The PlantPAx® system provides a modern approach to distributed control. The system shares common technology (Integrated Architecture® system) with all other automation disciplines in the plant. This approach creates a seamless information flow across the plant for optimization opportunities and enables a Connected Enterprise®. Our scalable platform provides you with the flexibility to implement a system appropriate for your application.

**What’s Inside**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select a PlantPAx System</td>
<td>3</td>
</tr>
<tr>
<td>System Infrastructure</td>
<td>13</td>
</tr>
<tr>
<td>Servers and Workstations</td>
<td>23</td>
</tr>
<tr>
<td>Controllers, Field Networks, and I/O</td>
<td>39</td>
</tr>
<tr>
<td>Analytics</td>
<td>55</td>
</tr>
<tr>
<td>Process Safety Systems</td>
<td>59</td>
</tr>
</tbody>
</table>

**Additional Resources**

These documents contain additional information concerning related products from Rockwell Automation.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PlantPAx Distributed Control System Configuration and Implementation User Manual, publication PROCES-UM00</td>
<td>Provides procedures to configure infrastructure components for your PlantPAx system.</td>
</tr>
<tr>
<td>Rockwell Automation Library of Process Objects, publication PROCES-RM000</td>
<td>Provides information on how to use the Process library, including the PlantPAx Instructions and display elements.</td>
</tr>
<tr>
<td>FLEXHA 5000 I/O System User Manual, publication 5075-UM001</td>
<td>Provides information on how to use FLEXHA 5000™ I/O</td>
</tr>
<tr>
<td>PlantPAx Hardware Specifications and Certifications, publication PROCES-SR027</td>
<td>Provides information on PlantPAx system hardware specifications and certifications.</td>
</tr>
<tr>
<td>Process Automation System Training Curriculum, publication PROCES-CA001</td>
<td>Describes the courses that are available for a better understanding of the PlantPAx system.</td>
</tr>
<tr>
<td><a href="https://www.rockwellautomation.com">https://www.rockwellautomation.com</a></td>
<td>Provides general information about Rockwell Automation process capabilities. From the menu bar, select Products&gt; Distributed Control Systems.</td>
</tr>
<tr>
<td><a href="http://www.migratemyprocess.com/webinars">http://www.migratemyprocess.com/webinars</a></td>
<td>Features prerecorded webinars on the DCS migration program and capabilities for process customers.</td>
</tr>
<tr>
<td>Product Compatibility and Download Center at <a href="https://compatibility.rockwellautomation.com/Pages/home.aspx">https://compatibility.rockwellautomation.com/Pages/home.aspx</a></td>
<td>Website helps you find product-related downloads including firmware, release notes, associated software, drivers, tools, and utilities.</td>
</tr>
<tr>
<td>PlantPAx Template User Manual, publication 9528-UM001</td>
<td>Describes the catalog numbers and details for using virtual image templates to configure virtual machines.</td>
</tr>
<tr>
<td>Stratix Ethernet Device Specifications Technical Data, publication 1783-TD001</td>
<td>Contains product specifications, certifications, and catalog numbers for Ethernet switch devices.</td>
</tr>
<tr>
<td>Converged Plantwide Ethernet (CPwE) Design and Implementation Guide, publication ENET-TD001</td>
<td>Provides information on Ethernet security and firewalls.</td>
</tr>
<tr>
<td>Product Compatibility and Download Center at <a href="https://compatibility.rockwellautomation.com/Pages/home.aspx">https://compatibility.rockwellautomation.com/Pages/home.aspx</a></td>
<td>Website helps you find product-related downloads including firmware, release notes, associated software, drivers, tools, and utilities.</td>
</tr>
<tr>
<td>Rockwell Automation Library of Electrical Protection Devices, publication PROCES-RM011</td>
<td>This manual describes how to configure the Add-On Instructions and visualization objects to integrate electrical protection devices by using IEC 61850 or EtherNet/IP™ connectivity within the PlantPAx® System.</td>
</tr>
<tr>
<td>Integrate E+H Instruments in a PlantPAx System Integration Document, publication PROCES-SG003</td>
<td>Provides pre-engineered, pre-tested, supported, and maintained integrated solutions for plant-wide diagnostics and lifecycle management.</td>
</tr>
<tr>
<td><a href="https://www.endress.com/">https://www.endress.com/</a></td>
<td>Products from Endress+Hauser.</td>
</tr>
<tr>
<td>Technology partners</td>
<td>Provides information on connected cabling systems and infrastructure management from Technology partners.</td>
</tr>
</tbody>
</table>
Welcome and thank you for choosing the PlantPAx Distributed Control System. The PlantPAx system is an integrated control and information solution that provides Plant-wide Optimization for a wide range of industries. This single-platform system is built on open industry standards to help support the seamless integration of system components, and to provide connectivity to high-level business systems.
A PlantPAx system consists of these system elements.

### Table 1 - System Element Descriptions

<table>
<thead>
<tr>
<th>System Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Automation System Server (PASS)</td>
<td>The PASS is a required system element that can host displays, alarms, and data connections to controllers. Multiple PASS servers can be used to provide additional system capacity or to create logical segregation of application content that is based on the process. For smaller systems, the PASS - C (consolidated PASS server) supports functions that otherwise would be hosted on application servers.</td>
</tr>
<tr>
<td>Operator workstation (OWS) and Application server (AppServ-OWS)</td>
<td>The OWS and AppServ-OWS provides an interactive graphical interface to monitor and control the process. The AppServ-OWS uses Microsoft® Remote Desktop Services (RDS) technology to serve multiple instances of the OWS as thin clients from one server. The technology provides for FactoryTalk® View SE thin clients that run applications and process data on a remote computer.</td>
</tr>
<tr>
<td>Engineering workstation (EWS) and Application server (AppServ-EWS)</td>
<td>The EWS and AppServ-EWS provides a central location for configuring the system and monitoring/maintaining system operation. The AppServ-EWS uses Microsoft Remote Desktop Services (RDS) technology to serve multiple instances of the EWS as thin clients from one server. The technology provides for FactoryTalk View SE thin clients that run applications and process data on a remote computer.</td>
</tr>
<tr>
<td>AppServ-Asset management</td>
<td>The asset management server acts as a centralized tool for managing automation-related asset information (both Rockwell Automation and third-party assets). The asset management application server includes capabilities for asset inventory, source control, audits, change notifications, reporting, and security.</td>
</tr>
<tr>
<td>AppServ-Batch</td>
<td>The batch application server provides comprehensive batch management, including unit supervision, recipe management, process management, and material management. The batch application server can be linked with visualization elements on the OWS and configuration clients on the EWS.</td>
</tr>
<tr>
<td>AppServ-Info</td>
<td>Data management storage can include a Historian or Microsoft SQL server. There are two different types of AppServ-Info servers depending on the function that is being provided: FactoryTalk® Historian software and the Microsoft SQL server.</td>
</tr>
<tr>
<td>Controllers</td>
<td>The ControlLogix® and CompactLogix™ controllers support continuous process and batch applications. These controllers also support discrete and motion applications.</td>
</tr>
<tr>
<td>Independent workstation (IndWS)</td>
<td>The independent workstation acts as a PASS, EWS, and OWS for single-station systems (independent class).</td>
</tr>
<tr>
<td>Domain controller</td>
<td>A domain controller is a server that manages security authentication requests within the Windows® server domain. PlantPAx uses a domain controller to store user account information, authenticate users, and enforce security policies.</td>
</tr>
</tbody>
</table>

### Scalable Architectures

Rockwell Automation characterizes the PlantPAx system that is based on its size or architecture class. A ‘characterized’ (system-tested) classification yields system performance data and recommended hardware and software configurations. The classes of PlantPAx architecture offer system scalability while organizing Integrated Architecture products consistent with process industry expectations.

The architecture classes include the following:
<table>
<thead>
<tr>
<th>Consideration</th>
<th>Skid Station Architecture (FactoryTalk SE Station) (small &lt;2000 I/O)</th>
<th>Distributed Architecture (single PASS (consolidated)) (small &lt;2000 I/O)</th>
<th>Distributed Architecture (single to multiple PASS servers) (medium=2,000…10,000 I/O)</th>
<th>Distributed Architecture (single to multiple PASS servers) (large = 10,000+ I/O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk Directory</td>
<td>Local FactoryTalk Directory for SE Station applications</td>
<td>Local FactoryTalk Directory</td>
<td>PlantPAx recommends that the FactoryTalk Directory is placed on its own PASS server.</td>
<td>PlantPAx recommends that the FactoryTalk Directory is placed on its own PASS server.</td>
</tr>
<tr>
<td>FactoryTalk Activation Server</td>
<td>-</td>
<td>Local FactoryTalk Activation Server</td>
<td>PlantPAx recommends that the FactoryTalk Activation server is placed on the Factory Directory server.</td>
<td>PlantPAx recommends that the FactoryTalk Activation server is placed on the Directory server.</td>
</tr>
<tr>
<td>Process Automation System Server (PASS)</td>
<td></td>
<td>For smaller systems, one PASS-C is required that typically includes the following:  - FactoryTalk Directory server  - HMI server  - Data server  - Alarm and Event server  - EWS / OWS The PASS-C supports functions that would otherwise be hosted on separate application servers. The PASS-C single computer also includes the following in a single workstation:  - FactoryTalk Historian  - FactoryTalk AssetCentre  - Microsoft SQL Server  - FactoryTalk Batch IMPORTANT: An additional PASS-C is required for redundancy. Note: Licensing per application is separate from the PASS-C template.</td>
<td>One PASS required that typically includes the following:  - HMI server  - Data server (Up to 2 Data services per PASS)  - Alarm and Event service Note: Optional redundancy is available. Note: Additional PASS Servers can be deployed to accommodate additional data and alarm requirements. No additional FactoryTalk licensing is required.</td>
<td></td>
</tr>
<tr>
<td>Engineering Workstation (EWS)</td>
<td>1 EWS required. Provided separately</td>
<td>Included within PASS-C image</td>
<td>1 EWS required. AppServ-EWS as needed</td>
<td>1 EWS required. Can have as many as 5 active and in use EWSs AppServ-EWS as needed</td>
</tr>
<tr>
<td>Operator Workstation OWS (Clients)</td>
<td>Provided separately via independent workstation or thin client.</td>
<td>Max 10 OWS clients Note: PASS-C requires additional machines outside of PASS-C image.</td>
<td>Can have as many as 120 OWS clients. AppServ-OWS as needed.</td>
<td></td>
</tr>
<tr>
<td>Controllers</td>
<td>1…5 Compact or ControlLogix</td>
<td>1…5 Compact or ControlLogix</td>
<td>ControlLogix Architecture</td>
<td></td>
</tr>
<tr>
<td>Application Server - FactoryTalk AssetCentre</td>
<td>Not applicable. If attached to PlantPAx DCS, confirm FactoryTalk AssetCentre can access the skid's asset details.</td>
<td>Included within the PASS-C image</td>
<td>AppServ-Asset (FactoryTalk AssetCentre) is a required component for the PlantPAx DCS.</td>
<td></td>
</tr>
<tr>
<td>Application servers</td>
<td>Not applicable. In chassis historian and in controller batch capabilities are available. Can be also integrated with a distributed architecture.</td>
<td>Included within the PASS-C image</td>
<td>AppServ-Batch as needed. AppServ-Information Management (FactoryTalk Historian or AppServ-Information Management)</td>
<td>AppServ-Batch as needed. AppServ-Information Management (FactoryTalk Historian) as needed.</td>
</tr>
</tbody>
</table>
PlantPAx System Estimator

Rockwell Automation offers the PlantPAx System Estimator tool as part of the Integrated Architecture Builder software. The System Estimator tool lets you define your PlantPAx system and verifies that your architecture and system elements are sized properly.

The System Estimator tool provides help you select system elements and size the system. The sizing guidelines are based on the rules and recommendations from PlantPAx system characterization to achieve known performance and reliability.

The following items are created based on your inputs:
- Supervisory Ethernet network with all servers, operator, and engineering workstations and controller chassis
- List of required software catalog numbers
- List of network components per subsystem
- List of controllers, I/O, and process devices

After selecting the system elements as defined in this guide, use the PlantPAx System Estimator tool to modify their properties. You can then create a bill of materials (BOM) with the Integrated Architecture Builder software. The BOM includes controllers, I/O, networks, drives, devices, and software products that comprise your Distributed Control System.

To access the Integrated Architecture Builder software to use the PlantPAx System Estimator tool, download the Product Selection Toolbox™.
Software Release Information

Performance guidelines are based on the use of the software versions listed. For new PlantPAx systems, we recommend that you use these versions of software.

- Studio 5000 Logix Designer® application, version 35
- Studio 5000® Application Code Manager, version 4
- FactoryTalk® View software, version 13
- FactoryTalk® Batch software, version 15
- FactoryTalk AssetCentre software, version 11
- FactoryTalk Historian software, version 8

For the latest compatible software information, see the Product Compatibility and Download Center.

Antivirus

PlantPAx recommends the installation of antivirus software on servers and workstations running industrial automation software. Although all FactoryTalk software is expected to be compatible with the antivirus protections on the market, PlantPAx has tested Windows Defender and Crowdstrike antivirus packages. These antivirus packages had no adverse effect on the performance of the PlantPAx Distributed Control System when used with the default configurations.

Proper configuration, management, and updating of antivirus software is required. Any antivirus protection can impact operation if the configuration of firewalls, network threat protections, and access controls is too restrictive.

CIP Security

PlantPAx recommends the use of CIP Security within the reference architectures for class 3 communications. PlantPAx tests found that CIP Security has minimal impact on system performance while using Integrity protection for Class 3 communication between the plant servers and controllers.

PlantPAx also recommends using the Trusted Slot setting with the controller properties. Communication from the controller to other devices, such as remote I/O modules and other controllers, are not impacted by using the Trusted Slot setting. When using the Trusted Slot setting, configuration changes to the controller can only be made through selected networks (EN4TR with CIP security).

PlantPAx System ID

The PlantPAx System ID is a unique identifier that helps simplify the management of your system over its lifecycle. The System ID creates a record of the installed products in your system and provides a dashboard that shows the hardware lifecycle status, notifications of updates and patches, and compatibility information. Use this information to:

- Plan spare and replacement parts to better size inventory
- Define the boundaries of the system
• Plan when and where to implement system upgrades

Your system integrator uses the Asset Inventory Agent within a FactoryTalk AssetCentre project to generate a system inventory file. Before delivering your system, your system integrator registers your System ID with Rockwell Automation and provides you directions on how to access your MyEquipment portal.

The System ID is only available if you purchase a PlantPAx PASS Bundle. The PlantPAx PASS Activation serial number is the System ID.

**PlantPAx Bundles**

**PlantPAx PASS Large 25 Client**

This software bundle provides everything that you need to run a PlantPAx DCS system with 25 HMI client stations. Included in the bundle is an HMI server with unlimited displays, 25 client stations, and unlimited browser-based HTML client connections. Core asset management and a PlantPAx System ID are integrated into the bundle. Additional assets can be added under recommended products.

<table>
<thead>
<tr>
<th>Support / License Options</th>
<th>Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 x 5 Support / Subscription License</td>
<td>9528C-PASS2ST11</td>
</tr>
<tr>
<td>8 x 5 Support / Perpetual License</td>
<td>9528M-PASS2ST11</td>
</tr>
<tr>
<td>24 x 7 Support / Subscription License</td>
<td>9528C-PASS2ST12</td>
</tr>
<tr>
<td>24 x 7 Support / Perpetual License</td>
<td>9528M-PASS2ST12</td>
</tr>
</tbody>
</table>

The catalog numbers in the previous table are for Electronic Software Delivery. To order software in media format, append the catalog number with “M”. For example: 9528C-PASS2ST11M

**Included in the Bundle**

<table>
<thead>
<tr>
<th>Description</th>
<th>Subscription License</th>
<th>Perpetual License</th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk View SE Large Bundle: Unlimited Display Server™ with 25 Clients</td>
<td>9701-VWSVBDL25T1T</td>
<td>9701-VWSVBDL25T1TPE</td>
</tr>
<tr>
<td>FactoryTalk View SE Large Bundle: Unlimited Display Server with 25 Clients Update</td>
<td>9701U-VWSVBDL25T1T</td>
<td>9701MU-VWSVBDL25T1T</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base</td>
<td>9515-FACTC2T</td>
<td>9515-FACTC2TE</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base Update</td>
<td>9515U-FACTC2T</td>
<td>9515MU-FACTC2T</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base Support</td>
<td>RSSPN-FACTC21 (8 x 5 Support) RSSPN-FACTC22 (24 x 7 Support)</td>
<td>RSSPM-FACTC21 (8 x 5 Support) RSSPM-FACTC22 (24 x 7 Support)</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent</td>
<td>9515-FACTIAENT</td>
<td>9515-FACTIAENTP</td>
</tr>
<tr>
<td>Description</td>
<td>Subscription License</td>
<td>Perpetual License</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent Update</td>
<td>9515U-FTACRT77</td>
<td>9515MU-FTACRT77</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent Support</td>
<td>RSSPN-FTACRT71 (8 x 5 Support)</td>
<td>RSSPM-FTACRT71 (8 x 5 Support)</td>
</tr>
<tr>
<td></td>
<td>RSSPN-FTACRT72 (24 x 7 Support)</td>
<td>RSSPM-FTACRT72 (24 x 7 Support)</td>
</tr>
<tr>
<td>My Equipment Portal Subscription</td>
<td>9300-MYEQUIP</td>
<td></td>
</tr>
<tr>
<td>Activation</td>
<td>9528-PAXPASSCLI</td>
<td>9528-PAXPASSCLIPE</td>
</tr>
</tbody>
</table>
PlantPax PASS Medium 10 Client

This software bundle provides everything that you need to run a PlantPax DCS system with 10 HMI client stations. Included in the bundle is an HMI server with unlimited displays, 10 client stations, and unlimited browser-based HTML client connections. Core asset management and a PlantPax System ID are integrated into the bundle. Additional assets can be added under recommended products.

### Support / License Options

<table>
<thead>
<tr>
<th>Support / License Options</th>
<th>Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 x 5 Support / Subscription License</td>
<td>9528C-PASS10T21</td>
</tr>
<tr>
<td>8 x 5 Support / Perpetual License</td>
<td>9528M-PASS10T21</td>
</tr>
<tr>
<td>24 x 7 Support / Subscription License</td>
<td>9528C-PASS10T22</td>
</tr>
<tr>
<td>24 x 7 Support / Perpetual License</td>
<td>9528M-PASS10T22</td>
</tr>
</tbody>
</table>

The catalog numbers in the previous table are for Electronic Software Delivery. To order software in media format, append the catalog number with “M”. For example: 9528C-PASS10T21M

### Included in the Bundle

<table>
<thead>
<tr>
<th>Description</th>
<th>Subscription License</th>
<th>Perpetual License</th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk View SE Medium Bundle: Unlimited Display Server with 10 Clients</td>
<td>9701-VWSVBDL10T2T</td>
<td>9701-VWSVBDL10T2TPE</td>
</tr>
<tr>
<td>FactoryTalk View SE Medium Bundle: Unlimited Display Server with 10 Clients Update</td>
<td>9701U-VWSVBDL10T2T</td>
<td>9701MU-VWSVBDL10T21</td>
</tr>
<tr>
<td>FactoryTalk View SE Medium Bundle: Unlimited Display Server with 10 Clients Support</td>
<td>RSSPN-VWSVBDL10T21 (8 x 5 Support)</td>
<td>RSSPM-VWSVBDL10T21 (8 x 5 Support)</td>
</tr>
<tr>
<td></td>
<td>RSSPN-VWSVBDL10T22 (24 x 7 Support)</td>
<td>RSSPM-VWSVBDL10T22 (24 x 7 Support)</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base</td>
<td>9515-FTACT2T</td>
<td>9515-FTACT2TPE</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base Update</td>
<td>9515U-FTACT2T</td>
<td>9515MU-FTACT2T</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base Support</td>
<td>RSSPN-FTACT21 (8 x 5 Support)</td>
<td>RSSPM-FTACT21 (8 x 5 Support)</td>
</tr>
<tr>
<td></td>
<td>RSSPN-FTACT22 (24 x 7 Support)</td>
<td>RSSPM-FTACT22 (24 x 7 Support)</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent</td>
<td>9515-FTACTIAENT</td>
<td>9515-FTACTIAENTP</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent Update</td>
<td>9515U-FTACRT7T</td>
<td>9515MU-FTACRT71</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent Support</td>
<td>RSSPN-FTACRT71 (8 x 5 Support)</td>
<td>RSSPM-FTACRT71 (8 x 5 Support)</td>
</tr>
<tr>
<td></td>
<td>RSSPN-FTACRT72 (24 x 7 Support)</td>
<td>RSSPM-FTACRT72 (24 x 7 Support)</td>
</tr>
<tr>
<td>My Equipment Portal Subscription</td>
<td>9300-MYEQUIP</td>
<td></td>
</tr>
<tr>
<td>Activation</td>
<td>9528-PAXPASSCLI</td>
<td>9528-PAXPASSCLIE</td>
</tr>
</tbody>
</table>
PlantPAx PASS Small 5 Client

This software bundle provides everything that you need to run a PlantPAx DCS system with five HMI client stations. Included in the bundle is an HMI server with unlimited displays, five client stations, and unlimited browser-based HTML client connections. Core asset management and a PlantPAx System ID are integrated into the bundle. Additional assets can be added under recommended products.

<table>
<thead>
<tr>
<th>Support / License Options</th>
<th>Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 x 5 Support / Subscription License</td>
<td>9528C-PASS05T31</td>
</tr>
<tr>
<td>8 x 5 Support / Perpetual License</td>
<td>9528M-PASS05T31</td>
</tr>
<tr>
<td>24 x 7 Support / Subscription License</td>
<td>9528C-PASS05T32</td>
</tr>
<tr>
<td>24 x 7 Support / Perpetual License</td>
<td>9528M-PASS05T32</td>
</tr>
</tbody>
</table>

The catalog numbers in the previous table are for Electronic Software Delivery. To order software in media format, append the catalog number with “M”. For example: 9528C-PASS05T31M

Included in the Bundle

<table>
<thead>
<tr>
<th>Description</th>
<th>Subscription License</th>
<th>Perpetual License</th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk View SE Small Bundle: Unlimited Display Server with 5 Clients</td>
<td>9701-VWSVBDOL05T3T</td>
<td>9701-VWSVBDOL05T3TPE</td>
</tr>
<tr>
<td>FactoryTalk View SE Small Bundle: Unlimited Display Server with 5 Clients Update</td>
<td>9701U-VWSVBDOL05T3T</td>
<td>9701MU-VWSVBDOL05T31</td>
</tr>
<tr>
<td>FactoryTalk View SE Small Bundle: Unlimited Display Server with 5 Clients Support</td>
<td>RSSPN-VWSVBDOL05T31 (8 x 5 Support), RSSPN-VWSVBDOL05T32 (24 x 7 Support)</td>
<td>RSSPN-VWSVBDOL05T31 (8 x 5 Support), RSSPN-VWSVBDOL05T32 (24 x 7 Support)</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base</td>
<td>9515-FTACT2T</td>
<td>9515-FTACBASEPE</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base Update</td>
<td>9515U-FTACT2T</td>
<td>9515MU-FTACT2T</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base Support</td>
<td>RSSPN-FTACT21 (8 x 5 Support), RSSPN-FTACT22 (24 x 7 Support)</td>
<td>RSSPN-FTACT21 (8 x 5 Support), RSSPN-FTACT22 (24 x 7 Support)</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent</td>
<td>9515-FTACTIAENT</td>
<td>9515-FTACTIAENTP</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent Update</td>
<td>9515U-FTACRT7T</td>
<td>9515MU-FTACRT7</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent Support</td>
<td>RSSPN-FTACRT71 (8 x 5 Support), RSSPN-FTACRT72 (24 x 7 Support)</td>
<td>RSSPN-FTACRT71 (8 x 5 Support), RSSPN-FTACRT72 (24 x 7 Support)</td>
</tr>
<tr>
<td>My Equipment Portal Subscription</td>
<td>9300-MYEQUIP</td>
<td>9300-MYEQUIP</td>
</tr>
<tr>
<td>Activation</td>
<td>9528-PAXPASSCLI</td>
<td>9528-PAXPASSCLIPE</td>
</tr>
</tbody>
</table>
PlantPAx PASS Upgrade

This software bundle provides a pathway for existing customers to get a PlantPAx System ID when modernizing their existing PlantPAx systems. The PlantPAx System ID is integrated into this bundle with the same lifecycle management available in the standard PASS bundles. Additionally, it provides a subscription to asset management software.

### Included in the Bundle

<table>
<thead>
<tr>
<th>Description</th>
<th>Subscription License</th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk AssetCentre Base</td>
<td>9515-FTACT2T</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base Update</td>
<td>9515U-FTACT2T</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Base Support</td>
<td>RSSPN-FTACT21 (8 x 5 Support)</td>
</tr>
<tr>
<td></td>
<td>RSSPN-FTACT22 (24 x 7 Support)</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent</td>
<td>9515-FTACTAENT</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent Update</td>
<td>9515U-FTACRT7T</td>
</tr>
<tr>
<td>FactoryTalk AssetCentre Inventory Agent Support</td>
<td>RSSPN-FTACRT71 (8 x 5 Support)</td>
</tr>
<tr>
<td></td>
<td>RSSPN-FTACRT72 (24 x 7 Support)</td>
</tr>
<tr>
<td>My Equipment Portal Subscription</td>
<td>9300-MYEQUIP</td>
</tr>
<tr>
<td>Activation</td>
<td>9528-PAXPASSUPGE</td>
</tr>
</tbody>
</table>

The catalog numbers in the previous table are for Electronic Software Delivery. To order software in media format, append the catalog number with “M”. For example: 9528C-PAXUPGT11M
Virtual Infrastructure

Virtualization breaks the dependency between operating system and physical hardware. Multiple virtual machines (VMs) can run different operating systems and applications from various locations on the same server. You can upgrade hardware without stopping your operation or replacing the operating system on the server or workstation system elements, thus reducing downtime and maintenance costs.

A VM behaves exactly like a physical computer because the VM contains its own ‘virtual’ CPU, RAM, hard disk drive, and network interface card. The VM runs as an isolated guest OS installation.

<table>
<thead>
<tr>
<th>Table 2 - Virtual Infrastructure Components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model Type</strong></td>
</tr>
<tr>
<td>Industrial Data Center</td>
</tr>
<tr>
<td>• E-2000 supports 2 host servers</td>
</tr>
<tr>
<td>• E-3000 supports 3 host servers</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Optional items:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Rockwell Automation offers virtual image templates as an option to deploy the PlantPAx distributed control system. The PlantPAx Virtual Image Templates deliver the core system elements as pre-configured, drop-in templates. For ease of operation and to help reduce cost, each single virtual image template can be reused.

Each template USB device includes one OS system for each applicable type. If you’re considering virtualization, we suggest that you visit the Rockwell Automation Industrial Networks website.

### Table 2 - Virtual Infrastructure Components

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| VersaVirtual™ Appliance      | The VersaVirtual Appliance is a hyperconverged (computing, networking, and storage) appliance for entry-level virtualization in a managed environment. One server can run multiple operating systems. Each application includes the host servers and the following:  
  - Rockwell Automation support  
  - Pre-engineered and configured virtualization software  
  - 1 management server (VersaVirtual 2000 only)  
  - Software defined storage (VersaVirtual 2000 only)  
  - VMware vSphere standard  
  - VMware vCenter foundation  
  - 2x10G copper uplink ports |
| Stratus ztC Edge             | ztC Edge from Stratus brings the benefits of virtualization and fault-tolerant computing to the industrial edge. Rugged, hot-swappable nodes can deploy on DIN rails inside the control cabinet. Run a PASS-C with additional capabilities on the ztC Edge to form a solution-in-a-box for smaller locations. For purchase information, contact your distributor. For more information, see [ztC Edge](#). |

### Table 3 - Virtual Image Templates on USB Devices

<table>
<thead>
<tr>
<th>Virtual Template</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>9528-PASSVTENM</td>
<td>USB device contains the virtual image template for the PASS. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated.</td>
</tr>
<tr>
<td>PASS-C</td>
<td>9528-PASSCVTENM</td>
<td>USB device contains the virtual image template for the PASS-C. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated.</td>
</tr>
<tr>
<td>EWS</td>
<td>9528-EWSVTENM</td>
<td>USB device contains the virtual image template for the EWS. The End User is responsible for acquiring the appropriate Microsoft OS license for Windows 10. All required Rockwell Automation software is pre-installed but not activated.</td>
</tr>
<tr>
<td>OWS</td>
<td>9528-OWSVTENM</td>
<td>USB device contains the virtual image template for the OWS. The End user is responsible for acquiring the appropriate Microsoft OS license for Windows 10. All required Rockwell Automation software is pre-installed but not activated.</td>
</tr>
<tr>
<td>AppServ-GWS, AppServ-EWS</td>
<td>9528-APPXWSENM</td>
<td>USB device contains the virtual image template for AppServ-GWS and AppServ-EWS. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated. You must purchase the appropriate Windows CAL from a Microsoft distributor. <strong>IMPORTANT:</strong> Each client needs an RDS CAL license.</td>
</tr>
<tr>
<td>AppServ-Info (Historian)</td>
<td>9528-APPHISENM</td>
<td>USB device contains the virtual image template for AppServ-Info (Historian). The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated.</td>
</tr>
<tr>
<td>AppServ-Asset</td>
<td>9528-APPASMENM</td>
<td>USB device contains the virtual image template for AppServ-Asset. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. All required Rockwell Automation software is pre-installed but not activated.</td>
</tr>
<tr>
<td>AppServ-Info (SQL)</td>
<td>9528-APPSOLEN</td>
<td>USB device contains the virtual image template for AppServ-Info (SQL). The End User is responsible for acquiring both the appropriate Microsoft OS license for Server 2019 and Microsoft SQL Server.</td>
</tr>
<tr>
<td>AppServ-Batch</td>
<td>9528-APPBATENM</td>
<td>USB device contains the virtual image template for AppServ-Batch. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. Most required Rockwell Automation software isn't activated. The FactoryTalk Batch software is not pre-installed for your convenience.</td>
</tr>
<tr>
<td>Domain controller</td>
<td>9528-PADCVTENM</td>
<td>USB device contains the virtual image template for a Domain controller. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019. You must purchase the appropriate quantity of Windows CALs from a Microsoft distributor.</td>
</tr>
</tbody>
</table>

Each template USB device includes one OS system for each applicable type. If you’re considering virtualization, we suggest that you visit the Rockwell Automation Industrial Networks website.
Template Distribution

Obtain PlantPAx virtual image templates by the following methods:

Media - Order a physical copy of the virtual image template. Only the latest virtual image templates are available via physical media. The End User is responsible for acquiring the appropriate Microsoft OS license for Server 2019 or Windows 10.

Electronic Software Delivery (ESD) - You must purchase licensed media before downloading an electronic copy of the virtual image template from the Product Compatibility and Download Center (PCDC) website. The latest and previous versions of the virtual image templates are available for download from the PCDC.

For additional information, see the PlantPAx Template User Manual, publication 9528-UM001.

VMware Component Requirements

The VMware vCenter server provides a centralized platform for managing your VMware vSphere environments. The virtual desktop and virtual server require resources from the physical infrastructure to operate. When you purchase hardware, consider future expansion plans by adding an additional 20...30% of resources. VMware makes it simple to scale the system size upward by adding servers in the future to provide additional resources.

Remember to divide the total system requirements by the minimum number of servers that are required to run the system at any given time. For example, with a three-server system that uses VMware fault tolerance or high availability, you divide by two. This type of calculation makes sure that the system can continue to run with two servers if one server fails.
VMware Sizing

Virtual Machines are limited by the CPU megahertz of the physical core. A common misconception is that a VM can use as much CPU megahertz as needed from the combined total available. One vCPU VM never uses more megahertz than the maximum of one CPU/core. If a VM has two vCPUs, it never uses more megahertz than the maximum of each CPU/core.

Table 4 - CPU and PlantPAx Resource Requirements

<table>
<thead>
<tr>
<th>Server and Workstation Type</th>
<th>vCPU</th>
<th>vRAM (GB)</th>
<th>vHardDisk (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Automation Domain Controller (PADC)</td>
<td>1</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>Process Automation System Server (PASS)</td>
<td>4</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td>Process Automation System Server - Consolidated (PASS-C)</td>
<td>4</td>
<td>32</td>
<td>120</td>
</tr>
<tr>
<td>Operator Workstation (OWS)</td>
<td>2</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>Engineering Workstation (EWS)</td>
<td>2</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>Operator Workstation Application Server (AppServ-OWS)</td>
<td>8</td>
<td>16</td>
<td>60</td>
</tr>
<tr>
<td>Engineering Workstation Application Server (AppServ-EWS)</td>
<td>4</td>
<td>16</td>
<td>100</td>
</tr>
<tr>
<td>Information Management Application Server Historian (AppServ-Info Historian)</td>
<td>2</td>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td>Information Management Application Server SQL (AppServ-Info SQL)</td>
<td>2</td>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td>Asset Management Server (AppServ-Asset)</td>
<td>2</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>Batch Management Server (AppServ-Batch)</td>
<td>2</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>VMware vCenter Server(1)</td>
<td>2</td>
<td>12</td>
<td>600</td>
</tr>
<tr>
<td>System Reservation (specify percent to be reserved)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) These requirements are for vCenter version 7.0. Depending on the version of vCenter used, these requirements may change. Verify the requirements with VMware.

Reference Network Topologies

PlantPAx reference topologies take advantage of converged architectures, that support:

- Access to device webpages throughout the architecture
- Access to the data in smart process devices from outside the local network

These reference topologies include:

- Example 1: Redundant PRP Topology
- Example 2: Resilient DLR Topology
- Example 3: Simplex - Star Topology
- Example 4A: PRP Skid and MCC Lineup
- Example 4B: DLR Skid and MCC Lineup
- Example 4C: Simplex Skid and MCC Lineup
Example 1: Redundant PRP Topology

Redundant PRP topology is used for critical operations, and includes infrastructure duplication, multiple fault tolerance capability, zero recovery time within the PRP zone, and minimal recovery time for traffic leaving the PRP zone. Redundant PRP recommendations include:

- 10 controllers per topology (pair of redundant Redboxes)
- In a redundant Redbox configuration, do not connect anything other PRP and uplink ports
- Ports in the PRP channel group can’t be configured for other resiliency protocol, such as DLR or Resilient Ethernet Protocol (REP).

Table 5 - Properties of Example 1 Architecture

<table>
<thead>
<tr>
<th>Redundant PRP Topology</th>
<th>Most robust option for operations that require high availability. PRP requires double the cabling and components to establish no single point of failure. For a true no single point of failure capabilities, PlantPAx recommends redundant power sources along with separate physical paths for media.</th>
</tr>
</thead>
</table>
| Why would I select this architecture? | • Implementation of EtherChannel for hardware redundancy between servers and workstations  
• EIGRP (Enhanced Interior Gateway Routing Protocol) provides Layer 3 routing capabilities  
• HSRP provides redundant PRP ‘RedBox’ functionality  
• PRP provides dual connectivity between two devices  
• RedBox (redundancy box) is a switch with PRP technology that connects devices without PRP technology to both LAN A and LAN B |
| What protocols does it use? | • Cisco® Catalyst® 9300 or 3950 stack switches  
• Redundant application servers via physical or virtualized environments  
• Pair of Layer 3 PRP enabled Stratix® switches:  
  - Stratix® 5410 (used if GPS, multiple PRP channels, rack-mount format, or AC power is required)  
  - Stratix 5400  
• Duplicate LAN A/B Layer 2 infrastructure switches:  
  - Stratix 5400  
  - Stratix 5700  
• Non-PRP devices require Stratix 5400 switch to enable VDAN support  
• 1756, 5015 and 5094 I/O families support PRP |
| What components do I need? | • Redundant application servers via physical or virtualized environments  
• Pair of Layer 3 PRP enabled Stratix® switches:  
  - Stratix® 5410 (used if GPS, multiple PRP channels, rack-mount format, or AC power is required)  
  - Stratix 5400  
• Duplicate LAN A/B Layer 2 infrastructure switches:  
  - Stratix 5400  
  - Stratix 5700  
• Non-PRP devices require Stratix 5400 switch to enable VDAN support  
• 1756, 5015 and 5094 I/O families support PRP |
**Example 2: Resilient DLR Topology**

Resilient DLR topology helps prevent communication loss between devices if a fault occurs. Multiport devices (embedded EtherNet/IP™ ports) equipped with DLR technology connect directly to neighboring nodes and form a ring topology at the end devices. If a break in the network is detected, the network provides an alternate forwarding path for the data to help recover the network. DLR recommendations include:

- 10 controllers per topology
- In a dual gateway configuration, do not connect anything other DLR and uplink ports
- Maximum of 50 switch nodes per ring
- Single VLAN per ring
- PlantPAx does not recommend DLR trunking or DLR DHCP
- Place at least 1 meter of cable between each DLR device
- Additional EN4TR required for concurrent communications

### Table 6 - Properties of Example 2 Architecture

<table>
<thead>
<tr>
<th>Resilient DLR Topology</th>
<th>This architecture provides a means to detect, monitor, manage, and recover from one fault ring-based network. You can use redundant gateways to provide DLR network resiliency to the rest of the network.</th>
</tr>
</thead>
</table>
| Why would I select this architecture? | - Implementation of EtherChannel for hardware redundancy between servers and workstations  
- EIGRP (Enhanced Interior Gateway Routing Protocol) provides Layer 3 routing capabilities; this protocol is used within the Cisco® Catalyst® switches  
- DLR is a ring topology that recovers after one point of failure (3 msec or less) |
| What protocols does it use? | - Cisco Catalyst 3950, 9300 stack switches  
- Redundant application servers via physical or virtualized environments  
- DLR gateway capable switches (if you need multiple rings, use a Stratix 5400 or 5410 switch)  
- DLR capable Stratix switches  
- DLR capable Ethernet modules |
| What components do I need? | Check I/O device specifications to verify DLR support. |
Example 3: Simplex - Star Topology

Simplex - Star topology features single network connections throughout the topology. There’s no redundancy so connected nodes can’t communicate on the network if there’s a network failure.

Table 7 - Properties of Example 3 Architecture

<table>
<thead>
<tr>
<th>Simplex - Star Topology</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Why would I select this architecture?</td>
<td>This architecture provides a basic network configuration. You can monitor and control non-critical equipment. However, there’s no ability to recover from an architectural fault.</td>
</tr>
</tbody>
</table>
| What protocols does it use? | • EtherNet/IP™ backbone between devices in a star topology  
• EtherChannel is optional  
• NIC teaming is optional. |
| What components do I need? | • Layer 2 Stratix switches  
• Ethernet capable devices |
Example 4 A: PRP Skid and MCC Lineup

PRP Simplex Connection to Either LAN A/B

PRP DCS LAN A/B Infrastructure

PRP MCC RedBox Connected to LAN A and LAN B

PRP MCC Connected to LAN A/B with DLR Ring

Redundant-PRP IEC 61850

PRP Network

LAN A / LAN B

IEC 61850 Module

Stratix 5400

IED Devices (PRP)

Stratix 5400

IED Devices (Non-PRP)
Example 4 B: DLR Skid and MCC Lineup

**DLR Simplex Connection to Either LAN A/B**
- DCS Skid
- DLR Member
- DLR Simplex/MCC Connection to DLR Ring Switch
- DCS Skid
- DLR Member
- MCC

**DLR DCS Integration**
- DCS Skid
- DLR Member
- Skid access switch is DLR member
- DLR MCC Lineup as part of the DCS DLR Ring
- DCS Skid
- DLR Member
- MCC

**Resilient-DLR IEC 61850**
- DLR Network
- IEC 61850 Module
- PRP or simplex is used when connecting IEDs to in-chassis IEC 61850 module. Chassis containing IEC 61850 module can be connected to DLR network via 1756-EN4TR module.
Example 4C: Simplex Skid and MCC Lineup

Simplex Connection to Simplex DCS

Simplex MCC Connection to Simplex DCS

Simplex IEC 61850

Simplex Network

IEC 61850 Module

Stratix 5400

IED Devices
The supervisory layer of the PlantPAx system can include several servers and workstations. This section explains the server and workstation system elements to help you define a bill of materials.

**PASS Servers**

The Process Automation System Server (PASS) is a required system element that hosts essential software components to run the system. The essential software components include the data server, HMI server, and alarm server.

You must determine how many PASS servers are needed for your architecture. If your system requires multiple servers, acquaint yourself with the following descriptions of the data, HMI, and alarm servers.

### Table 8 - PASS Server Software Components

<table>
<thead>
<tr>
<th>Software Components</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk® Directory (FTD) server(1)</td>
<td>Secures information from multiple Rockwell Automation software components across multiple computers and allows central administration throughout the PlantPAx system. Application components, such as display and security settings, can be stored in their original environments and made available to the entire PlantPAx system without the need for duplication.</td>
</tr>
<tr>
<td>FactoryTalk Activation server(1)</td>
<td>The FactoryTalk Activation server is part of the FactoryTalk® Services Platform. The server is used for FactoryTalk-enabled software products to be activated via files generated by Rockwell Automation over the Internet. This server essentially manages the files that are required to license Rockwell Automation products on the PlantPAx system.</td>
</tr>
<tr>
<td>FactoryTalk View HMI server</td>
<td>The human machine interface (HMI) server is configured within your FactoryTalk View SE application. The HMI server stores HMI project components, such as graphic displays, and serves these components to OWSs upon request. The HMI server can also manage tag databases and log historical data. Multiple HMI servers can exist on the PlantPAx system. Each HMI server must be on a separate PASS.</td>
</tr>
<tr>
<td>FactoryTalk View Data server (FactoryTalk Linx)</td>
<td>The Data server component provides access to information from the process controllers to servers and workstations on the PlantPAx system. The Data server that is mentioned in PlantPAx documentation generally refers to the Rockwell Automation Device servers. Data servers are configured within your FactoryTalk View SE application. A single PASS can host up to 2 instances of FactoryTalk Linx.</td>
</tr>
<tr>
<td>FactoryTalk View Data server (OPC UA connector)</td>
<td>The OPC UA connector provides access to data and alarms from OPC UA servers and devices. The OPC UA connector is configured within your FactoryTalk View SE application. No additional licensing is required to use the OPC UA data connector. PlantPAx recommends hosting the OPC UA connector on a dedicated PASS with no more than 50,000 OPC UA tags and 5,000 OPC UA alarms and conditions.</td>
</tr>
</tbody>
</table>
| FactoryTalk View Alarm and Event server | The Alarm and Event server publishes information from controllers and servers available to all subscribing OWSs. Alarm and Event servers are configured within your FactoryTalk View SE application. You can install only one Alarm and Event server on a PASS.  
  - PlantPAx System Release 5. supports Logix tag-based alarms. These device level, tag-based alarms monitor a tag value to determine the alarm condition. Tag-based alarms aren't part of the logic program and do not increase the scan time for a project. The controller caches information, such as time stamps, alarm states, and associated tag values in a 1000 KB buffer. The controller transmits the information to subscribing FactoryTalk Alarm & Event servers.  
  - For server tag-based alarms a FactoryTalk® Alarms and Events server monitors controllers for alarm conditions through data servers and publishes event information that can be displayed and logged. |

<table>
<thead>
<tr>
<th>Optional</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk Batch client software</td>
<td>If a Batch Application server is being used on the system, FactoryTalk Batch client components are required to support replication of batch-related objects on the displays to the OWS.</td>
</tr>
</tbody>
</table>

(1) In redundant PASS configurations, this component is included on the primary PASS only.
Determine the Number of PASS Servers

The following graphics illustrate how many servers are needed when you aren’t considering redundancy options.

Table 9 - Non-redundant Server Options

<table>
<thead>
<tr>
<th>Server Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option 1 - One PASS System Server</strong></td>
<td>![Diagram of one PASS system server] This option has all essential software components that are housed in one PASS server. The components are FTD, Data server, HMI server, and alarm and event server. There are additional system elements, such as batch management, asset management, and FactoryTalk Historian. You can deploy these elements on separate servers or you can deploy elements on the same server as detailed in Option 2. One HMI server license is required.</td>
</tr>
<tr>
<td><strong>Option 2 - One PASS Consolidated Server (small systems)</strong></td>
<td>![Diagram of one PASS consolidated server] The PASS - C option is for valid small systems with fewer than 2000 I/O points. With this option, you can locate multiple system elements on the same virtual image template. A USB device contains the system elements that are shown in the illustration for Option 2. One HMI server license is required.</td>
</tr>
<tr>
<td><strong>Option 3 - Multiple PASS Servers (additional data capacity)</strong></td>
<td>![Diagram of multiple PASS servers] This option contains all software components in one server as shown in Option 1. Option 3 also adds another server for extra data and alarm capacity without adding another HMI server. If the PASS server is being used as a data server, and additional capacity is needed, you can add more PASS servers. Use the PSE to determine if more PASS servers are needed. We recommend that you have an HMI server on the PASS if you’re segregating the application into individual operational areas. See Option 4. One HMI server license is required.</td>
</tr>
</tbody>
</table>
| **Option 4 - Multiple PASS Servers (logically segregated plant)** | ![Diagram of multiple PASS servers] Place the FTD on its own server to manage applications that exist on multiple client servers. If an area must be shut down, the other separate areas aren’t affected because the FTD is on its own server. For example, you can perform maintenance on one area without affecting another operational area of the plant. FTD can be a workstation class machine. An HMI server license is required for each PASS that contains an HMI server. The benefits of placing the FactoryTalk Directory on a dedicated server include:  
  - System Startup: It’s best if the FTD is the first component to start and the last to stop. Because most FactoryTalk software products rely on the various services that are provided by the FTD, the lowest risk scenario is to have it available as these products are initializing.  
  - Compatibility: While all versions are generally compatible, the FTD is occasionally required to be at the highest version of FTSP installed in the system. This requirement can interfere with another FactoryTalk component if the FTD is co-located with another product.  
  - Patching/Upgrading: Patching an FTD hosted on a dedicated computer translates to minimum system downtime, as it isn’t affecting the operation of other FactoryTalk components while rebooting.  
  - Redundancy: In redundant systems (for example, FactoryTalk View SE, FactoryTalk® Linx, FactoryTalk Alarms and Events), it’s best if the FTD remains available during any failover scenarios. While the redundant server pair can function without the presence of the FTD, the lowest risk scenario is keeping it available. |
### Table 10 - PASS Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
</table>
| **Hardware - virtual infrastructure** | Required:  
• 4 vCPU  
• 16 GB vRAM min  
• 60 GB vHardDisk  
Recommended CPU and memory allocation:  
• High priority Resource pool |
| **Hardware - traditional infrastructure** | The PASS must be installed on server-class hardware. The following are sample specifications that are based on PlantPAx system characterization:  
• Intel® Xeon Multicore processor (4 cores or greater)  
• 2.40 GHz CPU min  
• 16 GB RAM min  
• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure it supports redundant media) |
| **Operating system**          | Windows® Server 2019 operating system, 64 bit                                               |
| **Additional third-party software** | Antivirus software                                                                          |

<sup>(1)</sup> All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

### Table 11 - PASS-C Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
</table>
| **Hardware - virtual infrastructure** | The PASS-C was tested in a virtual environment using the Stratus zTC Edge 110i with:  
• Intel i7-8700T (or greater)  
• 2.4GHz GHz CPU min  
• 32 GB RAM min  
• Redundant Ethernet media |
| **Hardware - traditional infrastructure** | For systems with fewer than 2000 I/O points, the PASS - Consolidated contains HMI, data collection, decision-making, and asset management servers. These combined tools form a basic PlantPAx system in one server, referred to as consolidated. The PASS must be installed on a server-class computer. The following are sample specifications that are based on PlantPAx system characterization:  
• Intel® Xeon E3-1270 v5 (or greater)  
• 3.60 GHz CPU min  
• 32 GB RAM min  
• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure it supports redundant media) |
| **Operating system**          | Windows Server 2019 operating system, 64 bit                                          |
| **Additional third-party software** | Antivirus software                                                                    |
The PASS requires that you purchase an HMI server license. If the PASS server isn’t being used as an HMI server, then no license purchase is required. Make sure to account for process displays, faceplates, and navigation devices in your display count. All displays of the Rockwell Automation Library of Process Objects count against your display count license.

Whether you deploy a PASS system element in a traditional or virtual architecture, you must purchase the proper activations.

**Table 12 - PASS Software and Licenses**

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Image Template</td>
<td>9528-PASSVTENM (USB device contains a virtual image template that has pre-installed applications that are required on the PASS). 9528-PASSCVTENM (USB device contains a virtual image template that contains a consolidated PASS. The template has pre-installed applications that can be used on a PASS within the documented constraints for a PASS-C).</td>
</tr>
</tbody>
</table>

**Rockwell Automation software licenses**

Select the following for the first/main PASS in your system when the PASS is used as an HMI server:

- 9528x-PASS05T3y (PlantPAx PASS Small 5-Client)
- 9528x-PASS10T2y (PlantPAx PASS Medium 10-Client)
- 9528x-PASS25T1y (PlantPAx PASS Large 25-Client)

Select the following for a PASS that will be a redundant/secondary HMI Server:

- 9701x-VWRSVRT3y (Redundant Server Unlimited Display)

**Rockwell Automation software licenses (for PASS-C)**

Select one copy per project of the following:

- 9528x-PASS05T3y (PlantPAx PASS Small 5-Client)
- 9528x-PASS10T2y (PlantPAx PASS Medium 10-Client)

Select any quantity of the following up to 60,000 tags total:

- 9518x-HSTT1y (FactoryTalk Historian SE 1,000 Tags)
- 9518x-HST5KT4y (FactoryTalk Historian SE 5,000 Tags)
- 9518x-HST10KT5y (FactoryTalk Historian SE 10,000 Tags)
- 9518x-HST20KT6y (FactoryTalk Historian SE 20,000 Tags)
- 9518x-HST50KT7y (FactoryTalk Historian SE 50,000 Tags)

FactoryTalk Batch when required:

- 9358x-FTBT1y (FactoryTalk Batch Server - 1 Unit)
- 9358x-FTBT5y (FactoryTalk Batch Server - 3 Units)
- 9358x-FTBT2y (FactoryTalk Batch Server - 10 Units)
- 9358x-FTBT6y (FactoryTalk Batch Server - 30 Units)
- 9358x-FTBT3y (FactoryTalk Batch Server - 60 Units)

(1) When your system has two or more PASS servers that are HMI servers, purchase the FactoryTalk View SE software licenses.
(2) Where: x = M (perpetual use license) or C (subscription license) and y = 1 (8x5 support) or 2 (24x7 support)
(3) If necessary, the end user is responsible for acquiring the Microsoft SQL Server license.

**Engineering Workstation (EWS)**

The engineering workstation (EWS) supports system configuration, application development, and maintenance functions. The EWS is the central location for monitoring and maintaining the systems operation. The recommended limit is five EWS per system.

**Table 13 - EWS Virtual Requirements**

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Required:</td>
</tr>
<tr>
<td></td>
<td>• 2 vCPU</td>
</tr>
<tr>
<td></td>
<td>• 8 GB vRAM min</td>
</tr>
<tr>
<td></td>
<td>• 100 GB vHاردisk</td>
</tr>
<tr>
<td></td>
<td>Recommended CPU and memory allocation:</td>
</tr>
<tr>
<td></td>
<td>• Normal priority Resource pool</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows 10 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.
Whether you deploy an EWS system element in a traditional or virtual architecture, you must purchase the proper activations.

### Table 14 - EWS Traditional Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
</table>
| Hardware | The EWS must be installed on workstation-class hardware. The following are sample specifications that are based on PlantPAx system characterization:  
  - Intel Core 2 Duo (or greater)  
  - 2.40 GHz CPU min  
  - 8 GB RAM min  
  - Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media) |
| Operating system | Windows 10 operating system, 64 bit |
| Additional third-party software | Antivirus software |

### Table 15 - EWS Automation System Software and License

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Image Template</td>
<td>9528-EWSVTENM</td>
</tr>
</tbody>
</table>
| Rockwell Automation software license | The following licenses enable the software tools that are deployed on the EWS. \[1\] \[2\]  
  - 9324x-RLD3y  
  - 9701x-VWSSPT3y  
  - 9701x-VWSDRT1y |

\[1\] Where: x = M (perpetual use license) or C (subscription license)

\[2\] Where: y = 1 (8x5 support), y = 2 (24x7 support)

### Engineering Workstation Application Server (AppServ-EWS)

The AppServ-EWS uses ThinManager® or Microsoft Remote Desktop Services (RDS) technology to serve multiple instances of the EWS as thin clients from one server. Thin clients can run applications and process data on a remote computer. The recommended limit is five active and connected RDS client connections per AppServ-EWS. The application server can host up to 10 clients, but only five are to be active at one time.

### Table 16 - AppServ-EWS Virtual Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement(^{(1)})</th>
</tr>
</thead>
</table>
| Hardware | Required:  
  - 4 vCPU  
  - 16 GB vRAM min  
  - 100 GB vHardDisk  
  Recommended CPU and memory allocation:  
  Normal priority Resource pool |
| Thin client | We recommend a maximum of five active and connected FactoryTalk View SE clients per application server. |
| Operating system | Windows Server 2019 operating system, 64 bit |

\(^{(1)}\) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

Whether you deploy an AppServ-EWS system element in a traditional or virtual architecture, you must purchase the proper activations.

### Table 17 - AppServ-EWS Automation System Software and License

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Image Template</td>
<td>9528-APPXWSENEM</td>
</tr>
</tbody>
</table>
| Rockwell Automation software license | The following licenses enable the software tools that are deployed on an EWS client. \[1\] \[2\]  
  - 9324x-RLD3y  
  - 9701x-VWSSPT3y  
  - 9701x-VWSDRT1y |

\[1\] Where: x = M (perpetual use license) or C (subscription license)

\[2\] Where: y = 1 (8x5 support), y = 2 (24x7 support)
Operator Workstations (OWS)

The operator workstation (OWS) provides the graphical view and interface into the process. The OWS supports operator interaction and isn’t meant to support development or maintenance activities, although these activities are possible if desired.

Table 18 - OWS Virtual Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Required:</td>
</tr>
<tr>
<td></td>
<td>• 2 vCPU</td>
</tr>
<tr>
<td></td>
<td>• 4 GB vRAM min</td>
</tr>
<tr>
<td></td>
<td>• 40 GB vHardDisk</td>
</tr>
<tr>
<td></td>
<td>Recommended CPU and memory allocation:</td>
</tr>
<tr>
<td></td>
<td>• High priority Resource pool</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows 10 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

Table 19 - OWS Traditional Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>The OWS must be installed on workstation-class hardware. The following are sample specifications that are based on PlantPAx system characterization:</td>
</tr>
<tr>
<td></td>
<td>• Intel Core 2 Duo (or greater)</td>
</tr>
<tr>
<td></td>
<td>• 2.40 GHz CPU min</td>
</tr>
<tr>
<td></td>
<td>• 4 GB RAM min</td>
</tr>
<tr>
<td></td>
<td>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard–NIC make sure that it supports redundant media)</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows 10 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

Whether you deploy an OWS system element in a traditional or virtual architecture, you must purchase proper activations.

Table 20 - OWS Automation System Software and License

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual image template</td>
<td>9528-OWSVTENM</td>
</tr>
<tr>
<td></td>
<td>USB device contains a virtual image template that has pre-installed all applications that are required on the OWS.</td>
</tr>
<tr>
<td>Rockwell Automation software license</td>
<td>For each OWS: (1) (2)</td>
</tr>
<tr>
<td></td>
<td>9701x-VWSDRTTy</td>
</tr>
</tbody>
</table>

(1) Where: x = M (perpetual use license) or C (subscription license)
(2) Where: y = 1 (8x5 support); y = 2 (24x7 support)
## Operator Workstation Application Servers (AppServ-OWS)

The AppServ-OWS uses Microsoft Remote Desktop Services (RDS) technology to serve multiple instances of the OWS as thin clients from one server. Thin clients can run applications and process data on a remote computer to minimize the amount of information on a network. The AppServ-OWS is only configured to run FactoryTalk View SE clients and the recommended limit is 10 clients per application server.

### Table 21 - AppServ-OWS Virtual Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Required:</td>
</tr>
<tr>
<td></td>
<td>• 8 vCPU</td>
</tr>
<tr>
<td></td>
<td>• 16 GB vRAM min</td>
</tr>
<tr>
<td></td>
<td>• 60 GB vHardDisk</td>
</tr>
<tr>
<td></td>
<td>Recommended CPU and memory allocation:</td>
</tr>
<tr>
<td></td>
<td>• High priority Resource pool</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Thin client</td>
<td>We recommend a maximum of 10 FactoryTalk View SE clients per application server.</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

Whether you deploy an AppServ-OWS system element in a traditional or virtual architecture, you must purchase the proper activations.

### Table 22 - AppServ-OWS Automation System Software and License

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual image template</td>
<td>• 9528-APPXWSENM</td>
</tr>
<tr>
<td></td>
<td>USB device contains a virtual template for the AppServ-OWS.</td>
</tr>
<tr>
<td>Rockwell Automation software license</td>
<td>Purchase a license for each client that the AppServ-OWS servers:&lt;sup&gt;(1)&lt;/sup&gt; (2)</td>
</tr>
<tr>
<td>IMPORTANT: The identified set of Rockwell Automation licenses must be purchased for each client that is connected to the AppServ-OWS.</td>
<td>• 9701x-VWSDRT&lt;sup&gt;y&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> Where: x = M (perpetual use license) or C (subscription license)

<sup>(2)</sup> Where: y = 1 (8x5 support), y = 2 (24x7 support)

### ThinManager Server Options

The AppServ-OWS system element virtual-image template is pre-configured with Remote Desktop Services (RDS). The AppServ-OWS includes the ThinManager Server installation file. You can configure the AppServ-OWS as your ThinManager Server and deploy up to 10 OWS sessions to simplify the management of all devices and users.
ThinManager increases your productivity, visualization, mobility, and security from a centralized, and scalable management platform.

Safely and securely deliver your content to any combination of device, user, and location with the following features:

- Boost productivity by reducing the time that is spent in managing computers
- Enhance visualization by delivering your content to where you need it and the way you want it to be shown
- Extend security through encrypted communications, Active Directory, and secure thin clients
- Smart mobility where QR Codes, Bluetooth, Wi-Fi, and GPS make sure that devices receive content in authorized areas

For more information, see Thin Client Management Software.

**Independent Workstations (IndWS)**

The independent workstation (IndWS) combines the roles of the PASS, EWS, and OWS in one computer. This workstation can be used as a ‘shadow system’ for emergency purposes.

**Table 23 - IndWS Traditional Requirements**

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>The IndWS must be installed on workstation-class hardware. The following are sample specifications that are based on PlantPAx system characterization:</td>
</tr>
<tr>
<td></td>
<td>• Intel Multicore processor (4 cores or greater)</td>
</tr>
<tr>
<td></td>
<td>• 2.40 GHz CPU min</td>
</tr>
<tr>
<td></td>
<td>• 16 GB RAM min</td>
</tr>
<tr>
<td></td>
<td>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</td>
</tr>
<tr>
<td></td>
<td>There’s no virtual template for the IndWS.</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows 10 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>
If you deploy an IndWS system element, you must purchase the proper activations.

**Table 24 - IndWS Automation System Software and Licenses**

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
<th>(1) Where: x = M (perpetual use license) or C (subscription license)</th>
<th>(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockwell Automation software licenses</td>
<td>One per IndWS if being used as EWS:</td>
<td>• 9324x-RLDT3y (Studio 5000 Professional Edition Design Environment Software)</td>
<td>Select one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ~ 9701x-VWSTNB0L14y (FactoryTalk View SE Station Bundle: Unlimited Displays)</td>
</tr>
</tbody>
</table>

**Information Management Application Servers (AppServ-Info)**

Information management application servers (AppServ-Info) represent a broad category of servers and software that provides value to the PlantPAx system by offering data management and decision support functionalities. Except where specifically noted, all options that are listed must be installed on their own servers to maximize performance.

**Table 25 - Data Management Options**

| Category      | Requirement                      | Option                                                                 | |
|---------------|----------------------------------|----------------------------------------------------------------------|
| Time series   | High-speed, on-machine data collection | Information Management server is optional because you can use an embedded historian module for the ControlLogix chassis (FactoryTalk Historian ME). If the FactoryTalk Historian ME module is collecting 2500 points per second, the duration of history that is stored is approximately 14 hours. |
|               | < 2500 tags                       | • 1756-HIST2G (2 GB)                                                 |
|               | Longer term data storage         | An Information Management server is required with FactoryTalk Historian SE software. |
|               | > 2500 tags                       |                                                                      |
| Event based   | Relational database              | An additional AppServ-Info server can be considered for the storage of transactional data. You can select a Microsoft SQL server database to act as the central collection point for event-based data: |
|               |                                  | • FactoryTalk Alarm and Event data                                  |
|               |                                  | • FactoryTalk Batch data                                            |
|               |                                  | This database can be installed on an Information Management server or another server on your system. |

Additional tools to support your information management strategies include:

**Table 26 - Decision Support Options**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk Historian ProcessBook software</td>
<td>An Information Management server is required to enable ProcessBook content (standard ProcessBook displays, SQC view, batch view, alarm view). The content is to be hosted and displayed from within FactoryTalk View SE by using the ProcessBook Runtime.</td>
</tr>
</tbody>
</table>
AppServ-Info (Historian)

One of the ways to configure the AppServ-Info is as a historian to collect data. Follow these guidelines if you’re adding a Historian server to your PlantPAx system.

Table 27 - AppServ-Info (Historian) Virtual Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Required:</td>
</tr>
<tr>
<td></td>
<td>• 2 vCPU</td>
</tr>
<tr>
<td></td>
<td>• 4 GB vRAM min</td>
</tr>
<tr>
<td></td>
<td>• 320 GB vHardDisk</td>
</tr>
<tr>
<td></td>
<td><strong>Recommended CPU and memory allocation:</strong></td>
</tr>
<tr>
<td></td>
<td>• Normal priority Resource pool</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

Table 28 - AppServ-Info (Historian) Traditional Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>The Information Management server must be installed on server-class hardware:</td>
</tr>
<tr>
<td></td>
<td>• Intel Xeon Multicore processor (4 cores or greater)</td>
</tr>
<tr>
<td></td>
<td>• 2.40 GHz CPU min</td>
</tr>
<tr>
<td></td>
<td>• 4 GB RAM min</td>
</tr>
<tr>
<td></td>
<td>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

Whether you deploy a Historian system element in a traditional or virtual architecture, you must purchase the proper activations.

Table 29 - FactoryTalk Historian Software and Licenses

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.(1)(2)(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual image template</td>
<td>9528-APPHISENM</td>
</tr>
<tr>
<td>USB device contains a virtual template for the AppServ-Info (Historian).</td>
<td></td>
</tr>
<tr>
<td>Rockwell Automation software license</td>
<td>Select one of the licenses:</td>
</tr>
<tr>
<td></td>
<td>• 9518x-HSTT1y (FactoryTalk Historian SE - 1,000 tags)</td>
</tr>
<tr>
<td></td>
<td>• 9518x-HST5KT1y4 (FactoryTalk Historian SE - 5,000 tags)</td>
</tr>
<tr>
<td></td>
<td>• 9518x-HST5KT153y (FactoryTalk Historian SE - 10,000 tags)</td>
</tr>
<tr>
<td></td>
<td>• 9518x-HST20KT1y6 (FactoryTalk Historian SE - 20,000 tags)</td>
</tr>
<tr>
<td></td>
<td>• 9518x-HST5KT17y (FactoryTalk Historian SE - 50,000 tags)</td>
</tr>
<tr>
<td><strong>Note:</strong> order these in quantities to meet your need not to exceed a total of 60,000 tags.</td>
<td></td>
</tr>
<tr>
<td>FactoryTalk Historian Vision Client</td>
<td>Select for each client that is using FactoryTalk Historian Vision Client:</td>
</tr>
<tr>
<td></td>
<td>• 9518x-HISTR74y (FactoryTalk Historian Vision Client - Single User)</td>
</tr>
<tr>
<td>Excel® Add-in</td>
<td>9518x-HISTR3y (Historian SE, DataLink Client, 5 Users)</td>
</tr>
</tbody>
</table>

(1) If you plan to use redundant Historian for high availability, you must license an equivalent number of tags for the redundant Historian.

(2) Where: x = M (perpetual use license) or C (subscription license)

(3) Where: y = 1 (8x5 support), y = 2 (24x7 support)
AppServ-Info (SQL)

Another way to configure AppServ-Info is as a Microsoft SQL Server relational database. Software such as FactoryTalk AssetCentre, and FactoryTalk Batch use a SQL Server database to store and access process data. The FactoryTalk Alarm and Event server uses a SQL Server database to store information.

The process library includes standard reports that support basic and advanced alarm and event reports along with per process object reporting.

Table 30 - AppServ-Info (SQL) Virtual Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Required:</td>
</tr>
<tr>
<td></td>
<td>• 2 vCPU</td>
</tr>
<tr>
<td></td>
<td>• 4 GB vRAM min</td>
</tr>
<tr>
<td></td>
<td>• 120 GB vHardDisk</td>
</tr>
<tr>
<td></td>
<td>Recommended CPU and memory allocation:</td>
</tr>
<tr>
<td></td>
<td>• Normal priority Resource pool</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

Table 31 - AppServ-Info (SQL) Traditional Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>The Information Management server must be installed on server-class hardware:</td>
</tr>
<tr>
<td></td>
<td>• Intel Xeon Multicore processor (4 cores or greater)</td>
</tr>
<tr>
<td></td>
<td>• 2.40 GHz CPU min</td>
</tr>
<tr>
<td></td>
<td>• 4 GB RAM min</td>
</tr>
<tr>
<td></td>
<td>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Microsoft SQL Server</td>
</tr>
<tr>
<td></td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

Microsoft SQL Server is licensed in one of two ways: Server + CAL or Per Core. ‘CAL’ is an abbreviation for client access license. Server+CAL licensing is recommended for fewer clients. Every additional client requires a CAL license. Per Core licensing provides unlimited number of CALs.

Whether you deploy a Microsoft SQL Server system element in a traditional or virtual architecture, you must purchase the proper licensing. The End User is responsible for acquiring the appropriate Microsoft SQL Server licensing.

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual image template</td>
<td>• 9528-APPSQLENM</td>
</tr>
<tr>
<td></td>
<td>USB device contains a virtual template for the AppServ-Info (SQL).</td>
</tr>
</tbody>
</table>

Asset Management Servers (AppServ-Asset)

An asset management server (AppServ-Asset) is an extension to the PlantPAx system that adds maintenance and plant operations to the system with FactoryTalk AssetCentre software. This server provides controller data backup for disaster recovery, diagnostics, and real-time monitoring. The server also audits assets and monitors network health to improve overall resource availability.
The asset management server provides centralized system management for Rockwell Automation and third-party field assets.

Table 32 - AppServ-Asset Virtual Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Required:</td>
</tr>
<tr>
<td></td>
<td>• 2 vCPU</td>
</tr>
<tr>
<td></td>
<td>• 4 GB vRAM min</td>
</tr>
<tr>
<td></td>
<td>• 60 GB vHardDisk</td>
</tr>
<tr>
<td></td>
<td>Recommended CPU and memory allocation:</td>
</tr>
<tr>
<td></td>
<td>• Normal priority Resource pool</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

Table 33 - AppServ-Asset Traditional Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>The Asset Management server must be installed on server-class hardware:</td>
</tr>
<tr>
<td></td>
<td>• Intel Xeon Multicore processor (4 cores or greater)</td>
</tr>
<tr>
<td></td>
<td>• 2 40 GHz CPU min</td>
</tr>
<tr>
<td></td>
<td>• 4 GB RAM min</td>
</tr>
<tr>
<td></td>
<td>• Ethernet card that supports redundant media if NIC-teaming is used (if you plan to use a motherboard-NIC make sure that it supports redundant media)</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

Table 34 - AppServ-Asset Software and Licenses

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.(1) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual image template</td>
<td>• 9528-APPASMEM</td>
</tr>
<tr>
<td></td>
<td>USB device contains a virtual template for the AppServ-Asset.</td>
</tr>
<tr>
<td>Rockwell Automation software license</td>
<td>• 9515x-FTACT2y (FactoryTalk AssetCentre Base)</td>
</tr>
<tr>
<td></td>
<td>A license for AssetCentre Base isn't required when the system included a PASS licensed using a SystemID bundle as it is already included.</td>
</tr>
<tr>
<td>Asset licenses</td>
<td>Select one or more of the following so that the sum of licenses is equal to or greater than the number of assets that is to be managed by the Asset Management server:</td>
</tr>
<tr>
<td></td>
<td>• 9515x-FTACRT9y (FactoryTalk AssetCentre 25 Assets)</td>
</tr>
<tr>
<td></td>
<td>• 9515x-FTACRT1y (FactoryTalk AssetCentre 100 Assets)</td>
</tr>
<tr>
<td>Virtual server disaster recovery licenses</td>
<td>If disaster recovery is to be used, select from the following:</td>
</tr>
<tr>
<td></td>
<td>• 9515x-FTACRTD10y (Disaster recovery for Rockwell Automation)</td>
</tr>
<tr>
<td></td>
<td>• 9515x-FTACRTD2y (Disaster recovery for remote computers)</td>
</tr>
</tbody>
</table>

(1) Where: x = M (perpetual use license) or C (subscription license)
(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)
(3) The server license, included with the System ID bundle, includes 10 assets.

Whether you deploy an AppServ-Asset system element in a traditional or virtual architecture, you must purchase the proper activations.
Batch Management Servers (AppServ-Batch)

PlantPAx systems support scalable options for batch management that are based on ISA88 standards:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Logix Batch &amp; Sequence Manager</th>
<th>SequenceManager™</th>
<th>FactoryTalk® Batch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment</td>
<td>Logix controller code</td>
<td>Firmware-based controller feature</td>
<td>Server-based application (AppServ-Batch)</td>
</tr>
<tr>
<td>Supported controllers</td>
<td>ControlLogix 5580&lt;br&gt;CompactLogix 5380&lt;br&gt;ControlLogix 5570&lt;br&gt;CompactLogix 5370</td>
<td>ControlLogix 5570&lt;br&gt;CompactLogix 5370</td>
<td>ControlLogix 5580&lt;br&gt;CompactLogix 5380&lt;br&gt;ControlLogix 5570&lt;br&gt;CompactLogix 5370</td>
</tr>
<tr>
<td>Units</td>
<td>Single unit recipes</td>
<td>Single unit recipes</td>
<td>Multiple unit recipes</td>
</tr>
<tr>
<td>Phase construction</td>
<td>PhaseManager™ programs</td>
<td>PhaseManager programs</td>
<td>PhaseManager programs</td>
</tr>
<tr>
<td>Phase interface</td>
<td>Phase and bit logic</td>
<td>Pull-down menu</td>
<td>Pull-down menu</td>
</tr>
<tr>
<td>Max recipes/loops/sequences</td>
<td>32</td>
<td>Limited by memory or resources</td>
<td>Limited by memory or resources</td>
</tr>
<tr>
<td>Max input/report parameters</td>
<td>4</td>
<td>No max</td>
<td>No max</td>
</tr>
<tr>
<td>Parameter expressions</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Parameter data types</td>
<td>BOOL REAL</td>
<td>BOOL INT, INT, DINT REAL</td>
<td>BOOL INT, INT, DINT REAL</td>
</tr>
<tr>
<td>Procedural structure</td>
<td>Sequential Concurrent</td>
<td>Sequential Concurrent Divergent Recurrent</td>
<td>Sequential Concurrent Divergent Recurrent</td>
</tr>
<tr>
<td>Recipe design</td>
<td>Tabular HMI configured</td>
<td>SFC like</td>
<td>SFC like</td>
</tr>
<tr>
<td>Recipe editing</td>
<td>Runtime via HMI</td>
<td>Import only at runtime</td>
<td>Runtime editing via Recipe Editor</td>
</tr>
<tr>
<td>HMI integration</td>
<td>Faceplates</td>
<td>3 Active X</td>
<td>4 Active X API</td>
</tr>
<tr>
<td>Batch reporting</td>
<td>Queue controller services</td>
<td>Event client and archive services</td>
<td>Event client and archive services</td>
</tr>
<tr>
<td>FactoryTalk Batch integration</td>
<td>No</td>
<td>Yes</td>
<td>Na</td>
</tr>
<tr>
<td>Dynamic unit binding</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Unit arbitration</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The batch management server (AppServ-Batch) offers equipment-independent recipe management, batch-independent equipment control, and regulatory compliance.

Table 35 - AppServ-Batch Virtual Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement(1)</th>
</tr>
</thead>
</table>
| Hardware | Required:  
• 2 vCPU  
• 4 GB vRAM min  
• 60 GB vHDDisk  
Recommended CPU and memory allocation:  
• Normal priority Resource pool |
| Operating system | Windows Server 2019 operating system, 64 bit |
| Additional third-party software | Antivirus software |

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.
Whether you deploy an AppServ-Batch in a traditional or virtual architecture, you must purchase the proper activations.

Batch high availability options depend on the hardware and software options in the system:

- For the application server in a system where a bump in the process cannot be tolerated, FactoryTalk Batch software helps support a real-time, uninterrupted high availability option. This option leverages Stratus servers or VMware virtualization.
- Standard FactoryTalk Batch software supports a warm back-up option that allows a Batch server to start up and rebuild the active batches from the Event Journals and Logs and places them on the batch list in a held state.
- A redundant ControlLogix system with PhaseManager software provides protection so that the control platform continues to execute during a hardware failure.

### Table 36 - AppServ-Batch Traditional Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>The Batch Management server must be installed on server-class hardware:</td>
</tr>
<tr>
<td></td>
<td>- Intel Xeon Multicore processor (4 cores or greater)</td>
</tr>
<tr>
<td></td>
<td>- 2.40 GHz CPU min</td>
</tr>
<tr>
<td></td>
<td>- 4 GB RAM min</td>
</tr>
<tr>
<td></td>
<td>- Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure that it supports redundant media)</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

### Table 37 - AppServ-Batch Software and Licenses

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual image template</td>
<td>9528-APPSATENM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>USB device contains a virtual template for the AppServ-Batch.</td>
<td></td>
</tr>
<tr>
<td>Batch unit software licenses</td>
<td>Purchase multiple licenses to obtain the desired number of batch units.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBT1y (FactoryTalk Batch Server – 1 Unit)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBT5y (FactoryTalk Batch Server – 3 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBT12y (FactoryTalk Batch Server – 10 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBT16y (FactoryTalk Batch Server – 30 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBT13y (FactoryTalk Batch Server – 60 Units)</td>
<td></td>
</tr>
<tr>
<td>Batch backup software licenses</td>
<td>If a back-up server is required, obtain the equivalent number of units of back-up keys.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBR1y (FactoryTalk Batch Back-up Key – 1 Unit)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBR5y (FactoryTalk Batch Back-up Key – 3 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBR12y (FactoryTalk Batch Back-up Key – 10 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBR16y (FactoryTalk Batch Back-up Key – 30 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBR13y (FactoryTalk Batch Back-up Key – 60 Units)</td>
<td></td>
</tr>
<tr>
<td>eProcedure® software licenses</td>
<td>eProcedure is included with Batch licenses that are listed. These catalog numbers are to order software separately.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBEPT1y (FactoryTalk Batch eProcedure– 3 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBEPT2y (FactoryTalk Batch eProcedure– 10 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBEPT3y (FactoryTalk Batch eProcedure– 30 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBEPT4y (FactoryTalk Batch eProcedure– 60 Units)</td>
<td></td>
</tr>
<tr>
<td>eProcedure backup software licenses</td>
<td>eProcedure is included with Batch licenses that are listed. These catalog numbers are to order software separately.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBEPT1y (FactoryTalk Batch eProcedure Back-up Key – 3 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBEPT2y (FactoryTalk Batch eProcedure Back-up Key – 10 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBEPT3y (FactoryTalk Batch eProcedure Back-up Key – 30 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBEPT4y (FactoryTalk Batch eProcedure Back-up Key – 60 Units)</td>
<td></td>
</tr>
<tr>
<td>Batch View Clients</td>
<td>Each license enables one concurrent user to access FactoryTalk Batch from a remote browser.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 9358x-FTBT4y (FactoryTalk Batch View Standard)</td>
<td></td>
</tr>
</tbody>
</table>

(1) Where: x = M (perpetual use license) or C (subscription license)

(2) Where: y = 1 (8x5 support), y = 2 (24x7 support)
Domain Controllers

PlantPAx uses a domain controller to store user account information, authenticate users, and enforce security policies. Follow these guidelines for the domain controller:

- A domain controller is required if there are 10 or more workstations or servers.
- A domain controller is a separate computer. Do not load any application software on a domain controller. Load all system application software on the other computers, such as the PASS, application server, OWS, and EWS.
- The domain controller must be local to the system workstations and servers (within the local firewall) and not remote to the system.

### Table 38 - Domain Virtual Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>Required:</td>
</tr>
<tr>
<td></td>
<td>• 1 vCPU</td>
</tr>
<tr>
<td></td>
<td>• 4 GB VRAM min</td>
</tr>
<tr>
<td></td>
<td>• 40 GB vHardDisk</td>
</tr>
<tr>
<td></td>
<td>Recommended CPU and memory allocation:</td>
</tr>
<tr>
<td></td>
<td>• Low-priority Resource pool</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

(1) All numbers and figures are referenced for initial sizing only. If needed, adjust these values for system performance.

### Table 39 - Domain Traditional Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>The Information Management server must be installed on server-class hardware:</td>
</tr>
<tr>
<td></td>
<td>• Intel Xeon Multicore processor (4 cores or greater)</td>
</tr>
<tr>
<td></td>
<td>• 2.40 GHz CPU min</td>
</tr>
<tr>
<td></td>
<td>• 4 GB RAM min</td>
</tr>
<tr>
<td></td>
<td>• Ethernet card that supports redundant media if NIC-teaming is used (If you plan to use a motherboard-NIC make sure it supports redundant media)</td>
</tr>
<tr>
<td>Operating system</td>
<td>Windows Server 2019 operating system, 64 bit</td>
</tr>
<tr>
<td>Additional third-party software</td>
<td>Antivirus software</td>
</tr>
</tbody>
</table>

### Table 40 - Domain Software

<table>
<thead>
<tr>
<th>Category</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual image template</td>
<td>• 9528-PADCVTENM</td>
</tr>
<tr>
<td></td>
<td>USB device contains a virtual template for the AppServ-Asset.</td>
</tr>
</tbody>
</table>
The optimal number of controllers for the PlantPAx system depends on the size of your application, physical layout of your plant, and the design of your process. Consider segregating non-related process equipment into separate controllers so that maintenance activities in one area do not impact the operation of another area.

PlantPAx system release 5.0 adds process controllers to the Logix 5000® family of controllers. The process controller is an extension of the Logix 5000 controller family that focuses on plant-wide process control. The process controller is preconfigured with a default process tasking model and dedicated PlantPAx process instructions that are optimized for process applications to improve design and deployment efforts.

Regardless of which type of controller that you use, controllers are capacity limited. This capacity can be roughly estimated based on I/O count, but is also greatly impacted by the design of your application. These limitations can include the amount of automation code that is required, the amount of information being read by supervisory applications, and the number of alarms configured in your system.

### Table 41 - Process and Standard Controller Hardware

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Ethernet interfaces (ControlLogix)</td>
<td>For direct PRP connection: 1756-EN4TR, 1756-EN2TP</td>
</tr>
<tr>
<td></td>
<td>For direct DLR connection: 1756-EN4TR, 1756-EN2TR</td>
</tr>
<tr>
<td></td>
<td>For secure connections: 1756-EN2TSC</td>
</tr>
</tbody>
</table>

### Simplex Controllers

Non-redundant controllers are referred to as simplex controllers.

### Table 42 - Simplex - Process Controllers

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User memory</td>
<td>3 MB</td>
<td>10 MB</td>
<td>40 MB</td>
</tr>
<tr>
<td>PID loop control strategies @ 100 ms max</td>
<td>185</td>
<td>570</td>
<td>1425</td>
</tr>
<tr>
<td>PID loop control strategies @ 250 ms max</td>
<td>625</td>
<td></td>
<td>2000</td>
</tr>
<tr>
<td>PID loop control strategies @ 500 ms max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID loop control strategies @ 1000 ms max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tags/sec delivered to data server max</td>
<td>50,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logix tag based alarms max</td>
<td>7500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAx System Estimator included in the Integrated Architecture Builder software.
Table 43 - Simplex - Standard Controllers

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User memory</td>
<td>2 MB</td>
<td>4 MB</td>
<td>8 MB</td>
<td>16 MB</td>
<td>32 MB</td>
<td>3 MB</td>
<td>5 MB</td>
<td>10 MB</td>
<td>20 MB</td>
<td>40 MB</td>
</tr>
<tr>
<td>PID loop control strategies @ 100 ms max</td>
<td>85</td>
<td>380</td>
<td>175</td>
<td>215</td>
<td>430</td>
<td>360</td>
<td>75</td>
<td>500</td>
<td>910</td>
<td>1250</td>
</tr>
<tr>
<td>PID loop control strategies @ 250 ms max</td>
<td>235</td>
<td>235</td>
<td>425</td>
<td>425</td>
<td>860</td>
<td>860</td>
<td>860</td>
<td>1250</td>
<td>1875</td>
<td>2000</td>
</tr>
<tr>
<td>PID loop control strategies @ 500 ms max</td>
<td>10,000</td>
<td>10,000</td>
<td>20,000</td>
<td>20,000</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
<td>50,000</td>
<td>100,000</td>
<td>100,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 MB</td>
<td>10 MB</td>
<td>40 MB</td>
<td>325</td>
<td>325</td>
</tr>
<tr>
<td></td>
<td>190</td>
<td>325</td>
<td>325</td>
<td>625</td>
<td>850</td>
</tr>
<tr>
<td></td>
<td>1300</td>
<td>1300</td>
<td>1300</td>
<td>3000</td>
<td>3000</td>
</tr>
</tbody>
</table>

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAx System Estimator included in the Integrated Architecture Builder software.

Redundant Controllers

ControlLogix controllers support redundancy on EtherNet/IP networks. For a PlantPAx system, you need these components:

Table 44 - Redundant Process and Standard Controller Hardware

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard redundant controllers</td>
<td>• ControlLogix 1756-L73, 1756-L74, 1756-L75(1)</td>
</tr>
<tr>
<td></td>
<td>• ControlLogix 1756-L81E, 1756-L82E, 1756-L83E, 1756-L84E, 1756-L85E</td>
</tr>
<tr>
<td>Redundancy module</td>
<td>1756-RM2(2)</td>
</tr>
<tr>
<td>Standard Ethernet interfaces</td>
<td>• For direct PRP connection: 1756-EN4TR, 1756-EN2TP</td>
</tr>
<tr>
<td></td>
<td>• For direct DLR connection: 1756-EN4TR, 1756-EN2TR</td>
</tr>
<tr>
<td></td>
<td>PlantPAx recommends a dedicated Ethernet module for Supervisory communications (Non-Swapping IP addresses) and one or more Ethernet modules for I/O / MCC communications (Swapping IP addresses). For more information, see the ControlLogix 5580 Redundant Controller user manual, publication 1756-UM015.</td>
</tr>
</tbody>
</table>

(1) ControlLogix 1756-L71 and 1756-L72 controllers are not recommended for PlantPAx systems due to memory constraints.
(2) The PlantPAx system recommendation is to use only one redundant controller in a chassis with a 1756-RM2 redundancy module.

Table 45 - Redundant - Process Controllers

<table>
<thead>
<tr>
<th>Category(1)</th>
<th>1756-L81E</th>
<th>1756-L83E</th>
<th>1756-L85E</th>
</tr>
</thead>
<tbody>
<tr>
<td>User memory</td>
<td>3 MB</td>
<td>10 MB</td>
<td>40 MB</td>
</tr>
<tr>
<td>PID loop control strategies @ 100 ms max</td>
<td>125</td>
<td>325</td>
<td>325</td>
</tr>
<tr>
<td>PID loop control strategies @ 250 ms max</td>
<td>190</td>
<td>625</td>
<td>850</td>
</tr>
<tr>
<td>PID loop control strategies @ 500 ms max</td>
<td>625</td>
<td>850</td>
<td>1300</td>
</tr>
<tr>
<td>PID loop control strategies @ 1000 ms max</td>
<td>50,000</td>
<td>100,000</td>
<td>100,000</td>
</tr>
<tr>
<td>Logix alarms max</td>
<td>7500</td>
<td>7500</td>
<td>7500</td>
</tr>
</tbody>
</table>

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAx System Estimator included in the Integrated Architecture Builder software.
Controllers for Skid-based Equipment

The CompactLogix controller platform offers a solution for skid-based equipment to be part of the overall PlantPAx system if the application requires the following:

- Control of multiple loops for temperature, pressure, flow, or level
- Operating as a subsystem with sequencing and automation
- Controlled as part of the overall process, accepting reference inputs and delivering process variables to a supervisory controller

### Table 46 - Redundant - Standard Controllers

<table>
<thead>
<tr>
<th>Category(1)</th>
<th>1756-L73</th>
<th>1756-L74</th>
<th>1756-L75</th>
<th>1756-L81E</th>
<th>1756-L82E</th>
<th>1756-L83E</th>
<th>1756-L84E</th>
<th>1756-L85E</th>
</tr>
</thead>
<tbody>
<tr>
<td>User memory</td>
<td>8 MB</td>
<td>16 MB</td>
<td>32 MB</td>
<td>3 MB</td>
<td>5 MB</td>
<td>10 MB</td>
<td>20 MB</td>
<td>40 MB</td>
</tr>
<tr>
<td>PID loop control strategies @ 100 ms max</td>
<td>40</td>
<td></td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID loop control strategies @ 250 ms max</td>
<td>100</td>
<td>155</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID loop control strategies @ 500 ms max</td>
<td>150</td>
<td>195</td>
<td>240</td>
<td>315</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID loop control strategies @ 1000 ms max</td>
<td>315</td>
<td>400</td>
<td>430</td>
<td>625</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tags/sec delivered to data server max</td>
<td>10,000</td>
<td>20,000</td>
<td>50,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAx System Estimator included in the Integrated Architecture Builder software.

### Table 47 - Skid-based Controllers

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>User memory</td>
<td>0.75 MB</td>
<td>2 MB</td>
<td>3 MB</td>
<td>4 MB</td>
<td>5 MB</td>
<td>2 MB</td>
</tr>
<tr>
<td>PID Loop Control Strategies @ 100 ms max</td>
<td>12</td>
<td>35</td>
<td>50</td>
<td>65</td>
<td>80</td>
<td>125</td>
</tr>
<tr>
<td>PID Loop Control Strategies @ 250 ms max</td>
<td></td>
<td></td>
<td></td>
<td>65</td>
<td>80</td>
<td>250</td>
</tr>
<tr>
<td>PID Loop Control Strategies @ 500 ms max</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID Loop Control Strategies @ 1000 ms max</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tags/sec delivered to data server max</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3000</td>
<td>50,000</td>
</tr>
<tr>
<td>Logix alarms max</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7500</td>
</tr>
</tbody>
</table>

(1) These values are recommended maximum limits and are not intended for detailed system design or proposals. Limits can vary depending on the overall design of a system. For more detailed sizing, please use the PlantPAx System Estimator included in the Integrated Architecture Builder software.

Process Controller Emulation

FactoryTalk Logix Echo (FTLE) is a controller emulation software platform that emulates ControlLogix 5580 controllers. The platform also provides workflows designed to make emulation and program testing more accessible and flexible.

FactoryTalk Logix Echo is available as a subscription, available on the Rockwell Automation Software Portal. The license is a single node license.
## I/O Products

Field networks and I/O components connect process instrumentation and field devices to the PlantPAx system for real-time data acquisition and control. The PlantPAx system supports several families of I/O.

### Table 48 - I/O Communication Interfaces

| Chassis-based I/O modules | 1756 ControlLogix I/O | • 1756-EN2T, 1756-EN2TP, 1756-EN2TR, 1756-EN3TR, 1756-EN2F, 1756-EN2TXT, 1756-EN2TSC
For more information, see the ControlLogix System Selection Guide, publication 1756-SG001. |
| 5069 Compact 5000™ I/O | • 5069-AENTR dual-port EtherNet/IP adapter
• 5069-AENTRK dual-port EtherNet/IP adapter, conformal coated
• 5069-AEN2TR dual-port EtherNet/IP adapter with display diagnostics, integrated USB port, and SD card
For more information, see Compact 5000 I/O Modules and EtherNet/IP Adapters Specifications Technical Data, publication 5069-TD001. |
| 1769 Compact I/O™ | • 1769-AENTR
For more information, see the CompactLogix Communication Modules Specifications Technical Data, publication 1769-TD001. |
| Distributed I/O, low-channel density | 1734 POINT I/O™ | • 1734-AENT, 1734-AENTR EtherNet/IP adapters
• 1734-ADN, 1734-ADNX, 1734-PDN DeviceNet® adapters
For more information, see the POINT I/O Modules Selection Guide, publication 1734-SG001. |
| Distributed I/O, high-channel density | 5094 FLEX 5000™ I/O | • 5094-AENTR, 5094-AENTRX
• 5094-AEN2TR, 5094-AEN2TRXT
• 5094-AENSFPR, 5094-AENSFPRXT
• 5094-AENSFPR2, 5094-AENSFPRXT2
For more information, see the FLEX 5000 Modules Specifications Technical Data, see publication 5094-TD001. |
| Distributed I/O, no cabinet enclosure | 1738 ArmorPOINT® I/O | • 1738-AENT, 1738-AENTR, 1738-AENTRX EtherNet/IP adapters
• 1738-ADN, 1738-ADNX DeviceNet adapters
For more information, see the ArmorPoint I/O Selection Guide, publication 1738-SG001. |
| Condition monitoring module | 1444 Dynamix™ I/O | Built-in Ethernet connectivity with 1444-DYN04-01RA module
For more information, see the Dynamix -1444 Series Monitoring System User Manual, publication 1444-UM001. |
| Redundant I/O | 5015 FLEXHA 5000™ I/O(1) | 5015-AENTRX Redundant EtherNet/IP adapter.
For more information, see the FLEXHA 5000 I/O System Specifications Technical Data, publication 5015-TD001. |
| 1715 Redundant I/O | 1715-AENTR Redundant EtherNet/IP adapter
For more information, see the 1715 Redundant I/O System Specifications Technical Data, publication 1715-TD001. |
| Intrinsically Safe I/O | 1719 Class 1, Div 2 I/O | 1719-AENTR Intrinsically safe EtherNet/IP adapter
For more information, see the 1719 Ex I/O Technical Data, publication 1719-TD001. |

(1) Review the FLEXHA 5000 product documentation for limitations on the early release of this product.
<table>
<thead>
<tr>
<th>Module Type and Connection Method</th>
<th>In Local Chassis</th>
<th>Remote via an EtherNet/IP Network</th>
<th>Remote via a ControlNet® Network</th>
<th>Configure Hold Last Output State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Offline</td>
<td>Runtime</td>
<td>Offline</td>
<td>Runtime</td>
</tr>
<tr>
<td>Digital - direct</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Digital - rack-optimized</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Analog - direct</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Generic third-party - direct</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1715 Redundant I/O</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1718/1719 I/O</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1756-ENx - no connection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1756-ENx - rack-optimized</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Generic EtherNet/IP third-party - direct</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1788-ENZFFR or 1788-ENZPAR</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1788-CNZFFR or 1788-CNZPAR</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>No</td>
</tr>
<tr>
<td>1794 FLEX I/O</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>1734 POINT I/O</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>1734 POINT Guard I/O®</td>
<td>Yes</td>
<td>—</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>5069 Compact 5000 I/O</td>
<td>Yes</td>
<td>—</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>5069 Compact 5000 I/O Safety Modules</td>
<td>Yes</td>
<td>—</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>5094 FLEX 5000</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5094 FLEX 5000 I/O Safety Modules</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>5015 FLEXHA 5000 I/O</td>
<td>—</td>
<td>—</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(1) Only supported if adding an entire rack of Compact 5000 I/O modules.
**Concurrent Communication**

Concurrent communication provides for seamless failover for any redundant pair of hardware components.

With concurrent communication, data transmission between the ControlLogix 5580 controllers and the FLEXHA 5000 I/O modules can be completely redundant at the logical and physical levels.

Remember the following:

- Each 1756-EN4TR EtherNet communication module in the redundant chassis pair sends duplicated data on each LAN at the same time.
- Data with the similar designations, for example, 1A and 1A', are the same but from different controllers with the only difference being a small identifier. In this case, it is the prime (') designation.
- All data transmission starts at the same time. The duplicated data that reaches the adapters first is what’s used in the FLEXHA 5000 I/O system. The other data is disregarded.

**Logical Level**

Concurrent communication uses one logical CIP connection to transmit duplicate copies of I/O data to redundant devices. There is one I/O packet for each redundant device.

Via a 1756-EN4TR EtherNet/IP communication module, ControlLogix 5580 controllers operate in parallel and open the concurrent communication path to the FLEXHA 5000 I/O modules.

Each duplicate is targeted for one of the FLEXHA 5000 I/O modules in the redundant pair. The paired I/O modules receive duplicate data, compare the data, and establish one signal value that is set on the terminal screws.

A similar pattern is followed for input data that is transmitted from the paired FLEXHA 5000 I/O modules to the redundant ControlLogix 5580 controllers.
Physical Level

During transmission, the duplicated data passes along physical connections from the 1756-EN4TR EtherNet/IP communication modules and the FLEXHA 5000 EtherNet/IP adapter. Physical network redundancy is provided whether the system is operating in a PRP or DLR topology. Thus, the system has increased resiliency.

The physical network redundancy is achieved via redundant path between the 1756-EN4TR EtherNet/IP communication module and the FLEXHA 5000 EtherNet/IP adapter as follows:

- **PRP network** - Duplicated data at the physical level for each path.
- **DLR network** - Providing redundant paths.

Process Network Devices

PlantPAx leverages smart instrumentation to provide the right information to the right personnel at the right time. In a PlantPAx system, controllers are connected to field devices via field device components and communicate seamlessly through EtherNet/IP, DeviceNet, FOUNDATION Fieldbus, and PROFINET PA networks or by using HART protocol.

EtherNet/IP Devices

In a PlantPAx system, the EtherNet/IP™ network provides the communication backbone for the supervisory network for the workstations, servers, and the controllers. The EtherNet/IP network also supports controller downlinks and connections to remote I/O and field device interfaces.

The EtherNet/IP network technology is owned and managed by ODVA, a global association of member companies that advance open, interoperable information, and communication technologies in industrial automation.

Field instruments that support a direct connection to EtherNet/IP networks include the following:

- Endress+Hauser, Promass 83 and compact Promass 100 Coriolis flowmeters for liquid and gas flows
- Endress+Hauser, Promag 53 electromagnetic flowmeter for conductive liquids
- Endress+Hauser, Liquiline CM444 Multiparameter transmitter for monitoring and controlling processes
- Endress+Hauser, Proline Promag 100 Electromagnetic flowmeter for conductive liquids
- Endress+Hauser, Proline Promag L 400 Electromagnetic flowmeter for conductive liquids

Table 50 - EtherNet/IP Interface

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ControlLogix EtherNet/IP</td>
<td>1756-EN2T, 1756-EN2TP, 1756-EN2TR, 1756-EN3TR, 1756-EN4TR, 1756-EN2F</td>
<td>ControlLogix EtherNet/IP bridge</td>
</tr>
<tr>
<td>Time Synchronization</td>
<td>Aparian A-TSM/B</td>
<td>The Time Sync module provides Precision Time Protocol (PTP - Grand Master) and NTP Time services. This enables precision time synchronization for Logix Controllers and HMI systems. It can also provide GPS position data.</td>
</tr>
</tbody>
</table>
HART Devices

HART is an open communication protocol that is designed to connect analog devices to the controller and system.

The PlantPAx system interfaces with HART devices both directly and via remote I/O modules. The HART protocol creates one termination point to gather analog process variables and the additional HART digital data.

Highly-integrated HART provides a PlantPAx data type in the process controller for use with FLEX 5000 and FLEXHA 5000 modules:

- Configuration of devices within the I/O Configuration tree (no Add-On Instruction needed)
- Device diagnostics automatically propagate to the controller project

Table 51 - HART Interface

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
</table>
| Chassis-based I/O modules         | 1756-IF8H,1756-IF16H,1756-OF8H | Allen-Bradley® analog I/O with the following:  
  • 8-channel HART analog input module  
  • 16-channel HART analog input module  
  • 8-channel HART analog output module                                            |
|                                   | 1756-IF8H,1756-IF16H,1756-OF8H | Allen-Bradley isolated analog I/O with the following:  
  • 8-channel isolated HART analog input module  
  • 16-channel isolated HART analog input module  
  • 8-channel isolated HART analog output module                                      |
| Distributed I/O, high-channel density | 1794-IF8H,1794-OF8H | Allen-Bradley FLEX isolated analog I/O modules with the following:  
  • 8-channel isolated HART analog input module  
  • 8-channel isolated HART analog output module                                      |
|                                   | 1794-IF8H8HFXT           | Allen-Bradley FLEX I/O module with the following:  
  • Extended temperature, noise filtering 8-channel isolated HART analog input module |
|                                   | 5094-IF8H,5094-IF8HXT,5094-OF8H,5094-OF8HXT | Allen-Bradley HART I/O with the following:  
  • 8-channel isolated HART  
  • 8-channel isolated HART extreme temperature                                      |
| Distributed I/O, low-channel density | 1734sc-IE2CH,1734sc-IE4CH | Spectrum Controls, analog input module for the POINT I/O system  
  • 2-channel HART analog input module  
  • 4-channel HART analog output module                                              |
|                                   | 1734sc-IE2CH             | Spectrum Controls, isolated analog input module for the POINT I/O system  
  • 2-channel isolated HART analog output module                                      |
|                                   | 1769sc-IF4H,1769sc-OF4H  | Spectrum Controls, isolated analog Compact I/O modules with HART:  
  • 4-channel isolated HART analog input module  
  • 4-channel isolated HART analog output module  
  See the Encompass website for Spectrum Controls for product offerings.              |
| Distributed I/O, intrinsically safe | 1778-CF4H,1778-IF4HB,1778-CF4H,1778-IF4WB | Allen-Bradley EX I/O chassis-based design for Zone 2 or Class I, Div 2, via EtherNet/IP:  
  • 4-channel configurable HART analog module  
  • 4-channel HART analog input module  
  • 4-channel HART analog input-wide module                                           |
<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redundant I/O Modules</td>
<td>5015-UH11FTXT</td>
<td>Allen-Bradley redundant I/O with the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 8-channel Universal I/O module</td>
</tr>
<tr>
<td></td>
<td>1715-IF16</td>
<td>Allen-Bradley redundant I/O with the following:</td>
</tr>
<tr>
<td></td>
<td>1715-OF8I</td>
<td>• 16-channel HART analog input module</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 8-channel isolated HART analog output module</td>
</tr>
<tr>
<td>Wireless HART</td>
<td>SWA70</td>
<td>Endress+Hauser wireless HART:</td>
</tr>
<tr>
<td></td>
<td>SWG70</td>
<td>• WirelessHART adapter</td>
</tr>
<tr>
<td></td>
<td>RS54</td>
<td>• WirelessHART fieldgate</td>
</tr>
<tr>
<td></td>
<td>WHA-ADP</td>
<td>• Data manager</td>
</tr>
<tr>
<td></td>
<td>WHA-BLT</td>
<td>Pepperl+Fuchs wireless HART:</td>
</tr>
<tr>
<td></td>
<td>WHA-GW</td>
<td>• WirelessHART adapter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• WirelessHART bullet adapter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wireless HART gateway</td>
</tr>
</tbody>
</table>
FOUNDATION Fieldbus Devices

The FOUNDATION Fieldbus network is a protocol that is designed for robust, distributed process application control. Devices that are connected by a FOUNDATION Fieldbus network can be used for sophisticated process control with seamless data distribution from the H1 device-level network.

PlantPAx systems communicate with FOUNDATION Fieldbus devices through EtherNet/IP linking devices as shown in the examples. Other configurations are available for simplex and redundant topologies.

Table 52 - FOUNDATION Fieldbus Interface

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EtherNet/IP interface</td>
<td>1788-EN2FFR</td>
<td>Bridge from an Ethernet network to an H1 network. Supports redundant media and DLR-capable Ethernet network. Linking devices have built-in termination.</td>
</tr>
<tr>
<td>Power conditioning</td>
<td>1788-FBJB4R</td>
<td>Intelligent junction box supports redundancy, includes four drop ports and four trunk ports.</td>
</tr>
<tr>
<td>FOUNDATION Fieldbus network components</td>
<td>1788-FBJB6</td>
<td>Intelligent junction box with six drop ports and two trunk ports.</td>
</tr>
<tr>
<td>Additional components</td>
<td>Pepperl+Fuchs, FOUNDATION Fieldbus components, such as valve couplers, surge protectors, and distributors. See the Encompass website for Pepperl+Fuchs product offerings.</td>
<td></td>
</tr>
<tr>
<td>Segment protection</td>
<td>Helps protect against device or line faults with short- and open-circuit protection. Pepperl+Fuchs, intrinsic safety components, such as isolated barrier systems, hazardous area enclosures, and equipment. See the Encompass™ website for Pepperl+Fuchs product offerings.</td>
<td></td>
</tr>
</tbody>
</table>
PROFIBUS PA Devices

The PROFIBUS PA network connects automation systems and process control systems with field devices such as flow, level, pressure, and temperature transmitters.

PlantPAx systems communicate with PROFIBUS PA fieldbus devices through EtherNet/IP linking devices. Other configurations are available for simplex and redundant topologies.

Table 53 - PROFIBUS PA Interface

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROFIBUS interface</td>
<td>1788-EN2PAR</td>
<td>EtherNet/IP to PROFIBUS PA linking device. Supports redundant PROFIBUS PA media and DLT-capable Ethernet network. Linking devices have built-in terminators.</td>
</tr>
<tr>
<td></td>
<td>1788-FBJB4R</td>
<td>Intelligent junction box supports redundancy, includes four drop ports and four trunk ports.</td>
</tr>
<tr>
<td></td>
<td>1788-FBJB6</td>
<td>Intelligent junction box with six drop ports and two trunk ports.</td>
</tr>
<tr>
<td>Power conditioning</td>
<td>1788-CN2PAR</td>
<td>Included in the 1788-EN2PAR and 1788-CN2PAR linking devices.</td>
</tr>
<tr>
<td>PROFIBUS network components</td>
<td></td>
<td>Pepperl+Fuchs(1), PROFIBUS components, such as valve couplers, surge protectors, and distributors. See the Encompass website for Pepperl+Fuchs product offerings.</td>
</tr>
<tr>
<td>Additional components</td>
<td></td>
<td>Helps protect against device or line faults with short- and open-circuit protection. Pepperl+Fuchs, intrinsic safety components, such as isolated barrier systems, hazardous area enclosures, and equipment. See the Encompass website for Pepperl+Fuchs product offerings.</td>
</tr>
<tr>
<td>Segment protection</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) For more information on Encompass third-party products, see http://www.rockwellautomation.com/encompass.
**Motor Control Devices**

Rockwell Automation offers a broad range of motor control solutions to complement various application requirements. The portfolio of motor control devices includes simplified programming and configuration along with safety features to help protect personnel and assets that help to reduce downtime.

**Low Voltage Drives**

PowerFlex® Low Voltage AC drives provide scalable motor control solutions and are designed to deliver more powerful performance and flexibility for process applications. As part of a PlantPAx system, PowerFlex drives offer seamless integration into your process control system for simplified development, use, and maintenance.

### Table 54 - PowerFlex Drives and Communication Modules

<table>
<thead>
<tr>
<th>Drive Cat. No.</th>
<th>Description</th>
<th>Available Communication Modules</th>
<th>Description</th>
</tr>
</thead>
</table>

(1) For a complete list of catalog numbers, see the PowerFlex Low Voltage AC Drives Selection Guide, publication PFLEX-SG002.

### Medium Voltage Drives and Relays

PowerFlex medium voltage AC drives and relays provide scalable motor control solutions and electrical protection. Standalone drives control speed, torque, direction, starting, and stopping of standard asynchronous or synchronous AC motors. As part of a PlantPAx system, PowerFlex drives incorporate leading-edge technology, embedded communications, and significant commonality across multiple platforms, networks, operator interface programming and hardware. The benefits of this exceptional level of integration between the drives and Logix controllers provides distinctive time-saving features for the PowerFlex 6000 and 7000 drives.

### Table 55 - Medium Voltage Drives and Relays

<table>
<thead>
<tr>
<th>Drive Cat. No.</th>
<th>Description</th>
<th>Available Communication Modules</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF-6000G</td>
<td>PowerFlex 6000</td>
<td>13MLXE, 13MLXP, 13TMLXH, 13TMLXM, 13TMLXMP</td>
<td>EtherNet/IP, PROFIBUS RS-485, Modbus Communication Adapters</td>
</tr>
</tbody>
</table>
Soft Starters

SMC™ Soft Starters are designed to help minimize cost by reducing overall system power requirements and wear and tear on equipment. Our soft starters can be easily integrated into your process control system to offer higher productivity and shorter downtimes.

Across-the-line Starters

Our light industrial IEC starters are environmentally friendly, versatile, and flexible. Our heavy-duty NEMA starters are renowned for a more-rugged construction, more dependable performance, and longer electrical life. In addition, this portfolio offers Electronic Overload Relays that provide integration between the starters and Logix controllers. The diagnostic capabilities of the overload relays help maximize uptime for motor control in an automation system.

Table 55 - Medium Voltage Drives and Relays

<table>
<thead>
<tr>
<th>Drive Cat. No.(1)</th>
<th>Description</th>
<th>Available Communication Modules(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF-6000T</td>
<td>PowerFlex 6000</td>
<td>13TCOMME, 13TCOMMP, 13TCOMMPN1, 13TCOMMPN2, 13TMLXH, 13TMLXMM, 13TMLXMP, EtherNet/IP, PROFIBUS DPV1, PROFINET Communication Adapters, Modbus Communication Adapters</td>
</tr>
<tr>
<td>PF-7000 / PF-7000A / PF-7000L</td>
<td>PowerFlex 7000</td>
<td>13COMMER, 13COMME, 13COMMP, 13COMMM, 13COMMH, 13COMMPN, EtherNet/IP, PROFIBUS, Modbus Communication Adapters</td>
</tr>
<tr>
<td>SEL-710-5</td>
<td>Motor Protection Relay</td>
<td>See the SEL website or your Rockwell Automation representative for more information.</td>
</tr>
</tbody>
</table>

(1) For a complete list of catalog numbers, see the PowerFlex Medium Voltage AC Drives Selection Guide, publication PFLEX-SG003.

Table 56 - SMC Soft Starters and Communication Modules

<table>
<thead>
<tr>
<th>Cat. No.(1)</th>
<th>Description</th>
<th>Available Communication Modules(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150-F</td>
<td>SMC™ Flex Smart Motor Controllers</td>
<td>20-COMM-D, 20-COMM-E, 20-COMM-ER, DeviceNet communication adapter, EtherNet/IP communication adapter, Dual-port EtherNet/IP communication adapter</td>
</tr>
</tbody>
</table>

(1) For additional product information, see the Smart Motor Controllers - SMC™-3, SMC™ Flex, and SMC-50 Soft Starters Family Brochure, publication 150-BR144.

Table 57 - Electronic Overload Relays and Communication Modules

<table>
<thead>
<tr>
<th>Cat. No.(1)</th>
<th>Description</th>
<th>Available Communication Modules(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>185/582-E300</td>
<td>E300™ Electronic Overload Relays</td>
<td>185-ECM-ETR, EtherNet/IP communication module</td>
</tr>
</tbody>
</table>

(1) For additional product information, see the Motor Protection Solutions Brochure, publication 193-BR029.
Motor Control Centers

As an alternative to wiring each device individually, Rockwell Automation offers low-voltage motor control centers (MCC). The MCCs feature a rugged, high-performance packaging solution for all your motor control needs that integrate control and power in one centralized location.

CENTERLINE® MCCs are available with safety options that help reduce exposure to electrical hazards and arc flash mitigation and containment.

Table 58 - Low Voltage Motor Control Centers

<table>
<thead>
<tr>
<th>Category(1)</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
</table>
| CENTERLINE 2100 MCC | 2100 | • Designed to meet UL and NEMA standards  
• Allen-Bradley motor control devices: starters, soft-starters, and drives  
• Available with SecureConnect™ units  
• ArcShield™ arc-resistant enclosures available  
• EtherNet/IP and DeviceNet networking  
• IntelliCENTER® software |
| CENTERLINE 2500 MCC | 2500 | • Designed to meet IEC standards  
• Allen-Bradley motor control devices: starters, soft-starters, and drives  
• ArcShield™ arc-resistant enclosures available  
• EtherNet/IP and DeviceNet networking  
• IntelliCENTER® software |

(1) For more information, see Low Voltage Motor Control Centers.
Electrical Protection Devices

The ProSoft MVI56E-61850C is an in-chassis communication module that connects Intelligent Electrical Devices (IEDs) communicating on IEC 61850 to the process automation equipment communicating on EtherNet/IP. The IEC 61850 communication module allows users to have complete control, visualization and reporting across their entire PlantPAx system.

Refer to the ProSoft website for more information.

Additionally, PlantPAx fully supports the Library of Electrical Protection Devices. The Library of Electrical Protection Devices includes vendors such as Schweitzer Engineering Lab, ABB, GE and Allen-Bradley Intelligent Electrical Devices. The library contains Add-on Instructions, Global Objects and graphics that allows the user to easily integrate the control and visualization of IEDs into a power single line diagram.

Refer to Rockwell Automation Library of Electrical Protection Devices, publication PROCES-RM011 for more information.

### IEC 61850 Module

<table>
<thead>
<tr>
<th>Category</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 61850 module</td>
<td></td>
<td>Prosoft MVI56E-61850C Prosoft In-Chassis IEC 61850 Communication Module</td>
</tr>
<tr>
<td>IEC 61850 additional components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1756-EN4TR</td>
<td></td>
<td>In-Chassis Ethernet/IP Communication Module</td>
</tr>
<tr>
<td>Stratix 5400</td>
<td></td>
<td>Network switch for IEC 61850 protocol</td>
</tr>
<tr>
<td>ControlLogix 5580</td>
<td></td>
<td>Controller required for IEC 61850 module (v32 or greater)</td>
</tr>
</tbody>
</table>
Analytics is the discovery, interpretation, and communication of meaningful patterns in data. Analytics relies on the application of statistics, computer programming, and operations research to quantify performance.

Analytics provides methods to measure our performance and then provide feedback for continuous improvement. Analytics drive business value, regardless of the industry, by helping to:

- bring a product to market faster
- lower the total cost of ownership because of more effective maintenance
- improve asset utilization by maximizing the throughput

IIoT Data Enablement Options

To enable IoT applications with the critical data from the PlantPAx DCS, users need to utilize gateways that can pull data from the various data sources. PlantPAx offers multiple options to enable this data flow.
Device Level Options

Allen-Bradley products have device-level diagnostics built in, such as fault and alarm codes for use in fault routines. Other products provide predictive and prescriptive analytics at the device-level of the architecture.

Device-level analytics provide:
- Streaming analysis
- Runtime deployment
- Device data generation

Products that provide device-level analytics include:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FactoryTalk® Analytics™ LogixAI™</td>
<td>An embedded analytics software that enables controls engineers to apply models to make predictions in ControlLogix applications. Automated modeling capabilities that enable predictive capabilities in the controller.</td>
</tr>
<tr>
<td>Type: Diagnostic, Predictive</td>
<td>Environment: ControlLogix chassis</td>
</tr>
<tr>
<td>Requirements:</td>
<td>Available via the subscription portal</td>
</tr>
<tr>
<td>PlantPAx MPC</td>
<td>Model Predictive Control embedded in ControlLogix systems</td>
</tr>
<tr>
<td>Type: Predictive, Prescriptive</td>
<td>Environment: ControlLogix chassis</td>
</tr>
<tr>
<td>Requirements:</td>
<td>1756-PMPMC or 9529-PMPMPCENM module</td>
</tr>
<tr>
<td>APC Function Blocks</td>
<td>You can use APC function blocks in place of PID instructions for loops with long dead-times and interacting loops. The APC function blocks are licensed, run on the EWS, and require the Studio 5000 Logix Designer application.</td>
</tr>
<tr>
<td>Type: Predictive, Prescriptive</td>
<td>Environment: Logix 5000 function blocks</td>
</tr>
<tr>
<td>Requirements:</td>
<td>9324-RLDAPCENE for first controller</td>
</tr>
<tr>
<td></td>
<td>9324-RLDAPCCLENE for subsequent controllers</td>
</tr>
</tbody>
</table>

Device-level analytics provide:
- Streaming analysis
- Runtime deployment
- Device data generation

### Option Description

#### FactoryTalk Edge Gateway
FactoryTalk Edge Gateway software unifies data from industrial sources and control or automation systems. It integrates with a variety of cloud, IIoT, and big data applications including ThingWorx, Microsoft Azure IoT Hub, Microsoft SQL and more. It also uses OPC-DA, the automation industry standard for interoperability, to access KEPServer Enterprise data for third-party connectivity.

**PlantPAx specific support:**
- EventQ Add on enables the capture of controller-based events to be used in Standard PlantPAx report

**Type:** IIoT Data Enablement Software  
**Environment:** Software on Premise

**Requirements:**
- Software Licenses available via the subscription portal

#### FactoryTalk Linx Gateway
FactoryTalk Linx Gateway software provides data from the PlantPAx FactoryTalk Linx servers as a OPC UA Server. It integrates with IIoT applications that are configured as a OPC UA Client for live PlantPAx DCS data.

**PlantPAx specific support:**
- Enables the connection from FactoryTalk Linx to ThingWorx OPC Aggregator for live DCS data.

**Type:** IIoT Data Enablement Software  
**Environment:** Software on Premise

**Requirements:**
- Software Licenses available via the subscription portal

### Option Description

#### FactoryTalk® Analytics™ LogixAI™
An embedded analytics software that enables controls engineers to apply models to make predictions in ControlLogix applications. Automated modeling capabilities that enable predictive capabilities in the controller.

**Type:** Diagnostic, Predictive  
**Environment:** ControlLogix chassis

**Requirements:**
- 1756M-FIALGXAITTM FactoryTalk Analytics LogixAI appliance

#### PlantPAx MPC
Model Predictive Control embedded in ControlLogix systems
- Multi-variable in and multi-variable out
- Predictive control
- Reduction in variability

**Type:** Predictive, Prescriptive  
**Environment:** ControlLogix chassis

**Requirements:**
- 1756-PMPMC or 9529-PMPMPCENM module

#### APC Function Blocks
You can use APC function blocks in place of PID instructions for loops with long dead-times and interacting loops. The APC function blocks are licensed, run on the EWS, and require the Studio 5000 Logix Designer application.
- Internal model control (IMC) to control one process variable
- Coordinated control (CC) to control one process variable with up to three control variables
- Modular multivariable control (MMC) to control two process variables with up to three control variables

**Type:** Predictive, Prescriptive  
**Environment:** Logix 5000 function blocks

**Requirements:**
- 9324-RLDAPCENE for first controller
- 9324-RLDAPCCLENE for subsequent controllers
System Level Options

System-level analytics provide:

- Data management, and transformation
- Model training and deployment
- Pattern extractions

FactoryTalk products that add system-level analytics include:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Type:</th>
<th>Environment:</th>
<th>Requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavilion®</td>
<td>Provides closed-loop, prescriptive analytics to maximize process performance in quality, throughput and efficiency.</td>
<td>Predictive, Prescriptive</td>
<td>Server based</td>
<td>Pavilion® software</td>
</tr>
<tr>
<td></td>
<td>Model-based advanced, dynamic control drives stable performance&lt;br&gt;Integrated MPC, calculation, and soft sensor visualization and performance reporting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FactoryTalk® Analytics Edge ML</td>
<td>A machine learning application that provides expert-driven data analytics within the plant, where low latency is a requirement.&lt;br&gt;Helps make decisions as close as possible to the data&lt;br&gt;Reduce loads on controllers by off-loading data preprocessing&lt;br&gt;Reduces deployment time costs&lt;br&gt;Out-of-box connectivity reduces design time</td>
<td>Predictive</td>
<td>Server based</td>
<td>Pavilion® Analytics Edge ML base bundle or FactoryTalk Analytics Platform base bundle</td>
</tr>
<tr>
<td>(also applicable at enterprise level)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FactoryTalk® Analytics DataView</td>
<td>A visualization tool that lets you access and transform data through storyboards. Gain a business understanding of data to pinpoint opportunities for improvement.&lt;br&gt;Reduces time to value by reducing the dependence on data architects and data scientists&lt;br&gt;Enables self-service analytics&lt;br&gt;Minimizes the need for expensive infrastructure that is associated with traditional warehousing</td>
<td>Descriptive, Diagnostic</td>
<td>Server based</td>
<td>Pavilion® Analytics DataView base bundle or FactoryTalk Analytics Platform base bundle</td>
</tr>
<tr>
<td>(also applicable at enterprise level)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enterprise-Level Options

Enterprise-level analytics provide:

- Data visualization
- Data mining
- Enterprise resource planning
- Model training
- Model operationalization
- Pattern extraction
FactoryTalk products that add enterprise-level analytics include:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Type</th>
<th>Environment</th>
<th>Requirements</th>
</tr>
</thead>
</table>
| FactoryTalk Analytics Edge ML (also applicable at system level) | A machine learning application that provides expert-driven data analytics within the plant, where low latency is a requirement.  
- Helps make decisions as close as possible to the data  
- Reduce loads on controllers by off-loading data preprocessing  
- Reduces deployment time costs  
- Out-of-box connectivity reduces design time | Predictive | Server based | Part of the FactoryTalk Analytics; available via the subscription portal  
Requirements:  
- FactoryTalk Analytics Edge ML base bundle  
- FactoryTalk Analytics Platform base bundle |
| FactoryTalk Analytics DataView (also applicable at system level) | A visualization tool that lets you access and transform data through storyboards. Gain a business understanding of data to pinpoint opportunities for improvement.  
- Reduces time to value by reducing the dependence on data architects and data scientists  
- Enables self service analytics  
- Minimizes the need for expensive infrastructure that is associated with traditional warehousing | Descriptive, Diagnostic | Server based | Part of FactoryTalk Analytics; available via the subscription portal  
Requirements:  
- FactoryTalk Analytics DataView base bundle  
- FactoryTalk Analytics Platform base bundle |
| Vuforia® Augmented Reality | An industrial augmented reality platform that can improve workforce efficiency and customer satisfaction with real-time, step-by-step work instructions and data.  
- Work instructions become handsfree and are delivered in real time where assembly or field service take place.  
- Tribal knowledge of experienced workers is captured and shared with new workers and service technicians.  
- Remote expertise can be delivered to workers no matter where they are in the world.  
**PlantPAx specific support:**  
- Process strategy experience templates provide users with faceplate-like features within an AR experience. The templates enable users to build additional functionality around the PlantPAx information. | Descriptive, Diagnostic | Cloud-based | Part of the FactoryTalk® Innovation Suite Bulletin 95057C; available via the subscription portal  
Requirements:  
- Vuforia Engine software  
- Vuforia Studio software  
- Vuforia Chalk software  
- Vuforia Expert Capture software |
| ThingWorx® Industrial IoT platform | An integrated, secure solution to minimize risk, reduce IT burden, and maximize value from the software investment.  
ThingWorx industrial connectivity provides data access for client applications such as MES and SCADA and IoT and Big Data analytics software. It leverages OPC and IT-centric communication protocols to provide one source of industrial data. Supported protocols include proprietary protocols (including GE NIO, SuiteLink/FastDDE, and Splunk), IT protocols (including MQTT, REST, ODBC, and SNMP), and flow measurement export to common oil and gas industry formats.  
ThingWorx industrial connectivity provides one solution to collect, aggregate, and securely access industrial operations data. Connect, manage, monitor, and control diverse automation devices and software applications through one intuitive user interface.  
**PlantPAx specific support:**  
- Process strategy Thing templates replicate structure and functionality within ThingWorx, which enable users to create an analysis of the objects with Live and Historical Data  
- ThingWorx mashup templates provide the ability to investigate alarms by area, priority, and other critical alarming criteria. Advanced alarm analysis includes fleeting, chattering, and stale alarm insights. Similar dashboard functionality is also provided for SQL server reporting services. | Descriptive, Diagnostic, Predictive, Prescriptive | Cloud-based | Part of the FactoryTalk Innovation Suite Bulletin 95057C; available via the subscription portal  
Requirements:  
- ThingWorx platform software  
  - Asset Advisor  
  - Operator Advisor  
  - Production Advisor  
  - ControlAdvisor  
- ThingWorx Industrial Connectivity software |
A process automation solution often includes the requirement for an integrated safety system as part of the overall Safety Instrumented System (SIS) requirements for a process facility. The SIS logic solver is a separate but integrated technology that can use common or diverse technology to meet the safety integrity needs for any process application.

The SIS logic solver requirements can include fault tolerance, fail-safe, or a mix of architecture and Safety Integrity Level (SIL) requirements. Fault tolerance means that plant operation is maintained if a fault occurs, while fail-safe means that the SIS initiates a shutdown upon detecting a fault.

Table 59 - Typical SIL and Architecture System Requirements

<table>
<thead>
<tr>
<th>Process Safety Platform</th>
<th>Safety Application</th>
<th>Architecture</th>
<th>Typical SIL Range</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency shutdown/SIS</td>
<td>Fault Tolerant</td>
<td>Up to SIL 3</td>
<td>Low/High</td>
<td></td>
</tr>
<tr>
<td>Fire and gas</td>
<td></td>
<td>SIL 2</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>High integrity pressure system</td>
<td></td>
<td>SIL 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refining</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process Safety Platform</th>
<th>Safety Application</th>
<th>Architecture</th>
<th>Typical SIL Range</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burner management (continuous process)</td>
<td>Fault Tolerant</td>
<td>Up to SIL 3</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Subsea</td>
<td></td>
<td>SIL 2</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Power generators</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process Safety Platform</th>
<th>Safety Application</th>
<th>Architecture</th>
<th>Typical SIL Range</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burner management (power and utilities)</td>
<td>Fail-safe</td>
<td>SIL 2</td>
<td>High (2)</td>
<td></td>
</tr>
<tr>
<td>Turbomachinery</td>
<td></td>
<td></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Life sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mining</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power equipment</td>
<td>Fault Tolerant</td>
<td></td>
<td>Low/High (2)</td>
<td></td>
</tr>
<tr>
<td>Specialty chemical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Availability control systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) The AADvance solution is available in a Eurocard format, qualified for Subsea production applications under ISO13628-6.
(2) ControlLogix controllers are limited to a demand rate not to exceed 10 demands per year. While this is a high demand rate, this solution possibly could not be suitable for high-demand applications.

Safe, reliable systems safeguard people, property, the environment, and company or corporate reputations. Third-party certification for applying technologies in applications up to a specific SIL level significantly reduces complexity when complying with national and international process safety standards worldwide.

Process safety technology selection is based on functional and target SIL requirements, which are defined in the projects Safety Requirements Specification (SRS). For example, if the SRS requirement is for the Safety Instrumented Function to fail safely upon a fault, you can select a fail-safe only technology. If however, some level of fault tolerance is defined for your process safety system, you can select a fault tolerant technology.

There are different levels of fault tolerance available. For example:

- 1oo2d refers to a voting and degradation architecture where diagnostics are used to determine the validity of two values or states. When both values are 'healthy', then either one out of the two (1oo2) available is used in the outcome of the safety instrumented function (SIF). When one of the two values or states is determined to be 'invalid', then that value or state is no longer considered when determining the outcome of the SIF. (The voting degrades to 1oo1, one out of the remaining good one). This dramatically reduces the spurious trip rate of a basic 1oo2 architecture, while maintaining safety performance.

- 2oo3 refers to a voting and degradation architecture where comparison diagnostics are used to determine the outcome of the SIF. Two ‘out’ of the three (2oo3) available values or states are required to determine the outcome of a SIF. This architecture, often referred to as Triple Modular Redundancy (TMR), lets a failed value or state be ignored when resolving the SIF.

In addition to the comparison diagnostics, active diagnostics are also used to validate states and values that are used in the outcome of the SIF.
ControlLogix SIL 2 Systems

ControlLogix supports process safety applications up to SIL 2 that require fault tolerance and redundancy. ControlLogix supports 1oo2d fault tolerance with the 1715 I/O system. However, ControlLogix redundancy does not use a voting mechanism, rather it acts as a hot standby. The components of the 1715 I/O system comprise a pair of partnered Ethernet adapters that communicate to ControlLogix controllers via an EtherNet/IP network, and digital and analog I/O modules that are configurable in simplex and duplex modes.

The ControlLogix controller complies with the requirements of the relevant standards (SIL 2 according to IEC 61508) and can be used in low demand applications up to SIL 2 according to IEC 61508). The instructions of the associated Safety Reference Manual and User Manuals are to be considered.

ControlLogix SIL 2 systems use the same programming software and data interfaces as used for process control on the PlantPAx system. The hardware that is used for process safety must be dedicated for process safety applications. Specific hardware, firmware revisions, and software versions are required to meet SIL certifications.

AADvance and Trusted SIL 2, SIL 3, and TMR Systems

Diverse SIS logic solvers use different hardware and software platforms for process safety applications than that used for process control on the PlantPAx system. This approach is used to minimize common cause faults from influencing the overall safety integrity. Triple redundancy minimizes the possibility of any single component failure to cause a spurious or spurious trip. Diverse process safety integrates with the basic process control on the PlantPAx system by using CIP™ connectivity including profile support in the Studio 5000 Logix Designer application (AADvance) or via OPC connectivity (AADvance or Trusted®).

Both the Trusted and AADvance systems share a common EtherNet/IP network within a PlantPAx system. In addition, AADvance and Trusted support redundant Ethernet networks, while the AADvance system supports the CIP producer and consumer communication protocol.

Table 60 - Diverse SIL 2 and SIL 3 Products

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADvance system</td>
<td>• Configurable for SIL 2 and SIL 3&lt;br&gt;• Scalable redundancy for fault tolerance&lt;br&gt;• Simplex, duplex, or triplex configuration</td>
</tr>
<tr>
<td>Trusted system</td>
<td>Trusted technology uses 3-2-0 (3-2-2-0 optionally) fault-tolerant control to help eliminate spurious trips. Triple modular redundancy (TMR) uses majority voting to identify a source of failure. Available with OPC or CIP integration.</td>
</tr>
</tbody>
</table>

Table 61 - Additional Resources

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADvance Controller Solutions Handbook, publication ICSTT-RM447</td>
<td>Explains the features, performance, and functionality of the AADvance controller and systems. It sets out some guidelines on how to specify a system to meet your application requirements.</td>
</tr>
<tr>
<td>AADvance Controller System Build Manual, publication ICSTT-RM448</td>
<td>Provides experienced panel builders with information on how to assemble a system, switch on and validate the operation of a controller.</td>
</tr>
<tr>
<td>AADvance Controller Configuration Guide, publication ICSTT-RM405</td>
<td>Defines how to configure an AADvance controller by using the AADvance Workbench to meet your Safety Instrument Function (SIF) application requirements.</td>
</tr>
<tr>
<td>AADvance Controller Safety Manual, publication ICSTT-RM446</td>
<td>Provides mandatory guidance on how to apply AADvance to meet various industry standards and makes recommendations to apply AADvance in SIS applications safely.</td>
</tr>
<tr>
<td>AADvance Controller Troubleshooting and Repair Manual, publication ICSTT-RM406</td>
<td>Provides plant maintenance personnel with information on how to trace and repair a fault in an AADvance system and perform routine maintenance tasks.</td>
</tr>
</tbody>
</table>

SIL-rated Instruments

SIL-rated instruments are typically required for process safety loops. Rockwell Automation provides premier integration between ControlLogix systems and Endress+Hauser SIL-rated instruments. For more details, see the Endress+Hauser website at https://www.endress.com.
PowerFlex SIL 2 and SIL 3 Systems

PowerFlex AC drives offer SIL ratings up to and including SIL 3. Specifically, the PowerFlex 525 AC drive offers Safe Torque Off (STO) as a standard embedded feature with a safety rating of PLd/SIL2 Cat. 3. The PowerFlex 753 and 755 AC drives are available with optional STO functionality with a safety rating of PLe/SIL3 Cat. 3. In addition, the PowerFlex 753 and 755 offer a Safe Speed Monitor option for applications that can benefit from access to a safety zone while there is limited motion. The Safe Speed Monitor option has a rating of PLe/SIL3 Cat. 4.

PowerFlex STO functionality is designed to help safely remove power from the gate firing circuits of the output power devices (IGBTs). This functionality helps prevent the output power devices from switching in the pattern necessary to generate AC power to the motor. PowerFlex AC drives can be used in combination with other safety devices to satisfy the requirements of IEC 61508, IEC 61800-5-2 SIL 3, ISO 13849-1 PLe, and Category 3 for STO.

For more information, see the PowerFlex Low Voltage AC Drives Selection Guide, publication PFLEX-SG002.

OptiSIS Safety Integrated Systems

The OptiSIS® safety system uses an AADvance safety logic solver for a process safety solution that is ready to install and configure with no programming required. OptiSIS lets you configure safety functions by using an intuitive Cause and Effect interface from the HMI display.

OptiSIS includes options for:
- Fail-safe or fault tolerant architectures
- Indoor or outdoor environments
- Floor and wall mount
- 50 or 100 I/O count

OptiSIS is a great solution for small process safety applications. In addition, if you have an existing process safety system (for example, an older relay or legacy system) that can no longer be maintained, OptiSIS can provide a cost-effective and short delivery replacement.

For more information, see the OptiSIS Packaged Solution Profile, publication 1711-PP006.
Rockwell Automation Support

Use these resources to access support information.

<table>
<thead>
<tr>
<th>Technical Support Center</th>
<th>Find help with how-to videos, FAQs, chat, user forums, and product notification updates.</th>
<th>rok.auto/support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledgebase</td>
<td>Access Knowledgebase articles.</td>
<td>rok.auto/knowledgebase</td>
</tr>
<tr>
<td>Local Technical Support Phone Numbers</td>
<td>Locate the telephone number for your country.</td>
<td>rok.auto/phonesupport</td>
</tr>
<tr>
<td>Literature Library</td>
<td>Find installation instructions, manuals, brochures, and technical data publications.</td>
<td>rok.auto/literature</td>
</tr>
<tr>
<td>Product Compatibility and Download Center (PCDC)</td>
<td>Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.</td>
<td>rok.auto/pcdc</td>
</tr>
</tbody>
</table>

Documentation Feedback

Your comments help us serve your documentation needs better. If you have any suggestions on how to improve our content, complete the form at rok.auto/docfeedback.

Catalyst and Cisco are trademarks of Cisco Systems, Inc.
Microsoft, Excel, and Windows are trademarks of Microsoft Corporation.
CIP, CIP Security, CIP Sync, ContolNet, DeviceNet, EtherNet/IP are trademarks of ODVA, Inc.
ThingWorx and Vuforia are trademarks of PTC.
Trademarks not belonging to Rockwell Automation are property of their respective companies.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

Rockwell Otomasyon Ticaret A.Ş, Kar Plaza İş Merkezi E Blok Kat:6 34752, İçerenköy, İstanbul, Tel: +90 (216) 5698400 EEE Yönetmeliğine Uygundur

Connect with us.  

rockwellautomation.com —— expanding human possibility™

AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.392.2000, Fax: (1) 414.392.4444
EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleelaan 12a, 1631 Diegem, Belgium, Tel: (32) 2 683 0600, Fax: (32) 2 683 0640
ASIA PACIFIC: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication PROCES-SS001S-EN-P - August 2023
Supersedes Publication PROCES-SS001R-EN-P - December 2022
Copyright © 2023 Rockwell Automation, Inc. All rights reserved. Printed in the U.S.A.