qualityworx

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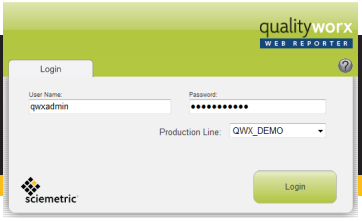
MANUFACTURING PROCESS ANALYSIS SOFTWARE



QualityWorX is the Quality Operating System that automates the collection, storage, archiving, retrieval, analysis and reporting of test and assembly data for discrete manufacturing. It delivers unparalleled insight into critical manufacturing processes, providing the competitive edge demanded by today's manufacturers. From the plant floor, to the engineering labs, to management offices around the globe, QualityWorX delivers the visibility manufacturers need to meet their production goals of improving both quality and yield while reducing costs.

FEATURES & BENEFITS

Quickly and easily gain insight into your production processes

- Generate powerful reports in seconds instead of hours
- Manage your production line proactively, instead of reactively
- Accurately monitor production line performance, driving continuous process improvement
- Maximize yields by quickly identifying the cause of bottlenecks in manufacturing processes

Develop a deeper understanding of manufacturing processes through analysis of stored process signatures

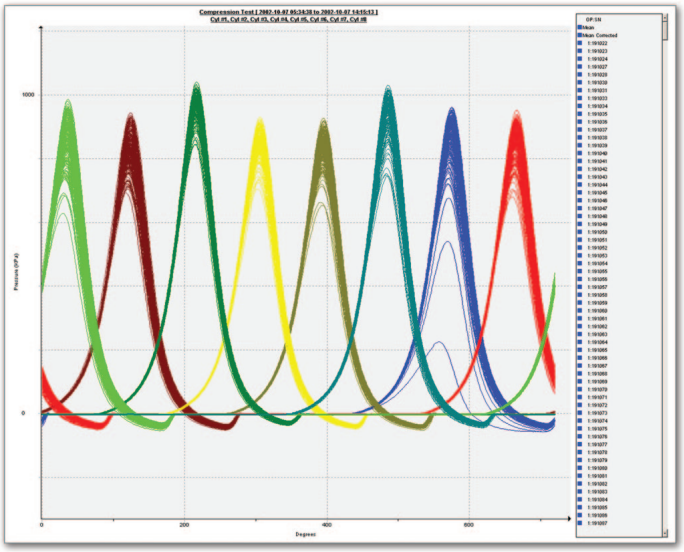
- Quickly compare signatures from 1000's of parts to identify features that can be correlated to product quality
- Re-analyze stored signatures to quickly optimize spec limits and test parameters
- Identify new failure mechanisms and develop new feature checks based on re-analysis of historical waveforms
- Accelerate process development, new product introduction, and line launch

Maintain 100% traceability through detailed records of end-to-end manufacturing data

- Collect and store the complete test record for every part – including process signatures—from a broad range of manufacturing hardware, including third-party tools, testers and PLCs
- Provide proof of compliance and retain detailed birth history record for regulatory requirements

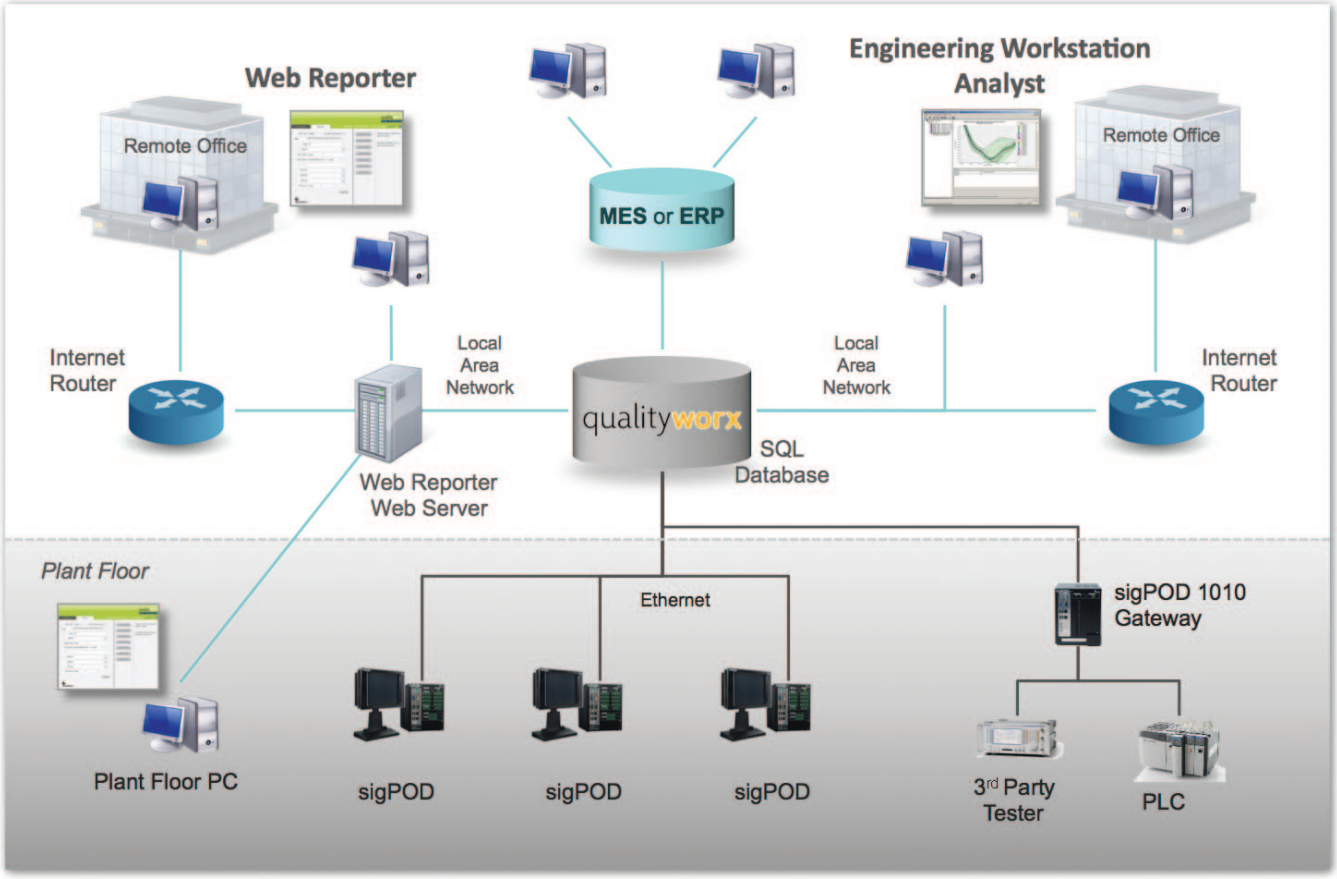
Minimize the impact of quality spills and reduce warranty costs

- Quickly identify other affected parts without the need for tearing down or re-testing parts – based solely on re-analysis of stored signatures
- Confine recalls to only the defective parts



FUNCTIONAL OVERVIEW

QualityWorX is a suite of software tools that automates the collection, storage, analysis, and reporting of manufacturing data. It combines the flexibility and speed of a SQL database, the power of advanced analytics, and the ease and accessibility of web-based reporting. All types of production data, including assembly, test, and repair operations, are collected from a wide range of plant floor systems for storage within the QualityWorX database. Reporting and analysis tools access the database across local and wide area networks, providing critical insight into the manufacturing processes and production line performance to all levels within the manufacturing organization.



COMPONENTS OF QUALITYWORX

At the core of every QualityWorX installation is a SQL database built on Microsoft SQL Server technology. Architected to efficiently store and organize all of your production data, including process signatures, features, spec limits, part-specific parameters, and defect and repair data. Management tools facilitate the configuration of the database structure and the regular, automated archiving of stored data.

The database is designed to grow with your testing and manufacturing needs. Multiple QualityWorX Data Servers can run at the same time. Automated utilities gather old history data in secure archives, without any interruption in production. This ensures speedy access to the latest production data while still allowing for full analysis of all current and archived data.

INTEGRATE SEAMLESSLY WITH PLANT NETWORKS

Add QualityWorX to your plant network and quickly begin collecting and analyzing data from the entire family of sigPOD test stations. Proprietary connections can be enabled to pull data from fastening and rundown tools including Atlas Copco, Bosch, and others. Open standards such as XML and OPC ensure that 3rd party devices are also able to leverage the storage and analysis power of the QualityWorX suite.

During production, new models and parts can be configured on the fly, and test stations can be added or deactivated in QualityWorX without any production downtime.

SUPPORTED DATA CONNECTORS

SigPOD	Automatic connection to sigPOD units
OPC	Connects OPC server to device (e.g. PLC)
Rundown Tools	
Atlas-Copco	PowerMACS, PowerFocus - serial / EtherNet/IP
Bosch	Bosch Data Concentrator
Data Connectors	
XML	QualityWorX XML format
Serial	Multiple ports (real + virtual), handshaking supported: OPC, DI/DO
FTP	Client sends data to FTP server, XML file format
PLC	Data transmission using OPC server (e.g. Kepware) or fieldbus via sigPOD or Gateway – PROFINET, EtherNet/IP, Modbus TCP, PROFIBUS, DeviceNet
Insertion API	Proprietary API allows 3rd party software applications to push data directly into QualityWorX

qualityworx WEB REPORTER

The Web Reporter is the standard reporting interface for QualityWorX, and a site license is provided with every database installation. The Web Reporter combines a simple, but powerful web-based interface with a comprehensive library of standard reports to enable all levels within the manufacturing organization to quickly retrieve, analyze and summarize production data.

ACCESSIBLE TO ANYONE, ANYWHERE

- Web-based application provides complete access to quality data from any computer with a network connection
- Simple, intuitive interface makes it accessible to all levels within the organization, from technician to manager
- No local software to install, all you need is your web browser – simply install the application on your web server, configure and go!

COMPREHENSIVE LIBRARY OF POWERFUL REPORTS

- Quickly and accurately calculate First Time Yield, and identify top failure categories
- Generate detailed summaries of product quality, performance and yield using one of seven powerful, configurable reports
- Precisely define desired dataset using flexible, powerful query builder
- Export any report to PDF or Microsoft Excel native format. Generate printer friendly versions for printing directly from your browser
- Click on a serial number in any report to drill into its detailed birth history record
- Report tables feature drill-downs or collapsible tables to expose as much, or as little detail as desired

Create a Report in 4 Steps

1. Enter **query** parameters.
2. Click button to **select** report.
3. Fill in report **options**.
4. **Launch** report.

Standard Reports

1. Part History
2. First Time Yield
3. Summary Report
4. Trend Browser
5. Failure Report
6. Failure Pareto
7. Repair Traffic
8. Defect Pareto

STANDARD REPORTS IN WEB REPORTER

Part History

Intuitive tree-based navigation of birth history data enables detailed investigation of pass/fail results, waveform characteristics and feature checks on a single serial number.

First Time Yield

Calculate First Time Yield (FTY) by station or Rolled Throughput Yield (RTY) across multiple stations.

- Toggle chart between FTY vs. station, and RTY vs. time, where RTY is calculated over a period of a day, week, or month, as selected by the user.
- *First Time Yield* is the number of unique parts without any failures (at that station), divided by the total number of unique parts through the same station.
- *Rolled Throughput Yield* is the product of the individual station FTY values.

Summary Report

Generate a detailed summary table of feature statistics and operation yields. User selects from a list of 13 statistical parameters that can be incorporated in the table, as well as embedded charts that provide quick, at-a-glance displays of feature trends. Detailed report collapses to compact operation level yield summary.

Trend Browser

Drill down to individual operations or features and display trend chart vs. serial number or date-time stamp. Toggle between detailed serial number list, and yield and statistical summary.

Failure Pareto

Quickly generate a Pareto chart of the top 10 failures. Drill down to a list of affected serial numbers, then link to individual part history report to quickly isolate and identify production issues.

Failure Report

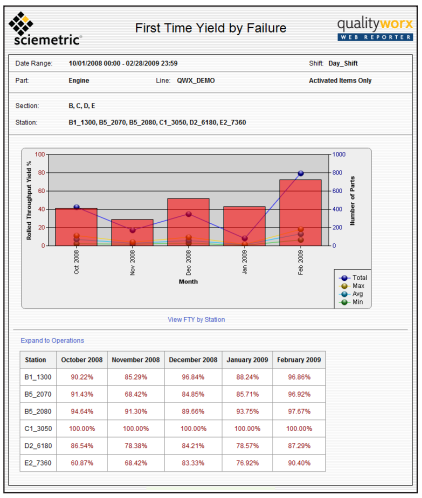
Review detailed listing of failed serial numbers with breakdown of individual failures by station and operation.

Defect Pareto

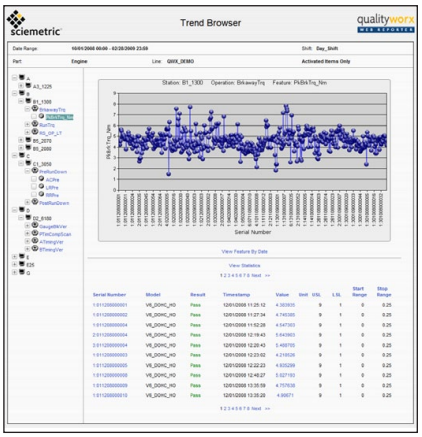
Create Pareto chart of top 10 defects, categorized by defect or repair details. Drill-downs and links to individual serial numbers assist in rapid identification of primary sources of defects (only available if Sciemetric Repair Bay Manager installed on production line).

Repair Traffic

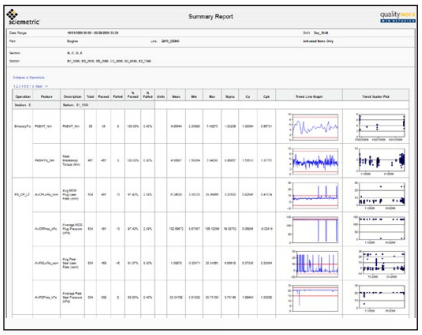
Detailed list of all serial numbers that have been repaired, specifying both the defects and the repairs (only available if Sciemetric Repair Bay Manager installed on production line)



First Time Yield



Trend Browser



Summary Report

qualityworx

ENGINEERING WORKSTATION ANALYST

For advanced data analysis, the Engineering Workstation Analyst features a powerful mathematical processing engine that can simultaneously analyze thousands of waveforms, rapidly simulate a broad range of test scenarios using historical data, or identify defects using line-wide trends and correlations. These advanced capabilities are combined with a suite of standard reports to provide the ultimate in data analysis and reporting environments. Engineering Workstation Analyst is ideally suited for Manufacturing and Quality Engineers who are tasked with developing and implementing new production processes, maximizing production yields, optimizing throughput, and identifying root causes.

DATA ANALYSIS

The Data Analysis tool allows engineers to create and analyze precise sets of data that reflect an exact combination of any stored manufacturing parameter: test stations, time, part and model parameters, repair/defect type, shift, operation, and more.

- Graphically examine the resulting data set using a variety of plotting techniques
- Overlay multiple waveforms on common axes to spot variations over multiple test stations and parts
- Overlay control limit waveforms (e.g. 3-sigma envelope)
- Export the dataset for further analysis (as a CSV comma-separated-variable file)

WHAT IF ANALYSIS

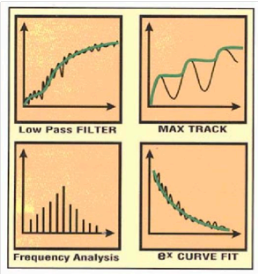
The What If Analysis function is a sequence editor that applies a series of functional steps to a dataset. A dataset consists of process signature waveforms and/or scalar data points for a specified subset of parts. Feature values can be extracted from the waveform data by applying sequences of mathematical processes or algorithms. Areas of interest can then be isolated, compared and manipulated, leading to the identification of manufacturing anomalies, which can then be eliminated by fine tuning the appropriate process control limits.

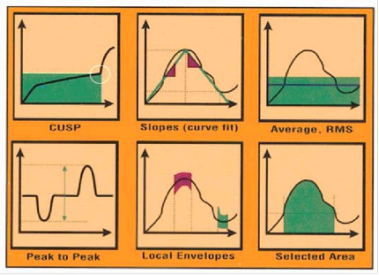
Waveform Processing Functions

Clipper
Concatenate
Derivative
Extract Waveform
FFT
High, Low or Bandpass
Integral
Kernel
Linear Filter
Max Track
Min Track
Moving Window RMS
Notch Filter
Pop Noise Filter
Remove DC
Smoother
Synchronous Filters

Waveform Feature Types

Area
Cusp
Envelope Window
Get Y at X
Knee
Kurtosis
Maximum
Mean
Median
Minimum
Number of Points
Peak to Peak
Power Sum
Rise/Fall Time
RMS
Skew
Slope
Standard Deviation
Threshold Count
Threshold Crossing
Variance





Sequence Editor Functions

Data and Waveform Calculate
Apply Signature Analysis function
Apply Process Data function
Limit Check
Conditionals and Loops: If, Else, While

STANDARD REPORTS IN ENGINEERING WORKSTATION ANALYST

In addition to the powerful analysis tools described above, the Engineering Workstation Analyst also comes with seven standard reports. The majority are shared with the Web Reporter and are described in detail in the Web Reporter section. The Real Time Status described below is unique to the Engineering Workstation Analyst, while the Trend Browser offers additional features not found in the Web Reporter.

Standard Reports

1. Part History
2. Trend Browser
3. Failure Report
4. Failure Pareto
5. Repair Traffic
6. Defect Pareto
7. Real-Time Status

Real Time Status

The Real Time Status is automatically updated at a user-controllable rate to provide real-time production trends. The Real Time Status report takes a snapshot of information in the QualityWorX database according to user-specified criteria.

- View real-time data on part pass/fail, timestamp
- Select a live part to see its part history

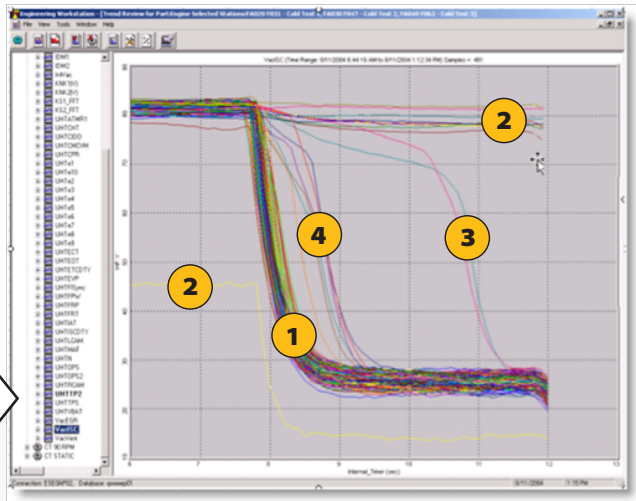
Trend Browser

While sharing the same architecture with the version found in the Web Reporter, some additional, advanced features are provided here:

- Verify statistics and compare datasets by overlaying on common graphs
- Graphically examine the resulting data set in multiple ways:
  - histogram / R-chart / X Bar / line
  - Zoom / pan / isolate and highlight data points
  - Identify serial number by clicking on a data point on the graph
- Overlay multiple waveforms on common axis to spot variations over multiple test stations and parts
  - Highlight individual trace by clicking on the serial number in the legend

This example shows process signatures from 1000 parts captured at the same test station. 4 types of signature groupings can be easily seen.

1. **Compliant:** well behaved signatures, tightly grouped and exhibiting expected characteristics.
2. **Not compliant:** These signatures clearly deviate from expected behaviour. Easily detected by most test systems.
3. **Not compliant:** in this case these are true failures that exhibit some of the desired behaviors, but still deviate from the norm. Easy to detect with process signature technology, but more difficult to catch with classical systems.
4. **Almost compliant but still failures:** subtle deviations from "normal behaviour" that would pass most tests and are only clearly visible in process signatures analyzed by QualityWorX.

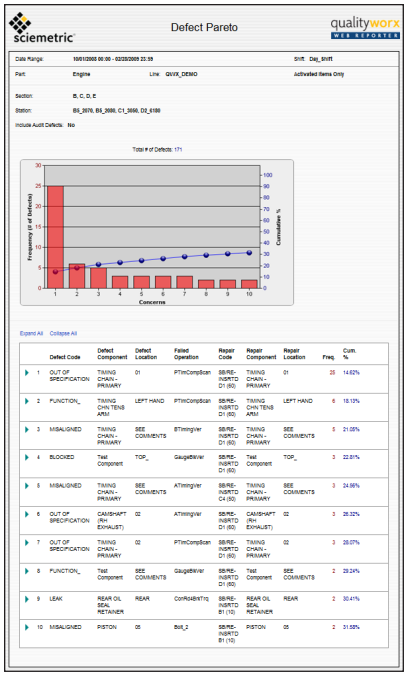


OPTIONAL COMPONENTS

REPAIR BAY MANAGER

Add the Repair Bay Manager module to the QualityWorX network to provide defect and repair management:

- Guides operators through repair process with complete access to part history record
- Suggested repair function (based on defect type)
- Stores all defect and repair information in QualityWorX database as part of birth history record, including location, component, defect type and repair type
- Provides both manual and automatic interface to the production line for entry and release from repair station
- Runs as a separate application on a sigPOD 1010 Data Node or any PC running Windows XP Pro, with a connection to the QualityWorX database



Defect Pareto

ERP BRIDGE

Add the MES / ERP Bridge option to the QualityWorX network to provide:

- Configurable, secure access to scalar data contained within the QualityWorX Data Server
- Flat table structure that dramatically simplifies access to database fields
- Exposure of live part information such as status, test results and build codes
- Data transfer simplified using auto store and removal functions

DECISION POINT

Add the Decision Point application to the QualityWorX network to provide:

- Real-time plant floor "go/no go" part management ensures that only parts that meet all pass/fail criteria are released
- Control of line flow through Field bus (PLC) and OPC handshake based on serial number
- Rules-based decision criteria that takes into account upstream pass/fail information, [sub]assembly serial numbers, date-time restrictions, and advanced rules such as excessive operation counts and feature value based limits
- Fully configurable line layout to match production line routing
- Runs as a separate application on a sigPOD 1010 Data Node or any PC running Windows XP Pro, with a connection to the QualityWorX database

PRODUCT CONFIGURATIONS

DATABASE CONFIGURATIONS

- **QualityWorX® Base**
  Five (5) connection database license for installation on a customer provided Microsoft® SQL Server 2005 or 2008 running on a 32 or 64-bit MS Windows® OS. Includes Web Reporter site license.

- **QualityWorX® Standard 10**
  Ten (10) connection database license for installation on a customer provided Microsoft® SQL Server 2005 or 2008 running on a 32 or 64-bit MS Windows® OS. Includes Web Reporter site license.

- **QualityWorX® Standard 20**
  Twenty (20) connection database license for installation on a customer provided Microsoft® SQL Server 2005 or 2008 running on a 32 or 64-bit MS Windows® OS. Includes Web Reporter site license.

- **QualityWorX® Enterprise**
  Unlimited[1] connection database license for installation on a customer provided Microsoft® SQL Server 2005 or 2008 running on a 32 or 64-bit MS Windows® OS. Includes Web Reporter site license.

- **QualityWorX® Enterprise Secondary[2]**
  Unlimited1 connection database license for installation on a customer provided Microsoft® SQL Server 2005 running on a 32-bit MS Windows® OS. Licensed for use on a Primary database feeder line.

- **Engineering Workstation Analyst Single License**
  One (1) concurrent license to connect to a QualityWorX Database and all Secondary databases on same Product Line.

- **Engineering Workstation Analyst Site License**
  Unlimited concurrent licenses to connect to a QualityWorX Database and all Secondary databases on same Product Line.

HARDWARE PACKAGES

(PRE-CONFIGURED AND READY TO GO)

- **Model 1010**
  SigPOD Data Node Platform
  - Runs data connector applications to connect 3rd party hardware to QualityWorX server
  - Compact form factor and Industrialized packaging for flexible placement on the plant floor
  - Supports up to 10 connections to a QualityWorX server
  - Includes Windows XP Pro, CPU, DVD-R/W drive

- **Model 1020**
  SigPOD Enterprise Data Node Platform
  - Runs data connector applications to connect 3rd party hardware to QualityWorX server
  - Supports 10 or more connections to a QualityWorX server
  - Includes Windows Server 2003 OS, CPU, DVD-R/W drive

- **Model 1030**
  SigPOD QualityWorX Server Platform
  - Compact, industrialized QualityWorX server package – ideal for locating on the plant floor
  - Connect directly to sigPOD via Ethernet port without the need for additional IT infrastructure
  - Pre-loaded with Windows Server OS, SQL Server and QualityWorX Base 5 Package (database cannot be upgraded beyond Base 5 Package)
  - Includes dual-core processor, dual hard drive, DVD-R/W drive

1 Total number of connections limited by server capacity and configuration.

2 A secondary database is required for each feeder line associated with the primary assembly line (e.g., head assembly, head machining, block machining etc.). One secondary database can support multiple, identical lines (e.g. three head assembly).

HARDWARE INSTALLATION REQUIREMENTS

	QualityWorX Data Server *SQL database and associated management tools*	**QualityWorX Web Reporter Server** *Web-based reporting application*	**QualityWorX Engineering Workstation Analyst** *Advanced desktop analysis and reporting software*
PROCESSOR	Min 2.4 GHz Pentium dual-core processor or equivalent Xeon 3.0 GHz processor recommended	Min 1 GHz Pentium dual-core processor or equivalent Xeon 3.0 GHz processor recommended	Pentium® 4 (or equivalent), 1.8 GHz or higher
MEMORY	4 GB min	4 GB min	–
HARD DRIVE	80 GB free hard disk space min, not including size of customer data, which depends on application. *Database drive should be RAID 1 configured for data backup.* *Note that database performance is dependent on drive seek/access times.*	1 GB of free hard disk space min	1 GB min 2 GB of free hard disk space min
REMOVABLE DRIVE	CD-ROM, Backup system (DVD/DVD RAM/ Tape): *Tape backup is highly recommended*	CD-ROM	CD-ROM
DISPLAY	SVGA (800x600)	SVGA (800x600)	XGA (1024x768)
OPERATING SYSTEM	Microsoft Windows Server 2003 or Microsoft Windows Server 2008 – 64 bit	• Microsoft Windows Server 2003 • Microsoft Windows Server 2008 – 64 bit (Recommended)	Microsoft Windows XP Pro, min SP2
ADDITIONAL SOFTWARE	Microsoft SQL 2005 Standard Edition or SQL 2008 R2 (64 bit)	• Microsoft Internet Information Server (IIS) • Microsoft .NET Framework 2.0 (or later)	–
CONNECTIVITY	Ethernet 100 Base T connection	Ethernet 100 Base T connection	Ethernet 100 Base T connection

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ABOUT SCIEMETRIC

Since 1981, Sciemetric's process monitoring and quality management systems and software have enabled some of the world's leading automotive, medical and industrial manufacturers to gain visibility into and control over their manufacturing processes. On the production floor, Process Signature Verification (PSV™) technology provides the most accurate determination of process health and part quality while collecting all data. Manufacturing managers use Sciemetric's analytic tools to transform the data into actionable information to reduce costs, manage quality, and maximize yield while providing proof of process compliance and complete line-wide traceability.

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