

Measurement Data Management

Measurement Data Network System MeasurLink®

- **MeasurLink®** is a data management modular software system that enables collecting data from a wide range of Mitutoyo measuring tools and systems including Coordinate Measuring Machines. It supports the “visualization of quality” by showing quality information important for judging the status of processes, such as control charts and process capability indexes, in an easy-to-understand way.



Note: MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

Is the inspection record data utilized to solve quality-related problems?

Measurement results printed out in the inspection room

Measurement results manually entered in a check sheet on the machining line

Hard to identify problems with only numerical data

Hard to respond quickly since it takes time to enter and analyze data. Unsure about reliability of analysis.

Current problem

- Data scattered in various locations in the plant
- Numerical data not effectively utilized
- Lack of knowledge about statistical calculations
- Management using spreadsheet software
- Problems need to be tackled by the on-site person in charge

Isn't there any quicker, simpler and more reliable management method?

SPC management can be easily done by combining Mitutoyo measuring instruments and MeasurLink®.

The SPC management can be done with MeasurLink® with a surprisingly simple procedure

MeasurLink® Real-Time

Proactive management

Process capability

Range of dispersion

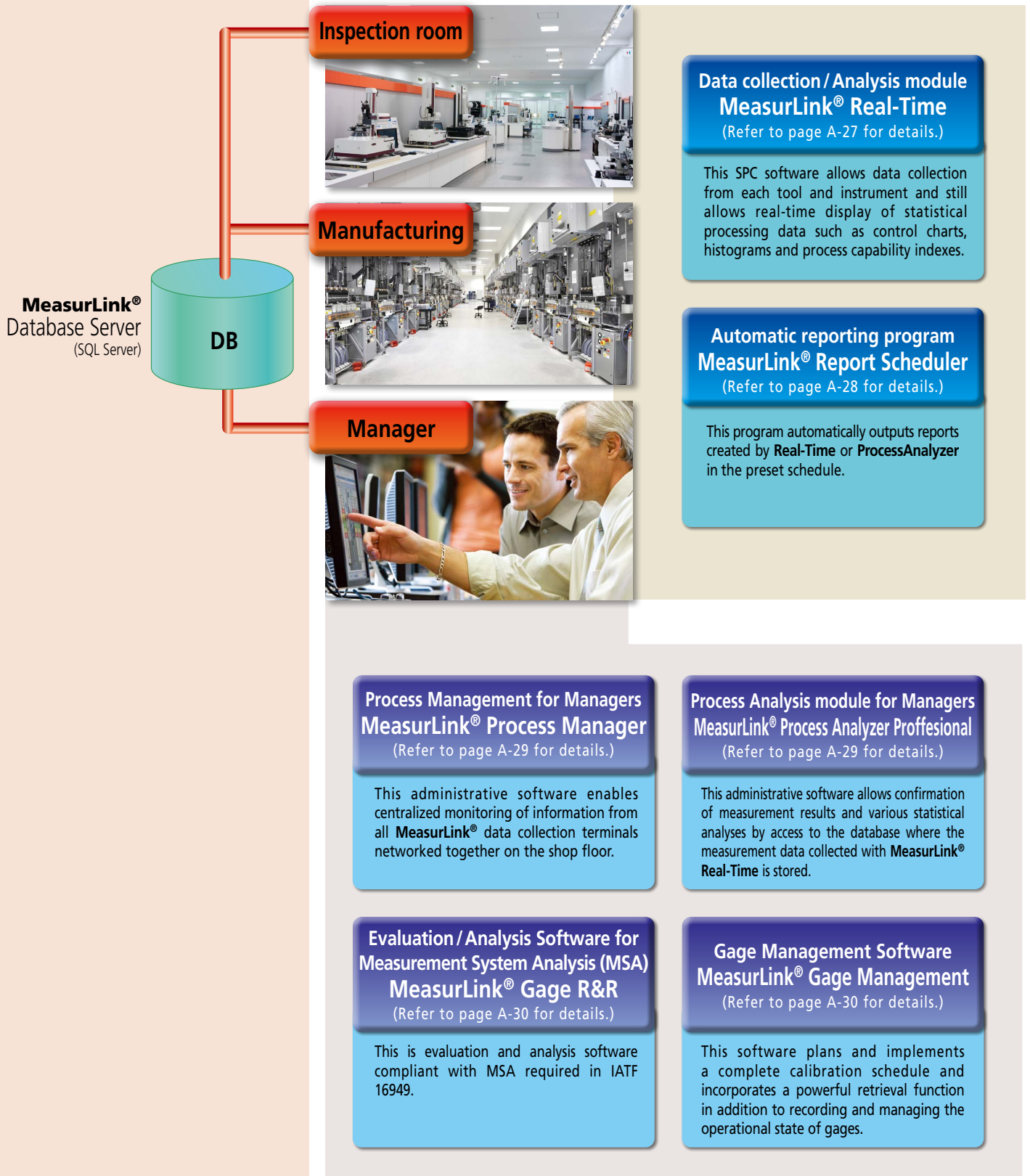
MeasurLink® is an IoT platform for quality management that realizes “Visualization of quality”.



Refer to the **MeasurLink® Brochure (E12028)** for more details.

• **Centralized monitoring from all MeasurLink® data collection terminals networked together on the shop floor**

Enables easy networking through the Database Server (SQL Server). It comprises the six software packages shown in the figure below, and allows for choosing/combining functions necessary for the purpose, such as “data collection” in the inspection room or on the shop floor, or “process monitoring/analysis” by the manager.



Measurement Data Management

MeasurLink® Data Collection/Analysis Software

Real-Time Standard (RT Std)

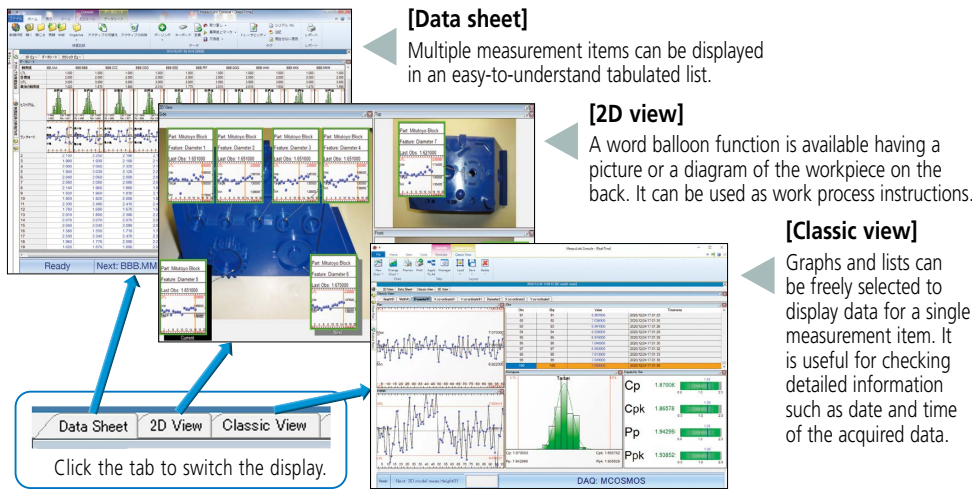
Real-Time Professional (RT Pro)

Real-Time Professional 3D (RT Pro 3D)

Real-Time is the Statistical Process Control (SPC) MeasurLink® module that collects data from Mitutoyo and third-party measuring devices and systems to provide analysis functionality in real-time by displaying control charts or process capability indexes.

• Various data views

Collected data can be displayed in various views, such as data lists, work instruction images, statistical analysis results, etc. The views can be switched easily according to the needs of the operator.



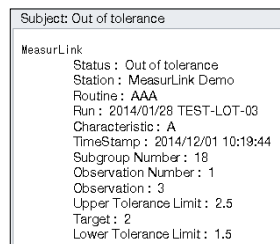
• Adding traceability information

Traceability information for each workpiece can be added, for example, serial no., lot no., inspector name, machine no., or cause of problems and remedies. Traceability will also support Barcode scanners for easy error free entry. This information can be used as search criteria when extracting data using the filtering function (RT Pro/RT Pro 3D) when a problem occurs.

• Alarm function

The operator and management are notified when an "Out of Tolerance" or other events occur.

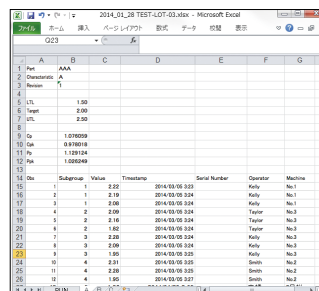
The method of notification can be selected from a pop-up window, E-mail (Fig. 1), audible alarm or log file.



(Fig. 1) Alarm notification by E-mail

• Exporting data to an Excel file

Measurement data can output to an Excel file. This function is useful if the data needs to be used in a department that does not have MeasurLink®. (Fig. 2)



(Fig. 2) Export to Excel

RT Std/RT Pro/RT Pro 3D Common Functions

- Connectable measuring instruments
- Measuring tool with Digimatic output (equipped with PC data processing unit)
- [Supported interfaces]
 - Wireless (USB) **U-WAVE** (VCP)
 - Wired (USB) **IT-020U/USB-ITN** (VCP or HID)
 - Wireless (D-sub 9 pin) **IT-007R, MUX-10F, DP-1VA LOGGER**, and others
 - Various RS-232C devices (partially restricted)

- Screen display mode when collecting data
 - Classic view
 - Data sheet
 - 2D view
 - Part data sheet, etc.
- Statistical Analysis result [Chart]
 - Xbar-R, Xbar-S, X-Rs control charts, Histogram, Run chart, Pre-control chart, Tier chart, Box plot chart, Meter chart, Indicator bar, Multivariate data control chart, etc.

[Statistics]
Maximum value, Minimum value, Standard deviation, Average $\pm 3\sigma/4\sigma/6\sigma$, Process capability indexes (Cp, Cpk, Pp, Ppk), Defect ratio, etc.

- Alarm function
- [Target items]
 - Out of tolerance
 - 1 point exceeds control limit line (following are related to management chart)
 - Consecutive 9 points on one side of center line
 - 6 points successively increasing or decreasing
 - Others including 8 judgment criteria for Shewhart control chart
- Adding traceability information
 - Measurement date (automatically added)
 - Serial No. (Keyboard entry)
 - Special causes and remedies
 - Selection from comment list registered as an option
 - Enter from keyboard when measuring classified title registered as an option (e.g. Lot No. LOT 001)
- Report print out function
 - Measurement values, analysis calculation results and various charts can be arranged to output according to requirements.

- Export function of measurement results
 - Excel
 - Text
 - QIF
 - AQDEF
- Security function
 - Once the access authorization is set, it requires "User name" and "Password" input before the program will start. Data editing actions such as reference, entry and changes require authorization according to the user's role in order to preserve data integrity.
- Operation languages
 - 19 languages are supported: English, Japanese, French, German, Dutch, Spanish, Swedish, Polish, Italian, Turkish, Korean, Chinese (simplified/traditional), Thai, Hungarian, Czech, Finnish, Portuguese, Russian

Events possible to be logged

- Measurement data
- Retake/modify data
- Failed data tests
- Assignable Cause and Corrective Action

MeasurLink® System Requirements

- Operating environments
[Operating System]
Microsoft Windows 7 (32-bit/64-bit)
Microsoft Windows 7 SP1
Microsoft Windows 8.1 (32-bit/64-bit)
(Microsoft Windows 8.1 RT is not supported)
Windows 10 (32-bit/64-bit)
(Windows 10 Mobile and IoT editions are not supported)
[Database]
Microsoft SQL Server 2017 Standard/Enterprise Edition
Microsoft SQL Server 2016 Standard/Enterprise Edition
Microsoft SQL Server 2014 Standard/Business Intelligence/Enterprise Edition
SQL 2019 Standard/Enterprise

RT Pro/RT Pro 3D Common Functions

- Connectable measuring instrument
· Mitutoyo Measurement Data Management System (equipped with PC data processing unit)
[Supported data processing software]
· CMM: **MCOSMOS V3.2** or later
· Vision System: **QVPAK V10.0** or later/**QSPAK V10.2** or later/**QSPAK MSE V3.1** or later/**QIPAK V4.1** or later
· Vision unit: **QVPAK VUE V4.1** or later
· Surface Roughness/contour instruments:
FORMTRACEPAK V5.311 or later
· Roundness instruments: **ROUNDPAK V7.0** or later
· Hardness testing machines: **AVPAK V2.0** or later
- Filter function
- Keyword items for data extraction
· Measurement data (year, month, day, time, week, etc.)
· Serial No.
· Traceability information (e.g. Inspectors, Machine No., etc.)
· Alarm item
- Import function for text data
A custom import template can be built to collect data in **Real-Time Pro/Pro 3D**. MeasurLink® supports ASCII file types such as CSV and TXT with minimum required information (e.g. part name, characteristic name and measurement values, etc.) In addition, MeasurLink® supports QIF, AQDEF, and QMD file types.

RT Pro 3D functions

- Screen display mode when collecting data
- 3D view

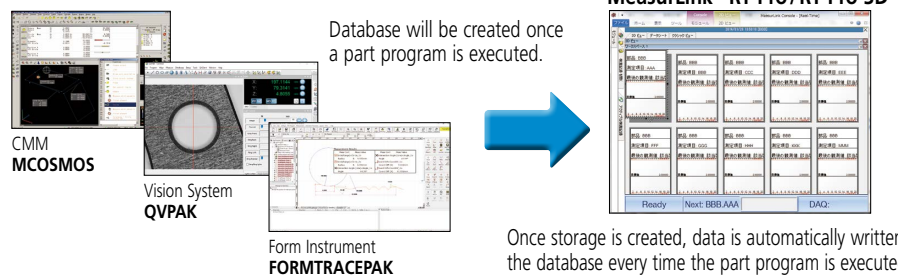
Functions		Data collection software		
		Real-Time Standard	Real-Time Professional	Real-Time Professional 3D
Collected data display	Classic view	✓	✓	✓
	Data sheet	✓	✓	✓
	2D view	✓	✓	✓
	3D view (Hoops)			✓
Data extract	Filter		✓	✓
Input from tools and devices	Measuring tools (RS-232C, USB)	✓	✓	✓
	Measuring instruments (DDE)		✓	✓
Text input	Import		✓	✓

Table 1 Data collection/analysis software **Real-Time** functional comparison

- **RT Pro/RT Pro 3D** enables customers to connect and acquire data from Mitutoyo coordinate measuring machines, vision and form measuring systems via native integration (DDE).

• Automatic linking with part programs

To automate the process of linking the CMM, Vision or Form system with MeasurLink®, some easy setup is needed on the device and in MeasurLink®. Then, when the part program is executed, the measurement system will send the part and measurement information to MeasurLink®, along with any tagged data related to the measurement. A new run can be created in **Real-Time Pro/Pro 3D**, or the data can be added to an existing run. The charts and statistics will continuously update and be displayed in the view.



• Filtering function

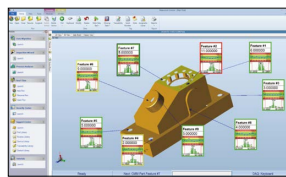
Required data can be easily extracted based on the date and time of the measurement, added comments, or alarms.

• Import function

Measurement data saved in ASCII files can be loaded. Also, a feature to customize a template for loading according to the format is provided.

• RT Pro 3D is a full-spec package

The feature to be measured can be displayed in detail using 3D CAD data.



[3D view]

3D graphics library HOOPS displays real view of the workpiece using an hsf file created from 3D CAD data. The displayed workpiece image can be freely turned, translated, or scaled so that you can get a clear view of the feature to be measured.

The word balloons and lead lines that display the measurement result and measured feature will move following the CAD data translation.

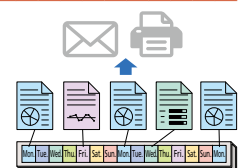
MeasurLink® Automatic Report Generation Program MeasurLink® Report Scheduler

Automatically generates a report created by the **Real-Time (RT Std/RT Pro/RT Pro 3D)** or **Process Analyzer Professional** modules, each of which is connected to the network according to a specified schedule.

The Use of MeasurLink® Report Scheduler

• Typical applications

- Automatic generation of a weekly report specified from among last week's data.
- Automatic report generation by extracting only data with tag information about "tool replacement" (due to wear, breakage, etc.)
- Automatic generation of a daily report for each shift by filtering inspection record data on the basis of a shift



MeasurLink® Report Scheduler common functions

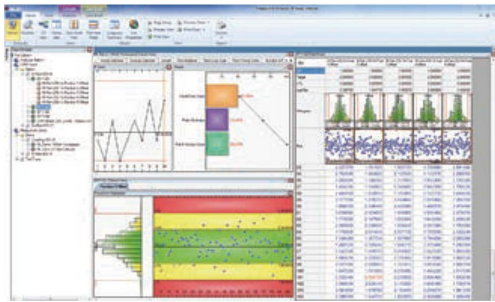
• Report output destinations

- Printer, file, E-mail (as an attached document)

Measurement Data Management

MeasurLink® Optional Process Analysis Software for Managers Process Analyzer Professional

Analyze data collected on all networked Real-Time stations to identify problem areas, take corrective action, and improve the quality of your product. Inspection data can be merged, filtered, charted and printed to identify long-term trends and identify root causes for process improvement.

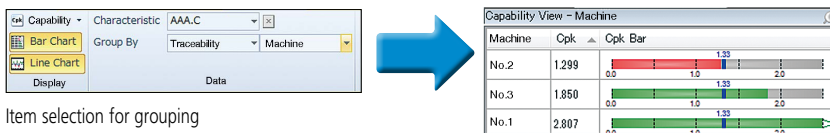


The same data displayable by data collection software can be displayed, including measurement results, charts, and statistical calculation results with the look and feel of Windows Explorer.

- Filtering function that allows data extraction and grouping

Data can be extracted or grouped by selecting the date and time and other traceability information as keywords.

Example) Grouping by Machine No. Cp, Cpk comparison



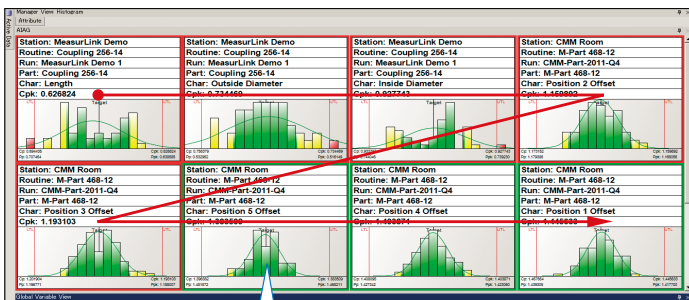
Cpk value and bar graph per machine

MeasurLink® Process Management for Managers Process Manager

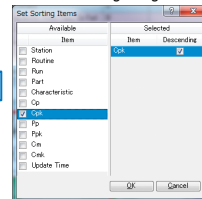
Monitor data as it is collected in Real-Time. **Process Manager** provides managers with the perfect tool to organize and maintain a shop-wide quality program at a glance. Display snapshot windows of characteristics that are currently being collected in MeasurLink® Real-Time. The data can be sorted by inspection station, capability or timestamp. Easily see process information without walking from one inspection area to another by viewing current production across all machines. Show clients your quality operation for the entire facility.

- **Manager View**

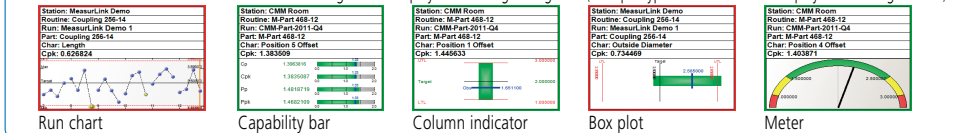
Displays various types of charts as an at-a-glance guide. The manager can narrow down all items of data currently being measured into a specific monitoring range of those of critical importance or sort those data (in ascending or descending order) on the basis of process capability index.



Possible to sort charts in the view and narrow down the monitoring range.



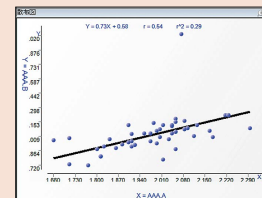
Selects various charts such as run charts and histograms to display as an at-a-glance guide. (Multiple types of charts can be displayed in Manager View.)



PA Pro Functions

- Result display
 - Classic view
 - Data sheet
 - 2D view
 - Part data sheet, etc.
- Statistical Analysis result [Chart]
 - Xbar-R, Xbar-S, X-Rs control charts, Histogram, Run chart, Pre-control chart, Tear chart, Box plot chart, Meter chart, Indicator bar, multivariate data control chart, etc.
- [Statistics]
 - Maximum value, Minimum value, Standard deviation, Average $\pm 3\sigma/4\sigma/6\sigma$, Process capability indexes (Cp, Cpk, Pp, Ppk), Defect ratio, etc.
- Report print out function
 - Measurement values, analysis calculation results and various charts can be arranged to output according to requirements.
- Exporting function of measurement result
 - Excel

Scatter plots: The relationship between two items can be plotted.



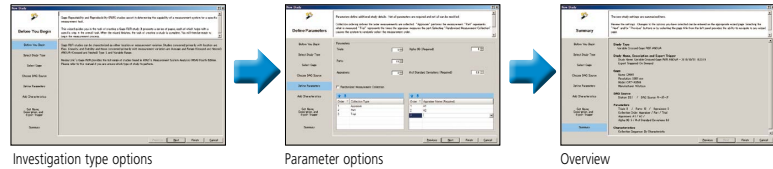
- Filter function
 - Keyword items for data extraction
 - Measurement data (year, month, day, time, week, etc.)
 - Serial No.
 - Traceability information (e.g. Inspectors, Machine No., etc.)
 - Alarm item
- Data processing
 - Data file merging, Copying
 - Editing
- Data processing capability
 - Old runs can be archived so they are not available for collection in Real-Time.
- Electronic signature function
 - Provides support for medical and pharmaceutical manufacturers electronic records, including audit trails, e-signatures and advanced security.
 - Conforms to FDA 21CFR Part 11

MeasurLink® Evaluation/Analysis Software for Measurement System Analysis (MSA) Gage R&R

Gage R&R is a collection of techniques whose purpose is to measure the capability of a measurement system for a measurement task. Gage R&R techniques provide information about a measurement system's reproducibility, R&R, location or stability. Graphical tools allow for isolation of gaging problems including inconsistencies in technique between operators or inspectors.

• Automatic calculation of MSA evaluation results

This allows the operator to simply input an evaluation method/evaluation condition and measurement data with the Wizard function. The operator can implement MSA evaluation simply by selecting an "investigation type option", "Measuring instrument option", "data input source option", "parameter option", etc.



• Evaluation method compliant with MSA (fourth edition)

The software can implement evaluation using the following methods compliant with MSA (Measurement System Analysis).

- 1) Measurement value tolerance Gage R&R variance analysis method
- 2) Measurement value tolerance Gage R&R range & average method
- 3) Measurement value branching Gage R&R variance analysis method
- 4) Measurement value branching Gage R&R average & range method
- 5) Measurement value range method
- 6) Measurement value simplified method
- 7) Measurement value MSA4
- 8) Deviation
- 9) Linearity
- 10) Stability

• Registration of gage-specific information

1. Registration of information on gages within the system

This allows registration of gage information on the following items and association with evaluated results.

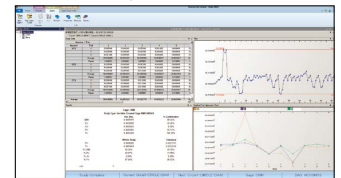
Registration items: Gage name, maker, model, resolution, unit, measuring range, etc.

2. Information link between MeasurLink® Gage Management and this software

This software can use measuring instruments information that has been registered in **Gage Management** directly as options. Additionally, since Gage R&R evaluation results are also linked with measuring instruments information, the schedule of Gage R&R expiry dates can be managed by **Gage Management**.

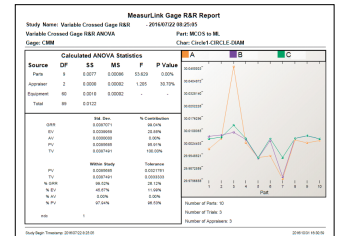
• Analysis chart view

Various charts such as the control chart are effective for analysis/judgment on variations due to operator, the adequacy of gage accuracy, etc., and remedies for problems.



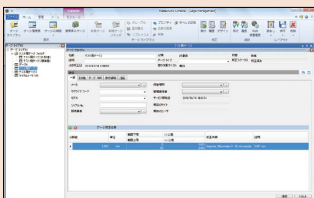
• Output of results as a report

Evaluated results and charts can be printed as a report.

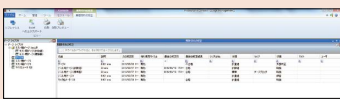


• Confirmation of detailed gage information

Allows confirmation of detailed information on individual gages. The software allows you to display a list of gages depending on "Calibration Overdue", "Next Month Due", etc., by setting a calibration date and confirm detailed information on the calibration history of gages.



Display of detailed gage information



Display of gages listed depending on calibration date



Display of calibration history

MeasurLink® Gage Management Software Gage Management

This software can help you plan and implement a reliable calibration schedule with a powerful retrieval function in addition to recording and controlling the status of measuring instruments. It enables simple recording of measuring instruments usage state (operation, storage, calibration, Gage R&R, repair and out-of-service) to speedily understand the current location and status of all measuring instruments. Measuring instrument information can be viewed from any networked terminal on which **Gage Management** is installed since the information is centrally managed in a database. Measuring instruments information can be shared between software packages linked to **Gage R&R**.

• Creation of a list of calibration-targeted gages from the gage management table

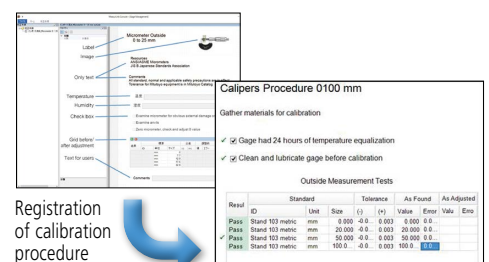
The target gages are retrieved from a variety of search items such as gage ID, gage type, model, maker, distributor, calibration date, current usage state and location to create the list.



Gage management table

• Registration and running a calibration procedure

Allows simple registration of the calibration procedure for each measuring instruments and implementation of the calibration.



Registration of calibration procedure

Calibration run