Brüel & Kjær Vibro
A member of the NSK Group

Product Specifications and Ordering Information
SETPOINT® CMS Overview

Overview

SETPOINT® Condition Monitoring Software (CMS) offers plant-wide condition monitoring solutions for critical, semi-critical, and auxiliary rotating and reciprocating machinery found in the following industries:

Hydro Power
Thermal Power
Oil & Gas
LNG
Petrochemical
Pharmaceuticals
General Industry
Metals & Mining
Pulp & Paper
Nuclear Power

The most capable and advanced implementation of the SETPOINT® CMS solution leverages the AVEVA™ PI System™ - the industry standard in enterprise infrastructure, for management of real-time data. Minimize down time at your plant through universal access over your entire network, and foundation for improving your process with a single repository of information.

As a full-service condition monitoring solution provider, we offer a range of services to meet your needs. This includes seamlessly integrating your process data, thermal performance monitoring, decision support functionality, and nearly unlimited visualization capabilities via AVEVA™ PI Vision™ and their ecosystem of complementary technologies.

SETPOINT® CMS application (Figure 1) provides simple to use tools to easily analyze and make decisions on the health of assets plant wide. We offer this software free to our clients, and it is available via our website at www.bkvibro.com.

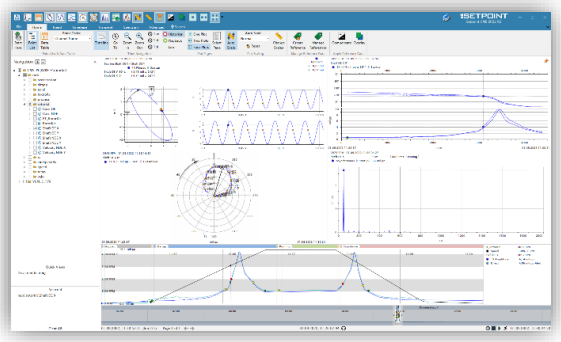

Figure 1, SETPOINT® CMS machinery diagnostics application

With more than 80 years of experience in machinery vibration solutions, B&K Vibro has deep expertise in applying cutting edge monitoring technologies. As a result, we offer a complete line of monitoring devices to cover your needs plant wide. This includes (see Figure 2):

VIBROCONTROL 8000 (VC-8000)

An API 670 machine protection system with an efficient and innovative approach to condition monitoring with patented *i-Factor*[1] data collection technology.

VIBROPORT 8000 (VP-8000)

A ruggedized portable version of the VC-8000 offering superior data through patented *i-Factor* data collection technology.

Vibro Condition Monitoring 3 (VCM-3)

A flexible descriptor-based condition monitoring device for semi-critical machines offering customized asset monitoring strategies to minimize downtime.

BKV Connect® and BKV Collect®

Our Wireless Sensor Solution provides early fault detection through online condition monitoring to the balance of plant.

[1]i-Factor, is an algorithm that returns a numerical measure that quantifies the waveform's "interestingness". When value is sufficiently large, a waveform is stored. In this way storage is conserved.

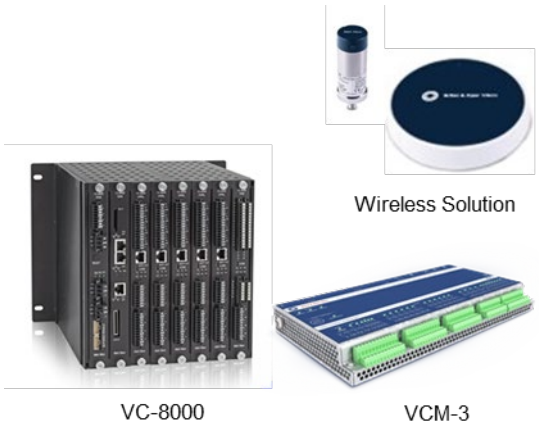

Figure 2, B&K Vibro plant wide instrumentation

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Highlights

All the power of the AVEVA PI System

Harness the full power of the AVEVA PI System by delivering native process data integration, world-class cybersecurity, built-in tools for push alarm notifications and decision support, an ecosystem of more than 400 AVEVA partners delivering advanced capabilities like performance monitoring, machinery learning, pattern recognition, and more.

Simple, intuitive user interface

We designed the CMS user interface by looking at popular stock trading and audio editing software, borrowing the concept of a timeline and time slider to quickly navigate to the data range of interest. Users easily zoom in and out, drop a cursor and see data in all of the powerful plot formats your machinery diagnostic professionals need.

Singular ease of data sharing

With SETPOINT® CMS, once data has been collected, it can be saved in an innovative *.cms* format that preserves everything of interest: machinery hierarchy, configuration parameters, waveforms, static data, alarms. Simply select the data points and data region of interest, save as a .cms file, and then share with anyone you want, anywhere in the world. To open, view, and interact with the data (including playing back recorded data), consulting experts simply download our free SETPOINT® CMS application from the web, no database or extraneous enterprise software required.

Elimination of vibration data silos

While our competitors integrate slow-moving data into the AVEVA PI System, our unique solution integrates all vibration data (including waveforms -the truth is in the waveforms). Why does this matter? Because it completely eliminates the need for a separate repository just for vibration data, reducing expensive separate infrastructure requirements and separate IT support for a completely different software platform. If you prefer to segregate process data servers from vibration data servers, you retain all the flexibility to do that – but those separate servers can now be based on the same system: your AVEVA PI System, meaning fewer systems to learn, license, support, and secure.

One plant-wide solution

B&K Vibro delivers an integrated all-in-one condition monitoring solution for all assets in your plant. From the smallest pump to the largest turbine, we have the right hardware to improve uptime with early fault detection.

True “no-infrastructure” option

We are the first company to offer all the benefits of condition monitoring without requiring so much as a single server or network. Our innovative flight recorder option captures all of the same data that would normally be streamed to a separate condition monitoring server but retains it right in the VC-8000 rack. When something of interest occurs, simply retrieve the data from the rack using the removable SD card or by connecting a laptop.

The flight recorder stores a full month of data or more. For many users, remote access to data is not nearly as important as ensuring that the data has been captured so that data-driven decisions can be made. When online and/or remote access to data is not imperative, our no-infrastructure option is an industry first that gives you new flexibility in when and how you deploy condition monitoring, without the need to wait for networks, servers, cybersecurity solutions, or your IT department.

Never lose collected data

Other systems rely entirely on a network connection to a server, saving virtually no data in the rack itself. We’ve engineered a more robust architecture that does not require redundant networks and servers.

We store the data right in the device on an embedded solid-state hard drive that holds a substantial amount of data – a minimum of one full month for VC-8000 – ensuring that if a server or network goes down, the data won’t be “missing in action”. It’s safely kept inside the rack for a month or more until the network and/or server is available again, allowing the data to be backfilled. This multi-layered approach using both local and server-based storage is an **industry-first** that reduces the amount of IT infrastructure required to achieve assurance against loss of data.

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Architecture Options

There are three configurations of the SETPOINT® CMS solution.

SETPOINT® CMS with AVEVA PI System

This implementation (see Figure 3) streams data continuously from all B&K Vibro devices into a connected AVEVA™ PI Server infrastructure to offer a true plant-wide solution. Customers use their existing PI ecosystem, or a stand-alone AVEVA PI Server can be deployed.

SETPOINT with AVEVA PI System provides the most capable and advanced functionality (see Software Options).

SETPOINT® CMS-XC (External Computer)

This implementation (see Figure 4) streams data into a B&K Vibro database. This database is very simple when compared to AVEVA PI System and there are no third-party visualizers, or data integrators.

Typically installed on a workstation or laptop rather than a server, this option directly translates into reduced cost and administration. This is ideal for VC-8000 customers at plants where channel counts are lower, and infrastructure is simpler.

SETPOINT® CMS Flight Recorder

When a network is not available, CMS data collection is embedded into the VC-8000 rack much like a flight recorder in an airplane (see Figure 5).

Our flight recorder is an embedded solid-state hard drive that stores up to 12 months of data. The database is identical to the CMS-XC solution, but this database remains in the VC-8000 rack until manually retrieved via the removable SDHC card, or by temporarily connecting a laptop.

Portable (VP-8000)

The VC-8000 eight-position (8P) rack is also available as a portable solution with ruggedized packaging, carry case, and quick connect cables.

The VP-8000 connects to any third-party protection system (via buffered outputs). Walk over to a machine and you can be collecting SETPOINT® CMS data in minutes (this uses the same architecture as CMS-XC, see Figure 4).

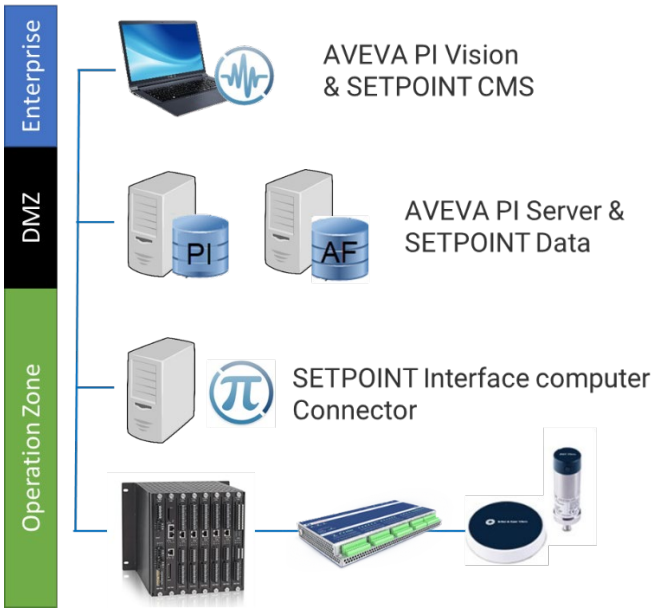

Figure 3, Option 1: SETPOINT® CMS with AVEVA PI System[1]

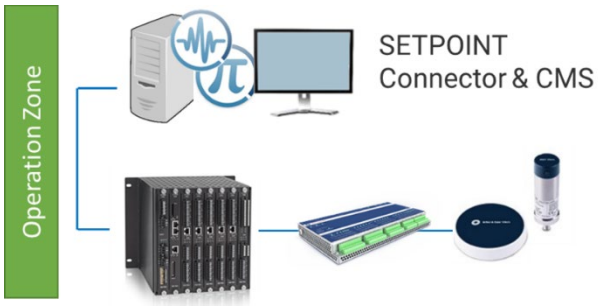

Figure 4, Option 2: SETPOINT® CMS-XC[1]

Figure 5, Option 3: SETPOINT Flight Recorder

[1]**SETPOINT® Connector** software transfers and buffers data between hardware devices and data storage

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SETPOINT® CMS Hardware Options

The hardware device options are not exclusive; you can use all three devices concurrently. The device you use for each machine will depend on the application and the value of the machine and process.

Item	VC-8000 & VP-8000	VCM-3	Wireless Sensor Solution
Machine Criticality			
Machine Criticality	Critical	Semi-critical	Semi-critical
Relay (Machine Trips)	Yes	-	-
Approval Options	API 670, SIL, Ex	Ex	Ex (sensor only)
Machine Applications			
Channel Types (Applications)	45	Custom Asset Templates	2
Machine Class	Fluid Film, REB, Reciprocating	Fluid Film, REB	REB
Software Platform (Options)			
SETPOINT with AVEVA PI System	Yes	Yes	Yes
SETPOINT CMS-XC	Yes	Yes	Yes (Beta)
SETPOINT Flight Recorder	Yes	-	-
Device Data Buffering	1 Month	In memory	-
Data Collection			
Trend Data (Static Data) – Minimum Time	80 msec	60 sec	12 hours
Waveform Data – Minimum Time	2.5 sec (8P rack) 5.0 sec (16P rack)	10 minutes	24 hours
Waveform Collection Triggers	I-Factor, Delta Time, Delta RPM, Boost	Delta Time	Delta Time
Network Bandwidth to SETPOINT Connector	9 KB/s per module typical (14 KB/s peak)	Minimal	Minimal
Network Bandwidth to AVEVA PI System	1.5 KB/s per module (70 KB/s peak)	Minimal	Minimal
Synchronous Waveform			
Rate (samples/revolution)	Up to 1 024	Up to 128	-
Duration (samples per waveform)	Up to 32 768	Up to 32 768	-
Envelope Waveform			
Frequency Span	20 kHz	20 kHz	-
Duration (samples per waveform)	Up to 32 768	Up to 32 768	-
Asynchronous Waveform			
Frequency Span	20 kHz	20 kHz	10 kHz
Duration (samples per waveform)	Up to 32 768	Up to 32 768	36 864

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Software Options

B&K Vibro can help you determine which solution is right for you depending on the features that you require.

Item	Flight Recorder*	CMS-XC*	AVEVA PI System
System Complexity			
System Administration / Maintenance	Minimal	Easy	Professional
Computer Requirements (Minimum)	None	Workstation	Server
Operating System Requirements (Minimum)	None	Windows Pro	Windows Server
Data Storage	Up to 1 year	Based on available storage	Based on available storage
Data Volume	52 Channels	100 Channels	Unlimited
Visualization and Analysis Software			
SETPOINT CMS Client	Yes	Yes	Yes
AVEVA PI Vision Client	-	-	Yes
Third-Party Visualizers	-	-	Yes
Third-Party Data Analyzers	-	-	Yes
View Real-Time Data	-	Yes	Yes
Data Management			
CMS File (.cms) Data sharing (i.e., E-mail)	Yes	Yes	Yes
Process Data Integration	-	-	Yes
Database Replication	-	-	Yes
Data Compression	Adaptive Exception Deviation	Adaptive Exception Deviation	Swinging Door Compression
Data Backups	-	-	Full Backups
Data Access / Security			
Concurrent Users	1	1–2	Many
Business Network Access	Data files (E-mails)	Limited	Full Access
Uni-directional firewall ports	-	-	Yes
Network Architecture	None	Plant Level	Enterprise
CMS Applications			
I-Factor* Waveform Collection	Yes	Yes	Yes
Rolling Element Bearing (Database)	-	-	Yes
Hydro Air Gap*	Yes	Yes	Yes
Machine States*	Yes	Yes	Yes
VC-8000 Events*	Yes	Yes	Yes
Performance Monitoring	-	-	Yes
Decision Support	-	-	Ready
Custom Events (Event Frames)	-	-	Yes
E-mail (or Other) Notifications	-	-	Yes

* Only available for VC-8000

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Specifications

For additional information and specifications refer to the following companion documents:

Components	Document
SETPOINT® CMS Visualization Specifications	S000028
SETPOINT® CMS Instructions	S1176125
VC-8000 Overview Specifications	S1077785
VP-8000 Instructions	C107832
VCM-3 Specifications	C107757
BKV Wireless Sensor Solution Specifications	C108380

Computer Requirements	

AVEVA PI Server	• 8 or more cores recommended
	• 16 GB RAM (32 GB recommended)
	• 1 TB storage recommended
	• 1000Base-T (Gigabit) Ethernet
	• Supported Microsoft Windows Operating System (64-bit)
	  – Windows Server 2019
	  – Windows Server 2022
	• Microsoft SQL Server (Express Edition 2012 or higher)
	• PI Server 2018 SP2 recommended*
	• PI Asset Framework 2018 SP2 recommended*
	* Compatible back to PI Server 2012; mandatory for Spectral bands feature

SETPOINT® CMS / SETPOINT® Connector	• Dual-core CPU or better
	• 8 GB RAM recommended
	• 300 MB hard drive space
	• 100Base-T Ethernet or better
	• Microsoft .NET Framework 4.8
	• Display resolution: SXGA (1280 x 1024) or better
	• PI AF Client 2012 or higher*
	• Supported Microsoft Windows Operating System (64-bit)
	  – Windows 10 Pro
	  – Windows 11 Pro
	  – Windows Server 2019
	  – Windows Server 2022
	* All SETPOINT® software uses PI AF Client to communicate securely with the PI System

Computer Requirements			
Server Capacity	**Channels**	500, in any mix (e.g., 150 BKV Collect sensors)	
	Process points (originating outside B&K Vibro devices):	Built-in license for 10% of PI tags	
	Number of devices:	No upper limit	
Data Storage Requirements (Hard Drive Size)	**Data Storage Required**		
	Collection Rate	**Per 1 CH, per yr**	**Per 300 CH, per yr**
	1 minute	25.8 GB	7.7 TB
	20 minutes	1.3 GB	390 GB
	2 hrs	216 MB	65 GB
	1 day	18 MB	5.4 GB
Network Firewall Port Access	**Protocol**	**Port**	**Direction**
	VC-8000	8001	To Device
	CMS-XC (client)	8002	To Connector
	VCM-3	8181	To Connector
	VCM-3	443	To Device
	BKV Collect	8883	To Connector
	AF	5457	To AF
	PI	5450	To PI

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General Features	
Data Validity	• Indicates non-valid data • Indicated NOT OK transducers or points • Indicates if data is in alarm
Event Notifier	Available via AVEVA PI Server for screen, E-mail, cell phone, web services, text, and other mediums
OPC Integration	Available via AVEVA PI Server
CMMS Connectivity	Available via AVEVA PI Server
ERP Connectivity	Available via AVEVA PI Server
Local Time Support	Yes
Display Data Collection Status	Yes
Manually Start/Stop Data Collection	Yes
Access Rights	• User-Based • Role-Based • View-Only • Administrator Changes to access rights logged by user, date, and change
Hardware Alarms	• Superimposed on trend plots and time slider • Shown in Alarm list (Dependent on hardware platform)
Software Alarms	• Supported in AVEVA AF Server • Multi-state alarms (requires customization in AVEVA AF Analytics) • Shown in Alarm list
Advisor/ Decision Support	Supported in AVEVA AF Analytics
Export Archive Data	From CMS-XC or flight recorder databases export large amounts of data to archive it for future use
Document Management	Available via AVEVA PI Server
Machine State	• Manually added • Automated (VC-8000 based) State displays

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Ordering Information

Step 1:

Ensure you have condition monitoring enabled and licensed hardware.

VC-8000

If ordering a new machinery protection system rack, specify CM module licenses in all slots from which condition monitoring data is desired, and ensure that an eSAM is present in rack slot 2. Refer to datasheet S1077785 for rack ordering information.

If using SETPOINT® CMS with an existing VC-8000 rack, use the hardware info tab on the front panel display or in the MPS Maintenance application to look for the presence of CM-ENABLED. If "CMS" status is present and enabled, your hardware already supports CMS communications. If this status is not present, your modules will require an upgrade to CM-ENABLED status. This can be done in the field via a Factory Authorized Service Provider, and prices can be quoted upon request to reflect your particular installation and location.

VCM-3

If ordering new VCM-3 devices also order the correct quantity of device licenses that will integrate to SETPOINT®.

VCM3-License
SETPOINT VCM-3 License when ordering new devices

If using SETPOINT® CMS with existing VCM-3 modules that have not been licensed order a device upgrade to enable data collection. Refer to the SETPOINT® Instructions (S1176125) on how to apply this license.

VCM3-License-Upgrade
SETPOINT VCM-3 License when upgrading existing devices

BKV Connect® and BKV Collect® do not require device licenses to integrate with SETPOINT®.

Step 2:

Ensure that you have purchased PI Tag licenses for your hardware modules.

Once hardware has been licensed, your devices can communicate with SETPOINT® CMS. However, sufficient PI Tags must be licensed and available for storing the data supplied by the SETPOINT®-Connector. Two types of tags can be used: Special SETPOINT® PI Tags and Standard PI Tags. SETPOINT® PI Tags can be ordered directly from B&K Vibro and are limited to use only for data originating in B&K Vibro devices*. The advantage of SETPOINT® PI Tags is that they incorporate all necessary PI System Access (PSA) licensing required when SETPOINT® data is written to and read from a PI Database.

Alternatively, Standard PI Tags can be purchased directly from AVEVA or excess tags may already be present as part of your existing PI System. To use tags of this type with VC-8000 data, you must secure a separate PI System Access (PSA) license allowing the tags to be used in conjunction with a 3rd party application such as SETPOINT®. Contact AVEVA directly for details (www.aveva.com). In addition, you must also confirm that you have a sufficient quantity of Standard PI Tags to store the data generated by your B&K Vibro devices.

A single channel in the VC-8000 monitoring system for example can return multiple data types simultaneously and may consume anywhere from 2 to 29 PI tags to store its data, depending on channel type and channel configuration. For estimation purposes assume 23 tags per UMM channel, and 2 tags per TMM channel. Consult the SETPOINT® Instructions (S1176125) for a tabular summary of PI tag consumption versus channel type and channel configuration of your particular device.

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Step 3:

Order SETPOINT® CMS, containing all required AVEVA software (or CMS-XC)[1].

This software is supplied on a USB memory stick and can be used on as many computers as required by the installation.

The memory stick contains the following:

SETPOINT® Connector software
SETPOINT® CMS client software
AVEVA PI System software2
AVEVA AF Client (AF SDK) software

1. Microsoft SQL Express 2012 edition or higher is also required. The Express edition is free of charge and can be downloaded from www.microsoft.com .
2. 10% of total PI tags can derive from sources other than B&K Vibro devices. If more than 10% are needed contact the factory for other options.

AVEVA PI Vision is optional and may be purchased as per Step 4. When purchased it will be included on the USB stick.

Choose from these options if a complete PI System is being purchased from B&K Vibro. Select the number of tags according to the SETPOINT® Instructions (S1176125). A PSA (PI System Access) license is included to allow SETPOINT® access to the AVEVA PI System.

C107666.001
SETPOINT®, PSA, and 500 tag PI System

C107666.002
SETPOINT®, PSA, and 1000 tag PI System

C107666.003
SETPOINT®, PSA, and 2000 tag PI System

If more than 2000 tags are required order additional tags in 1000 tag increments.

C106807.001
Supplemental PI Tags, 1000 PI tags

If the PI System has already been purchased it can be licensed for SETPOINT® access with the PSA Package.

C107666.004
SETPOINT®, PSA (PI System Access) Package

The “SETPOINT® Only” option assumes that the necessary tags and PSA (PI System Access) licenses have already been secured directly from AVEVA or CMS-XC database or VC-8000 flight recorder will be used. SETPOINT® software may also be downloaded directly from our website. This option is only necessary if you need physical media.

C106542.001
SETPOINT® Only, CMS-XC and PI Enterprise Users

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Step 4:

Order additional software as required.

AVEVA PI Vision is an optional component that is not strictly required for using CMS. However, it is strongly recommended, as PI Vision provides essential features for most users, such as the ability to create machine train diagrams, asset hierarchies, alarm list shortcuts, and event list shortcuts. It also provides powerful trending and analysis tools for static data types.

AVEVA PI Vision can be ordered directly from AVEVA; customers with existing copies of AVEVA PI Vision can use those as well.

Visualization products are ordered per named user.

C106808.003
PI Vision (per named user) – PI Visualization Software

PI DataLink provides a way to query PI data directly from Microsoft Excel and gives an easy way to do additional add-hock analysis or create reports. Microsoft Excel much be purchased separately.

C106808.002
PI DataLink (per named user) - Excel add-in

Additional process data can be brought into PI using PI Interfaces. If the protocol needed is not seen here, please contact the factory for additional interface options.

AVEVA PI Interface Software	
PI-to-PI Interface Software	C106809.001
SP-2020/PII-01 PI Interface Software Modbus Ethernet PLC (OSIsoft P/N PI-IN-MO-EPLC-NTI)	C107206.001
SP-2020/PII-02 PI Interface Software Modbus Serial PLC (OSIsoft P/N PI-IN-MO-MPLC-NTI)	C107207.001
SP-2020/PII-03 PI Interface Software Software Modbus Plus (OSIsoft P/N PI-IN-MO-MBP-NTI)	C107208.001
SP-2020/PII-04 PI Interface Software OPC (DA - Data Access) (OSIsoft P/N PI-IN-OS-OPC-NTI)	C107209.001
SP-2020/PII-05 PI Interface Software OPC (HDA - Historical Data Access) (OSIsoft P/N PI-IN-OS-OPCHDA-NT)	C107210.001
SP-2020/PII-06 PI Interface Software OPC (AE - Alarms & Events) (OSIsoft P/N PI-IN-OS-OPCAE-NT)	C107211.001
SP-2020/PII-07 PI Interface Software OPC (XML) (OSIsoft P/N PI-IN-OS-XML-NTI)	C107212.001
SP-2020/PII-08 PI Interface Software OPC (HDA Server COM Connector) (OSIsoft P/N PI-CTR-OS-OPCHDA)	C107213.001
SP-2020/PII-99 PI Interface Software Other	C107214.001

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Step 5:

Ensure that you have appropriate computers and peripherals required to host the software and interconnect all components.

Installations will require suitable server machine(s) for hosting SETPOINT® CMS software powered by AVEVA PI System; suitable client machines for running SETPOINT® CMS and PI Vision (web browser); suitable network switches, routers, firewalls, and CAT 5/6 or fiber-optic cables; and other computing and networking infrastructure as may be required by your IT and/or Instrument & Control departments.

B&K Vibro can also supply these components upon request. Our scope for many SETPOINT® installations has included the following:

Mid-grade server complete with all required coreload software installed and configured.

A typical mid-grade server consists of a machine with 8 processor cores, 32 GB RAM, a 1 TB RAID 5 hard drives, and a rail kit for mounting in a 19” rack. B&K Vibro can source any model or manufacturer desired to reflect your IT department standards. We can also install our software on a machine you supply, at your site or in one of our field service offices.

Keyboard/Mouse/Monitor (KMM)

A KMM is often supplied on a pull-out tray so that it can be retracted when not in use. Similar to a notebook computer in appearance, it contains a large folding screen and an attached keyboard with trackball mouse or another pointing device. The tray is designed for mounting in a 19” rack.

Network Switches

When multiple devices racks are interconnected as part of a single CMS installation, each rack is configured with a unique IP Address and connected via a switch to a common network backbone. B&K Vibro always uses network and switch components from well-known manufacturers like Hirschmann® or others as they are ruggedized for industrial use at elevated temperature and vibration levels; however, you may direct us to source any desired make and model, or you can supply your own.

Step 6:

Consider appropriate B&K Vibro services to install and configure all components.

B&K Vibro can provide complete installation services in addition to all required hardware and software. This includes software configuration and PI Vision screen design services.

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Subject to technical changes