks, is typically managed through a web or command line interface and is bundled with a pre-installed OS and application software that is used to perform a dedicated function or set of tightly coupled functions.

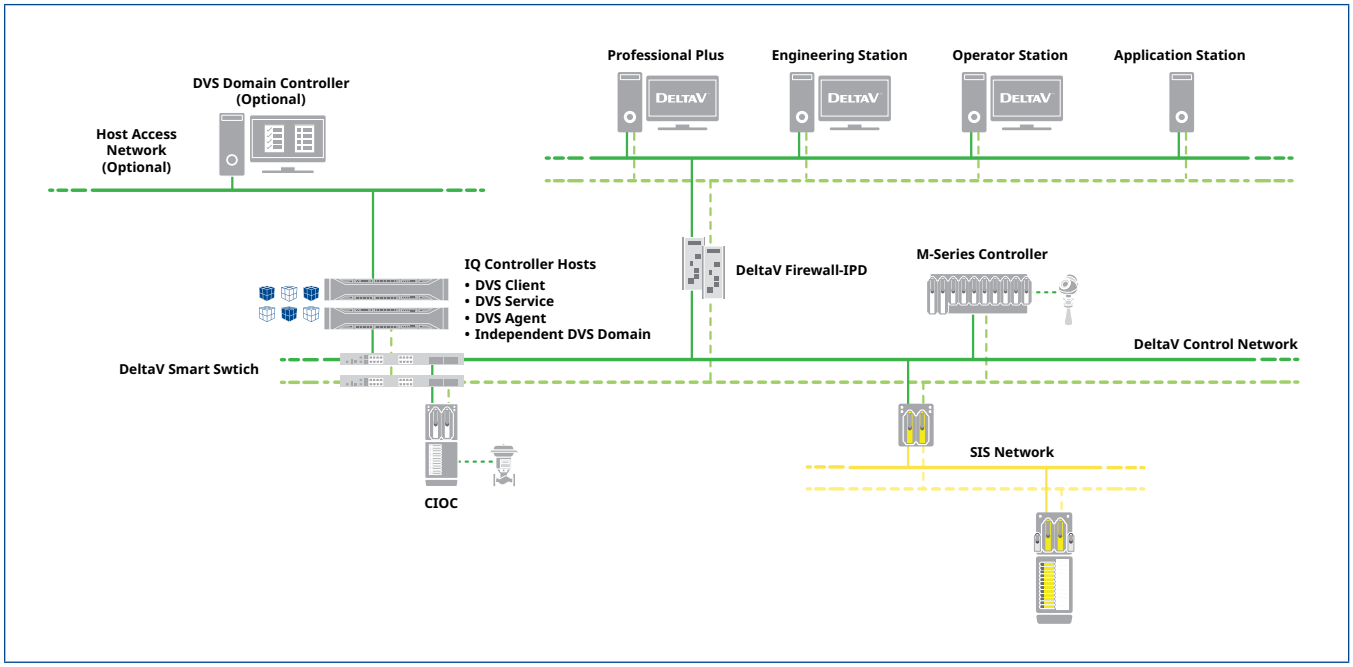
System Planning

In redundant mode, each server pair can accommodate up to 10 redundant IQ controllers. In simplex mode, each host accommodates up to 10 IQ controllers. Each IQ Controller instance counts against the overall controller count for the system.

Separate hosts are required for IQ Controllers and virtual DeltaV workstations, but they can be managed by the same DeltaV Virtual Studio instance.

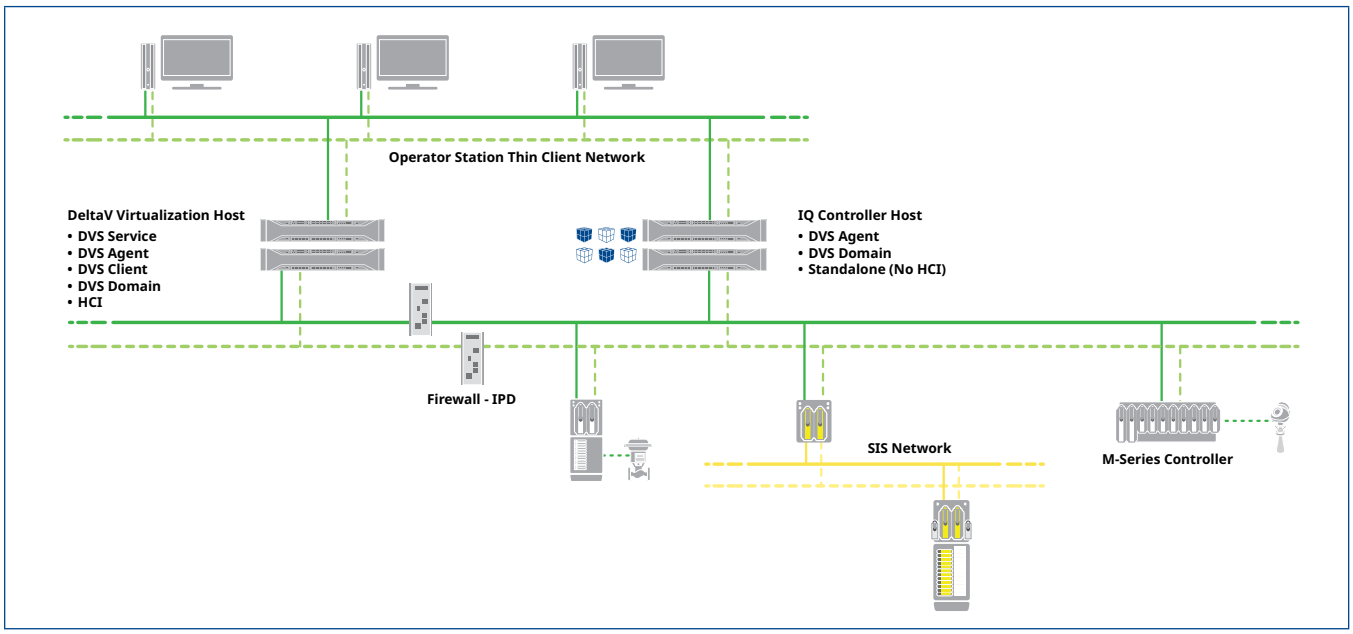
The IQ Controller supports two deployment models: integrated within an existing DeltaV Virtualization System (DVS) architecture or deployed as a standalone control platform.

An example of a DeltaV system using redundant IQ Controllers and physical workstations is shown below.



In this scenario, the domain controllers for the IQ Controller host servers can be run on separate hardware or as a virtual machine on the host server itself.

IQ Controller can be integrated into an existing DeltaV Virtualization system, as shown by the example system below.



In this scenario, the IQ Controller hosts can be assigned to the same Windows domain as the existing DeltaV Virtualization hosts. In addition, IQ Controller hosts and IQ Controller instances can be managed using the same DeltaV Virtual Studio instance as the existing DeltaV Virtualization hosts.

Certifications

The following certifications are available for the DeltaV IQ Controller:

- **Security Certifications**
  Achilles Level 2

Specifications for the DeltaV™ IQ Controller	
DST Limit	3,000
Module Execution Rates	100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 30s, 60s
Memory Required	2 GB
Disk Required	2 GB

Licensing and Prerequisites

- DeltaV IQ Controller requires a DeltaV system on v15.FP3 or greater.
- DeltaV IQ Controller requires DeltaV Virtual Studio v5.1 or greater, which must be purchased separately. Previously purchased DeltaV Virtual Studio licenses can be used to manage IQ Controller instances.

Ordering Information

Description	Model Number
Dell R660xs Host Hardware	SE2770C01
Redundant DeltaV IQ Controller -or- Simplex DeltaV IQ Controller	Redundant: VE1023SwREDS001_YyFYzz Simplex: VE1023SwSIMS001_YyFYzz
Flex DST w-Year Subscription for use with PK Flex Controller or IQ Controller; xxxx Flex DSTs	VEFLEXDSTSwSxxxx_YyFYzz
DeltaV Virtual Studio (DVS) for Small to Medium Systems – Base License for up to 20 VMs ■ DVS Access Key ● For physical dongle, order must include VF1026LDK	VF1026S020
DeltaV Virtual Studio (DVS) v5.1 Software Media ■ Electronic media available for download via Guardian **Note:** For physical media on USB, use VF1052DVS51L39-PD	VF1052DVS51L39
DeltaV Virtual Studio Templates for Control Hardware Only (Media) ■ For use with DVS v5.1 & Up	VF1052S006

These model numbers are for initial subscriptions only; model numbers for renewals are listed separately in the price book.
Please check **DeltaV™ Virtualization PDS** for latest part numbers.
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).

Related Products

- **DeltaV Virtualization**
- **DeltaV PK Flex Controller**

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